RelMo 2008^{SP1}

Forensic Mapping and Animation Software

User Manual
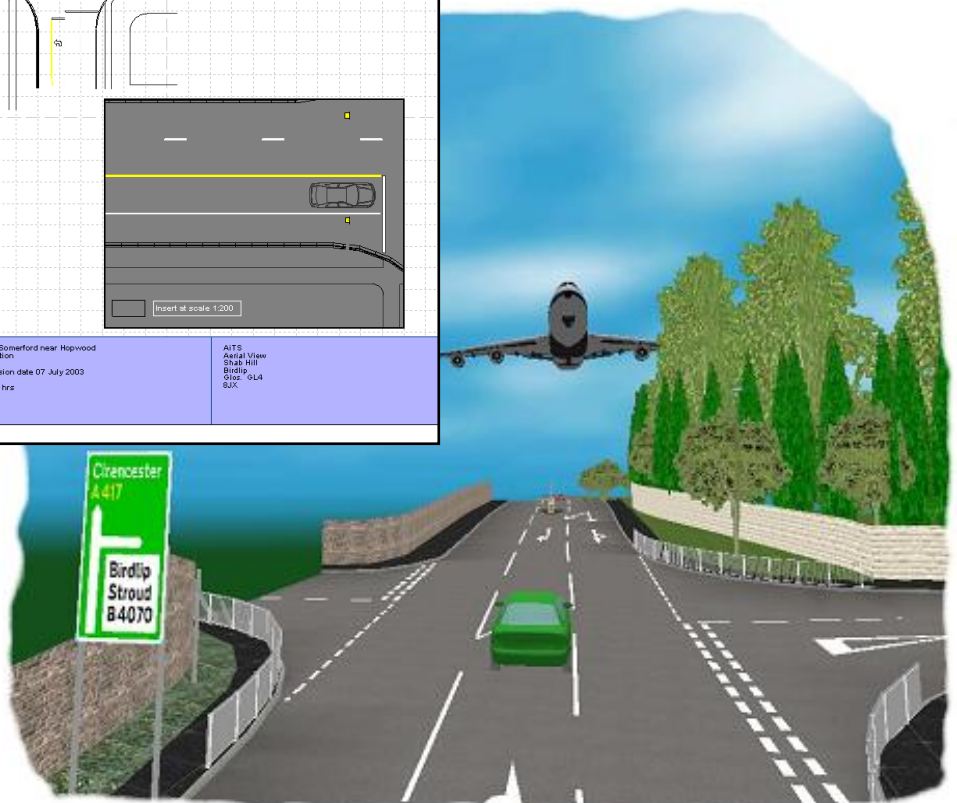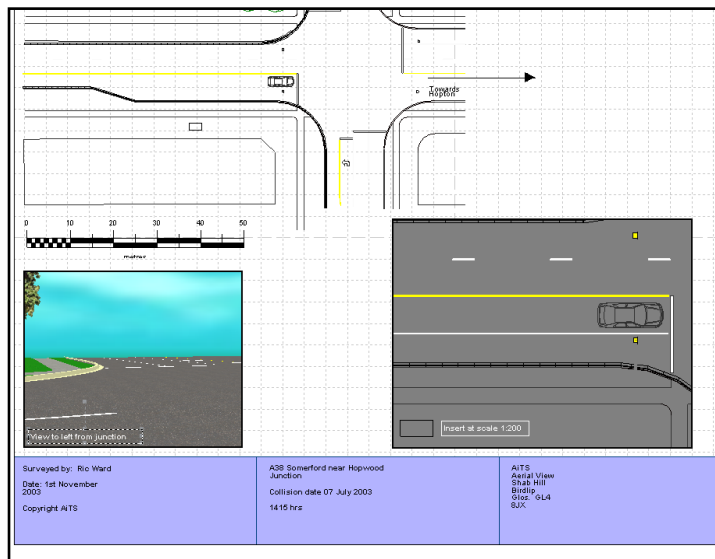
aits training

For RelMo 2008 (SP1)

Price £50.00

Table of contents

Description and System requirements

Description

RelMo is an object based digital terrain mapping program that allows the user to download data directly from some electronic distance measuring equipment. For users of other software, RelMo can import files using a number of data formats including DXF and XYZ files. You can also export from RelMo in either XYZ or DXF format. The program also has CAD functionality allowing surveys and plans to be edited or built from scratch.

RelMo comes with a Codes Library covering many useful point and line styles. The Codes Library can be edited to customise the codes to match the ones you are used to or, build new codes.

There is a fully functional query menu which allows the user to interrogate distances, radii and angles both in 2 and 3D. The analysis menu allows the user to create grids, contours, slope graphs, visibility plots and cross sections. Dimensioning tools allow 2D plans to be annotated with distances in either imperial or metric units.

3D views can be created by growing panels rendered with images and by using complex line and point styles which as well as having 2D symbols also have 3D shape.

You can move around the model in either 2 or 3D view. The movement can be 'free' or you can add animation to objects to show specific movement. There is no physical limit to the number of objects that can move. Animation can be played back in real time.

A RelMo Viewer is provided on the CD free of charge. You may distribute this viewer to as many people as you wish. Once in Viewer format, animation may be viewed but not altered. RelMo files have the file extension .rlm, Viewer files have the extension .rlv. In addition, RelMo 2008 allows the user to create Windows AVI files to play on other computers or for later conversion (using third party software) to DVD format.

Plan plotting is achieved using layout pages which have real CAD functionality allowing the user to add 2D plans, 3D images, and other images such as photographs, text, lines and other drawing objects.

In short RelMo is a 'one stop shop' for 2D plan drawing, 3D imaging, and animation.

Minimum system requirements
The system requirements are different for 2D and 3D use of the software.

The program is designed to work under Windows 2000®, Windows XP® and Windows Vista®.

Minimum 2D requirements
Pentium® 1.5GH minimum
Graphics card with at least128Mb of RAM.
500Mb RAM
Wheelie mouse

Minimum 3D Requirements
Pentium 2.5GH minimum
Graphics card with at least 256Mb of RAM (512Mb recommended).[1]
1Gb RAM 2Gb recomended
CD or DVD writer
Wheelie mouse

Plotting requirements
Windows® printer or plotter (pen plotters are not supported)
Networking and shared printers - The printer drivers should be installed on the computer(s) operating RelMo.

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[1] Not all graphics cards support hardware shadowing. If you intend to use shadows and multiple lights, please check the RelMo website to find a suitable card

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Installation Networking and Management

Security

RelMo is licensed to the user on a year by year basis. The annual licence fee gives you access to updates, fixes and, telephone support. On each anniversary of purchase the software will shut down unless an update code is obtained from the supplier. To protect the software RelMo uses a hardware key and encryption software. If you decide not to renew an annual licence, you will still be able to view any saved work using the RelMo Viewer but, you will not be able make any alterations to a job. If you do decide to end your licensing agreement, we would suggest that you export all your archived work as DXF files which can then be imported into other software. Lighting and animation will not be exported in DXF format. It is however supported in XYZ format.

Our XYZ format is made public thus manufacturers of other systems who wish to export to RelMo or, import from RelMo, can do so by obtaining the documentation and writing the relevant import or export routine for their own software.

The program is supplied deactivated. Once you have installed the software you will need to call *AiTS* for your activation codes.

Note - If you are installing over an older version of the software, always back up your jobs, Codes and Template libraries before installation.

Two types of hardware key are available, either a USB key for standalone computers or a USB network key for computers that are networked.

Using a hardware key conveys significant advantages to users. The user and company names together with the licence number are stored on the key itself, along with the products you are entitled to use and the expiry date. The key allows you to install the software on any number of machines and simply move the key itself from machine to machine when you want to use another computer.

Installing Your Software

Do not insert USB Hardware keys until you have installed the software. Insert the CD which should auto run. Two sets of programs will be installed, the RelMo software package and the Deskey hardware key drivers.

By default, the AiTS software will be loaded into the folder C:\Program Files\AiTS. You can change this folder during the installation process. You will need to restart your computer following installation.

Activation on first use

When you first receive your hardware key, it will have been supplied to you in an 'inactive' state. This means that until you contact us to obtain an activation code, it will not allow you to use any of the software.

To obtain an activation code, start Licence Manager and select the Update button. Note down the code that the program generates and also your licence number. Contact us by phone or email with your licence number and current code and we will provide an activation code. Type this into the relevant space in the Licence Manager update dialog exactly as given, press Okay and your key should be activated.

Activation on anniversary

Your licence will expire on each anniversary date. Each time you start RelMo within 30 days of the expiry date, you will be warned that the software is about to expire. Follow the same procedure in the paragraph above.

Note - You should never attempt to guess an update code and enter this into Licence Manager. Each wrong attempt will cause a counter to decrease which will eventually lead to the key shutting down. If a key does shut down it will have to be returned to us. A fee to unlock the key will be charged.

Stand alone use

The majority of users are likely to operate our software on a stand alone machine, in other words a computer to which the key can be physically attached. This is the simplest type of installation to consider. Just install the software on your computer using the installation CD and select the option to install Local Drivers when prompted to choose by the installation program. The setup program will install all the necessary programs and then install the drivers for the hardware key itself.

Re-boot the computer, if prompted to do so and attach the key. When the machine restarts the computer should detect the key and allow you to activate it as described above.

Network use

Although each hardware key is network aware, you are limited in use not only to the number of programs currently licensed to you, but also to the number of process licences held on the key itself. For non-network specific keys this number is one, which means that if someone is using the licence, no-one else will be able to start the program. If you want to operate over a network we can supply keys which have sufficient process licences to enable access to multiple copies of the program concurrently.

Network installation is slightly more complicated, even if in reality it is not much more difficult to implement. First and foremost you should decide which computer on your network is to be the nominated server machine. This chosen machine must be visible to the other (client) computers that will connect to it.

If you want to run programs on the server machine, you need to install the software to this computer as usual using the installation CD. Choose 'Network Drivers' when prompted by the setup program. You should select the 'Start Service on System Start' if this option is presented to you during installation. Re-boot if necessary, attach the hardware key and you should then be able to activate the key as described earlier.

If you don't want to install anything other than the server drivers to the server computer, you can browse to the 'setup.exe' file in the DES folder on the CD. Launching this program only installs the DESNet server drivers. Note however that you will not be able to activate the key from this machine, since Licence Manager will not be installed. You will have to activate the key over the network, using the Licence Manager on another machine.

On the client computers you should install the normal programme files software and choose 'Local Drivers' when prompted during the setup process in exactly the same way as described in the Stand alone section above. Once installed however, you need to 'point' the client computer to use the key attached to the server machine. From Control Panel launch the DESKey icon (DES are the manufacturers of the keys we use). Make

sure the 'Enable DK2 Network Access' option is checked and then click the 'Networking' tab. You can then browse through the network to the server computer using the 'Add' button. You will also need to do this should you move the key to another computer for any reason.

File locations
Users will periodically need to access and amend the following files on a regular basis;
   The Codes survey
   The Templates library
   The Textures library.

By default these are installed in the following locations:

Windows 2000/XP
   …Program Files/aits/surveys/templates,
   …Program Files/aits/bin/Codes and
   …Program Files/aits/textures

Windows Vista
   Documents and Settings/all users/application data/aits/relmo

Where network administrators restrict users access to the C drive (or the drive where the program file is installed), they will need to relocate these files to an area on the machine that the user can access.

A new folder such as RelMo Resources can be created with sub folders such as Codes, Templates and Textures into which the appropriate files can be located. It is suggested that these folders are not located remotely unless your network is high speed as the files are in some cases quite large.

Once relocated you will need to point RelMo to the location of these files (see page 40).

Care of the Hardware Key

The Hardware key is an item of electronic equipment and as such should be protected from moisture, extremes of heat and cold and stored securely when not in use. You should not attempt to dismantle it as you are highly likely to damage the internal electronic components.

Loss or damage

Please take care of the key and guard against damage, loss or theft. Although we will replace defective keys free of charge, we will make a charge for keys that have been lost or damaged. In the case of a network key, this cost will not be limited to the cost of a new hardware key, but will also include the value of any unused licence(s) on that key.

Program Updates

Service packs

From time to time we release service packs between major version changes. These service packs are normally notified by email, and are available for downloading from the RelMo website at www.relmo.co.uk.

You annual licence fee entitles you to receive these updates and also any major releases for as long as you pay the fee. Major version changes are forwarded on a CD.

Additional resources

New RelMo resources, such as line style, point codes and new objects often appear on the RelMo website at www.relmo.co.uk. Some of these are free and some attract a fee.

We can also build additional Objects for you using our 3D digitising technology. Please contact us for details.

The RelMo Environment
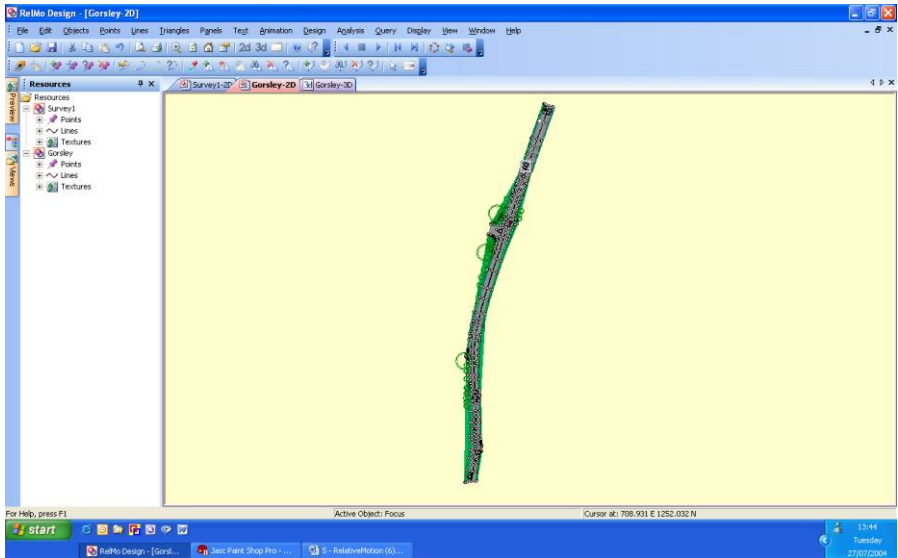
General

There are two main windows in the RelMo environment. The left hand window called the Control Bar gives access to commonly used items such as Objects, Templates, Resources and Views. The main screen on the right is the editing screen.

Control Bars

You can choose to show or hide the Control Bars. From the View menu select Control Bars and check those that you wish to display. By default they will appear on the left side of the screen as small icons. If you move your mouse close to one of the icons, the relevant Control Bar will expand. If you move away from the Control Bar it will return to a small icon.

To permanently display a Control Bar or Control Bars, when they are expanded click on the small pushpin in the top right corner. When the pin points down the Control Bar is locked, when it is horizontal, the Control Bar will auto hide when the mouse is moved away.
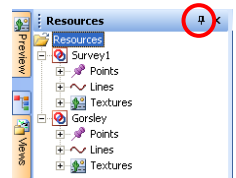
Each Control Bar can be resized by dragging the top or sides of the frame. They can also be undocked and moved. To move a Control Bar use the mouse to drag the blue top bar. Note that an outline shows what will happen when you drop the Control Bar. Examples are shown below.
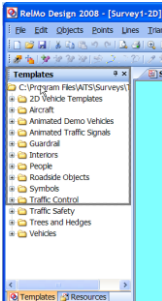
The Control Bar will be docked above templates
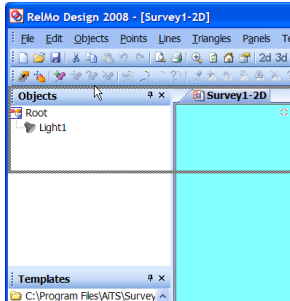
The Control Bar will be docked below the Button Bars
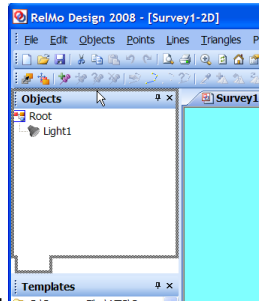
The Control Bar will be docked in Objects as a Tab

To reset the Control Bars, from the View menu select Control Bars, Reset Control Bars.

Note – From RelMo 2008 Service Pack One, Control Bars will work whilst undocked.
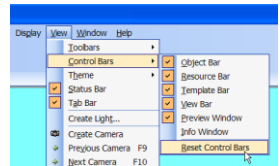
Toolbars

Each toolbar can be customised to show the buttons that you use most frequently. To customise a toolbar click on the small downward arrow at the end of the toolbar, click on the toolbar you wish to customise and the check or uncheck the buttons you want to display.

To add buttons that do not form part of that toolbar click on Customise and drag the buttons onto the toolbar.

Toolbars are customised on a per-user basis, if several people use a computer, when they log on, that user's toolbars will be loaded.
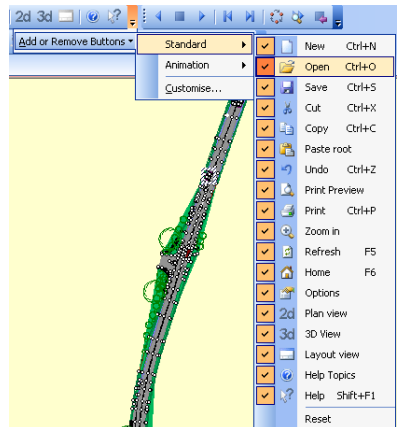
You can choose which toolbars to display by right mouse clicking on the area to the right of the existing toolbars. Check or uncheck the appropriate toolbar.
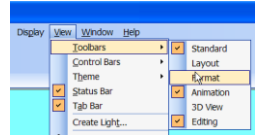
Moving between views and surveys
If you have several surveys open or, different views such as 2D and 3D, you can swap between them by clicking on the tabs that appear at the top left of the screen.

If you have several views open, the tabs may extend right beyond the extent of the screen. In this case use the small left and right arrows to scroll the tabs into view.

Selecting commands
As well as using the toolbar buttons, the majority of the commands can be reached by use of the right mouse button. The menus change depending on the command you are in.
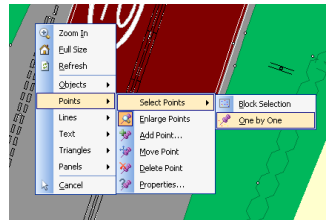
Feedback
Feedback appears at the bottom of the screen towards the centre. The feedback depends on what on the current mode for example, in 2D it will tell you the name of the current Active Object, when measuring distance however, the distance and change in height is displayed. In the example below, the user has selected a number of points.

For Help, press F1   Mode: Select points by block or individually (7 selected)
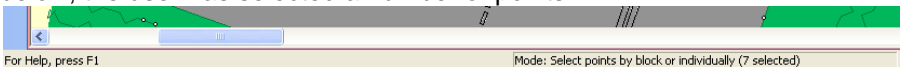
Feedback on the cursors current position is displayed in 2D towards the right hand side of the screen.

Shortcut commands

Control + Z   Undo
Control + C   Copy
Control + V   Paste

F1   Help
F2   Set scale (2D view)
F2   Fly (3D view)
F3   Go to location, easting, northing and height
F4   Fly speed increments (3D view)
F5   Refreshes the screen
F6   Full size (2D view)
F6   Home (3D view)[1]
F7
F8
F9   Previous camera (3D)
F10   Next camera (3D)
F11   Full screen mode (3D)

1 – Home in 3D is a position 100 metres above the centre of the survey.

Moving and zooming in and out
(2D)
In 2D view hold the cursor over the area you wish to zoom in on, use the wheel of the mouse to zoom in and out. Follow the point you wish to zoom in on until it gets to the centre of the screen at which point it will remain there until you meet maximum zoom. Reversing the direction of the mouse will move out.

As well as using the wheelie mouse, you can zoom in, or show full screen by clicking on the Zoom in button 🔍. Having clicked on the zoom in button, drag a box around the area you wish to display by keeping the left mouse button depressed (the box appears from the centre of the magnifying glass).
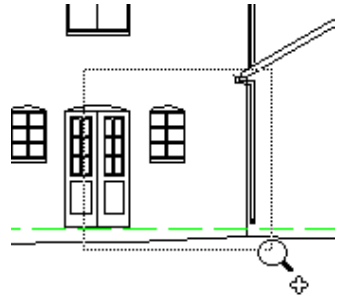
F6 or clicking the home button 🏠 will return you to full screen view.

You can pan across the survey in 2D view.
This feature only works if you are not in an editing mode that also uses the shift key (such as rotate object). Hold down the shift key and with the left mouse button depressed drag the survey across the screen.

(3D)
Use the wheel on the wheelie mouse to zoom in and out. Holding down the Control key will increase the rate at which you zoom in.

Shift and left mouse or, button A to the right, allows you to drag the survey about the screen.
Control and left mouse or, button B to the right, moves you about the centre of the survey.
Left mouse only or, button C to the right, rotates the survey about your eye.
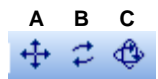
Flying in 3D

You can fly around the scene in 3D

F2	Fly or stop flying
F4	Set Fly speed increments
Control + A	Speed up in increments
Control + Z	Slow down in increments (you can use this command to stop)
ESC	Escape from Fly mode
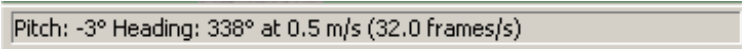
You can control your heading and pitch using either the arrow keys or the mouse with the left mouse button depressed. Whilst flying, you are given feedback at the bottom of the screen. This includes, Pitch (where a negative figure is down), Heading in degrees, Speed in metres per second and the Frame rate in frames per second.

Pitch: -3° Heading: 338° at 0.5 m/s (32.0 frames/s)

If you get lost whilst in free flight, use Esc to stop flying and click on the home button .

General principles

Whether you are downloading a survey from electronic distance measuring equipment, importing a survey from another piece of software or, creating a survey from scratch, the principle way in which RelMo works is the same.

This section describes the general principles behind the way in which RelMo works and, for users who have been used to CAD, demonstrates the difference between CAD and Digital Terrain Models (DTM's).

Unlike CAD, in which lines are the all important feature and, the nodes at the end of each line are simply used to join it to another line, in RelMo the points (or nodes) are more important than the lines. Each point knows its easting, northing and its height and therefore knows where it exists in space. Lines are then used to join the points together. Both points and lines can be coded. These codes are recognised by RelMo and the appropriate point or line style is then applied to the point or line. For example a point that contains a code PTREE will, when imported, create a 2D symbol of a tree around the point. Similarly, two points joined by the code WL will produce a 2D symbol of a wall. This is shown in the diagram below to the left. In addition, when viewed in 3D, the PTREE code will place a picture of a tree on the point and the WL code will produce a wall rendered with a bitmap, (the diagram below to the right).
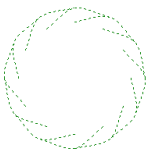
2D drawing   *3D image*

For users of electronic distance measuring equipment this means that, as each point is imported, it is automatically placed in its correct position in space and, where a line style has been defined by the user, the points are automatically joined together with the correct line style.

For those who import a job from another piece of software, the story is similar. Again as each point is imported it is placed in its correct position in space and, where a line style has been defined by the user, the points are automatically joined together with the correct line style. It is worth pointing

out here that not all software will output line and point styles. For example DXF files only output lines, their colour and thickness. An XYZ file however will output styles in the form of a code thus RelMo can assign the correct style to the code. The difference is shown below.
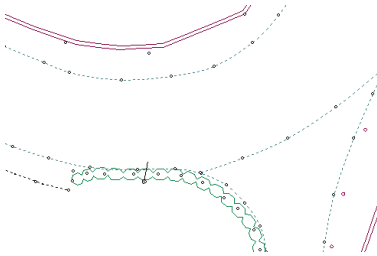
Data downloaded from electronic distance measuring equipment or an imported XYZ file which stores full code information.
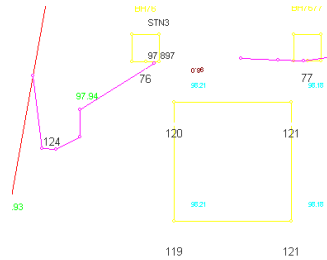
A DXF file which only imports lines, their colour and thickness

For users who wish to create or design jobs from scratch or from manually recorded measurements all points, (unless a specific height is manually entered), will be created at a default height and a 'flat earth' survey will be produced much like many 2D CAD systems. RelMo contains a host of tools to assist you to manually create a survey.
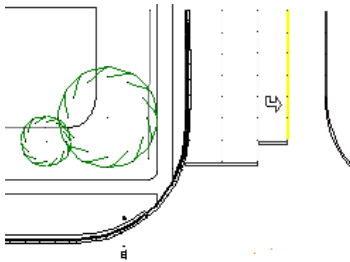
An example of a manually created survey

The next stage is to edit your data in the software. Not many of us import a perfect job and therefore some form of editing will be necessary! This is where the difference between CAD and DTM's becomes large.

In CAD, you are unlikely to worry about the height of any points, the eventual aim being to create a 2D plan of an area. If you never interrogate the job to measure distances or if the area was almost level, the lack of any height data has little significance. However if the area was on a slope, then height does matter as the distances to be measured are likely to be those along the slope rather than the horizontal distances. This is where a DTM comes into its own.

Having imported or download the job and, after correcting any line styles, the DTM is triangulated. This process creates triangles between all the points and thus creates a surface onto which extra points can be added. The advantage of this triangulation process is that new points will land on the surface at the correct interpolated height between existing points. This means that any interrogation of distances etc taken from the model will be more accurate.

Now the user has a choice. If 2D plan production is the only goal you can choose between producing a 2D line drawing or a coloured plan. Two examples are produced below.
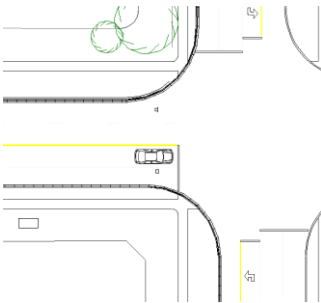
2D plan (line drawing)   2D plan (coloured)
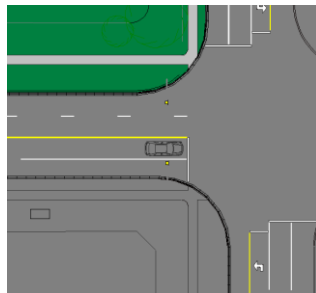
If the objective is to create a line drawing, the triangles are created in a single colour and then switched off. This means that they do exist to allow you to add points at the correct level, but you never see them. If a coloured plan is required, the triangles are created in a single colour and then over painted to distinguish between the grass, road etc.

If 3D views or animation are to be added then the triangles are painted with the appropriate texture as well as the solid 2D colour to produce the 3D view.

A 3D view of a Canadian junction

If 2D plan production is your goal then the final stage is to add your plans to the Layout Pages, add your text, arrows and any additional features before you plot to your Windows® plotter.
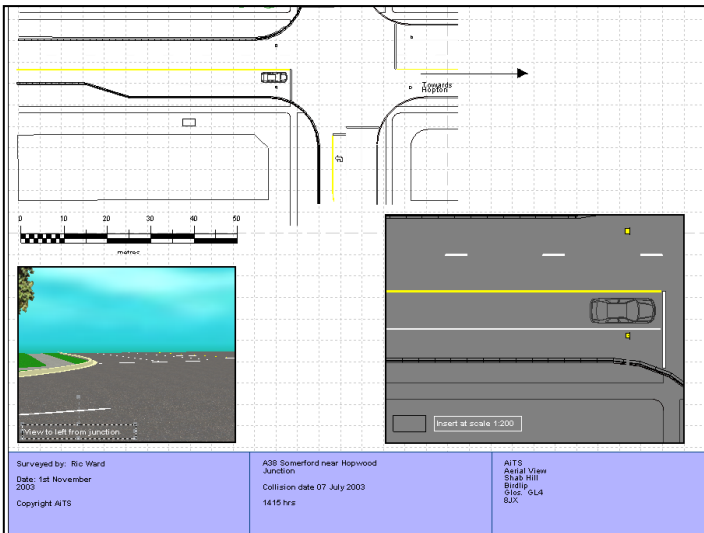
Finally, if animation or fly-bys are required, in 3D view, you can add your animation and cameras prior to distributing your finished job on CD together with a free RelMo Viewer program.

The importance of the Codes survey

The importance of the Codes survey that by default resides in C:\program files\aits\bin folder cannot be stressed enough. As mentioned previously, this is where each new survey draws the information for any point and line codes, textures and any plan templates that you have.

Whether you want to create a new code style, alter an existing one or simply change the letter code of a feature, you should do it in the Codes survey. In this way it will be available for all future jobs.

There are also ways of making new codes available to older surveys and this is dealt with in the body of the manual.

Surveying protocols

For users who wish to download data from electronic distance measuring equipment (EDM's), there are a number of protocols that you will need to follow in order to ensure the file successfully loads and that lines link together correctly.

Unfortunately, no matter which software you use, you will find that they all have different surveying protocols!

Stations and check observations

Using the RelMo Download Utility you can download surveys generated from EDM equipment. Use of that equipment should be as described by your supplier, but a few general hints and tips may be helpful in getting the best out of your equipment and RelMo.

The use of control or check observations seems to have declined in certain vocations over the past few years.

Control observations are a vital part of surveying practice. Although in some circumstances they are not actually necessary to complete a survey, they demonstrate throughout the survey that data integrity is being maintained, that the equipment has not been moved, and that you are surveying accurately.

When using multi-station surveys, the use of control observations is essential. A sensible approach to using control observations can make it very easy to create surveys with many stations and, as importantly, demonstrate that the survey is accurate.

RelMo is designed, in common with most surveying software, to use the check observations as well as checking on the accuracy of the survey, as a way of creating the station setup locations in multi station surveys. Unless you use check observations, you'll end up having to perform many more steps before you can use the data you've surveyed.

Single station surveys
These are the only type of surveys where check observations are not essential, however desirable they might be!

AiTS International   **21**

For a single station survey, you'll have the option of defining the location of a station using your survey equipment. If you don't, RelMo will setup the first station at the location specified in RelMo when it imports the data, (1000 north, 1000 east and 100 high by default). Most if not all equipment requires you to name this station, the name of which will be stored by RelMo. RelMo will accept stations either as numbers (1, 2 etc.) or letters (A, B etc.).

Assuming that you will be observing good surveying practice and using a back sight station as a check observation point, follow the procedure below.

Having set your station up at A (or 1) you will need to define the back sight station position.

Note – It is advisable not to use the practice of shooting an arbitrary back station point to a church spire or other feature in the distance as unlike some software packages, RelMo will not ignore this point which will be added to the survey.

Locate a suitable position for station B (or 2), your back sight station. Mark the position of the station and, using your pole, 0 set on station B (or 2) and then in your normal point gathering screen, type –STB (or –ST2) depending on your lettering or numbering convention. Record the shot. Now record your data as normal, and prior to completing the job, take a final shot to the back site station –STB (or –ST2).

It is good practice to take periodic shots back to B (or 2) during the point collecting routine. This will allow RelMo will calculate the difference between each check observation to station B (or 2) and list any difference in the log file (see page 203 for further details).

Two station surveys
As with multi-station surveys, you will need to define the second station position before you move the station to the new position. Having setup at station A (or 1), we would suggest that you locate the position for your station B (or 2). Mark the position of the station and, using your pole, 0 set on station B (or 2) and, in your normal point gathering screen, type –STB (or –ST2) depending on your lettering or numbering convention. Record the shot. Now record your data as normal, and prior to moving the station, take a final –STB (or –ST2) to Station B (or 2's) position. Now move your station and set-up at B (or 2) entering the station details as you would normally.

The first step having moved is to 0 set back to A (or 1) and then, in the normal point collection screen, type –STA (or –ST1) in the point code field and take a shot to your pole now on the old station A (or 1) position.

Collect all the data as normal and, before finishing take a final check observation, again using –STA (or –ST1) before switching off.

Multi station surveys
For multi-station surveys, the technique is pretty much the same as with a single and two station surveys. By way of an example, we will use a four station survey of a building and its surrounds, just to illustrate the main points. This can be extended to as many stations as you desire, the only limitation being the capacity of the surveying equipment!

We will use the –ST codes although there is no need if you can enter these in separate fields on your measuring equipment.
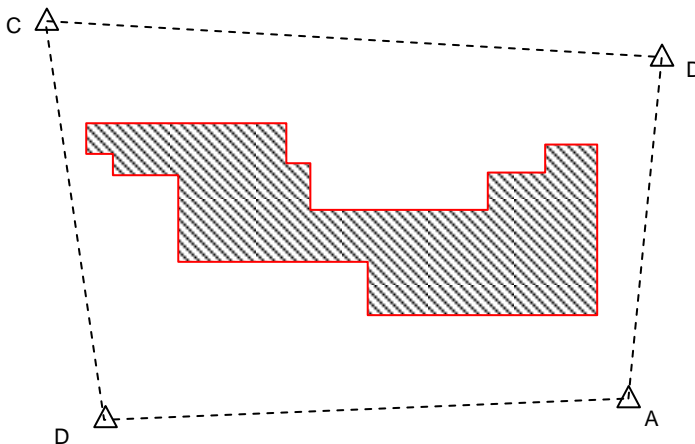
Let us assume that you've set up on station A, your first station and, you are using a letter rather than number convention for your stations. In this example we will also use the special station code (**-ST**_name_) to define the stations.

From station A your first check observation would be to station B (**-STB**). At this point, RelMo will create a new station at B. You can then take an observation to station D (**-STD**), and RelMo will create that station too. Carry on and survey all the points you can see from A, at which time you would then be ready to move to station B. Before moving take a check observation to B (**-STB**).

Now you can physically move the equipment to station B and setup on that location. From B, your first observation should be back to station A (**-STA**). Then you should take an observation to station C (**-STC**). RelMo will then create that station. RelMo by this time has created all the stations, and any subsequent observations to the stations will be check observations. All check observations are recorded in the internal log file as too are the station setup details (see page 203 for log file details). As before you can then survey all the visible points from station B, take a final check observation back to A (**-STA**)and move to station C. The process is exactly the same as the previous station move. Take a check observation to D (**-STD**) and then one back to B (**-STB**) before moving to station D.

At station D you follow exactly the same process and then move to station D making sure you take check observations to both A and C.

Surveys where you can take control observations back to the starting station are said to be 'closed' and this allows a useful check on the accuracy of your surveying as ideally your final check observation to A, should report a zero or small difference from the original definition of the setup on station A.

In some surveys however it is not possible to close the survey in this way. Linear surveys, along perhaps a winding section of road, do not always lend themselves to being closed in this manner. In these circumstances, you can't close the survey, but your existing check observations should still be fairly consistent.
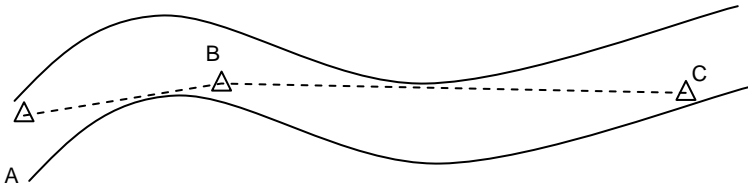
As you can see, the key to the whole process of RelMo creating a complete survey all in one go from your data is the use of control observations. RelMo knows and automatically adjusts itself to take account of differing zero headings at each station, because it knows the bearings of each station from each other. This means that whenever you move to a new location, RelMo already knows where it is in 'real space' and can interpret that survey data properly.

Surveying methods
Starting and ending lines
As previously mentioned RelMo recognises codes that you enter in your distance measuring equipment and translates these into various line and point styles during the import/download process. The way in which you start and end lines is, (as you would expect having read this section), specific to each individual piece of software.

This section describes the way in which RelMo recognises start and end codes and also special codes.

Note – for historical reasons users of Sokkia instruments can enter their control codes to stop lines etc. See the section on RelMo download for more information.

An example of a junction which has a number of kerbs is shown on the following page.

Codes are stored in a special survey called Codes. This survey resides in the C:\Program Files\AiTS\bin folder. Every time you start a new job, RelMo takes a copy of these codes and uses them in the new job. Thus, if you decide to add, delete, rename or amend any of the codes, if you do it in the Codes survey they will be available for all new jobs. If you do it in an existing survey the changes or additions will only be available in that specific survey and the Codes survey will be unaffected.

In the world of surveying there seems to be two common practices. For those who do not like walking there is lazy! This method involves zigzagging across a series of features taking first one feature then the next and the next before moving further up the feature taking the same detail on the way back. The diagram below illustrates this method with the order in which the points are taken
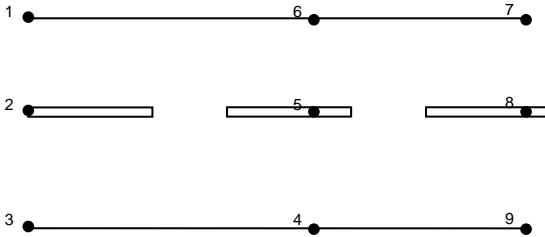
The default code for a straight kerb in RelMo is KS and for one of a range of centre lines, L421. If the user simply crossed the road in the order of the points adding KS, L421, KS and KS, L421, KS etc the kerbs would be created as shown by the red zigzag line.
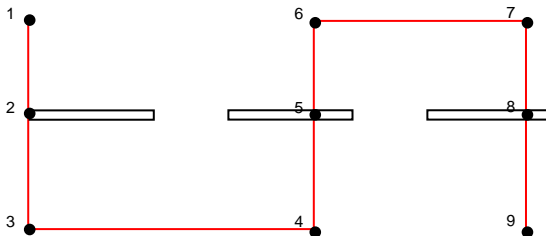
This is not very meaningful and happens because RelMo joins the points with the same code in the order in which the points are taken. However RelMo can distinguish between the two features with the same code by adding a number after the feature. Thus in our example above, the left hand kerb would become KS1 and the right hand kerb KS2. Numbers can continue to be added for any number of separate kerbs. The sequence for the survey above becomes KS1, L421, KS2 and KS2, L421, KS1 and so on back an forth across the road. In this case there is no need to add a number to the centre line code as RelMo will automatically join point 2 to 5 to 8 as there is no other L421 on the survey. Neither do you have to add a KS1, 2, 3 to the Codes survey as RelMo automatically recognises the number after the code.

For those who enjoy walking and prefer to survey up one kerb and down the other, either the 1, 2 codes can be used, (KS1 for the first kerb, KS2 for the second etc.), alternatively you can use the RelMo dot (.) codes.

Using this method, a dot (full stop) is used to force a code to stop. Using our example survey again, the order in which the points are surveyed is changed to reflect the fact that we are now surveying up and down the road.
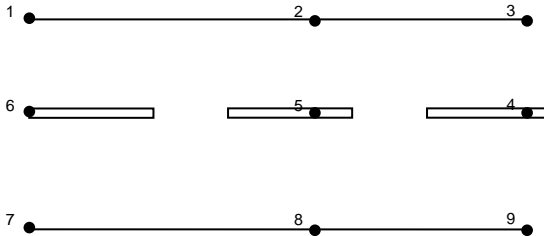
In this case points 1 and 2 would be coded as KS and point 3 as KS. the dot has the effect of ending this kerb line. 4, 5 and 6 are coded as L421 (there is no need to add a dot as there are no other lines of this style on the survey). Points 7, 8 and 9 are all codes as KS although point 9 would be coded with a dot if there were further KS's to survey.

As we all make mistakes, you can also add a dot before a code to start a new line. If for example, you forgot to add a dot after the KS of point 3 above, you could add it before the KS of point 7 i.e. .KS This stops the KS at point 3 being joined to the KS at point 7.

You can also use the dot codes or a space to change from one line style to another at the same point. In the survey below, the straight kerbs (code KS) are also linked to curved kerbs (code KC)

If we simply surveyed points 1 and 2 as KS (ending point 2 with a dot of course) and point three as KC, RelMo would leave a gap between points 2 and 3. To end the KS and start the KC at point 2, code as follows.

Code point 1 as KS, point 2 as KS. (to end the KS feature). Point 3 is coded as ..KC the leading double dots tell RelMo to link point 3 to point 2 using the point 3 code.

AiTS International   **27**

Knowing a little more about dot codes, try to work out the sequence for points 1 to 10 below using the dot code method. The answers are on the following page!
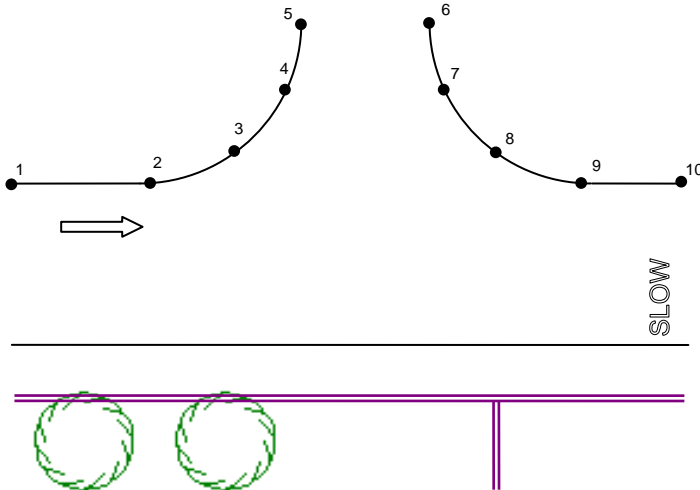
Answers using the dot code method
1   KS
2   KS.
3   ..KC
4   KC
5   KC.
6   KC
7   KC
8   KC
9   KC.
10   ..KS.

Point codes such as trees and lamp post do not require the use of a dot. Point codes only expect one point to create a feature, thus recording 3 points with the code PTREE will lead to the creation of three individual trees, one at each point rather than a line of trees between the three points.

Double coding of points

RelMo will also accept a comma to allow you to double code a point. Thus if point 2 were coded as KS,KC the same effect as with the dot codes above would be achieved.

If your EDM does not have a comma, you can change the symbol used to separate the codes. See page 75 for further details.

Closing a rectangle

If you want to join the last point of a line back to the first point of that line, put a double dot after the last point as shown in the diagram of a small square building (code B) shown below.

Survey as;
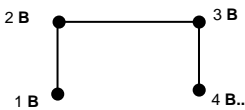
RelMo would create the following on import.
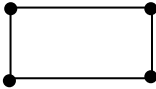
Two point codes

Two point codes expect only two points to create the line. There is no need to add dots or numbers to cause a two point code to stop and restart somewhere else. A good example of a two point code is a road arrow. The code for an ahead arrow is AA Points 1, 2, 3 and 4 in the example below are all codes as AA Because AA is a two point code, no arrow is created between points 2 and 3.
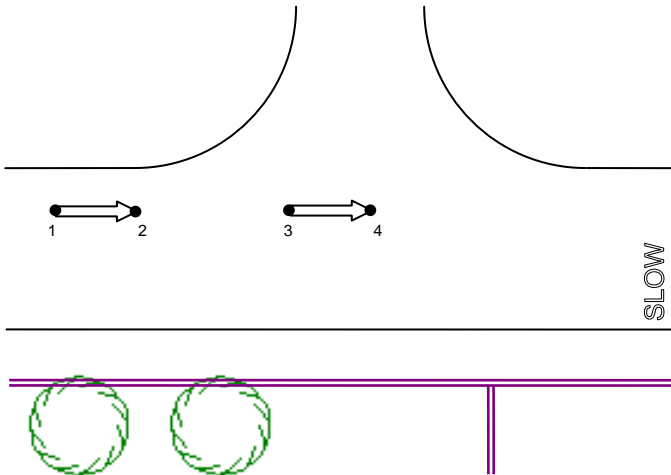
Three point codes

The final special line code is the three point code. This code expects three points in the order base left, base right and, anywhere along the top. Such codes are useful for anything that needs to scaled in two directions for example ground text such as SLOW on the road or the outline of a vehicle. The diagram below shows the order of surveying for a line symbol called SLOW

Points 1, 2 and 3 are all coded SLOW. Point 3 can be anywhere along the top (including outside the box). There is no need to end the code with a dot before starting another SLOW as only three points are expected by RelMo. Reversing points one and two will result in a mirror image, useful if you have a directional object.

Finally, there is nothing to stop you surveying your whole site with one code and settling down to some serious data editing in the warm and dry when you return to the office!

Special survey codes
There are a number of special survey codes which can assist when you cannot actually see the survey point you want to take.

These codes are entered into the point code (not the point number) field on your electronic distance measuring equipment.

Note that if you output data from your EDM in coordinate format, (Easting, Northing, Height, Code) and import the file rather than downloading it, only the –OBJ and –TX codes will be recognised.

Create a new object
This code allows you to create a new object in the RelMo survey with the name of *name* where *name* is any name you wish to give it.   Note that there is no space between the code -OBJ and the name. This observation and all subsequent observations will then be created in the new object. It is anticipated that this observation will be at the very least dual coded for example, ***-OBJname,WL*** It is vitally important to make sure you have a comma between the **-OBJ*name*** and the point code. If not, then RelMo has now way of knowing where the object name part ends and the point code begins. A new object will be created as described and the observation will have the coding as described by the point or line code following the comma or space.

If you wish to revert back to the base object, use the code **-OBJ.**.   The single dot instructs RelMo to revert back to the base object. Remember too that you MUST have a comma after the **-OBJ.** if you wish to add a point or line code. You can create as many separate objects in the base object as you require. If you use a different name a new object will be created. If you use the same name, the object of that name will be used.

As RelMo triangulates the surface on a per Object basis, this routine may prove useful when surveying features that you may not want triangulated into the main body of the survey such as the top corners of a building.

Creating a Rectangle from three points

This command creates true rectangles from three survey observations. Survey two points along one side of the rectangular feature (preferably the longest side) with normal codes and survey the third point anywhere along the opposite side, The third point is coded as **-REC** as shown in the diagram below. RelMo will then create a true rectangle from the three points. The third point is not used, but inserted into a hidden object ORIGINAL which is created as a child object of the main survey.

STATION

PT: 2
CODE: B

PT: 4

PT: 3
CODE: -REC

PT: 1
CODE: B

PT: 5

On downloading points 4 and 5 are created at the same surveyed height as point 3.

Point 3 is unused and moved to a child object called Original
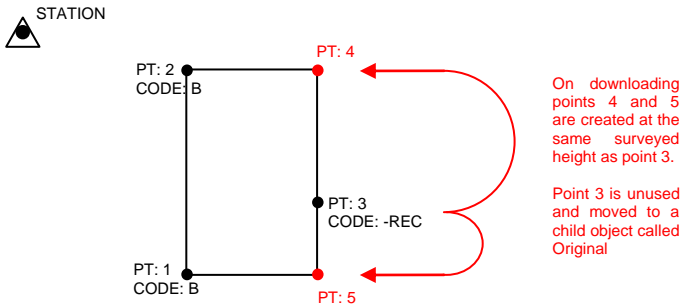
Creating a Rectangle from two points

Using this command you can create a true rectangle of a specified *distance* to one side of two observations. Code the first observation as normal. Code the second observation using the code **-REC***distance* where *distance* is the width of the rectangle in metres. A positive value, e.g. **-REC1.5,** or **-REC2.7** creates a rectangle to the right of the line joining the two observed points. A negative number, e.g. **-REC-1.2,** or **-REC-3.6** will create the rectangle to the left.

STATION

PT: 2
CODE: -REC2.5

PT: 4

PT: 1
CODE: B

PT: 5

On downloading points 4 and 5 are created at the same surveyed height as point 2.

In this case, 2.5 metres to the right of the surveyed line
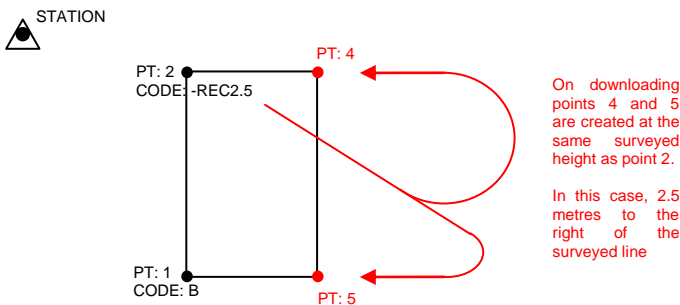
Creating a point for a hidden rectangular Indent

Use this code to generate rectangular indentations along a building or wall line. As with -REC, this code requires three surveyed observations. Survey the first two points at either end of the indentation, survey the third point anywhere within the indentation and code it as **-RIN** as shown in the diagram below. The third observation is not used, but inserted into a hidden object ORIGINAL which is created as a child object of the main survey.

PT: 5
CODE: B

PT: 3
CODE: B

PT: 7

STATION

PT: 4
CODE: -RIN

On downloading points 6 and 7 are created at the same surveyed height as point 4.

PT: 2
CODE: B

PT: 6

Point 4 is unused and moved to a child object called Original

PT: 1
CODE: B
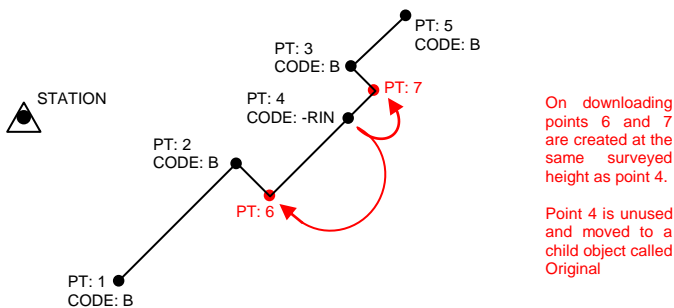
Creating a point for a hidden rectangular indent by stipulating a distance
As with -REC*distance*, this code allows you to create a rectangular indentation at a specified distance. Code the first point as normal and on the second, code it using **-RIN*distance*** where distance is the depth of the indentation. For example –RIN3.5 creates the points 3.5 metres to the right of the survey line. A negative value would create the points to the left.

PT: 4
CODE: B

PT: 3
CODE: -RIN3.5

PT: 6

On downloading points 5 and 6 are created at the same surveyed height as point 3.

PT: 2
CODE: B

PT: 5

STATION

PT: 1
CODE: B
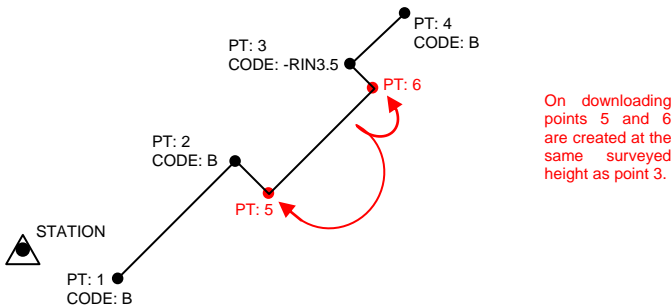
Creating a point perpendicular to the survey line
This code allows you to create a new point at a perpendicular to three observations. This causes an extra point to be generated on an extended baseline formed by the first two observations at the point where the perpendicular from the third point intersects the baseline. All the points are joined together using a line code specified for the first observation. **–NLP** is entered as the point code. The example below illustrates this coding.

On downloading point 4 is created at the same surveyed height as point 3. The point is created at the extended baseline from point 1 and 2, perpendicular to point 3

PT: 4

PT: 2
CODE: B

PT: 3
CODE: -NLP

STATION

PT: 1
CODE: B
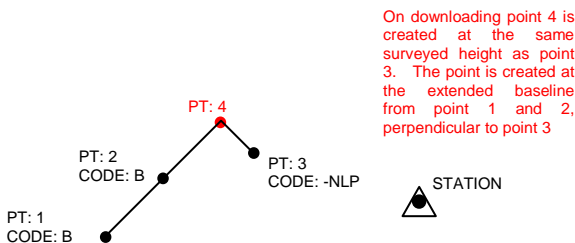
The opposite of this code is **–NPL**. This code is very similar to -NLP, but instead the baseline is formed by observations 2 and 3 and the perpendicular by observation 1 as shown in the diagram below.

PT: 4

On downloading point 4 is created at the same surveyed height as point 3. The point is created at the extended baseline from point 1 and 2, perpendicular to point 3

PT: 2
CODE: B

PT: 1
CODE: B

STATION

PT: 3
CODE: -NPL
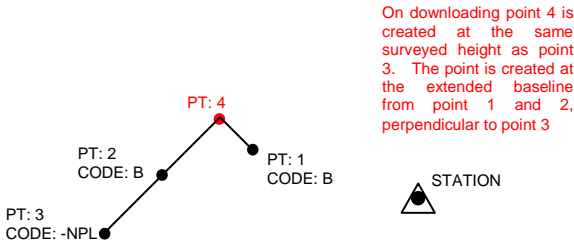
Horizontal Offset

This code can be used to create an offset observation. This is very useful when the centre of the object is not accessible. Two observations are required. The first is taken at the correct distance, i.e. to one side of the object and the second is taken towards the centre of the object and given the code **-HA** The first point is removed to the ORIGINAL child object and the second point is created using the distance and vertical angle specified by observation 1, but the horizontal angle from the second observation. In effect the data from both observations is combined to produce the correct observation.

PT: 1
CODE: TREE

PT: 3

On downloading point 3 is created from point 1 and 2 at the intersection of the two lines. Both points are moved to the Original, a child Object of the main survey.

PT: 2
CODE:-HA

STATION
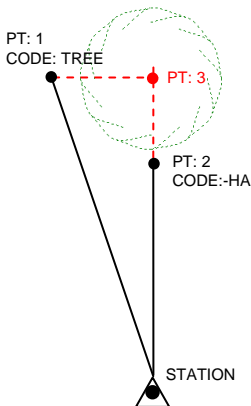
Vertical offset

This code allows you to create an offset observation vertically above or below a real observation in an otherwise inaccessible location. Two observations are required. The first is made to a point as normal, with the normal code. The second observation is made towards a point vertically above or below the first observation and given the code **-VA** RelMo then extracts the distance and horizontal angle from the first observation and uses the vertical angle from the second observation to determine the location of the height of the observation. The only information used from the second observation is the vertical angle. RelMo does not physically create a point at this new location, but instead inserts a block of text describing the height of this location above the first location. This is especially useful when surveying cliff edges, buildings, trees etc where the top of the object is inaccessible.

You may need to set the mode on your electronic distance measuring equipment to measure the vertical angle.

PT: 2
CODE:-VA

On downloading the height of the vertical offset is added as a text note to point 1. Point 2 is not created.

PT: 1
CODE: TREE
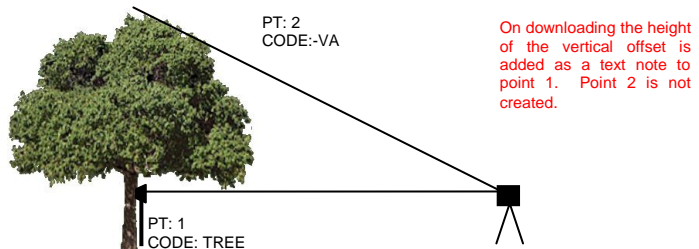
Interpolated points

This code allows you to create a new point at the midpoint of two observations. This causes an extra point to be generated between the two existing observations. The first point is coded with the code for the point you wish to create and the second –CN. On download the two survey observations are inserted into the ORIGINAL object which is created as a child object of the main survey.

PT: 2
CODE:-CN

PT: 3

On downloading point 3 is created midway between point 1 and 2. Point 1 and 2 are moved to the Original child Object of the main survey.

PT: 1
CODE: TREE
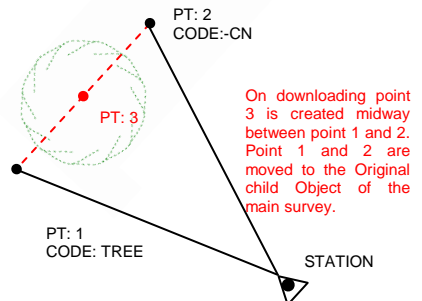
STATION

Line of Sight Offsets
Line of sight offsets are defined using a baseline between the current station and the observed point. They allow great flexibility in creating the point at an offset from the baseline, either to the left or right of the observed location, forwards or backwards from the observed location or above or below the observed location. The physical observation is removed to the ORIGINAL child object, and the offset point created in the survey model. The descriptions below illustrate the various options available.

Left and right offsets
There are two options. You can either offset by a specified distance which you enter as a distance in metres after the code. Note that no space is left between the code and the distance.

> **-OL***n.nn* offset left of the line of sight n.nn metres or,
> **-OR***n.nn* offset right of the line of sight n.nn metres

The alternative is to offset by the current detail pole length. For example if your detail pole is currently set at a height of 1.6 metres, entering 2 after the code will offset the point by $2 \times 1.6 = 3.2$ metres.

> **-TL***n* offset left of the line of sight, where offset = $n \times$ current detail pole height
> **-TR***n* offset right of the line of sight, where offset = $n \times$ current detail pole height

Left and right are defined as follows.
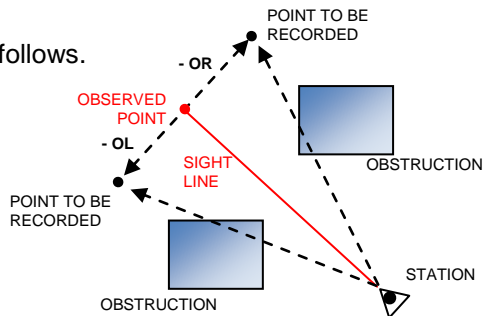
Forwards and rearward offsets
This offsets the observation directly ahead or directly behind the pole along the line of sight. You can either offset by a specified distance which you enter as a distance in metres after the code. Note that no space is left between the code and the distance.

> **-OF***n.nn* offset forwards along the line of sight *n.nn* metres
> **-OB***n.nn* offset backwards along the line of sight *n.nn* metres

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The alternative is to offset by the current detail pole length. For example if your detail pole is currently set at a height of 1.6 metres, entering 2 after the code will offset the point by $2 \times 1.6 = 3.2$ metres.

> **-TF***n* offset forwards along the line of sight, where offset = *n* $\times$ current detail pole height
>
> **-TB***n* offset backwards along the line of sight, where offset = *n* $\times$ current detail pole height

Upwards and downwards offsets
This creates the point immediately above or below the detail pole. You can either offset by a specified distance which you enter as a distance in metres after the code. Note that no space is left between the code and the distance.

> **-OU***n.nn* offset upwards from the observation *n.nn* metres
>
> **-OD***n.nn* offset downwards from the observation *n.nn* metres

The alternative is to offset by the current detail pole length. For example if your detail pole is currently set at a height of 1.6 metres, entering 2 after the code will offset the point by $2 \times 1.6 = 3.2$ metres.

> **-TU***n* offset upwards from the observation, where offset = *n* $\times$ current detail pole height
>
> **-TD***n* offset downwards from the observation, where offset = *n* $\times$ current detail pole height

Adding a text note
You can add a text note to a point. Type **–TX***text* where *text* is the annotation you wish to appear against the point. You may add a code after the text using a comma for example **–TXdrain cover,WL** (note there is no space between the –TX and the text). This will start a string code (wall left) and put the text note 'drain cover' against the point. If the code is omitted, RelMo will use the same code as the previous point. Thus if you are working along a string and adding notes at various points, the string will not be broken. If you use **–TX** as the very first point of your survey, in the absence of a code, RelMo will assume that the point is a default point PNT.

Using Attributes to change a Code

Using the correct attribute, you can force RelMo to display a point or line in a way specific to the line or point you are defining. For example you may have a point code in your symbol library called PTREE to signify a tree and, by default, it may be 10 metres high and 8 metres wide. However, the tree you wish to survey is 20 metres wide and 35 metres high. To force the tree to be created in the correct dimensions when surveying the point would be coded, PTREE:X20Y20Z35 where the : (colon) is the attribute delimiter. The X tells RelMo the dimension of the X axis, the Y the Y axis, and the Z the Z (or height) axis. By way of a second example, for a 2.5m high wall, with a width of 0.4m you would code the WALL code as, WALL:H2.5W0.4 where H is the height and W the width.

Only one colon may be present per code but attributes may be combined as in the examples above. It is the attribute identifier (the W, H etc.) which determines how the data that follows is interpreted.

You can use multiple codes per observation such as PTREE, F where each code is separated using a comma or space. Each individual code can be allocated attributes so that for example you may use, PTREE:Z20, F:H2.9. A full list of attributes are listed below.

LINE SPECIFIC ATTRIBUTES		
Attribute	Description	Example
:C	Forces the line style generated to be curved rather than straight	:C
:S	Forces the line style generated to be straight rather than curved	:S
:Hd	Specifies the height of a complex line where d is the height in metres	:H2.65
:Wd	Specifies the width of a complex line where d is the width in metres	:W0.4
:RGBn	Forces a line of colour n where n is a 24 bit integer with 0=Black	:RGB255

POINT SPECIFIC ATTRIBUTES		
Attribute	Description	Example
:Ad	Specifies the angle of rotation of a complex point where d is the clockwise angle of rotation	:A90
:Xd	Specifies the X dimension of a complex point where d is in metres	:X2.5
:Yd	Specifies the Y dimension of a complex point where d is in metres	:Y3.0
:Zd	Specifies the Z dimension of a complex point where d is in metres	:Z35

Most of the attributes are only applicable to complex points and lines and can be edited after import using the appropriate edit properties commands. Please note that using point code attributes for a line code, or vice versa has no effect.

Note – If your EDM does not have a colon, you can change it to another symbol. See page 75 for further details.

Initial Set-up and Options

Introduction

To set up your options, from the View menu select Options or click on the Options button. The Options dialog will appear.

You can change the options for the current job by making the changes and clicking OK or, you can change the options for all future jobs by making the changes and then clicking the Default button.

Most options will only need to be set up the once, however some will change on a per job bases.

This section takes you through each of the Options tabs, explaining their meaning and the effect they have once you change them.

General tab
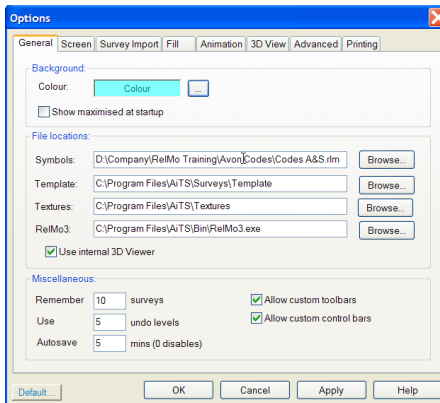
Colour

The background colour of the RelMo screen can be changed. The default colour is white.

Show maximised on start-up

The program can be forced to open maximised to fit the whole screen, check the Show Maximised on start-up box to force this option. If you leave this box unchecked, the program will remember its size from the last time it was closed.

File locations

There is an option to change the location of the symbols, template and textures library. Users on networks who are restricted from viewing the C drive (or drive where the program file is installed will need to relocate Symbols, Templates and Textures to an area on the machine that they can access, (see page 7).

Use internal 3D viewer
You can choose to use the RelMo internal 3D viewer (an integral part of the program). Alternatively you can choose to use the external viewer. The external viewer is supplied on the CD and is loaded onto your computer as part of the installation process. The program also needs to know the location of this program if you use the Pack and Go Wizard to distribute your files to others.

Most recently used files
You can choose the number of most recently used files that are displayed in the File list.

Undo levels
You can set the number of undo levels. Setting a large number of undo levels may caused abnormally large memory usage after a prolonged session. This had the affect of slowing the software down. However you can alter the number of levels if you require.

Autosave
RelMo has an autosave feature. You can choose the frequency of the save, by default 10 minutes by altering the number in the box. To disable, change the number to 0 minutes.

Note – during animation routines (either creating or playing), and whilst editing in the symbols library, autosave is automatically disabled.

Allow custom toolbars
If checked, this will allow the user to customise the toolbars. From SP3 customised toolbars are stored on a per user basis (provided of course users are using different log on names).

Note – If you lose your toolbars uncheck this option, save and close the file. Reopen RelMo and the toolbars should reappear.

Allow custom Control Bars
If checked, this will allow the user to customise the Control Bars. From SP3 customised Control Bars are stored on a per user basis (provided of course users are using different log on names).

Screen tab
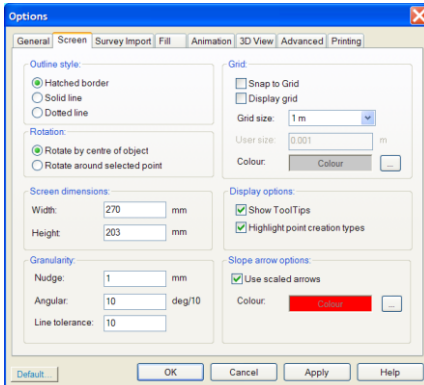
Outline Style
You can alter the border that appears around the Active Object. Select between a hatched, solid or dotted line. (The Default setting is hatched).

Rotation
You can choose to rotate objects about the centre of the object or a selected point. (The Default setting is about the centre).

Grid
You can choose whether to display a grid and you can define the size of the grid. You can also set the snap to grid option. Snap to grid can also be set and unset from the Design menu. Snap to grid is useful when using RelMo to design new objects and codes.

Screen Dimensions
Screen Dimensions allows you to take physical measurements against a flat panelled monitor. RelMo has its own set of measurement tools which are unaffected by this option.

Should you wish to take a measurement (with a ruler for example) from a plan displayed on screen, this measurement will be accurate if you enter the exact screen dimensions in the Width and Height boxes. If you set this Option, click on the Default button.

Granularity
The Granularity option allows you to alter the default amount by which the arrow keys move and rotate an Object. The Default settings are 100 mm and 10/10 or 1 degree respectively. Finer movement can be achieved by reducing the numbers.

Display Options
Show tooltips will display the point number, code and any annotation associated with the point when the mouse is held stationary over a point for more than half a second. You have to be in a points or lines menu such as Point Properties or, Draw Line for this feature to work.

Highlight point creation type will colour code all points displayed on screen. The colours are listed on page 92.

Slope Arrow Options
Slope arrows can be used to display the direction of the slope on a triangulated surface. You can chose whether to show scaled arrows (larger arrows for greater slopes) and the colour in which they display (see page141).

Survey Import tab
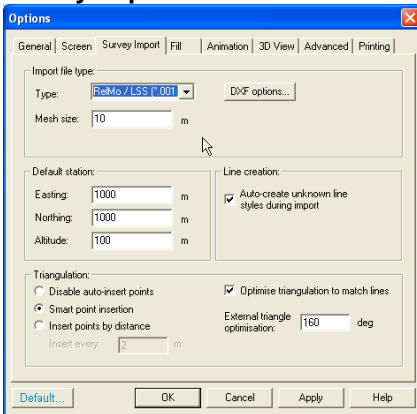
Import file type
Import file type does not affect users who use RelMo download to download data from EDM equipment. It only affects files which are imported using the File, Import routine. However the other settings on this tab do have effect so users of electronic distance measuring equipment should not skip this section.

Users who export from EDM equipment in XYZ coordinate format will need to set this option to XYZ standard as this type of file is imported rather than downloaded.

Mesh size relates to users who are importing XYZ mesh information. This number must be set to a multiple of the mesh being imported i.e. for a 5 metre mesh, 5, 10, 15, 20 etc.

Set the default file format that you will be importing.

There are further options for users who import DXF files. If you change this option you should click the Default button.

Clicking on the DFX options button allows the user to select which DXF entities are imported. CAD users should have a fuller knowledge of the various entities.
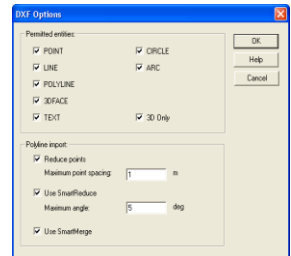
Polyline import attempts to reduce the number of points created by DXF files. DXF breaks polylines into many very short straight line segments each joined by a point. Reduce points, attempts to space these points, by the distance shown.

SmartReduce looks along the line from one point to the next and, if it is within the angle given, deletes that point assuming that the line is almost straight. It then makes a further pass, to check the remaining points. Smart merge then joins all the line segments of any 'continuous' line together to form one line. Generally, good integrity is maintained when all three boxes are checked, the maximum point spacing is set to between 1 and 2 metres and an angle of 5 degrees is applied.

Polyline reduction tools turned off

The same import with the tools on
Note the reduction in points.
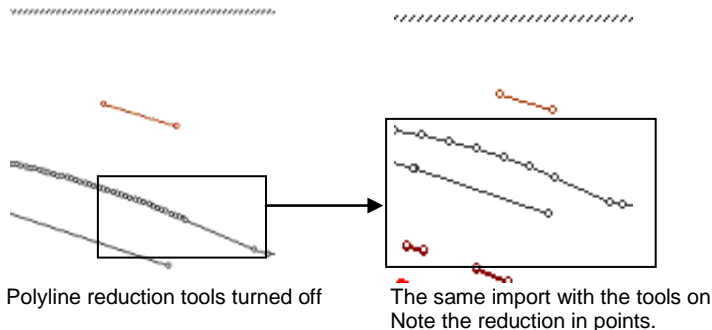
It is worth reiterating here that DXF files do not retain any point or line code information thus all that is imported is a series of lines.

Default station
The base location for your first station, by default this is set at 1000 metres east, 1000 metres north and 100 metres high. For users of distance measuring equipment who do not specify a station location when setting up their instrument, the first station will be set up at this location.

Line creation

If you wish to load a file from someone else who does not use the same codes as you, RelMo will not be able to link the lines together. This applies to all file types that RelMo can read such as DXF, XYZ, LSS load and RelMo load. By checking the auto create unknown line styles button, RelMo will link any codes of the same type with a basic line in the order of their observation numbers. This may produce reasonable results, depending of course on the logic employed to survey the points in the first place!

Note – Any code that starts with a P will not be linked as RelMo assumes that a code beginning with P is a point code rather than a line code.

Triangulation

The triangulation section of the dialog, allows you to control how RelMo should try and optimise the survey to generate the best possible triangulation. As mentioned previously RelMo is a digital terrain model and therefore the surface needs to be triangulated so that any editing in the form of adding points etc. will ensure that they land on the surface of the model rather than at the height set in the default station location. The Disable option prevents any form of optimisation taking place.

The Smart point insertion option creates points along a line every X.xx metres where X.xx is the measurement entered in the 'insert every' box. If however the curvature between this new point and the last point is less than the smart angle specified in the DXF options dialog, the point is not created. The effect of this option is to increases the point count around areas of high curvature, but reduces the additional points inserted along nearly straight sections. This means that when triangles are created between the points their edges will more faithfully follow the edge of any line. The significance of this is for models which are to be coloured in or rendered with 3D textures. Colouring in is done on a per triangle basis therefore it is important to ensure that the edge of the triangles match the edge of any change in surface which is usually demoted by a line.

The third option, to insert points by distance merely inserts points at the specified distance with no attempt to add additional points at areas of high curvature.

The Optimise triangulation to match lines option attempts to match the triangulation process with existing lines. In other words, triangles should be

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formed along line edges rather than crossing existing lines. RelMo achieves this during the triangulation process by inserting points where lines cross the edge of a triangle. It then repeats the triangulation process, adding these new points to the model. Up to 20 iterations of this process can take place, which can take a few seconds. The process is not guaranteed to break every triangle, but in the majority of cases the results are excellent.

Examples of the various methods are produced on the following page
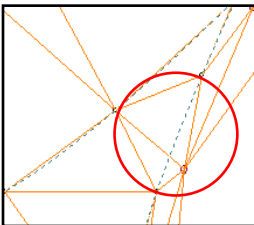
No form of triangulation optimisation. As can be seen, two triangles break across the edge of kerb line.
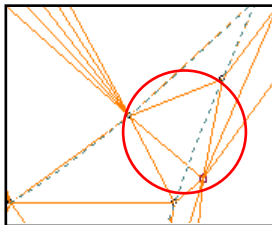
Smart point insertion (5º) two triangles still break across the edge of kerb line as the kerb only has a slight curvature and extra points have therefore not been added
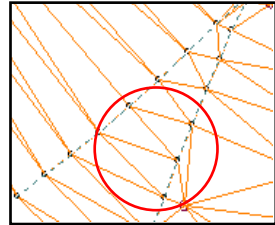
Points by distance added every metre. Triangles have now been formed with their edge along the line. However more triangles than are needed have been added making the model less efficient on slower computers.
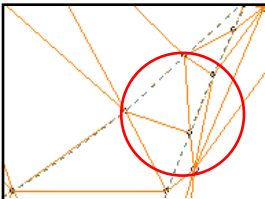
Optimise triangles turned on triangle edges now follow lines more faithfully.
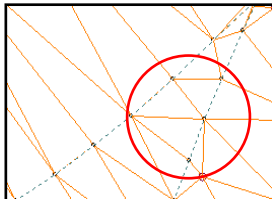
Optimise triangles with insert lines every 2 metres. An excellent compromise in this survey.

External triangle optimisation attempts to prune those very long thin triangles that form around the edge of a survey but which do not form any part of the survey itself.

Fill
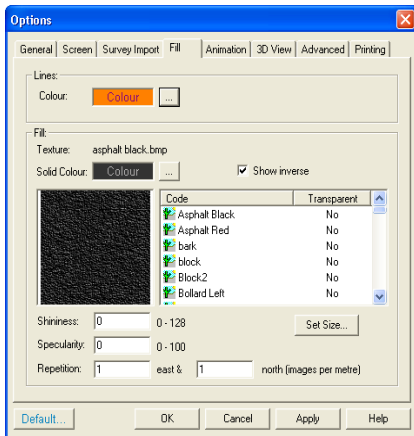
Lines

This feature sets up the colour of the triangle border. You only see the outline if you are in a triangle type routine such as add triangles or fill triangles or, you physically turn on the triangle outline from the Display menu.

You can force the triangle outlines to show all the time by selecting Show triangle outline from the Display menu.

Fill

When you create triangles and panels in your model, you can set a default colour and texture for them (colour for the 2D view and texture for the 3D view). The colour/texture that will be used by default. You will need to change this colour in the routine in which you are working if you require a different colour or texture. To alter the defaults, first click on the texture you require and then alter its 2D colour if required. Altering the 2D colour does not alter the colour of the 3D texture. If you wish to do this you will need to use third party software such as Paint Shop Pro. If no texture is required select None from the textures list.

For users who predominantly create 2D surveys, change the texture to None and the same solid colour as your screen background.

Shininess and specularity affect the way that light is reflected from the texture. The default settings are 0.

Repetition is the number of times the bitmap you have selected is repeated per metre. The default setting is 1 east, 1 north. Increasing the repetition will cause the image to display more frequently thus making the image appear more refined or smaller.

Set size is used for ortho-photos. It is necessary to set the size of the ortho-photo using the bottom left and top right of the photo. For more information see page 189.

Animation tab
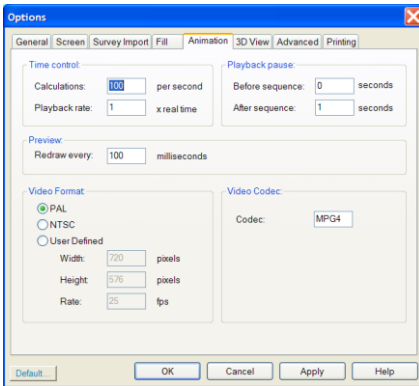
Time control

Time control allows you to set the number of calculations that your computer makes per second. The trade off is smoothness against file size. The default setting is 100 calculations per second.

The playback rate allows you to change the rate at which the animation plays. The default setting is 1, which is real time.

Preview

You can preview the motion of an animated object in both 2 and 3D. The redraw option alters the number of times the outline of the vehicle is redrawn per second. The default setting is 100 milliseconds. If you increase the number, you will get less outlines. There is an option to include the redraw in plotted output.

Playback pause

This feature allows you to set a pause when an animation is set to loop continuously.

Video format

RelMo 2008 allows the user to create Windows video files (which can also be turned into DVD's using third party software). PAL is the European format, NTSC is the North American format. User Defined allows you to define your own size.

Video Codec

Video streams can create very large files, so some method of compressing the video is desirable. CVID is installed on the majority if not all Microsoft based computers. It is considerably slower than more recent video codecs. Your computer will need to have the appropriate video compression software installed. Windows media player contains a number of formats. MPG4 and XVID work particularly well with RelMo.

3D View tab

This tab allows you to set up the global defaults for 3D views. There is an option to change these in individual documents.
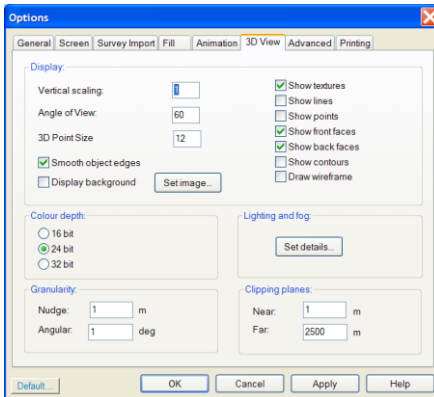
Display

Vertical scaling allows you to exaggerate the vertical scale or Z axis. Enter a value of 1 for no vertical exaggeration.

Angle of view allows you to increase or decrease the angle from your eye. 60° simulates the human eye. 120° would give you a wide screen view.

3D point size allows you to set the default size at which the points will be displayed in 3D view. The size of 3D points very much depends on what you are doing. For example, if you are working on a survey anything between 6 and 12 will probably suffice. However if you are building a new detailed 3D code you may which to reduce this considerably or all the points will merge together. The range is 0.1 – 5000.

Smooth contours will allow the edges of any triangles to be smoothed rather than have sharp changes in slope. Smoothed object edges look more natural in most circumstances.

Display background allows you to display a background bitmap. Check the box and click on Set Image. Select a texture for the background. RelMo is supplied with a number of background textures including Cloud1, Cloud3 Cloudsnight etc. These reside in the folder c:\program files\aits\textures.

You can choose to show the following by default,
- Textures – shows the textures you have added, if left unchecked only the default colour will be displayed.
- Lines – shows any lines that you have created.
- Points – shows the points.
- Show front faces – renders the front of any triangle with your texture.

- Show rear faces – renders the rear of any triangle with your texture (speed may be enhanced on slower computers if you only show the front).
- Contours – shows the contours, the interval of which you can set.
- Draw wireframe – shows the terrain and any objects as a wire frame model.

You can turn all of these feature on or off from the Display menu whilst in 3D view.

Colour depth
Colour depth can be set at 16, 24 or 32 bit. Again, the issue is one of speed. 32 bit requires more processing than 16 bit, however 32 bit gives more colour depth. The default value is 24 bit.

Granularity
You can choose by how much the arrow keys will move an object in 3D by changing the granularity nudge (in metres) and angles (in degrees). Finer control may be needed when building new Objects to use as Templates etc.

Nudge also alters how far you move for each click on the wheel of a wheelie mouse.

Note - Once changed, you will need to close the 3D view and re-open it for the changes to take effect.

Clipping planes
Clipping plane sets the distance between which 3D Objects are displayed on the screen. The default setting is Near, 1 metre and Far, 2500 metres, thus only textures between this range will be displayed. Again, reducing the near clipping plain is useful when doing close up work such as building new code styles. If you begin to get odd display problems with triangles, check the near clipping plane which may be too close. Do not set either Near or Far to 0.

Lighting and fog
Lighting and fog are dealt with in the main section of the manual. See page 146.

Advanced
Acceleration
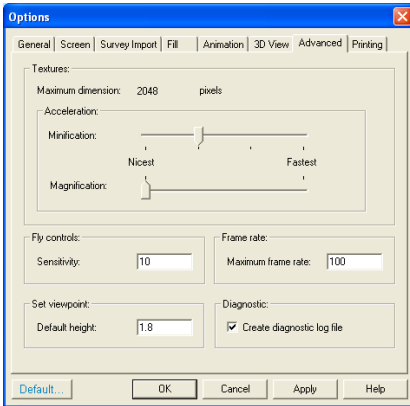
Graphics acceleration can be fine-tuned. This is only necessary where slower processors are being used and some graphics quality may need to be lost at the expense of smoothness of any movement. The options vary between nicest, the best display and fastest, the least jerky movement.

Fly controls
The sensitivity of the response from the mouse when flying can also be altered. 10 is the default setting, 100 would be extremely sensitive to any movement of the mouse.

Frame rate
The maximum frame rate can be set so that the flying speed cannot be increased above the maximum set here. 30 frames per second is the default value.

Set Viewpoint
This relates to the height of the eye when the View, Set Viewpoint command is used in 3Dview. This command allows the user to look from a particular point towards another point on the model in 3D view.

Create diagnostic log file
Creates a file that reports various aspects of your hardware. This file is of use to the RelMo support team and should be left unchecked unless you are asked to turn it on. If checked, a Log file is generated every time the user switches into 3D view. Log files are created in the same folder as the program is installed and can be deleted if this feature has been switched on inadvertently.

Printing tab

This is the only Options page that is dynamic. The various options are specific to each of your Layout Pages (plan templates). Hence the Page name appears at the top of the dialog. To set up the options differently for each plan template, first create the plan templates (see page 163). Then with that template page open, click on View, Options, Printing to bring up the dialog below.
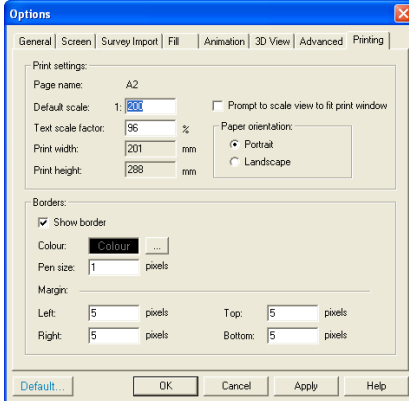
Print settings

The programme supports Windows® printers and plotters. Pen plotters are not supported.

Printing is dealt with in more detail on page 163.

The default scale is the scale at which any 2D view will be saved. When you have made a new 2D view, it can be dragged into the appropriate Layout Page for subsequent annotation and printing.

The text scale factor is necessary for a few users whose computers do not correctly scale the text as seen on screen to the plotter/printer. If you find that text appears on one line on screen but two lines when plotted, reduce the text scale factor by a couple of percent. Once you have found the appropriate setting, click the Default button to set this default for all new jobs.

Scale view to fit print window allows you to take views at a particular scale but when you drag the view into the Layout Page you are asked whether you wish to stretch the plan to fit the print window. This results in a plan to the largest scale for the page but, can result in some 'non conventional' scales. It is advisable therefore to add a scale bar to your plan if measurements may be required to be made.

Paper orientation sets the default paper orientation. You can change this via the normal print dialog.

Border

By default you can print a border around the outside of the plan. If checked, this border will be displayed in the Layout Page. You can also adjust the colour and weight of the border.

Margins

You can alter the margins to try and compensate for those printers that insist on producing a larger leading edge or do not align your plot centrally on a piece of paper. This is a matter of experimentation and once done, you are recommended to click Default.

Understanding Objects

Objects, Parents and Children

Introduction

RelMo is an Object based system whereby groups of points are bound together as Objects. If you are a CAD user, you can equate an Object to a CAD layer. Objects can be visible, hidden, locked etc.

Objects can also have sub-objects know as Children. For example, a set of traffic lights may be made up of a pole and box as the main object, but have a child object, the lights. The advantage of this system is that the sub object can be animated to create a working set of traffic lights.

Objects are separate entities and cannot be linked to each other thus when you triangulate your model to create the terrain, you will need to ensure that all the points for the terrain are within the same Object. Any points that you do not wish to be triangulated into the ground model should be stored in a separate Object and merged with the main survey after triangulation

For users who import from CAD software, RelMo will store each CAD layer as a separate Object. This may mean that you have to merge some Objects together to produce the ground model. If you download direct from electronic distance measuring equipment you can force points to be imported into a separate Object by using the –OBJ command (see page 31 for details).

Objects are managed via the Objects Control Bar which lists all the Objects and their children. You can only edit the Active Object. This is indicated in the Object Manager by the coloured highlighted symbol.

All jobs contain a Root Object and a default light (Light 1). Under normal circumstances the Root Object does not in itself contain any points. It is merely the 'container' for all other Objects. There are two exceptions. When you create a new point or line style, they are merged with the Root (see page 95 (points) and page 108 (lines) for information on creating new point and line styles). Users who create jobs from scratch can choose to create an Object in which to add their points or, add them to the Root Object. Points should never be added to a light.

The example below seeks to show the main features of the Object Control Bar tree.

In this example, the main Survey points are contained within the Parent Object called Rw1, the Active Object is Artic 3-axle. RW1 has a number of child Objects. The light (Light 1) is the default light that appears as a Child of the Root in all jobs. Lighting is dealt with later in this manual.
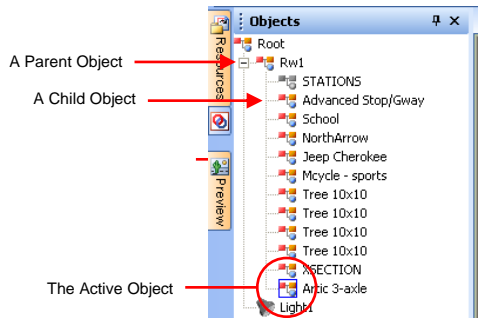
Managing Objects
Right mouse clicking on an Object in the Control Bar allows you to do the following.

Set Active
Set the Object as the Active Object. Note that there are a number of different ways of setting an object active. See page 57.

New Object
Create a new Object as a Child of the highlighted Object.

Merge
Merge the Object with the Active Object in which case all the points and lines will be added to whichever object is currently active.

Merge Children
Merge an Objects Children with the Parent Object.

Copy Animation
Copy animation from the Active Object to the Object you have selected.
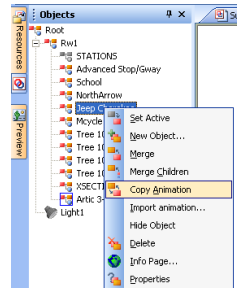
Import Animation
This feature allows the user to import animation from a file. The file is generated by third party software such as an incident data recorder.

Note - We do not write these routines, we do however supply information to third parties on the required file format. Problems on importing data should be addressed to the authors of that software.

Hide Object
Hide the Object so that it is not visible on the main screen.

Delete
Delete the Object (and any Children).

Info Page
Add an Information page to an Object. This allows you to attach text, and pictures to an Object. You can choose to show or hide the Information Box. (See page 155 for further information on Info boxes).

Properties
Inspect the Objects Properties (see page 64).

Moving an Objects position in the tree
You can also change the order of Objects by holding down the left mouse button and dragging them further up or down the tree. Note that the order that Objects are displayed in the tree is also the order in which they are displayed on screen. If Artic 3-axle is dragged above Rw1 it will not be visible as it will be drawn on screen before the road surface in Rw1 which will then obscure it.
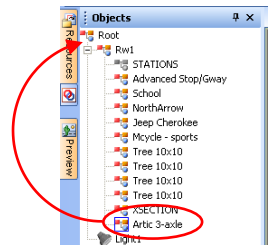
Merging objects
Merging objects deserves a little more explanation as users who import from CAD will often import a number of Objects which are based on their CAD layers. As mentioned above, before the ground model can be triangulated, all the points that form the ground model will need to be merged into the same Object. In the example to the right, a job called DXF One has been imported from CAD. As can be seen the features such
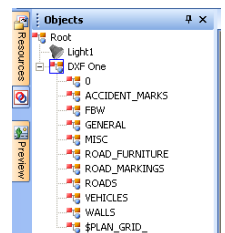
as ROADS, VEHICLES etc. were created in a number of CAD layers.

These layers have been imported as separate RelMo Objects however they should all be included in one Object as they all form apart of the terrain model.

To merge the Child Objects of DXF One, right mouse click on DXF One and click on Merge Children
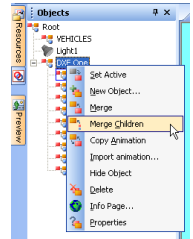
The results are shown in the Control Bar Window below. And DXF One can now be triangulated.
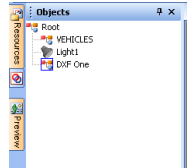
Making Objects Active
An Object can only be edited when it is the Active Object.

When an Object is active it is surrounded by a box. In the diagram of the 2D view to the right, the car is the Active Object. The style of this box can be changed using View Options and clicking on the Screen Tab. You can select from solid, hatched or dashed.
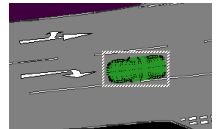
In 3D, you will need to turn on the View Outline from the Display menu. The traffic lights to the right are the Active Object.
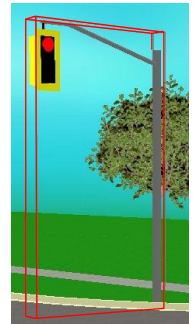
There are other ways to make objects active. In 2D mode, double click on the Object or use the mouse with the left mouse button depressed to drag a box around the Object.

In 2 or 3D, you can also move between Objects by using the Tab key or, Shift + Tab to reverse the order.

Cut, Copy and Paste
You can Cut, Copy and Paste Objects. To Cut or Copy an Object set the Object Active and select the appropriate action from the Edit menu. Alternatively use the Windows® shortcut Control+X for Cut or Control+C for Copy.

Note - When you cut an Object the Root Object will be come the Active Object.

To Paste an Object you have a choice. You can Paste into the Root Object or alternatively Paste into another Object. Where you wish to Paste into another Object, *you must make that Object Active*. When you Paste, the centre of the base of the Object you are pasting will land on the surface of the Object you are pasting into. The Windows® shortcut for Paste is Control+V. Control+V automatically pastes into the Active Object rather than the Root.

When you Paste, the cursor changes to the cursor shown on the right. Position the cursor at the point you wish to Paste the centre of the object and click the left mouse button.
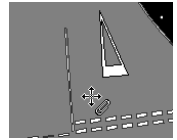
A common fault is to fail to set the object you wish to paste *into* as the Active Object. If the Root Object is active when you use the Paste Command, your pasted Object will land at the default height for imported surveys set in Options, Survey Import. This can lead to pasted Objects hanging in mid air.

If you are pasting an Object with a large base onto a Slope, expect some of the Object to disappear into the slope. You can correct this by Pitching or yawing the Object onto the slope using the Object, Transform, Rotate to command or you can use Auto Level from the Object, Transform menu.

Moving Objects – 2D
Objects can be moved and rotated.

To Move an Object, first set the Object Active.

Click on the Move button or right mouse click and select Move from the Objects Transform menu.

The Object can now be moved by holding down the left mouse button and dragging it to its new position.
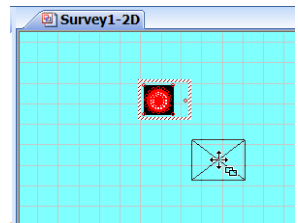
When in the Move command, the cursor changes and an outline of the Object appears. This outline can be difficult to see on surfaces in the dark grey or black range.

You can also use the arrow keys to move an Object. This allows for very accurate placement of Objects.

The amount that an Object moves in the response to the arrow keys can be changed. From the View menu select Options and click on the Screen tab. Under the heading Granularity you can alter the Nudge value for movement.

You can also move multiple Objects by setting several Objects active by dragging a box round them. Right mouse click and select Move.

You can also move an Object to a specific Easting/Northing or Height using the Objects, Transform, Move To dialog.

Note - When moving Objects in 2D they retain their original height. This means that on a surface that slopes, the Object may be left floating in the air or, buried in the surface. If you need to move an Object any distance on a surface with significant slope, you are better off cutting and pasting as mentioned above.

Moving Objects – 3D and locked ortho mode
Moving objects in 3D and locked ortho mode has the advantage that it allows an Object to stay in contact with the surface of the parent Object. To move an Object in this way, you need to set the view so that the cursor is over the parent object rather than over the un-triangulated background (this is easier in locked ortho mode as you are locked above the survey). Click on the Move button 🔁 or right mouse click and select Move from the Objects Transform menu.
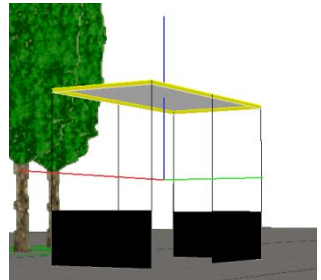
The Object can now be moved by holding down the left mouse button and dragging it to its new position. To keep it in contact with the surface of its Parent, you must hold down the Control key as you drag.

Note that it is the centre base of the Object that stays in contact with the Parent surface. Where the parent surface slopes, it may be necessary to use the pitch and yaw commands or the AutoLevel command to keep the whole Object on the surface.

Rotating Objects – 2D
There are a number of ways in which an Object can be rotated. To Rotate an Object, first set the Object Active.

To free rotate by mouse or arrow keys, click on the Move button 🖐 or right mouse click and select Move from the Objects Transform menu. The Object can now be rotated by holding down the Shift key and left mouse button. Move the Cursor further from the Object for finer control. Releasing the mouse button will leave the Object in the new position. You can also use the arrow keys to rotate an Object (shift and arrow keys). This allows for very accurate placement of Objects. The amount that an Object rotates in the response to the arrow keys can be changed. From the View menu select Options and click on the Screen tab. Under the heading Granularity you can alter the Nudge value for angular value for rotation. You can also rotate multiple Objects by setting several Objects active by dragging a box round them. Right mouse click and select Move.

Note – When you free rotate an Object, you should see two arrows, one pointing forward and one to the right. If the arrows are pointing differently, use the set heading command on page 62.

To rotate an object by a specific number of degrees, select Rotate To from the Objects, Transform, menu.

To rotate an Object by survey points, from the Objects menu, select Transform, Rotate by Points. Select the point in the Active Object about which you want to rotate. Now select a second point in the Active Object to form your bearing. Finally select a point to which you want the Active Object rotated to. On selecting the third point the Object will be rotated.
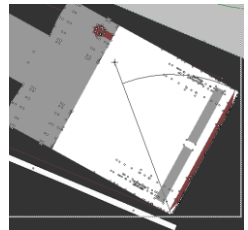
This command can be used in conjunction with the Transform by Points tool (see page 63).

Pitching Rolling and Yawing – 2D

You can Pitch, Roll and Yaw Objects either for animation purposes or to make Objects lie on a surface which is sloping.

The picture to the right shows some of the problems that can occur. Most of these can be cured using a combination of Pitch Roll and Yaw.

To select Pitch Roll and Yaw make the Object the Active Object and ether Select Rotate To from the Objects, Transform menu or right mouse Click and Select Objects Transform Rotate to. The dialog box below will be displayed.

By default all objects are created with the y-axis pointing vertically up the screen (roll). The x-axis (pitch) is to the right and the z-axis (yaw) is at right angles to the other axes and points out of the screen. A positive roll value will therefore rotate the object to the left, and a positive pitch angle will rotate the front of an object downwards. For consistency within the program a positive yaw rotation will rotate the object clockwise.
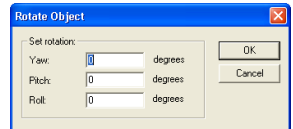
The values are stored and thus it is simple to alter the value or return the Object to its original position.

Auto-level

Auto-level will automatically level an object on the surface of the model. Before using Auto-level you should rotate the object to face the correct direction. Once done, ensuring that the object you are trying to rotate is the Active Object, select Auto-level from Objects, Transform.

Auto-level works by picking up the slope of the triangle under the centre of the object and pitching and rolling the object to match that triangle. Thus if you Auto-level a large object on a very uneven terrain, parts of the base of the object are likely to disappear into the surface or be left suspended in the air.

Pitching and yawing Objects – 3D and locked ortho mode

Make the Object active and click on the Move button or right mouse click and select Move from the Objects Transform menu.

Three bars will be seen coming from the centre of the Object. The green bar should be pointing out of the front of the object, the red bar to the right and the blue bar out of the top. If the bars are facing differently than described, re-set the heading (see setting the heading below).
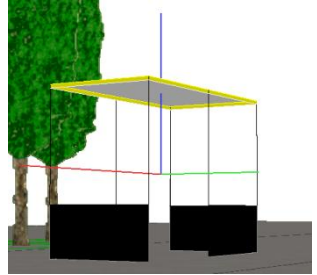
To pitch and rotate the Object hold down the shift key and use the left mouse button to drag the Object to the new position.

Setting the Heading

On some Objects it can be difficult to know which part of the Object is the 'front'. On some imported objects it may also be necessary to set the heading. To display an axis, select Set Heading from the Object Menu.

The forward or yaw axis is shown in green. The right or roll axis is shown in red. You can set their position yourself using the left mouse button to rotate the axis. To permanently reset the heading, rotate the object so that the front is facing north (up the screen) and select Zero Heading from the Draw, Object command.

Scaling Objects

Objects can be made larger or smaller. This is useful when importing Objects built by others which often have arbitrary scales. You can find many useful objects on the Web and samples supplied with CAD packages.
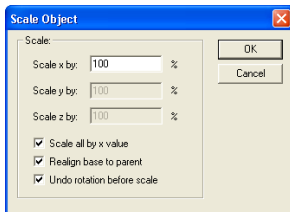
To scale an Object, first set it as the Active Object. Select Scale by either right mouse clicking, Objects, Transform, Scale or select Transform, Scale from the Objects menu.

The dialog box to the left will appear.

Enter the factor you wish to scale by, where 50% would be half size and 150% would be one and a half times the size (decimal entries are allowed). To keep the Object in proportion, enter the factor in the X axes box and check the Scale all by X value box. Your object will be scaled by its centre. If you want it to remain in contact with the ground or its parent Object, check the box Realign base to parent. If the Object has been rotated you can undo any rotation at the same time.

Offsetting Objects

You can offset an Object from its original position by either one of two methods. You can offset by a known distance by selecting Objects, Transform, Offset.
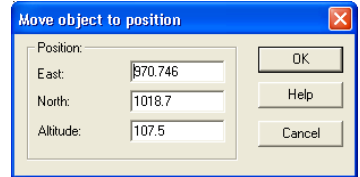
Enter the number of metres East, North or the change in height. To move an Object West or South, enter a negative value.

You can also offset by points. From the Objects menu, select Transform, Offset by Points. This method allows you to select a point from the Active Object and a second from another Object, the Active Object will then move, aligning the two points on top of each other. This command can be used in conjunction with the Rotate by Points tool (see page 60).
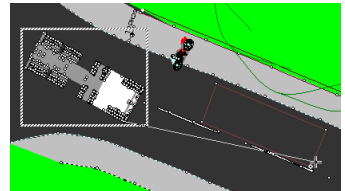
This command can be useful when trying to stitch two Objects which have common points together. An example would be two areas of a plan that were surveyed separately. By noting the coordinates and heading of two common points, one Object can quickly be transformed to align with the other Object. Once transformed, merge the two Objects and use the Merge Points Command from the Points menu to delete any duplicate points and permanently stitch the model together.

Flipping Objects

Objects can be flipped about their X, Y and Z axis. Select the appropriate Command from the Objects, Transform menu. This enables you to invert Objects through any axis quickly.

If your Object is triangulated you may need to flip all the triangles as the wrong face will now be reflecting light (the dark side will appear bright and the bright side dark). This Command can be found in 3D view on the Triangles menu.

Object Properties
The Properties of an Object can be inspected, set or altered. The Object Properties dialog box can be accessed in a number of ways.

From the Objects Control Bar, right mouse click on the Object and select Properties.

From the Objects menu select Properties. This will display the Properties of the Active Object.

Alternatively, set the Object as the Active Object (double click on the Object) right mouse click and select Properties from the Objects menu.

The following dialog box will appear.

You can change the name of your Object which can be useful for identification purposes within the Objects Control Bar. You can change the height of an Object (see post). You can choose whether to include the Object in any printing that you do. You can set the object to be Active.
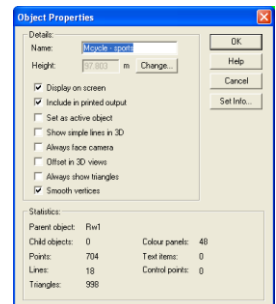
Note – You can exclude Objects from individual views in the Layout Pages. This means that although they exist in the main survey, they will not be printed. See Excluding Objects from the printed output on page 169.

You can choose whether the lines between the points are to be shown in 3D output. This is a useful feature. For example the trees supplied in the template library have points and lines about their base to create a tree symbol for 2D output. However in 3D you display the image of the tree rather than the 2D symbol. If you leave the show lines box unchecked the lines will not be displayed even if, in 3D view, you are displaying lines in other Objects.

You can force an object to always face the camera. This has the effect of enhancing the 3D effect of some objects. For example, there are two ways of creating a 3D model of a tree. You can create two panels at 90º onto which you place two identical images of a tree, one on each panel. If you now look at the tree in 3D, it has depth height and width. Alternatively you can create a single Panel with an image of a tree and check the Always Face Camera box. The tree will now turn to always face the screen thereby appearing to have 3D shape.

Offset in 3D views stops display problems where one object is placed immediately onto another. For example imagine a survey of a road onto which you wish to place the word 'SLOW'. If you have a symbol for 'SLOW', you can import this as an Object and place it on the road surface. You now have a triangulated surface of asphalt, the road, and one with white triangles, 'SLOW'. Graphics cards can have problems ''knowing' which triangle to display as they get further into the distance. Consequently shimmering can occur. By checking the Offset in 3D Views box for the 'SLOW' Object, this shimmering will be minimised.

Always show triangles overrides the Display Command to turn off the triangles of all Objects within a Survey. This can be useful for Objects such as a scale bar which have triangles which always need to be displayed and where you wish to print your survey without displaying any triangles.

Smooth vertices affects the way that that light reflects off the edge of triangles. It has the effect of smoothing the edge of the triangles. Some objects look better with smoothed edges and some look better with sharp angular edges.

Finally the statistics for the Object are shown at the bottom of the dialog Box.

Creating new Objects from a group of points within another Object
You can create a new Object from a group of points. Set the Object from which you wish to extract the points as the Active Object.

Either right mouse click and, click on Select Points from the Points menu or from the main menu choose Points, Select Points. There are

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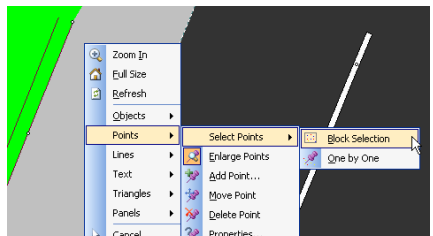
options to make a Block Selection or, select points One by One. Using the Block Selection command allows you to select a group of points by dragging a box, (mouse with left button depressed), around the points.
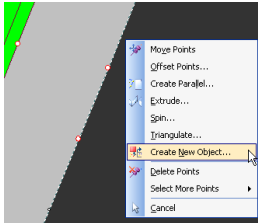
The selected points appear enlarged and red in colour.

Right mouse click and click on Clone area. The Add New Object dialog box appears.
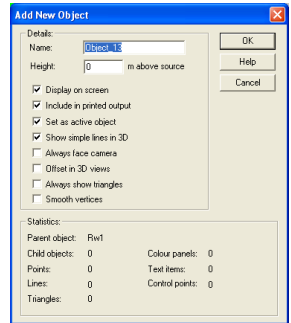
Give the new Object a meaningful name. You can now set the properties of the Object including its height above the source Object.

See Object Properties earlier in this section for a description of the various Properties.

Once you click OK you will be asked if you want to keep or delete the original points. Click on the appropriate choice.

Dealing with Groups of Objects
You can make alterations to groups of Objects. Select a group of Objects by using the mouse with the left button depressed to drag a box around several Objects. Once selected, right mouse click.
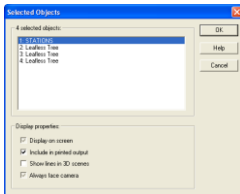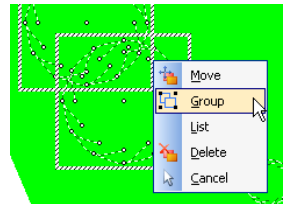
You can check which Objects you have selected by selecting List and you can make changes to the entire group by checking or un-checking the Display Properties box.

Where a box appears greyed out it means that only some of the Objects have a particular Property.

You can also Delete a selected group of Objects or group the Objects together as one Object. Where you group Objects, you have the option to ungroup them by right mouse clicking on the Object and selecting Ungroup from Objects menu or, Selecting Ungroup from the Objects menu.

Note – If you group Objects that always face the camera they will rotate about the centre of the new object. This can result in some interesting effects such as whole forests sweeping around the survey!

Template Objects

Introduction

Template Objects are Objects which are used frequently. They are stored in a Template Library. You can create your own Templates.

To access the Template Library open the Template Control Bar and highlight the template you wish to use by clicking the left mouse button on it.

Note - it is useful to have the Preview Control Bar displayed as well.

Provided the Template Object has a Mini View, a preview of the Object will be displayed. See the following page for the way to create Templates.

You can now drag the Template you want to use into the Survey by holding down the left mouse button. Once over the survey, release the mouse button and the cursor will change to the Paste cursor.

Position the cursor over the place where you wish to place the Object and click the left mouse button again. The Object will be pasted into the Active Object at that position and on the surface of the Object. You can now use the Windows® shortcut Control + V to reload the cursor with another copy of the Template Object ready to be pasted.

Troubleshooting Tip – If your Template Object disappears when you paste it, you have attempted to paste it into the Root Object. It will be hanging in the air at the default height set in Options, Survey Import! Control + Z will undo the paste, now make the Object you wish to Paste into the Active Object and try again.
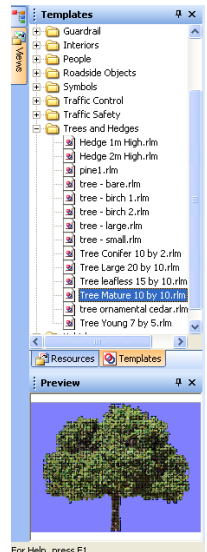
Remember – if you want the object to land on a surface, you must make the Object containing that surface active prior to copying the template Object.

Creating your own Template Objects
You can save any RelMo Survey as a Template Object. By default Template Objects are stored in C:\Program Files\AiTS\Surveys\Template. You can create new folders as necessary.

To save a survey as a Template, first open the Objects Control Bar. Right mouse click on the Root and set the Root Active. Right mouse click on the Root again and Merge its Children. You now have one object named Root. Right mouse click on Root again and click on Properties. Change the name of the Root to reflect the nature of your Object. Close the Properties box and the Object Manager.

You now need to save a view of the Object. From the File menu select Set MiniView, this will open a small 3D view of the Object. Use the arrow keys, drag with the mouse and the mouse wheel to select the view. Click on Save and close the Window.

Note - Before finally saving your template, remove all unused codes (see page 202) and delete all Layout Pages.

Finally save your survey to the Template Library.

Getting Started

The flow chart below gives you a suggested method of working in RelMo

What do you want to do?
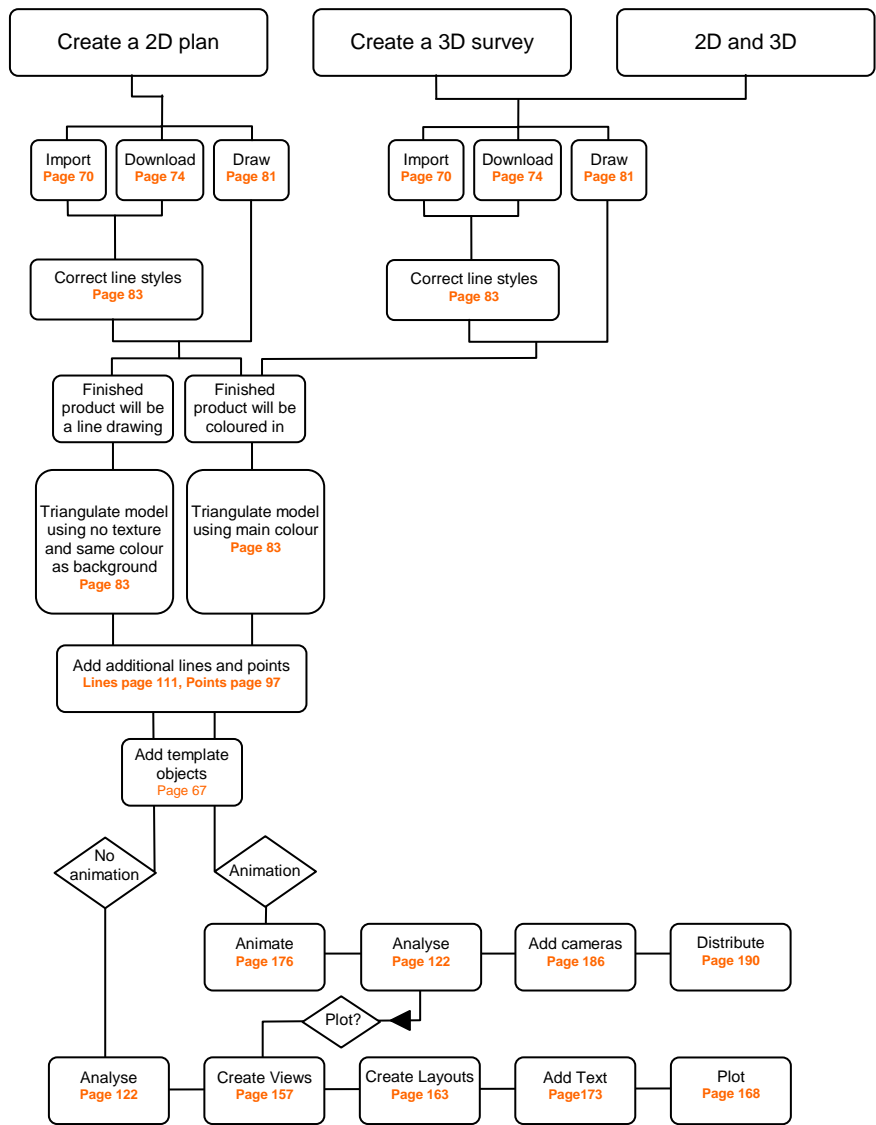
Importing

Introduction

Also see page 206 for the current import data formats supported by RelMo. For downloading from EDM equipment see page 74.

When you import, RelMo looks at a specific survey called Codes.rlm. By default this survey can be found in C:\Program Files\AiTS\bin. As you open a new job, RelMo takes a copy of the Codes survey and adds it to the new survey. As the points are imported, RelMo notes their location, (the X, Y and Z) and then more importantly, looks up the code and places the appropriate symbol at the location. For example, if it finds a line between two points such as a wall it will place a wall between that point and the next and the next etc.

You can change the code of any particular point or line style to match one that you are already used to. You can also add further codes or delete or amend existing codes. See page 95 (points) and page 107 (lines) for more information.

Note - Not all file types support Codes, for example DXF exports everything as a 'line'.

Import dialog Box

From the file menu, click on import, the Import dialog box will appear.
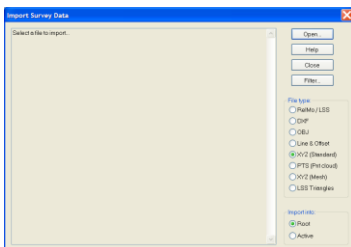
Select the options button to reflect the file type you wish to import.

Use the Open button to browse your computer for the file you wish to import.

You can choose to import into the Root (the norm for all new surveys) or the Active Object if you are adding to an existing survey.

Note - Users who are using EDM equipment to import a survey in two parts should import both parts into the Root, before using offset by points (page 63) and rotate by points (page60) to align the two sections. The surveys can then be merged (page 55) to form a single survey.

Using the Filter Option
You can use the filter command to filter out some data. Click on the filter button.
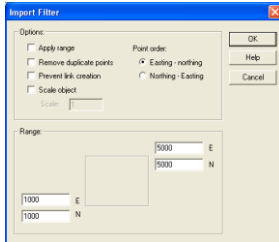
You can choose to apply a range. This is useful when you are trying to import a section of data from a large block such as OS data in the UK. In such a case you may have 2000 m^2 of data but only require a particular 500 m^2. Check the apply range button and enter the easting and northing of the bottom left and top right corners of the data you wish to import. RelMo will only import points within this block.

Remove duplicate points will remove any points that are duplicated. This sometimes occurs with less robust export files from some CAD software. RelMo will remove one of the duplicated points and attempt to join any lines that were joined to them.

Prevent link creation will import only the points, ignoring any lines which link the points together. See Survey Import Options on page 43 for the opposite effect i.e. creating links where you only have point data to import.

Scale Object will cause an object to be reduced or expanded in size during the import. This can be useful if the import file contains data in alternative or arbitrary units.

Note - If you have the ability to output an XYZ file which will retain line code information and, you have changed the RelMo Codes Library to match your own codes, your line styles will automatically be created including and Complex 3D lines such as fences, walls, etc.

RelMo/LSS
RelMo and LSS load files take, for historical reasons, the same format. See page 77 for the format. RelMo supports the import of LSS 001, 002 etc load input files only when the EDM equipment is set to survey using the VASD (Vertical Angle Slope Distance) mode. If you don't use this mode, use the LSS Output Survey command to create an XYZ file.

DXF files

Most programs will allow the user to output DXF files. DXF files do not remember point and line codes, thus every line and every point is simply imported as point and line.

Further DXF problems can occur where survey data has been imported into a CAD package and further CAD symbols have been used to finish the plan. You will find that the survey data retains the height information however the additional symbols will be added at height 0. The symbols below represent two spot levels (points surveyed for height information only) on a piece of sloping ground.

The surveyed point is the black point in the centre of the cross. The CAD package has generated the additional red points and joined them with lines to create the symbol, a cross.

However when viewed from the side in 3D the following effect is seen.

Surveyed slope
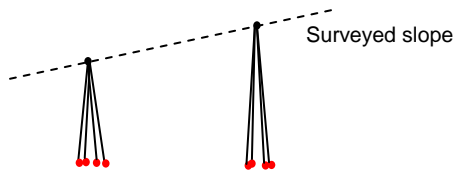
Contact your CAD support office if this problem occurs.

Since the addition of complex line styles in Version 4.0, DXF is no longer the ideal import media.

It is worth noting that DXF OS data will be imported at its real world Northings and Eastings. If you have already created a survey and are adding the OS data as a 'location plan', your survey will be somewhere in the area 1000E 1000N. You are likely to have to move your OS survey closer to your main survey by using either the Objects Move button to drag it or the Objects Transform Offset Command to move it by coordinates.

OBJ files
Imports Wavefront (a 3D modelling package) Object files.

Line and offset
You can import line and offset files written in a text editor such as notepad. See page 208 for further details.

From Version 5 on, you are advised that the best method of adding line and offset information is by direct entry to the main screen. See adding points on page 99 for further details.

XYZ Standard files
Unlike DXF, XYZ files do retain point and line code information. This has a distinct advantage in that, provided you have changed the RelMo codes to match those you normally use, all the lines that you survey will be replicated in RelMo.

See the section on page 209 onwards for basic details of how to export XYZ files from commonly used software.

Note - Some software exports Eastings, Northings, Height and some, Northings, Eastings, Height. Once you discover which your own software does, you can set the appropriate order in RelMo from the Import dialog by clicking on Filter.

PTS Points Cloud
Data generated by laser scanner devices.

XYZ Mesh files
These files form a mesh over which an ortho-photo can be laid. Companies such as GetMapping will supply mesh data and the corresponding Ortho-photo. You can animate onto the surface of a mesh.

RelMo Download Utility

The RelMo download utility is for users who wish to download from electronic distance measuring (EDM) equipment.

Users of Topcon, Geotronics and Sokkia and Leicia electronic distance measuring equipment can download directly into RelMo using the RelMo download utility.

From RelMo select File, Download. The download utility program is launched. On the first occasion you use this software you will need to set up the program to recognise your EDM.

Setting up for your equipment
Select Options from the Actions menu.

From this dialog box various parameters controlling the operation of the program, and the default data formats may be set. By default RelMo Download is set up for a Geodimeter total station. This must be changed to match your equipment you use.
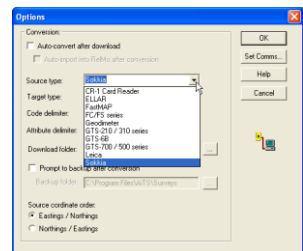
The various options available are:

Auto Convert after download
This option forces RelMo to attempt to convert the downloaded file immediately after it has been downloaded. You will be prompted for this conversion, so you have the opportunity to cancel the conversion before it takes place.

Auto-import into RelMo after conversion
Use this option to force RelMo Download to automatically launch or re-open RelMo and import the converted file.

With both the above features selected, you will not have the opportunity to inspect or edit the raw data as the whole process of downloading, converting and importing will be fully automated.

EDM Source Type
Select your equipment from the available list.

Target Type
RelMo measured format is the only option.

Code Delimiter
This is the symbol you use when you wish to double code a point (e.g. PLP5,WL for a point that is a lamppost and the start of a wall to the left). By default it is set to a , (comma). However if your EDM does not have a comma or, the comma is an awkward series of key strokes, you can change the delimiter to one on the list. See page 29 for further details on double coding of points.

Attribute Delimiter
If your survey equipment allows additional text to be inserted into a point code, you may also use attributes to specify extra information concerning a particular point or line code.

If your EDM does not have a colon, you can change the symbol from the list.

See page 39 for further details.

Coordinate order:
Choose either;
Eastings then northings. (Standard format for the Northern hemisphere)
Northings then eastings. (Southern hemisphere format)

Download folder
Set the default location where you would like the downloaded files to be saved. This is only a guide location. You can choose a more suitable location during the download process.

Backup location
Set the location where you would like a backup copy of the downloaded file and any converted file to be saved. By default this is set to A:\ You can however change it to a more suitable location by clicking on the '…' button.

Communications Options

From the Actions menu select Comms Options
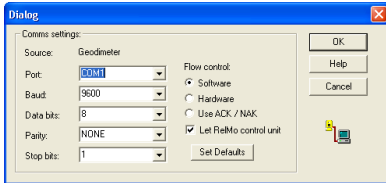
From this dialog box you may set the communications protocol used by your EDM.

Set up the port number to match the port to which the total station is connected. RelMo Download supports port numbers COM1 to COM8 inclusive.

Select 'Set defaults' to set the remainder of the settings recommended by the manufacturer of your electronic distance measuring equipment. If you have altered these settings on your instrument, you must match the settings in RelMo download to match the altered settings.

You also need to ensure that your instrument is set up to measure in vertical angle slope distance mode (VASD). This is the only surveying method that can be interpreted by RelMo. Consult your handbook if you are unsure.

Further options for Sokkia users
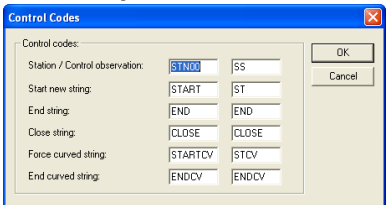
Sokkia users can used the Actions, Control Codes option to set up a number of codes used by Sokkia instruments to start and end lines etc. The Control Codes Option is shown to the left with the various control code options. You can change the codes to match your own. (Two alternatives are available).

If RelMo Download is able to communicate with the equipment directly, i.e. allow you to select jobs from the instrument from within RelMo Download the Let RelMo control unit option will appear. Check the box. (If your equipment is not able to communicate directly with RelMo, this option will not appear).

Most communications problems are found to be due to incorrect settings. Please check your machine(s) for compatibility.

Using RelMo Download

From RelMo select File, Download. RelMo will be minimised on the task bar and the RelMo Download utility will be launched.

Connect your EDM equipment to the computer. Click on the Download button.
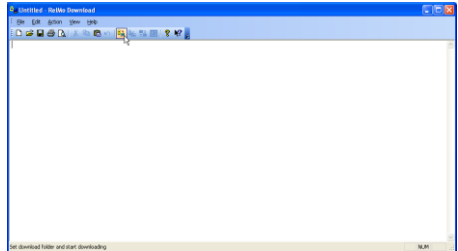
Users where RelMo cannot directly control the unit.
When the Download button is clicked the filename download dialog will appear. Select a name for your file and the folder in which it will be stored. Click Open, the Ready to download dialog will appear.
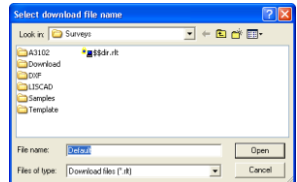
Follow the instructions in the dialog in the order given. Ensure you are ready to send the data on the EDM before you click the Begin button as RelMo only allows you 15 seconds before the COM port times out. Once you start sending data from the EDM, you will see the data appear on the screen as it downloads. The filename extension for a raw data file is .rlt
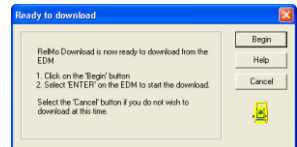
Users where RelMo can control the unit
When you click the download button a dialog will appear listing the Jobs stored in the head. Select the job you want to download and click OK. The filename download dialog will appear. Select a name for your file and the folder in which it will be stored. Click Open and your job will be downloaded. Once you start sending data on the EDM, you will see the data appear on the screen as it downloads. The filename extension for a raw data file is .rlt
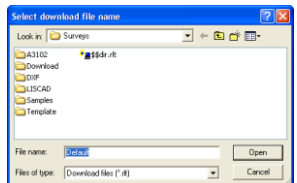
Converting the data

Once you have downloaded the raw data, you can edit and save it or, convert it and do your editing in the converted data. We suggest you edit converted (load file) data and the format of this is given in the following section.

Click on the convert data button. Your data will be converted and a summary will appear, listing the number of errors found. Error lines will be marked as a 0, in the converted data, flagged with a message that the line cannot be interpreted and will be ignored during the import routine.

If the backup data files box is checked, your data will be backed up to the location you set up in the Actions, Options dialog. If this is to a disk drive, you will be prompted to load a disk.
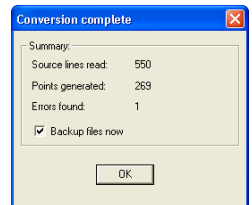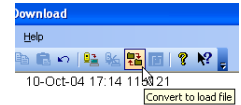
Both the raw data file (.rlt) and the converted file (.001) are backed up.

When you click OK, the RelMo load file will appear on screen. You can edit and save this file by referring to the next section.

Loading into RelMo

Once you have edited the data click on the Import button. Your file will be imported into RelMo and the RelMo Download utility will close.
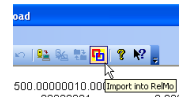
RelMo load file format

On the following page you will find an example of a RelMo load file. Load files are given the file name extension .001. For those who wish to edit the file before it is loaded, the following explanation of the lines may prove helpful.

The first field of each line describes what information is contained in that line. The table below lists the various field codes, their format and any notes.

0 Description: Comment line

  Format: 0, text

  Note: A 0 comment line is ignored by RelMo in the import process. This can be a comment entered by the user into their electronic distance measuring equipment. Equally it can be a line that RelMo has been unable to interpret. Where RelMo is unable to interpret a line, it will add its own comment such as 'unrecognised field'.

1 Description: Surveying parameters.

  Format: 1, DMS, VASD

  Note: RelMo only accepts DMS (degrees, minutes and seconds) and VASD (vertical angle slope distance). You will need to ensure that your survey equipment is set up to measure in this way.

2 Description: Location of station

  Format: 2, Easting, Northing, Level, Scale factor (optional), Station description (optional)

  Note: This line need not be defined and if not, RelMo will place the first station at the default location stored in RelMo (typically 1000N, 1000E, 100H)). See page 44 for details of how to change this location.

3 Description: Station setup

  Format: 3, Station label, Back sight station, Horizontal angle to back sight station, Instrument height in metres

  Note: Stations labels may be numbers or letters.

4 Description: Back sight station or check/control observation

  Format: 4, Observation number, Horizontal angle, Vertical angle, Slope distance in metres, Label of station observed

  Note: Although not required for a single station survey, back sight stations are mandatory for

5 Description: Detail observation

  Format: 5, Observation number, horizontal angle, vertical angle, slope distance, Detail pole height, point or line code.

  Note:

6 Description: Text attached to point

  Format: 6, text

  Note: The text will be imported attached to the previous point

9 End of file.

An example file is produced below.

```
0, RelMo / LSS load file generated using RelMo Download v3.0
0, File name: D:\RelMo Training\Geodometer\011S01C.006
1, DMS, VASD
0, 11
3, A, B, 0.0000, 1.840
0, CAESER
4, 1, 000, 00, 00, 90.10.20, 35.11, 0.070, B
5, 2, 349.56.17, 90.05.45, 25.25, 1.700, B1
5, 3, 352.37.38, 90.06.43, 19.37, 1.700, B1
5, 4, 356.32.12, 90.09.21, 14.46, 1.700, B1
5, 5, 359.40.27, 90.04.48, 12.34, 1.700, B1
5, 6, 31.16.19, 89.08.00, 11.20, 1.700, B1
5, 7, 42.30.32, 88.17.30, 14.35, 1.700, B1
6, WATERSTONES
5, 8, 92.31.20, 88.09.54, 12.52, 1.700, B2
5, 9, 130.36.03, 90.59.26, 4.68, 1.700, B2
5, 10, 135.40.07, 91.03.29, 4.77, 1.700, B2
5, 11, 153.34.58, 90.00.18, 13.49, 1.700, B2
5, 12, 153.29.58, 89.44.33, 29.64, 1.700, KC
5, 13, 159.54.38, 90.14.56, 17.65, 1.700, KC
5, 14, 161.10.39, 90.16.41, 16.44, 1.700, KC
5, 15, 161.45.33, 90.19.28, 15.21, 1.700, KC
5, 16, 162.38.28, 90.26.50, 13.80, 1.700, KC
5, 17, 167.25.27, 91.16.54, 8.74, 1.700, KC
5, 18, 179.20.32, 93.24.04, 4.52, 1.700, KC
5, 19, 186.30.09, 94.28.39, 3.67, 1.700, KC
5, 20, 193.05.13, 95.14.04, 3.30, 1.700, DK1
5, 21, 205.50.50, 96.26.48, 2.82, 1.700, DK1
5, 22, 221.40.10, 97.04.05, 2.64, 1.700, DK1
5, 23, 246.54.41, 96.57.22, 2.83, 1.700, DK1
5, 24, 256.54.29, 96.02.46, 3.10, 1.700, KC2
5, 25, 270.10.16, 94.49.10, 3.92, 1.700, KC2
5, 26, 282.07.41, 93.32.05, 5.79, 1.700, KC2
5, 27, 286.03.44, 93.02.28, 7.65, 1.700, KC2
4, 28, 000, 00, 00, 90.10.20, 35.11, 0.070, B
9
```

Creating from scratch

RelMo will allow you to create a plan or to build a model for use as a code or template from scratch. This section is intended to give you an idea for the first steps and should be used in conjunction with the rest of the manual.

Manually recorded line & offset measurements
- o Open a new survey.
- o From the Control Bar Objects tab, right mouse on Root and Create New Object.
- o Name the Object and set it Active.
- o From the points menu, select Add Points.
- o Add two simple points, adjusting their easting and northing so that they are the correct distance apart for your datum line.
- o From the Design menu, select Add Points. Choose Line and Offset and click on locate points. Locate your baseline by selecting the two points added earlier.
- o Now add your points, joining them with lines where required, by giving the distance along and, to left and right of the datum.
- o Autocalc the triangles.
- o Add any templates, animation etc.

Manually recorded triangulation measurements
- o Open a new survey.
- o From the Control Bar Objects tab, right mouse on Root and Create New Object.
- o Name the Object and set it Active.
- o From the points menu, select Add Points.
- o Add two simple points, adjusting their easting and northing so that they are the correct distance apart for your two fixed points.
- o From the Design menu, select Add Points. Choose Two Distances and click on locate points. Locate your baseline by selecting the two points added earlier.
- o Now add your points, joining them with lines where required, by giving the distance along and, to left and right of the datum.
- o Autocalc the triangles.
- o Add any templates, animation etc.

Manually recorded parallel offset measurements
- o Open a new survey.
- o From the Control Bar Objects tab, right mouse on Root and Create New Object.
- o Name the Object and set it Active.
- o From the Design menu, select Add Points.
- o Add the points to form your first line using the appropriate Add Points method with the appropriate line style.
- o Select the line and right mouse click to create parallel lines.

Triangulating the model

Preparing for triangulation

Having imported, downloaded or drawn the model and corrected and line styles, i.e. converted lines that where accidentally surveyed with a curved line style to a straight one and visa versa (see page 115, Line Properties) and, corrected any points that were coded with an incorrect height (see page 101, Point Properties) the next step is to triangulate the model.

Users who have imported their model from CAD should ensure that all the ground model points are within the same object (see merging objects on page 56).

The next step is to triangulate the main model. Use the flowchart on page 69 to decide the way in which you want to triangulate the model.

Triangulating the main model

Triangulating the model

To triangulate the model, ensure that the Object you wish to triangulate is active. Right mouse click and select AutoCalc Triangles from the Objects menu or select AutoCalc Triangles from the Main Objects menu.

The Set Triangle Properties dialog box will appear. Select the texture first and then change the Solid Colour if necessary. The texture applies to the 3D and locked ortho view. The Solid colour applies to 2D view. To change the texture click on the … button.
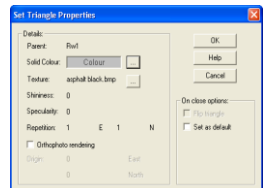
The Surface Properties box will be displayed. First select the image you require from the list and then change the solid colour if necessary. (Note the order that this is done).
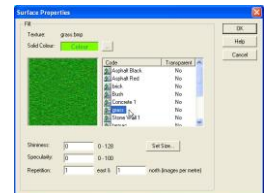
Set the Repetition, the number of times that the texture repeats itself per metre. This is important in 3D view as it affects the 'coarseness' of the image.

By way of example, the grass image to the right shows a triangle filled grass repeated at 0.5 metres (top), and at 2.0 metres (bottom). Normally, a repetition of 1 and 1 will suffice. Set size applies to ortho photographs. See page 189 for further details.
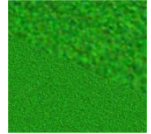
Users wishing to create a simple 2D line model
As suggested in the flow chart on page 69, users who simply want to produce a 2D line plan should triangulate the model with textures set to none and a solid colour that matches the background colour of your screen.

Users wishing to create a 2D coloured plan or 3D model
Users who wish to create a 3D model or a 2D model with coloured in surfaces should triangulate the model with the majority colour/texture.

Having created the triangles, and before escaping from the triangle routine, it is suggested that the triangles are inspected to see if there are any problems such as triangles breaking over two surfaces. If there are, you can adjust the triangle creation routine (see page 45) or manually delete and then add new triangles that follow the line features.

Manual triangle creation
Triangles can be added manually rather than allowing the software to control the triangulation routine. This is useful when designing new template objects or complex lines and points or, where one or two triangles in the model break across two surfaces In the latter it may be easier to delete the offending triangles and manually create your own triangles by linking the points in a different order.

There are two warnings when manually creating triangles. If you leave a hole (an un-triangulated section) in the ground model, any animation that passes over the hole will produce unpredictable results. This is because the distance across the non existent triangle is not known. If you create a triangle on top of another triangle and produce animation across the top of it, again, strange things can happen. This is because the object will not know which triangle or level to use.

Partial triangle creation

You can partially triangulate the model by selecting a number of points (see selecting points on page 102).

Once selected, right mouse click and select Triangulate. The Select triangle properties Dialogue will appear. Select a texture and solid colour and click OK. Triangles will be created between the selected points.
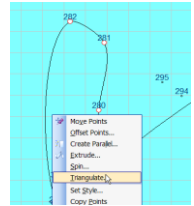
To delete a triangle

Make the object that contains the triangles the Active Object, right mouse click and from the Triangles menu select Delete Triangles. Alternatively click on the delete triangles button. The cursor will change and the triangle outlines will be shown. Click anywhere on the Triangle you wish to delete.
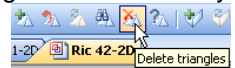
To create a triangle manually

Right mouse click and from the Triangles menu select Add Triangles. Alternatively click on the Add triangles button. Right mouse click again and Edit the current fill to set the 3D texture and 2D solid colour. Alternatively, if a triangle of the right colour already exists in your survey, use the dropper tool to click on that triangle and pick up its Properties. Once set, use the mouse to select the three points you wish to form the triangle.
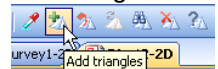
Note – These points should be selected in an anti-clockwise direction. Triangles have two faces and by creating them in an anti-clockwise direction, you will ensure the top face is uppermost. This has the following implications;

- o *In 2D, when in a triangle routine, the triangles will invert their solid colour (this tells you that you are viewing the back face. You will not be able to click on the triangle (with the exception of the flip command below) unless you hold down the shit key.*
- o *In 3D view where you have chosen to display one side only (to enhance the speed on lower end computers) any inverted triangles will not be displayed.*
- o *In 3D view inverted triangles will not display bright and will appear to be in shadow.*

Flipping triangles
If you do find you have inverted triangles (an example is shown to the right), right mouse click and select Triangle Properties from the Colour menu. Click on the triangle and use the Flip button in the Triangle Fill Properties dialog box to automatically turn the triangle over. Alternatively click on the flip triangles button and then click on the triangle you wish to flip.
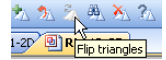
Triangle Properties
You can inspect and change a triangle's Properties. (To change several triangles, use the Fill Triangle routine. To change many triangles use Find and Replace). Set the object Active which contains the triangle whose Properties you wish to inspect and either right mouse click and, from the Triangles menu select Properties or, click on the Triangle properties button.
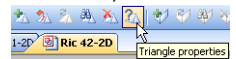
The cursor will change and all the triangle outlines will be displayed in the Active Object. Click on the triangle whose Properties you wish to inspect. The Triangle Properties dialog will be displayed.
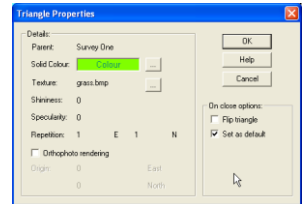
You can change either the solid colour or the texture by clicking on the … button. You should change the texture before you change the solid (2D) colour. This is because if you change the texture it will automatically change the solid colour to the default colour that it is associated with.

Colouring in the remaining triangles
Having triangulated the model with one colour and texture, users who wish to create a coloured in plan or who are creating a 3D model will need to re-colour a number of triangles. In this section we look at how to colour the remainder of the model. Users who are creating a simple 2D line plan as a line drawing without fill can skip this section.

Adding colour and textures by triangles
Set the object you wish to colour as the Active Object.

Right mouse click and from the Triangle menu select Fill Triangles. You can now choose to fill the triangles One by One or by Entire Object. Select One by One. Alternatively, click on the Change Style button.
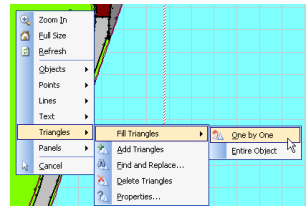
The triangle outlines will appear on the model and your cursor will be loaded with the current fill colour (the one that you used to fill the entire model). To change this colour, right mouse click on the main screen. The menu to the right will appear. Click on Edit Current Fill.
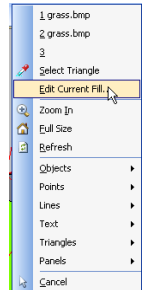
The Set Triangle Properties box will appear. Select the texture and solid colour as described on the previous pages.

Once you have selected the texture and solid colour, click OK. You can now colour the triangles by placing the cursor over the triangle and clicking the left mouse button. To colour multiple triangles place the cursor over the first triangle to be coloured, click and hold down the left mouse button and drag the mouse over all the triangles you want to be coloured. When you release the mouse button, the triangles that the mouse passed over will change both colour and texture.

To change back to a colour/texture you have already used, right mouse click and select the colour/texture from the top of the list (the last 3 textures are stored). If the texture has dropped off the list, click on the dropper tool and select the triangle you want to change to by left mouse clicking on that triangle on the model.

Finding and Replacing Triangle Colours and Textures
You can find triangles with same properties and replace them with different Properties. Find and replace effects all the triangles of the selected object.

Right mouse click and from the Triangle menu select Find and Replace or click on the Find and Replace button.
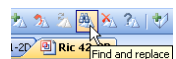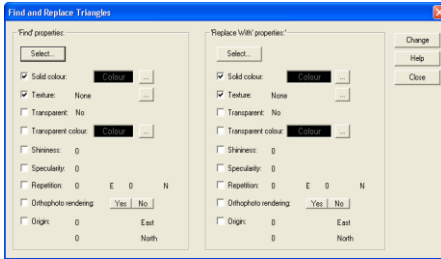
The Find and Replace dialog box appears. From the Find Properties you can specify particular properties or click on the Select button. If you click on Select, the dialog will disappear allowing you to select a triangle. Click on the triangle you wish to find. The dialog will reappear.

On the Replace With side of the dialog change the Properties to the new settings or, if you already have a triangle with those Properties click on Select and left mouse click on the triangle. Click change and all the triangles you selected on the Find side of the dialog will change to those you selected on the Replace With side.

Rotating Triangles (3D command)

As mentioned previously, triangles have two sides and, when you render them with an image the way that the image reflects light and joins up with the edges of an adjacent triangle will depend on the way that you created the triangles. The image to the right demonstrates this where the join in the bricks between the two triangles does not align.

Provided you remember to create the triangles anticlockwise, this problem should not arise. However if it does, you can rotate the triangle to match the edges. This command is only available in 3D.

In 3D, make the Object that contains the triangles the Active Object and enlarge the points. From the main Triangles menu select rotate points. Click on one of the points of the triangle you wish to rotate, you can continue to click until it is all the way back to the original orientation.
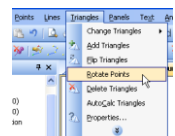
The image to the right has been corrected and the brickwork now appears seamless even though it is created from two triangles.
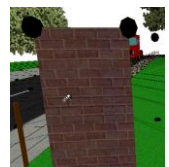
You may need to combine this routine with the Flip Triangles routine on page 86.

Triangle display options

Normally whenever you enter a triangle routine the outline of the triangles will always be displayed. Escaping from the triangle routine will cause the triangle outlines to disappear. You can force the triangle outlines to show permanently by selecting Show Triangle Outline from the Display menu.
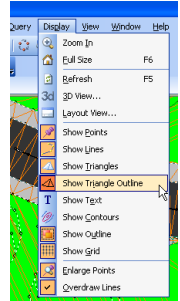
You can also turn off the triangles by deselecting Show Triangles from the Display menu. In 2D this will leave you with a line drawing. In 3D, the ground model will disappear!

The Textures Library

The textures that you add are loaded from the Textures Library.

On the Resources Control Bar, expand the textures tree and right mouse click on a texture. You can now add, amend or delete a texture.
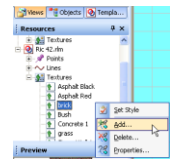
To add a new texture, click on Add, the Add New Texture dialog box appears. If you are adding a new texture that you have obtained from the web or, you have taken a digital photograph of a new texture, you will need to manually transfer it to the folder where your keep your textures. By default RelMo installs textures to C:\program files\AiTS\textures. You can save your textures in either .bmp, .jpg or .gif format. If you want to add a transparent colour, one that RelMo allows you to see through, the texture must be saved as a bitmap (see below for transparency).

To create a texture that is going to repeat over many triangles such as grass, make sure the texture is square and the edges are all similar. Programs such as Paint Shop Pro are a big help as they help you to create this sort of repetitive bitmap or 'tile'.

Having placed your image in the textures folder Click on the button marked >> next to File Name. Select the texture (a preview appears in the preview window) and click Open.

You will be returned to the Add New Texture dialog and the selected image will be shown in the preview window. By default, the name for the new texture will be the same as the name you gave to the Image. You can now alter this name. Select an Alternative Colour that will be displayed if you turn off Show Textures in 3D view. If you need a transparent colour, (see below for transparency), check the enable transparency button and select the colour that is to be transparent. Finally select the default shininess, specularity and repetition for your texture. Click OK and exit the Library remembering to save the changes.

Transparency
You can add a transparent colour to any image that you are going to convert into a Texture. When you specify a colour as a transparent colour, it is not displayed in 3D view and anything behind the colour can be seen. This can be useful for such things as windows, trees etc.

You will need an external image editor to 'paint' a transparent colour onto your image. For example if you take a digital photograph of a house, and rather than displaying the windows and glass, which you will not be able to see through, you paint the glass a colour that is not used elsewhere in the image, you can specify this as the transparent colour and look through the windows. An example of a tree bitmap is shown to the right

The resulting 3D image is shown to the left.

Note - To use transparency the image must be saved as a bitmap.

Tip – use a colour that is close (but not too close) to either the image or the background against which it is to be displayed. This is because of the way that graphics cards handle images and the way they are displayed. If a colour such as orange had been used, a slight orange tinge might be seen around the edge of the tree.

Where to make new textures

If you make a new texture in the current job, it will only be available in that job. To make the new texture available to all new jobs, you should make the new texture in the Codes survey that resides in C:\program files\ AiTS\bin. Vista users will be prompted for an alternative loacation

If you don't make the texture in Codes, you can open the Codes survey and from the Resources Control Bar, drag the new texture from your current survey to textures in the Codes survey. Save and close Codes.

Points

An Introduction to Points

Whether you are trying to achieve a 2D line drawing, 2D coloured survey or 3D model, you are likely to have to add or change some points. You can also design schemes from scratch by manually adding points and linking them with lines.

Where data has been imported or downloaded, the points can be edited or added by making the Object which contain or, is to contain, the points the Active Object. (Double click the Object or drag a box round it with the mouse).

Displaying points

You can choose whether or not to display points. From the Display menu select Show Points. Note that only points in the Active Object will be displayed.

Enlarging points

Points can be shown in a large size to make it easier to work on them. You can make them smaller or larger by Selecting Enlarge Points from the Points menu.

In 2D the size of the points is set. In 3D you can define the size of the points by selecting Set 3D Point Size from the points menu. You can enter a figure in the range given.

Identifying points

There are three methods of identifying points. The first is by colour, the second by hovering over the point to obtain feedback, finally you can chose to display point numbers on screen.

By colour

To switch this option on, go to Screen Options from the View, Options menu and check 'Highlight point creation types'.
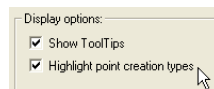
Highlight point creation type will colour code all the points as follows;

Red   User created point, created during editing
Black   Original survey point created during the import routine
Grey   Created from a special code e.g. –RIN
Blue   Created during triangulation or auto-insert points.

By Hovering
To switch this option on, go to Screen Options from the View, Options menu and check 'Show Tool Tips'.
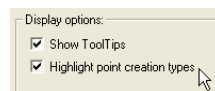
Show Tooltips allows the user to hover over a point to show a tooltip which lists, point number (where the point is an original survey point), point code and the height. The screenshot to the right shows an original imported point. This feature only works in 2D.
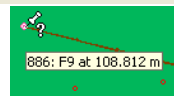
By Displaying Point Numbers
From the Points menu, select Show Point Info. Ensure that on the Display menu Display Point Info is checked. The point numbers in the Active Object will be displayed.
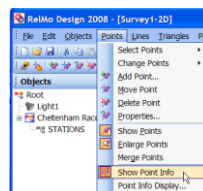
Two types of point numbers can be displayed, either the original survey point number or, the RelMo point number. These may be different.

The original survey point number is the point number as recorded by your electronic distance measuring equipment when you took a particular observation. The RelMo point number is the point number assigned by RelMo.

Whereas the original survey point number will not change, the RelMo point number constantly changes where you have added or deleted points or, auto points have been created on triangulation. The change occurs after each Save. Prior to saving, 0 will be displayed.

When displaying the original point number, points that have been added in RelMo will not display a point number.

You can choose which to display and, alter the font, size and colour from Points, Point Info Display. The Point Info Display Dialog will be displayed.
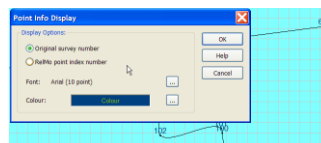
Note that some imported file types such as DXF files do not have survey point numbers.

Snapping to a point

Most Point commands will allow the user to snap to the nearest point in 2D view. As you move the cursor around the screen the nearest point will be highlighted. Clicking the left mouse button will snap to that point.
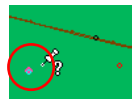
The Point nearest the cursor is highlighted.

In 3D view, you must click on the point itself.

Resolving Ambiguity

If you select a point which is very close to another point, the Resolve Ambiguity dialog box will appear. Select the point you wish to edit from the list. To avoid this happening, try zooming in further before selecting the point.
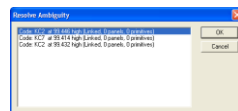
Simple and Complex points

There are two different types of point, Simple and Complex.

Simple points are points that contain a basic symbol such as a triangle, circle or rectangle. These simple points are about the same size as the point itself.

Complex points are built by the user and can be such things as trees bollards, lamps etc. These points, as well as having a 2D symbol often also have a 3D shape.

Point codes

Every point has a unique code. When you give a point the relevant code, the 2D symbol and in the case of complex points, the 3D shape associated with that code will be drawn at the correct location. It is good practice to start all point codes with the letter P. This stops unknown point codes from being linked up with lines on import if the 'auto-create line for unknown line' features is turned on.

Point codes know that the symbol is produced by a single point therefore users of electronic distance measuring equipment simply need to enter the point code and take the observations without the need for any additional start of symbol or end of symbol codes.

Point Code Library

The style associated with a point or a line is defined in the special survey called Codes that resides in the C:\Program files\aits\bin folder. Each time you start a new job RelMo takes a copy of the codes in the Codes survey and adds them to your job.

You can add or amend points or change the code associated with a point. If you want these changes to be available to all new jobs, you need to make the changes in the Codes survey.

To access the Code library you will need to display the Resources Control Bar (page 10).
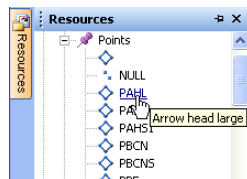
Complex codes are indicated by the blue diamond symbol and Simple codes by their symbol such as a dot or a triangle. When you hover over a code a description is displayed. When you click on a Complex code, a preview of its symbol appears in the Preview Control Bar if you have it open.

If you are changing to RelMo from another surveying package, it is recommended that you change your RelMo codes to match the ones that you are used to using. Some things will need to change for example you will have to comply with the RelMo protocols for starting and ending line codes.

Creating and amending codes

Whether creating new or amending existing codes, you have a number of options.

Right mouse click on the code you wish to amend or any code if you wish to make a new one. Choose Add to make a new code, edit to amend an existing code or Properties to change the code or description.
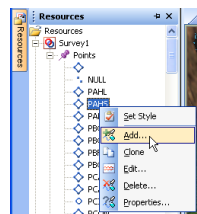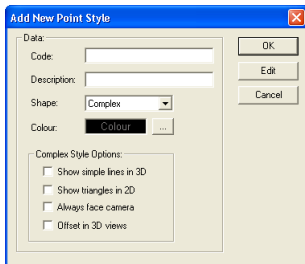
To create a new code, right mouse click on a code and click add. The add New Point Style dialog box appears.

Type in a Code (this can consist of letters or numbers). Remember, by convention you should use a P to start a point code. You should also ensure that you do not duplicate codes in both Points and Lines. Add a description that will appear as a tool tip in the Control Bar window. For a simple point, select a shape from the drop down list and change the colour. If you wish to design a complex shape, select complex from the drop down box and choose a colour for the point.

In relation to Complex codes there are a series of further options.

Show simple lines in 3D - This Option allows you to create a simple line symbol for your point for use in 2D for printing plans. However the simple lines will not be displayed in 3D. A good example of this is a tree.

In 2D the simple symbol is associated with the point. In 3D the 2D symbol is not required because a 3D image of a tree is displayed. You can force the lines to be shown in 3D by selecting lines from the Display menu.

Show triangles in 2D - This Option will usually depend on whether you produce coloured plans or, simple line drawings.
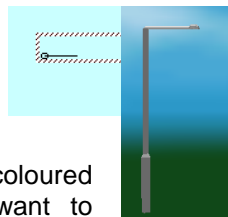
For those who produce coloured plans, you are likely to want to display the triangles which make up a coloured object. If you prefer to produce line drawings, a simple 2D symbol is all that is required. The lamp post to the right shows the 3D triangulated model but the 2D symbol is a simple line drawing in which no triangles are displayed.

Always Face Camera   This feature causes the point to rotate to face the screen. This has the effect of producing a 3D effect for flat objects. A tree is a good example of this.

Offset in 3D views   This feature minimises interference between triangles which are very close to each other for example white lines on a road surface. It causes the Windows® operating system to minimise the interference that occurs when two objects in the distance are vying for the same pixel on the screen.

Having checked the appropriate options click Edit. The main window now becomes the Codes editor with a green point displayed at 0,0,0. This point is the survey point. Using all the normal RelMo tools, create the Complex Point.
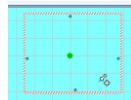
You can also copy Objects that you have created in a main RelMo survey into the editor.

Important
When finished you must click on the Control Bar Objects tab and merge any Objects with the Root Object which will have the name that you gave for the code. Once finished, quit the codes editor using Quit symbol

Click Save and your Code will be saved.

Note - To make this Code available for all future surveys, you will need to create it in, or drag it into, the Codes.rlm survey that (by default) resides in C:\ Program files\AiTS\Bin.

Adding Points
There are two ways of adding a point. To add a simple point and have the opportunity to change its coordinates, ensure that the Object that you wish to add the point to is Active and, from the Points menu, select Add Points or, click on the add points button

Click on the screen where you want to add the point. The Add point dialog will appear. You can select the point style from the drop down list of codes or, if you do not know the Code, click on the … button. A full list of codes and their description will appear.

Note that if the point is a Complex one you also have the opportunity to define its angle (from screen north). For example this is useful to ensure that a lamp post is facing the right way. You can also correctly proportion the code by defining the size of its X, Y and Z coordinates.

For users of EDM equipment, you can proportion the code at the scene using additional Attribute codes, (see page 39).

The second, and more diverse method of adding points is from the Design menu. To add a point to an Object using this method, ensure that the Object is Active and select Add Points from the Design menu.

The Add Points dialog will appear. You are presented with a number of different options for adding points. You can define a style for the new points. To change the point style, click on the three dots and select the point style from the list. If you wish to create a line between the points create, check the create line box and select the line style by clicking on the three dots.

You can now choose the method by which you wish to add the points. Provided the model has been triangulated, points will land on the surface of the model unless the Force default height box is checked. If you check this box, you can enter the height for the point in metres.

Freestyle points
Freestyle allows you to add points by placing the cursor over the place where you wish to add the point and clicking the left mouse button to create the point. The new point will appear on the model in the style set in the Add points dialog box.

Adding by coordinates
Adding by coordinates allows you to type in the easting and northing of the point again, the point will land on the surface of the triangulated model unless a default height is entered.

Adding by line and offset
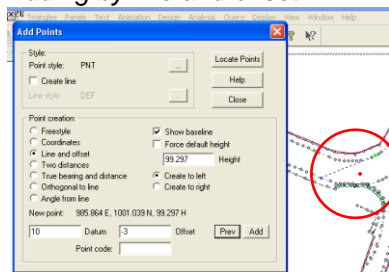
Adding by line and offset allows you to locate the two points on the ground model at either end of the line. To do this click on Locate points, the Add Points dialog will disappear. Click on the points at each end of the line. If the show baseline box is checked, the baseline will be shown on the model as a dotted line. The Add points dialog will reappear. Enter the distance along the baseline and the distance off. Check either create to left or create to right where the green dot indicates the end of the baseline. Click preview and the point will appear as a red dot on the model. If the position looks correct click Add and the point will be added. Again, the point will land on the surface of the triangulated model unless a default height is entered.

Adding by two distances (triangulation)
Adding by two distances or, using the triangulation method again allows you to locate the fixed points on the ground model. To do this click on Locate points, the Add Points dialog will disappear. Click on the fixed points on your survey. If the show baseline box is checked, a baseline will be drawn between the two fixed points as a dotted line. The Add points dialog will reappear. Enter the distance of the new point from fixed point one and the distance from fixed point two and choose create to left or right of the line. Again, a preview of the point location will appear in red. If the two distances are too short to provide an intersection, a warning message will appear in the Add points dialog. If the provisional point is in the correct location, click Add and the point will be added. Again, the point will land on the surface of the triangulated model unless a default height is entered.

Adding by true bearing and distance
Adding by true bearing and distance allows you to add a point by defining the direction and distance from another point. To do this click on Locate points, the Add Points dialog will disappear. Click on the point that you want as your reference point. The Add points dialog will reappear. Enter

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the true bearing and distance the new point. Again, a preview of the point will appear in red. If the provisional point is in the correct location, click Add and the point will be added. Again, the point will land on the surface of the triangulated model unless a default height is entered.

Orthogonal to line
Creates an additional point at 90º to the end of a line and then creates a new baseline from the end of the first line to the new point allowing you to add another new point at 90º to the new line. In this way a series of new points can be created in a 'step' fashion.

First use the Locate Points button to select the first baseline, the Add Points dialog will disappear allowing you to select the two points with the mouse. The Add points dialog will reappear. Enter the distance from the line and whether the point is to be created to the left or right of the baseline. Preview the point (shown in red) using the Prev button and if correct click the Add button.

Angle from line
Creates an additional point at a specified angle and distance from the end of a selected line.

First use the Locate Points button to select the baseline, the Add Points dialog will disappear allowing you to select the two points with the mouse. The Add points dialog will reappear. Enter the angle and distance from the end of the line and whether the point is to be created to the left or right of the baseline. Preview the point (shown in red) using the Prev button and if correct click the Add button.

Deleting points
To delete a point in an Object, make the Object Active. Right mouse click and select Delete Point from the Points menu or from the Draw menu select Points, Delete Point. Alternatively click on the Delete Points button. If the point is linked to another point by a line, a warning message appears, click yes if you still wish to delete the point and, its attached lines.

Note – If you delete a point that has been triangulated into the model, the triangles attached to that point will also be deleted. You will need to create new triangles using the Add Triangle routine on page 85.

Moving points

To move a point, right mouse click and select Move from the Points menu or from the Draw menu select Points, Move Point. Alternatively click on the Move point button.

Click on the point, (the cursor will snap to the point), and with the left mouse button depressed drag the point to its new position.

Note – If you move a point that has been triangulated into the model, the triangles attached to that point will also move.

Rotating points

With complex points it may be necessary to rotate the point to get it to face the right way. For example a streetlamp. Select Properties from the Points menu or click on the Points Properties button.

The Points Properties box will appear.

You can change the rotation of the point by setting a figure of between 0 and 360 in the Complex style Angle box. 0 is the top of the screen.
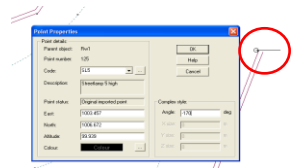
Point Properties

To interrogate or alter the Properties of a point, right mouse click and select Properties from the Points menu or from the Draw menu select Points, Properties. Alternatively click on the Properties button.
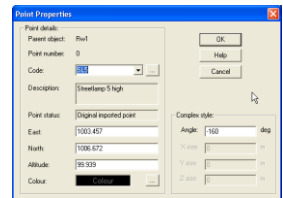
Changing points

You can quickly change the style of a point by selecting the style from another point within the survey. You can also change the style of all the points within an Object. From the Points menu select Change Points and choose from One by One or Entire Object.

If you select Entire Object, all the points will be changed to reflect the current default style. If you select one by one, the cursor will change. Now select the style you want to apply by clicking on the dropper tool and clicking on the point whose style you want or by right mouse clicking on a point in the Points Tree in the Resources ControlBar. The cursor will then change back to the Change Points cursor and you can click on each point to which you wish to apply the new style.

Selecting points

You can select individual points or groups of points. There are several methods of selecting points. To select points, from the Points menu go to Select Points and chose from one of the four methods shown below. Selected points appear with a red outline.

One by one

One by One allows you to Click on the individual points you wish to select.

Note – RelMo remembers the order in which you select the points. This can be useful when using commands such as create parallel when deciding whether to create to the left or right of the original points.

Block selection

This command allows you to drag a box with the left mouse button depressed around a number of points to select them all.

Select by line

This command allows you to click on a line. All the points on that line will be selected.

Select by Style

Selecting by Style displays the Style dialogue box. Choose the point code for the style you wish to select (click on … if you need to see a description of the code) and click OK. All points of that style within the Active Object will be selected.

Extruding points

Once a Point or series of points have been selected using Select Points from the points menu, they can be extruded. Extruding points allows you to grow a vertical panel to a specified height. This panel can be coloured and or, rendered with an image. For example, the digital image of an actual house can be added to a survey of a street.

Extruding points will depend on the way in which you have surveyed. Users with reflectorless electronic distance measuring equipment are able to take observations of top corners of buildings etc. using the –OBJ command (see page 31) in such cases, the panels are added to the points in 3D mode (see page 145) as the points for the top of the panel already exist and it is therefore unnecessary to add further points to form a panel. Users who require a reflector or who have created a survey from scratch will need to add the additional points at a height measured or known to the user.

For more information on extruding panels and adding images see the section on Panels on page 127.

Offsetting points

Having selected your points, this feature allows you to move the selected points by a specified distance north or east or to change their height. For south and west, or to lower the point, use a negative value. Any line attached to the points will also move.

Creating parallel points

Having selected your points, this feature allows you create a single point or a series of points parallel to the selected points. This is a powerful feature as it allows you to create different point styles for the new points, join them with a line and, fill the space with triangles. If you are creating a survey from scratch, this tool can prove to be a great time saver. (Also see create Parallel lines on page 118).
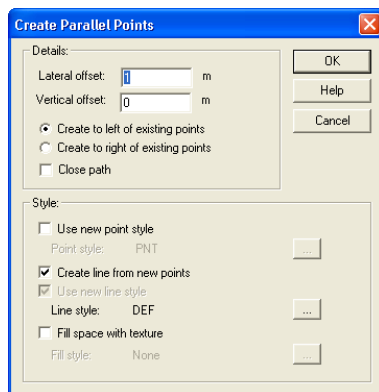
Right mouse click and select Points, Select Points and choose from block selection or one by one. Each point you select will be highlighted in red. Once you have selected the points, right mouse click and select Create Parallel. The Create Parallel Points dialog will appear.

Select the lateral (sideways) offset in metres and enter any vertical offset.

Select Create to left or right of the existing points where left is to the left of the points in ascending observation number.

Select close path if you are joining the points with a new line style and wish to join the first new point to the last new point.

You can choose to change the point style by checking the Use new point style button and changing the style using the … button. If you leave this box unchecked, the new points will be created in the same style as the originals.

You can choose to create a line style between the new point by checking the Create line from new points button. Check the use new line style box and select the line style by clicking on the … button.

Finally you can force the software to triangulate the surface between the new and existing points. To select the fill style, check the box and chose the texture and fill colour for the triangles. Click OK and the new points will be created.

Selecting a group of points to create a new Object (cloning)
Having selected your points, you can create a new Object from the selected points. Right mouse click and select Clone area.

The Add New Object dialog box appears.

Give the new Object a meaningful name. You can now set the Properties of the Object including its height above the source Object. See Object Properties on page 64 for further details.
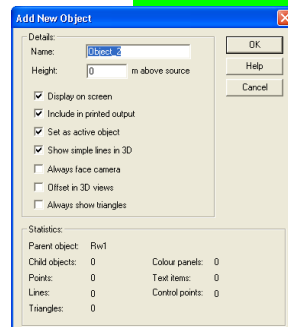
When you click OK you will be asked whether you want to keep or delete the original points. Choose which is appropriate.

Any points and lines attached to the points will now be copied to the new Object.
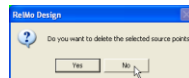
Converting a Point to an Object
You can convert any RelMo complex point to an Object. This is useful where you may wish to animate a complex point (such as a tree which falls over). As only Objects can be animated, you will need to convert your point to an Object.

On the Resources Control Bar, expand the points tree. Right Click on the point you wish to convert. Click Copy As Object. Your point will be converted to an Object within the current Active Object.
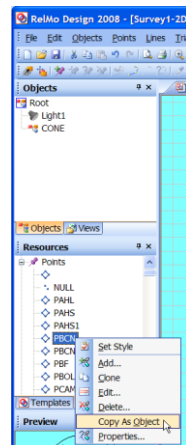
Merging Points
The merge points command will create one point where multiple points exist in the same place i.e. with the same x, y and z coordinate.

The merge points command is Object based.

Any lines attached to the multiple points will be preserved after the points have been merged.

Select Merge Points from either the Objects or Points menu.

Lines

An Introduction to Lines

Whether you are trying to achieve a 2D line drawing, 2D coloured survey or 3D model, you are likely to have to add or change some lines. You can also design schemes from scratch by manually adding points and linking them with lines.

The colour, style and thickness of these lines is contained in the Codes Library.

Where you are importing point data you will normally link lines between points, however RelMo allows the user to create lines from scratch. These lines are called freestyle lines.

Displaying lines

If lines are not shown, from the Display menu select Show Lines.

Identifying lines

You can identify a line by hovering over the line to obtain feedback. To switch this option on, go to Screen Options from the View, Options menu and check both boxes in the Display options section of the dialog.

Show tool tips allows the user to hover over a point to show a ToolTip which lists, line code and the number of points in the line. This feature only works in 2D.

Selecting a line

To select a line, click on the Select line tool and move the cursor over the line which will highlight. Clicking the left mouse button will select the line.

You can adjust the sensitivity of the highlight tool by changing the value of Line tolerance in View, Options, Screen. The value represents the distance in pixels from

the line before it is highlighted.
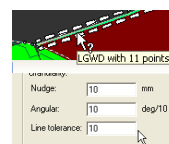
In 3D view, you must click on a point attached to the line.

Resolving Ambiguity
If you select a line which is very close to another line, the Resolve Ambiguity dialog box will appear. Select the line you wish to edit from the list. To avoid this happening, try zooming in further before selecting the line.
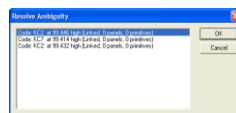
Simple and Complex lines
There are two different types of line, Simple and Complex.

Simple lines are lines that contain a basic line styles such as a solid, dashed or dotted line. They can be curved or straight and their width and colour can be defined.

Complex lines are built by the user from, points lines, triangles and panels to form a solid 3D shape. They also have a 2D symbol. See the following section for further details.

Line codes
Every line has a unique code. When you give a line the relevant code, the 2D symbol and in the case of complex lines, the 3D shape associated with that code will be drawn between points at the correct location. It is good practice not to start line codes with the letter P. This allows unknown line codes to be linked up on import if the 'auto-create line for unknown line' features is turned on in View, Options, Survey Import. If a code does start with a P, it is assumed to be a point code and will not be linked by the auto-create routine.

There are several different types of line code including auto repeat, 2 point lines and three point lines. Briefly,

- o An auto repeat line will continue to repeat its symbol until told to stop. This code is used for features such as walls carriageways, white lines etc.

- o A two point line code will end after the second point. The symbol will stretch between the two points. This code is used for features such as road arrows.

- o A three point line code requires the base and height to be entered to cause the feature to stretch to, in effect, fit the box you have created with the three points. It will automatically end after the third point has been entered. This code is used for features such as road text.

For more detail, see page 30.

Line codes know the symbol that they are associated with therefore users of electronic distance measuring equipment simply need to enter the line code and take their observations to produce a completed line drawing on import.

Creating and amending codes
The style associated with a point or a line is defined in the special survey called Codes that resides in the C:\Program files\aits\bin folder. Each time you start a new job RelMo takes a copy of the codes in the Codes survey and adds them to your job.
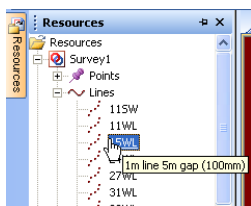
You can add or amend lines or change the code associated with a line. If you want these changes to be available to all new jobs, you need to make the changes in the Codes survey.

To access the Code library you will need to display the Resources Control Bar (page 10).

Complex codes are indicated by a striped symbol (curved for curved line styles and straight for straight styles). Simple codes are indicated by a solid symbol, again either curved or straight. When you click on a complex code a preview of its symbol appears in the Preview Control Bar if you have it open.

If you are changing to RelMo from another surveying package, it is recommended that you change your RelMo codes to match the ones that you are used to using. Some things will need to change for example you will have to comply with the RelMo protocols for starting and ending line codes.

Whether creating new or amending existing codes, you have a number of options.

Right mouse click on the code you wish to amend or any code if you wish to make a new one. Choose Add to make a new code, edit to amend an existing code or Properties to change the code or description.
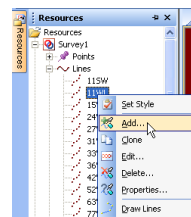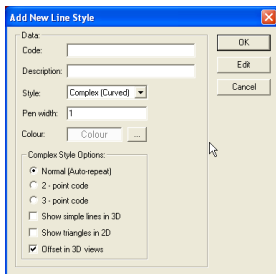
To create a new code, right mouse click on a code and click Add. The add New Line Style dialog box appears.

Type in a Code (this can consist of letters or numbers). Remember, by convention you should not use a P to start a line code. You should also ensure that you do not duplicate codes in both Points and Lines. Add a description that will appear as a tool tip in the Control Bar window. Select the style, you can choose from a range of simple lines or a complex straight or curved line.

In relation to simple lines, change the colour and pen width of the line to reflect the colour and thickness of the line that you want to appear on screen and print out on any plans.

If you wish to design a complex shape, select complex straight or curved from the drop down box. Changing the colour for a complex line will change the colour of any simple lines that are included in the object to that colour.

Note – Complex straight or curved relates to whether the code is to be a curved or straight line style. For example it is reasonable to assume that a hedge line would follow a curved line, however a brick wall would be in straight sections, thus the hedge would be complex curved and the wall complex straight.

In relation to Complex codes there are a series of further options. You can choose from Normal (auto-repeat), 2 point or 3 point line codes as described above and on page 30.

Show simple lines in 3D - You can choose whether the simple lines that you use in your code should be shown in 3D. In the example to the right where a series of simple lines have been added to simulate a mesh, these are shown in 3D.
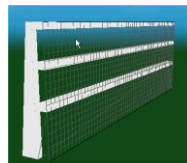
Show triangles in 2D - This option allows triangles to be shown in 2D. In the case of the fence above, they would not normally be shown as the fence has simple lines to depict its shape for printing. However in the case of, say, a road marking code such as an arrow or give way symbol, they could be shown in 2D as they are created from triangles. The example to the right demonstrates this where the user prefers to plot coloured in 2D plans. For users who prefer line drawings, the lines that surround the shape rather than the triangles would be shown.

Offset in 3D views - This minimises interference between triangles which are very close to each other. This feature is useful where you create something that is more likely to lie on rather than stick out of a surface such as the road marking above. In effect when this option is selected, Windows® lifts the symbol off the surface when it is in the background and places it back on the surface when in the foreground. The effect is never seen by the user.

Once you click edit, the main window becomes the Codes editor. A guide line will appear as a dotted line as you start to create your Complex Code. In RelMo the start of any line is coded as green and the finish as red. In addition the guide line depicts the survey line. Thus in the diagram below, the point that starts the line style should be placed or surveyed centrally and the style will start with a solid and dashed line.
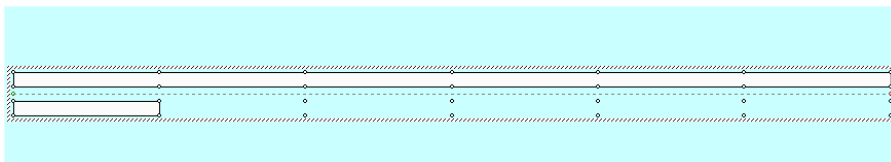
The start of the guide line is at 0, 0, 0. The advantage of the guide line is that it allows you to design codes that are offset from the surveyed line such as hedge to the left and hedge to the right (both supplied with the program).

Note the way in which the line is designed. Only one instance of the style is built as the line will continue to repeat itself when used in the survey. This also applies to the barrier with fence on the previous page, only one upright has been built and the crossbars are added at the correct length as far as the next upright. When used, the first upright will repeat itself as the second upright.

In the road line style, the points are positioned at metre intervals as this is a curved line style. With points positioned like this the curving will be smooth.

It is important that, when you have finished creating your code, you must click on the Objects Control Bar and merge any Objects with the Root Object which will have the name that you gave for the code. Click Save and your Code will be saved.

Note - To make this Code available for all future surveys, you will need to create it or, drag it into the Codes.rlm survey that (by default) resides in C:\ Program files\AiTS\Bin.

Remember
If you have created your Code in a different survey you can simply open the Codes survey and from the Resources Tab on the Control Bar, drag your new code into Codes, save the Codes survey.

Adding lines between points
Ensure the Object containing the Points you wish to link is the Active Object.

Right mouse click and select Draw Line from the Lines menu. Alternatively, click on the Draw Lines button. The Add New Line dialog will appear.

To bypass this dialog box, in the Resources Control Bar right click on the line style you wish to use and click Draw Lines.
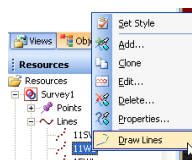
The Add New Line dialog allows you to set the line properties prior to drawing it.

Select the Code from the drop down list. If you do not know the Code, click on the … button. A full list of codes and their description will appear. You can select the code from this list.
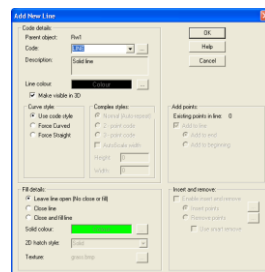
Forcing lines to be straight or curved
Although each code has a style such as straight or curved, you can force a straight line to be curved or, a curved line to be straight by changing the Curve style. You can also force a line to be straight or curved, overriding it's default properties. If you use an EDM you can also do this at the survey site using special codes called Attributes, (see page 39).

Overriding Complex styles
If the line is a complex style you can again override some of the codes existing properties.

Auto repeat -   This will force the line to be a repetitive line code such as a kerb line.

2 point code -   This will cause the style to stretch to fit between two surveyed points. This is useful when placing features such as road surface arrows onto the road surface although arrows etc. should be set up as 2 point line styles by default.

3 point code -   This will cause the style to stretch along the base and to the depth specified by a third point. Again, these codes should be set up by default.

AutoScale width -This prompts RelMo to expand or contract the width of the complex line dependent on its length. In this way scaling automatically ensures that the overall shape of the complex feature remains the same, however large (or small) it may be drawn. The Height option, if set to a positive value greater than 0, forces RelMo to display the complex line features at whatever height you set. Thus only one code is then necessary for say, hedges or walls. You can then set the height in this box to create hedges or walls at a different height. Similarly you can override the default code width of a complex line to draw features at a particular width.

Closing lines

If you choose to close a line or, close a line and fill it with a colour, hatching or texture, when you escape from the last point in the string, RelMo will join to the first point of the line to the last point of that line and, where appropriate, fill it with colour and or textures.

Adding Freestyle lines

Lines are normally created by linking existing points however you can create freestyle lines in which case a point will be added wherever you click on the screen and, the line will be drawn between the points in the style selected.

Either create a new Object from the Objects Control Bar or, set the Object in which you wish to draw the line Active.

Right mouse click and select Draw Line from the Lines Menu. Alternatively, click on the Draw Lines button. The Add New Line dialog will appear.

To bypass this dialog box, in the Resources Control Bar right click on the line style you wish to use and click Draw Lines.
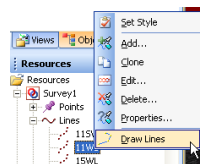
Holding down the Control key click on the survey where you wish to start your line, a point will appear and you can now carry on creating the line by clicking on the screen. If at any stage you want to link to an existing point, release the Control Key.

If the grid is displayed and snap to grid is turned on, holding down the Control Key will cause the point to be created at the nearest grid intersection.

Changing lines

You can quickly change the style of a line by selecting the style from another line within the survey. You can also change the style of all the lines within an Object. From the Lines menu select Change Lines and choose from One by One or Entire Object.

If you select Entire Object, all the lines will be changed to reflect the current default style. If you select one by one, the cursor will change. Now select the style you want to apply by clicking on the dropper tool and clicking on the line whose style you want. The cursor will then change back to the Change Lines cursor and you can click on each line to which you wish to apply the new style. The changes will be reflected straight away.

Deleting and unlinking Lines
Deleting a complete line

You can delete a whole line. Make the Object that contains the Line the Active Object. Select the line using the select line button, right mouse click and click on Delete Line or, from the Lines menu, click on Delete Line. The line will be deleted but the points will remain. If you do not want to delete a whole line, you can either unlink segments of the line or delete a segment of the line (see below).

Unlinking a line

To delete only parts of a line, from the Lines menu select Unlink Points or, click on the unlink button. The cursor will change allowing you to click between points to unlink them. Continue along the line from point to point. If you miss an interim point, you cannot unlink. Escape will free you from the line, allowing you to remain in the unlink command; using the escape key again will free you from the Unlink command. When you unlink, the points are not deleted.
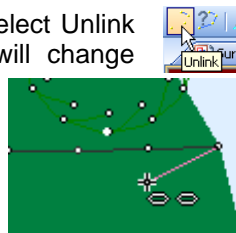
Deleting a segment

A segment is part of a line between two points.

If you want to delete a single segment rather than unlink a series of segments, Click on Delete Segment from Lines, Segments, from either the main Lines menu or by right mouse clicking.
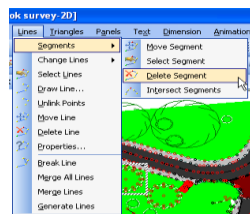
Click anywhere along the segment you wish to delete. The points will not be deleted.

Moving lines

Moving whole lines

Lines can be moved. When moved, their points will also move. To move a line, first select the line and then right mouse click and select Move. Use the cursor with the left mouse button down to move the line. The points of the line retain their original height.

Moving line segments

You can move a single line segment. Click on Move Segment from Lines, Segments, from either the main Lines menu or by right mouse clicking. With the mouse, drag the segment you wish to move to the new position. The points will retain their original height.

Line properties
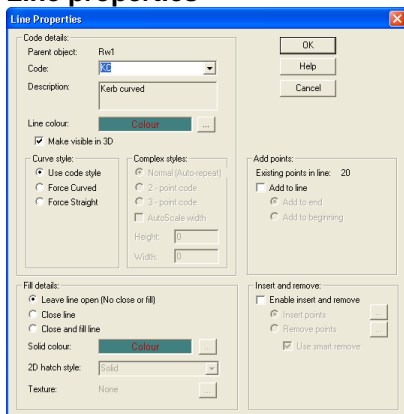
The properties of a line can be inspected and amended from Line Properties.

Right mouse click and from the Lines menu select Properties. Alternatively click on the Line Properties button. The Properties dialog appears.

You can now make alterations to the Line. See Adding Lines on page 111 for the options.

In addition, you can also add or delete points to a line

Increasing the number of points in a line

In an earlier section we said that sometimes triangles would break across two surfaces. Version 5 onwards minimises these problems by searching for lines that cross triangles (see page 45). However if you do find a situation where the triangle edges do not break along lines, this feature allows you to add points to a line and re-triangulate the model. This feature is also useful when designing new Objects where additional points can be added to help build complex line styles.

The screenshot on the following page demonstrates the problem with triangles that break across two surfaces.

One solution is to add more points to the line between the two surfaces and re-triangulate the model.

FOOTPATH
Triangles breaking across both surfaces
ROAD
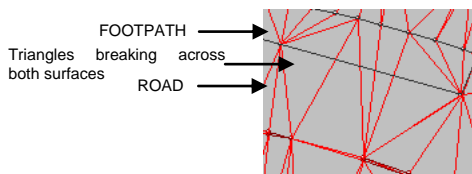
From Line Properties check the Enable Insert and Remove check box. Click on Insert Points and click the button marked … .

The Insert Points dialog will appear. You can choose from three options.
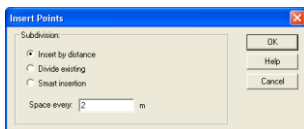
The first is to insert points at a regular interval. This option requires you to specify the minimum interval for the points.
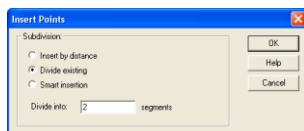
The second is to divide the line into a number of segments in which case points will be added to create the number of segments you specify.
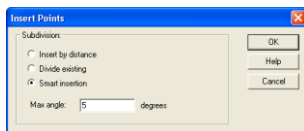
The final method is to use the smart insertion routine whereby points will be added to the line where the curvature of the line exceeds the angle specified. This has the effect of adding more points to tighter curves.

The height of any new points will be interpolated automatically from the height of adjacent surveyed points.

If you have added points to solve the problem of a triangle breaking across two surfaces, once added, re-triangulate the object from Objects Autocalc' Triangles. The new points will now be included in the model. Compare the triangles in the screenshot to the right with those above. The footpath and road are now triangulated correctly with no triangles breaking across two surfaces.
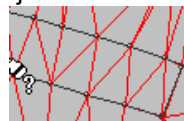
Decreasing the number of points in a line
You can remove points from a line. This feature is useful if you have imported too many points on a line such as can happens with some DXF files. If you remove too many points from a curved line it will lose the original curves. Use Edit Undo or Control+Z if this occurs.

From Line Properties check the Enable Insert and Remove check box. Click on Remove Points and click the button marked '…'. The Reduce Points dialog will appear.
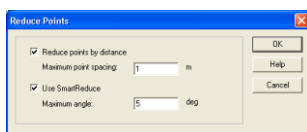
 You can choose to reduce the number of points along a line by specifying the maximum point spacing. Any points at a lesser interval will be removed.

The SmartReduce option removes points only if the angle between adjacent points exceeds a certain amount that can be set in the associated edit box. Hence multiple points very close together (typical of DXF files) will be ignored.

SmartReduce can be combined with the maximum point spacing to efficiently remove lines with large numbers of points.

Extruding lines
Once a line has been selected using Select Line from the Lines menu, they can be extruded. Extruding lines allows you to grow a vertical panel to a specified height. This panel can be coloured and or, rendered with an image. For example, the digital image of a wall can be added to a survey.

Extruding lines will depend on the way in which you have surveyed. Users with reflectorless electronic distance measuring equipment are able to take observations of top corners of buildings etc. using the –OBJ command (see page 31). In such cases the panels are added to the points in 3D mode (see page 145) as the points for the top of the panel already exist and it is therefore unnecessary to add further points to form a panel. Users who require an EDM with a reflector to record points or who have created a survey from scratch will need to add the additional points at a height measured by or known to the user.

Right mouse click and select Lines, Select Lines. Once you have selected the line right mouse click and select Extrude.

The Panel Properties dialog will appear. You can select a solid colour and a texture. For more information on adding digital images see the section on Panels on page 127.

Offsetting lines
First Select the line and then right mouse click. Select Offset, the offset line dialog will appear. Enter the distance to be offset north, east, or height (negative for south, west or lower), and click OK.

Creating Parallel lines
This feature allows you create a new line parallel to an existing one. This is a powerful feature as it allows you to create different point and line styles for the new line and, fill the space with triangles. If you are creating a survey from scratch, this tool can prove to be a great time saver. (Also see create Parallel points on page 103).

Right mouse click and select Lines, Select Lines. Select the line from which you want to create a parallel one, right mouse click and select Create Parallel.
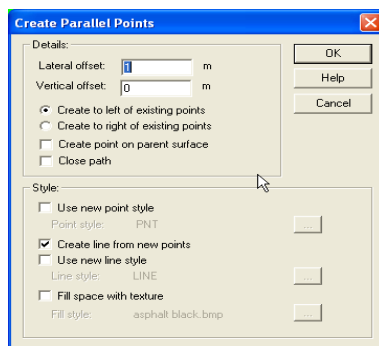
The Create Parallel Points dialog will appear.

Select the lateral offset in metres and enter any vertical offset and click create to left or right of the existing points where left is to the left of the points in ascending observation number.

If you check the Create point on parent surface button, the new points will land on the surface of the model (where the model is triangulated). If the box is left unchecked the new points will have the same height as the point from which it was created.

Select close path if you are joining the points with a new line style and wish to join the first new point to the last new point.

You can choose to change the point style by checking the Use new point style button. Change the style using the … button. If you leave this box unchecked, the new points will be created in the same style as the originals.

You can choose to create a line style between the new point by checking the Create line from new points button. Check the use new line style box and select the line style by clicking on the … button.

Finally you can force the software to triangulate the surface between the new and existing points. To select the fill style, check the box and chose the texture and fill colour for the triangles.

Reversing the point order of a line
Some Complex line styles are formed to the left or right of a surveyed line such as Hedge which has two codes, hedge left (HL) and hedge right (HR).

If you survey the points in the wrong direction, the hedge line will be produced on the wrong side of the survey line.

To correct this, you can reverse the order of the points. This will have the effect of turning the line round. To reverse the point order, right mouse click and from the Lines menu click Select Lines. Select the line you wish to reverse and right mouse click. Click on Reverse points and the line will be reversed.

Breaking Lines
Break lines allows you to make two (or more) lines from one line. This is useful where you have surveyed a line with one code where in fact it should have been coded with more than one code. For example, a line surveyed as a curved kerb where there were in fact two straight segments at either end. By breaking the line at the Point where the style should change, you create two lines one of which can have its style changed.

Using this method saves having to unlink numerous segments and then re-linking the points with a new line style.

There is a second reason for breaking lines. The way that RelMo creates Auto-repeat lines means that some line styles will 'cut the corner' rather than match exactly to the surveyed point. The screenshot to the right demonstrates this where a metal barrier should map to the point indicated by the mouse arrow.
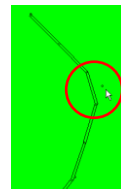
To map the line to the point it must be broken. Ensure that the Object that contains the line is the Active Object. Right mouse click and select Lines, Break Line. Click on the Point that the line has missed and the Line will be broken at this point. One line will now end at the point and the next start at the same point. Occasionally this can lead to some chamfering on the joint.
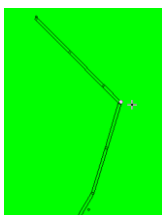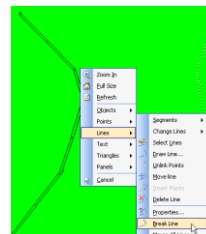
Merging lines

Merging lines is the opposite of breaking lines in that two lines of the same style can be merged together where they share the same point. This has the advantage in that once joined, you can change the style of the whole line rather than doing it twice. You can also choose to merge all lines in the survey in which case all lines of the same style which share common points will be merged.

Note - if you have broken a line for one of the reasons above and you then Merge the broken line, the line will be returned to its original state, missing the survey point.

To Merge a line, from the Lines menu click on Merge Lines or, Merge all Lines.

Converting a Line to an Object

You can convert any RelMo complex line to an Object. This is useful where you may wish to animate a complex line (such as a fence which falls over). As only Objects can be animated, you will need to convert your line to an Object.

On the Resources Control Bar, expand the lines tree. Right Click on the line you wish to convert. Click Copy As Object. Your line will be converted to an Object within the current Active Object.
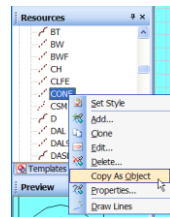
Spinning lines

Taking measurements from the model

Querying Distances

You can measure distances, slopes and radii within the model. The diagram below shows how RelMo reports the various distances between points.
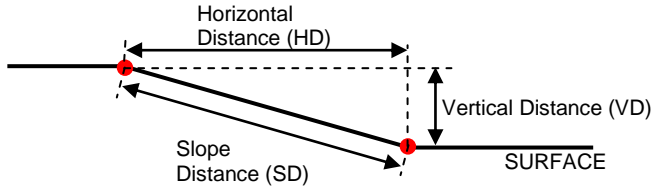
From the Query Window, select from the commands shown in the screenshot to the right. The various commands are explained below.
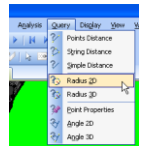
Points Distance

Reports the Slope, Horizontal and Vertical distances between two points. The distances are reported at the bottom of the screen as shown below. The bearing from the first point to the second is also given. Finally, the slope is given in degrees. The slope is from the first to the second point with a negative value indicating a decline.

SD=12.223 HD=12.221 VD=0.189 at 17.77° (Slope: 0.89°)   Curs
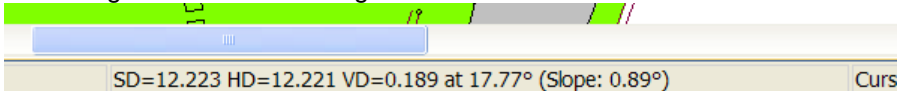
String Distance

Use the String Distance command to click on a number of points along a line. The slope and horizontal distances together with the change in height between the first and last point will be displayed. Note that clicking on the first and last point of the line does not report the distance along the whole line.

Simple Distance

Use the Simple Distance command where you want to find the distance between any two places on the model. When you use this command, you are not restricted to clicking on a point. Only the horizontal distance is reported.

Querying Radii

2D Radius

You can find the radius of any three points by using the Radius command. Click on any three points in sequence, the circle will be displayed on screen and the 2D radius together with the centre point in metres north and east will be displayed. The length of the arc formed by the points you selected is also given.

Radius=25.380 (1112.483E, 1036.259N) Arc=0.590

3D Radius

You can find the radius of any three points by using the Radius command. Click on any three points in sequence, the circle will be displayed on screen and the 3D radius together with the centre point in metres north, metres east will be displayed as shown below.

Querying Angles

2D Angle

You can measure an angle between any three points. Make the Object that contains the points the Active Object. From the Query menu select Angle 2D. Click on the three points in the order shown to the right. The angle (ignoring any height change between the points) will be given
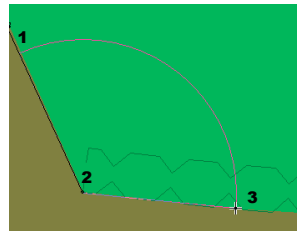
at the bottom of the screen.   2D angle= 115.22°

3D Angle

Like the 2D angle command above you can measure an angle between any three points and include the change in height between the points as part of the calculation. Make the Object that contains the points the Active Object. From the Query menu select Angle 3D. Click on the three points in the same way as you do for 2D angles. The angle will be given at the bottom of the screen. Incidentally, the screen shot of the 3D angle here is the same angle measured above.

3D angle= 120.30°

Adding dimensions

You can add both linear and angular dimension arrows to your 2D plan. The advantage of adding these arrows is that they automatically calculate and display the distance on the 2D plan. By default the slope distance is displayed in metres, however you can change this to display the horizontal distance, choose different units and alter the precision.

There are three types of Dimension, Add Dimension, Add Simple Dimension and Add Angular Dimension.

Adding the Dimension

From the Dimension menu select either Add Dimension or Add Simple Dimension. Add Dimension allows you to add a dimension between points, Add Simple Dimension allows you to add a dimension between any two places on the model. The dimension cursor will be displayed. Click on the two places between which you wish to measure.
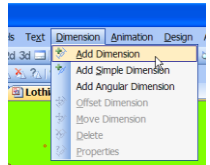
A Dimension arrow will appear with the slope distance. displayed. The dimension is displayed directly between the two places that you clicked. You can now alter the position of the dimension by offsetting it.
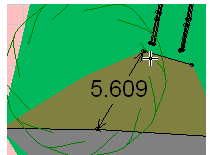
Setting the Properties (Linear Dimension)

Having added the dimension you can now set its Properties. From the Dimensions menu select Properties. With the mouse, select the Dimension you wish to alter the Properties of. The Properties dialog for that dimension will appear.

In relation to the arrow, you can change its colour and the type of arrow head and its size.

You can choose whether to display the end extensions and specify their length and whether there should be a gap between the extensions and the points to which they refer.
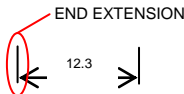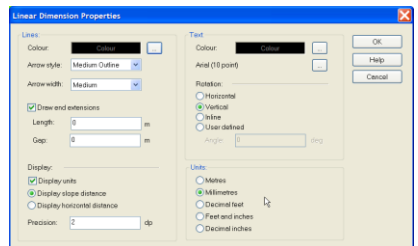
By default, units are not shown, you can check the box and the units will be displayed after the distance. You can also choose whether the slope or horizontal distance is displayed, (see page 122 for the difference between slope and horizontal distance).

You can check the level of precision by entering the number of decimal points that will be displayed.

In relation to the text you can choose the colour and font as well as the way in which it is displayed (rotation).

Finally you can define the display units.

Adding an Angular Dimension
From the Dimension menu select Add Angular Dimension. The dimension cursor will be displayed.
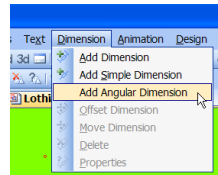
Click on the angle in the order shown on the diagram to the right, you do not have to click on points and you can reverse the order from 3 to 2 to 1 to display the outside angle.
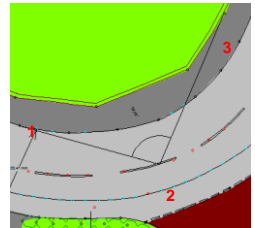
The dimension lines will be displayed together with the angle.

You can now alter the Properties of the dimension.

Setting the Properties (Angular Dimension)
Having added the dimension you can now set its Properties. From the Dimensions menu select Properties. With the mouse, select the Dimension you wish to alter the Properties of. The Properties dialog for that dimension will appear.
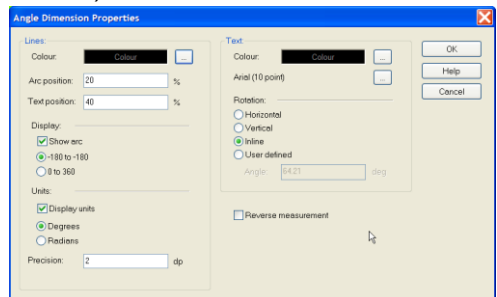
You can change the colour of the dimension lines, the offset of the arc and the offset of the text position. (Offsets are a percentage of the length of the dimension line).

You can choose whether or not to display the arc and where the arc is greater than 180, reverse the measurement.

The angle can be shown in degrees or radians and the precision specified to a number of decimal places.

The colour and size of the text can be altered as well as the text position. Finally, the reverse measurement can be shown.

Offsetting the Dimension
From the Dimension menu click Offset Dimension. The cursor will change. Move the cursor over the dimension you wish to offset, it will turn white. Drag the Dimension to the position you want it.
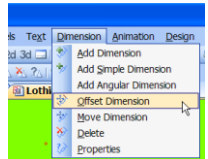
The arrow and text will be moved and two offset lines will be produced as shown to the right.
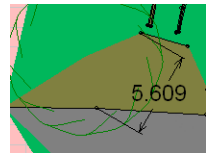
Moving the dimension line
You can move the line and text by selecting Move from the Dimension menu and dragging the arrow with the mouse. The line, any extensions and text will all move.

Deleting the dimension line
You can delete the line and text by selecting Delete from the Dimension menu then clicking on the dimension you wish to delete.

Panels

Introduction

Panels are used to raise colour or textures from the surface of the model. The general principle to be applied is, where a surface is horizontal or tends towards horizontal, triangles are used to colour or add textures where the surface is vertical or tends towards vertical use panels.

Panels are grown by selecting points, stipulating a height and colour / texture for the panel. The software generates new points above the selected points at the top of the panel and renders it with the image / colour selected.

General uses include creating 3D walls, trees, buildings etc. as shown in the screenshot to the right.

The points at the top of the Panel are automatically generated by the software in response to the height that you enter into the dialog box. Where users are able to use reflectorless EDM equipment to precisely produce points at the top of the Panel, use the 3D editor to render your Panels. See page 129 for further details.

The points at the top of a Panel may be moved to form sloping panels for the creation of pitched roofs etc. This is best done in the 3D editor.

Adding panels – 2D

Make the object that is to contain the panel the Active Object. Right mouse click and select Add Panels from the Panels menu. Alternatively select Add Panels from the Panels menu or, click on the Add Panels button.

Select the points where you want to grow the panel. If you are closing an Object for example creating a solid wall, you will need to click on the start point of the Panel as the last point to create the fourth side as shown in the diagram to the right.
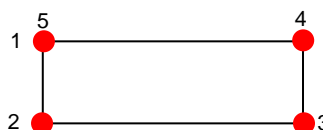
If you want to create a panel between points in two different Objects, you will need to merge the Objects before you create the Panel.

Once you have selected all the points, right mouse click and select Extrude. The Set Panel Properties dialog will appear.
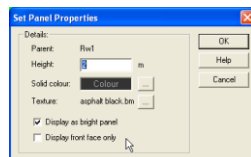
Type in the height for your panel. You can also choose to display as a bright panel in which case the shadowed side will appear as bright as the side that is facing the light source. You can also choose to display only the front face. This can be useful if you only want to display one side of a building for example. If you check the box, the panel will appear invisible when looking from behind which may mean that you need to add a back to the panel in a solid colour.

To change the Texture, click on … . The Surface Properties dialog box will appear. Select the appropriate texture for your panel also set the repetition to correctly size the image. If you don't require a Texture, select None from the list of textures and select a solid colour instead.
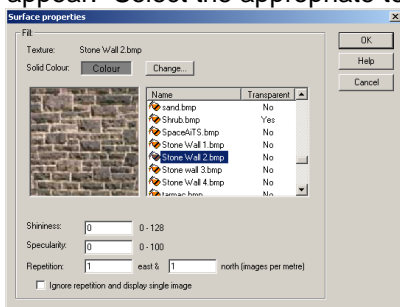
If you are creating a panel where the texture should not be replicated, for example a digital photograph of the front of a building, check the box to Ignore Repetition. Remember, you need to load any Textures you have created into the Codes Library first.

Click Ok and, OK to Set Panel Details, and the Panels will be created. You can view the panel in 3D.

Editing panels
Editing single panels
You can change a panels properties at any stage, note that although you may have strung a panel along a series of points, any changes you make will only apply to the single panel you have selected.

Select Panel Properties from the Panels menu or right mouse click and do the same. Alternatively click on the panel properties button.

The Panel Properties dialog will appear. Change the Properties as required.

Editing multiple panels
You can find and replace panels with different Properties. Find and replace affects the Active Object.
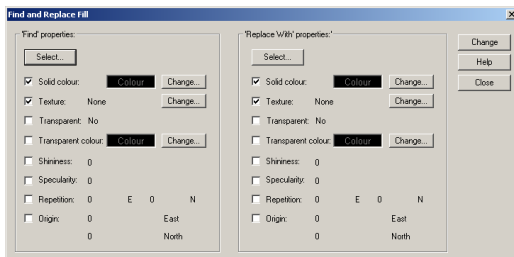
Right mouse click and from the Panels menu select Find and Replace. The find and replace dialog box appears. From the Find Properties you can specify particular properties or click on the Select button. If you click on Select, the dialog will disappear allowing you to select a panel (all of which will be highlighted). Click on the panel you wish to find. The dialog will reappear. On the Replace With side of the dialog change the Properties to the new settings or, if you already have a panel with those Properties click on Select and mouse click on the panel. Click change and all the panels you selected on the Find side of the dialog will change to those you selected on the Replace With side. Close the dialog.

Adding panels – 3D
Users of reflectorless EDM's can take observations of the top corners of buildings etc. where users of manual EDM's would not be able to place the reflector of their pole. In this way, digital images of the scene can be taken and rendered between the points to produce a correctly dimensioned image. A brief description of the method to reproduce the front of a building follows.

At the scene, use the –OBJ command (page 31) to create a new Object and shoot the top two corner points of your building. Using the –OBJ command will ensure that the points at the top of the building are not triangulated into the main model.

Note - If you accidentally include the points in the main model, you can separate them out by selecting the points and creating a new Object before you create the triangles in the main model (page 104).

Once you have triangulated the main model you will need to merge the points at the top of the building into the main model. Drag the Object containing the points into the main ground model. Then right mouse click on the Object and click Merge. The points will

now be part of the main model but, not triangulated into it.
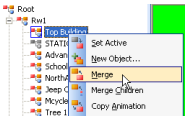
In 3D view, click Add Panels, select the image in the normal way and then click on each of the four points of your building starting at the bottom left and working clockwise.
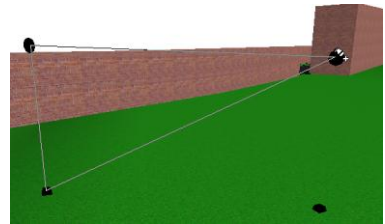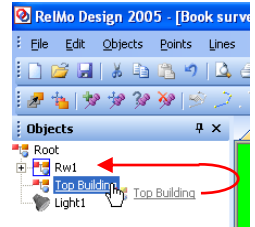
You may need to rotate or flip a panel if it has been created the wrong way round.

Rotating Panels (3D command)

If you have not followed the clockwise rule when you created your panel, you may find the image is on its side.

Where this occurs, you can rotate the points which in turn will rotate the image.

This command is only available in 3D. In 3D, make the Object that contains the panel the Active Object and enlarge the points. From the main Panels menu select rotate points. Click on the panel you wish to rotate, you can continue to click until it is all the way back to the original orientation.
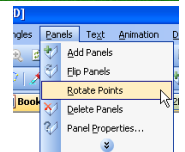
The image to the right has been corrected.

You may need to combine this routine with the Flip Panels routine below.

Flipping panels

If you find that the image is facing the wrong direction you can flip the image to face the other way. From the Panels menu select Flip. Alternatively click on the Flip Panels button. Click on the panel (not the points) to flip the panel. You may need to combine this routine with rotate points above.

Deleting Panels

Individual panels can be deleted. From the Panels menu select Delete Panel. In 2D, click on the point to the left of the panel you wish to delete. In 3D, click on the panel itself.

Text

Introduction

If you are intend to Add Text for plotting, ignore this section and go to the printing section on page 173.

Both 2D and 3D text is supported. Some line styles that replicate text such as road markings are actually created from a triangulated alphabet rather than actual text. The alphabet survey is available from the resources pages of the RelMo website.
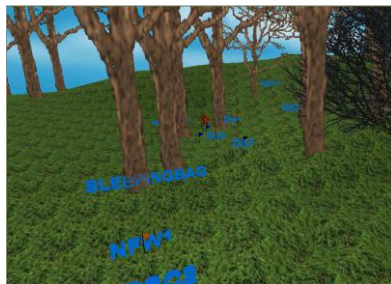
Users of EDM equipment can also attach a note to a point. On download these notes will appear as 2D text. Deleting the text no longer deletes the point that it is attached to.

You can choose whether to plot text created in the main 2 and 3D windows.

As mentioned above text for plotting is not usually created in the main 2D window. If you wish to add annotation for plotting see the Layout pages section on page 173.

Adding

Adding text

To add text, first ensure that the intended plot scale is correct. From the View menu click on Options and go into the Printing tab. Set the scale at which you intend to plot.

From the text menu select Add Text. Click on the point where you wish to add the text. The add text dialog will appear. Type the text you wish to add, (return to start a new line). Then set your Properties for both 2 and 3D and adjust any Borders and Leaders you wish to add.
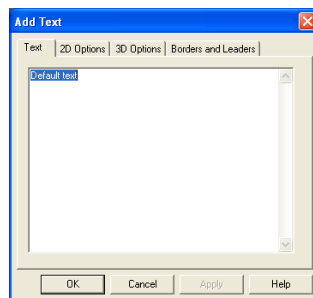
2D Options

You can choose whether or not to display the text in 2D view. If you only wish to display the text in 3D view, select this option. You can change the font by clicking the … button. Choose between left, centre or right justification. You can change the colour of the the text by clicking on the … button.

You can chose between top left, centre or right or bottom left, centre or right referencing. This is in relation to the point which anchors the text. You can also enter the orientation.
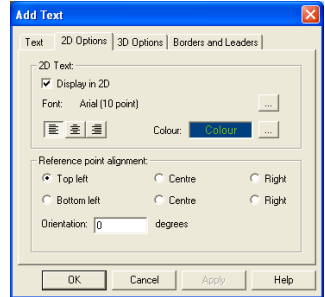
3D Options

You can choose whether or not to display the text in 3D. The size can be altered as a percentage of full size. It is suggested that you leave the text at 100% and then decide whether the size is correct by viewing the text in 3D view. If it needs to be altered use the Properties option from the text menu.

Like 2D text you can set the justification and change the font colour. You can also reference the text in relation to the point.
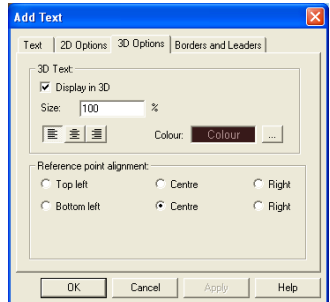
Borders and Leaders

The border and leader options are different for 2 and 3D. In 2D you can choose whether or not a border is drawn. You can set the margin, (the distance between the text and and the border) and change the colour of the margin.

You can choose whether or not to have a leader. A leader is a line drawn to a particular point. If you choose to include a leader, the head will be shown centre top of the text attached to a null point. Use the move points routine (page 101) to drag the leader to where you wish it to be positioned.
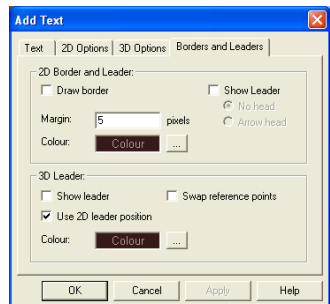
In 3D you can also choose whether or not to have a leader and whether or not it is to be positioned the same as the 2D leader. If you deselect this option, the 2 and 3D leaders can be positioned differently. Swap reference point will position the leader where the text was and the text where the head of the leader was. To change the height of 3D text, query the Points Properties of the text, (page 101), and alter the height.

Deleting text

From the Text menu select Delete. Click close to the text you wish to delete. The text will be deleted however the null point which held it in position will remain. To delete the null point use the delete points routine, (page 100).

Moving and Rotating text

From the text menu select Move Text. To move the text, drag it with the left mouse button depressed. To rotate it, hold the shift key down and use either the mouse or the arrow keys.

Attaching text to a point (3D command)

In 3D an extra command allows you to attach text to an existing point. Whilst in 3D make the Object which contains the point the Active Object. From the Text menu select Add Text to Point. Select the point to which you wish to attach the text and the Add Text dialog will appear. Now add your text in the normal way. The text will appear 5 metres above the point. To change the height use the Point Properties routine, (page 101), on the null point created with the text.

If the point to which the text is attached is contained within an animated object, the text will move with the animation.

Design tools

Introduction

RelMo contains a number of design tools which help you to build structures to be saved as Template Objects for later use or, used to create complex line or point styles. All the Complex codes in RelMo are built using the program. For users of some other software who have been used to stitching together a limited number of symbols to create a new 'block', this concept will be new. Basically there is no 2 or 3D shape (within reason) that cannot be built in RelMo and saved as either a template or complex code.

As well as the normal method of adding points these additional tools will allow you to create some quite complex shapes. They include creating ellipses, arcs and rectangles and, spinning lines to create a 3D shape from a 2D profile.
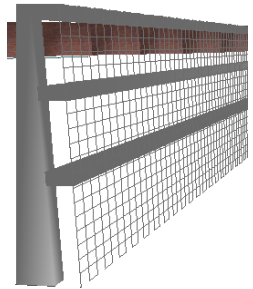
For example the complex code BBG shown to the right was created by manually adding 4 simple points and adjusting their northing, easting and height to form the upright. These points were then manually triangulated using Add Triangles in 3D. One longitudinal post was then added as a child Object by creating a rectangle, filled with grey, extruding it with grey to the length required by the regulations. This created an upright oblong which was flipped on its side using the Objects, Transform tools and then moved to sit against the main upright. The copy and paste commands were used to create a further two longitudinal posts which were also moved. In 3D, a line was created at the base in front of the posts, up the side, along the front of the top post and down the other side (this line is not shown in 3D). The points along this line were increased using Points Properties 'add points to line' routine and then the mesh was created using a simple line between the inserted points which was then forced to show in 3D.

Design Options

You can set up the various design options from the Design Options menu. This allows you to set various default styles for Point Line and Fill. Checking the Create as child object ensures that the rectangle or ellipse is created as a sub-object in its own right. Once the whole Object has been created, you can merge the child Objects to form one Object.
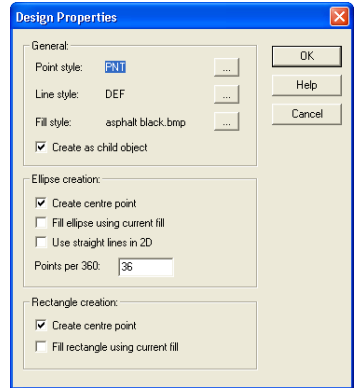
In relation to Ellipses, you can choose to fill the ellipse using the fill style described above, create a centre point and force straight lines to be used in 2D. The number of points per 360º can be set. The maximum is 36, smaller objects require less points.

Rectangle options include creating a centre point and filling the rectangle with the fill colour/texture set at the top of the dialog.

Once these options have been set use the appropriate tool from the design menu to create your shape.

Ellipses

Having set up your Design Options, use the Design Ellipse tool to design circles. Hold down the shift key for a true circle. Once you have formed your ellipse, you can select the line and extrude it to form various shapes.

Circle

Having set up your Design Options, use the Design Circle option to draw a circle. There are a number of circle option including;

From 3 points	Click on three points to create the circle.
Diameter	Click on two points which form the diameter.
Radius	Click on two points which form the radius.
Centre and radius	Allows you to click anywhere on the model to define the centre of the circle. Once this has been defined, the dialog to the right appears. You can adjust the centre and add the size of the diameter or radius.
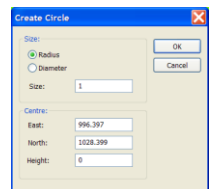
Arcs

Having set up your Design Options, use the Design arcs tool to design arcs. You need to click on three existing points to create an arc. Note that these can be in different objects (use the tab key to move between objects).
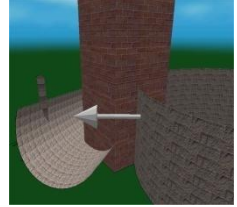
Once you have your ellipse, you can select the line and extrude it or spin it to form various shapes.

Rectangles

Use the Design rectangle tool to draw rectangles. Drag the rectangle to the size you want using the left mouse button.

Holding down the shift key will force your rectangle to be square.

Once you have your rectangle, you can select the line and extrude it to form various shapes.

Spinning lines or points

Spinning lines or points is a powerful feature that allows you to create a 3D object from a line or series of points. For example the line on the right can be spun through 360° to create a solid 3D pawn from a chess set.

Lines need not be spun through 360° allowing the user to create complex concave and convex objects which can be merged together to form one complex shape such as a light column or ornamental bollard.
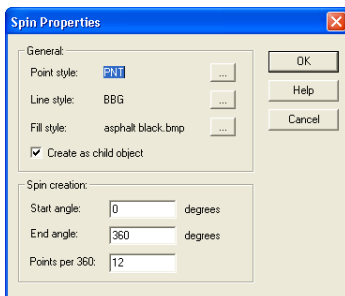
First draw your x axis profile using a basic line style (see drawing freestyle lines on page 113) or, by creating a series of points.

When the profile is complete, select the line or series of points using the Select Line or, Select Point tool.

Right mouse click and select Spin. The

Spin Properties dialog will appear. You can now select the Line style and Fill style for your object. Also select whether the new Object should become a child of your existing work (in which case it will be given the name Spin in the Objects Control Bar). The start angle where 0 is ground level 90 is above the x axis 180 is ground level but mirroring the line and 270 is directly below the x axis. When you click OK, the new 3D object will be created.

Analysing the Model

Because RelMo is a digital terrain model, the ground model of your survey can be analysed to create a number of plots. These plots are produced as Child Objects of the main ground model and can be turned on or off. They can also be added to the Layout Pages for subsequent plotting.

Contour plots
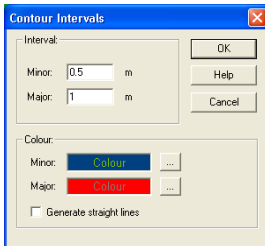
Contour plots analyse the ground model only, thus excluding any complex lines and points that have been created. You must have triangulated the model before creating a contour plot. When the plot is created, it is created as a child of the ground model. You can show or hide it or, delete it by right mouse clicking on it in the Control Bar window.
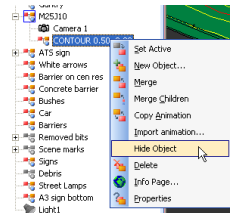
To create a Contour plot select Create Contours from the Analysis menu. The Contour Interval dialog will appear. Enter the interval for your major and minor contours and, select their colour. If you want the contours to be smoothed rather than a series of straight lines, uncheck the straight lines box. Contours can be viewed in 2 or 3D. To plot a contour map see page 168 (printing).

2D Contours

3D Contours
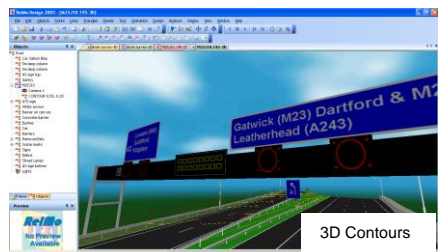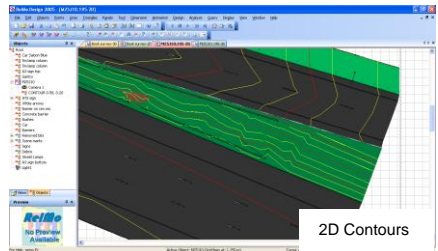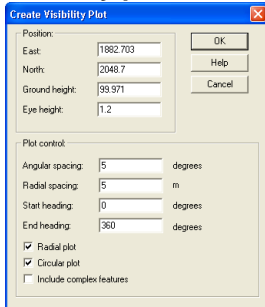
Visibility plots

Visibility plots analyse either the ground model or the ground model and complex lines and points. You must have triangulated the model before creating a Visibility plot. When the plot is created, it is created as a child of the ground model. You can show or hide it or, delete it by right mouse clicking on it in the Objects Control Bar.

To create a visibility plot select Visibility Plot from the Analysis menu. The cursor will change. Select the place on the model from which you want to view the terrain. The default height is set in View, Options, Advanced, Set Viewpoint. However, you have an opportunity to alter the height during the plot creation. As soon as you have clicked on place you wish to view from, the Create Visibility Plot dialog will appear.

You can make any alterations to the View point position including the eye height.

You can set the Plot controls to show the angle of the plot lines and the heading of the plot.

You can choose whether or not to include complex lines and points.

Note - If you include these features, RelMo treats them as solid blocks. This works well for such features as a wall, however for trees and fences which clearly are not either blocks or, solid, will cause false representation of what can and cannot be seen.
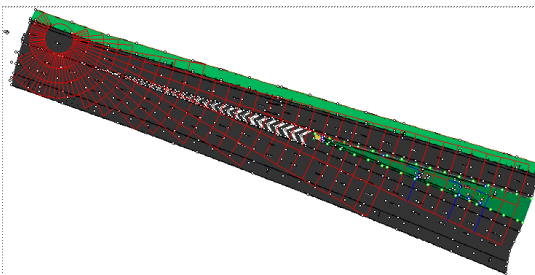
Click OK and the visibility plot will be created. Areas that can be seen are plotted in red and areas that cannot be seen are plotted in blue.

This can be viewed in either 2 or 3D. To plot a contour map see page 168 (printing).

Slope graphs

Slope graphs analyse the ground model. Complex lines and points are ignored. You must have triangulated the model before creating a Slope graph. When the plot is created, it is created as a child of the ground model. You can show or hide it or, delete it by right mouse clicking on it in the Objects Control Bar.
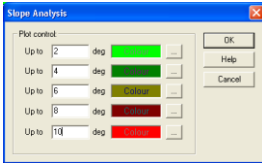
To create a Contour plot, select Slope Graph from the Analysis menu. The Slope analysis dialog will appear. Enter the bands and colours with which they will be associated. In the dialog to the left, Flat to 2º will be displayed in light green, 2 to 4º in dark green etc. Click OK and the plot will be created. Slope plots are best viewed in 2D. To plot a slope graph see page 168 (printing).
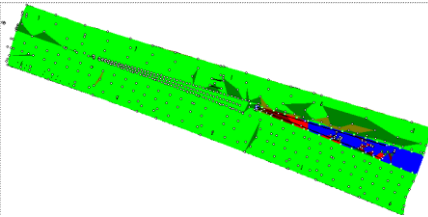
Slope direction

You can choose to display slope arrows on the plan. One arrow is produced for each triangle. The arrows also scale, thus the larger the arrow, the greater the slope. Arrows point down the slope. This feature can be useful, (depending on the accuracy of your surveying), for finding water runoff points etc. From the Analysis menu select Show slope direction. To turn off the slope arrows, from the Analysis menu deselect Show slope direction. The model must be triangulated to use this feature. Slope arrows can be included in any plans that you print (see page170).
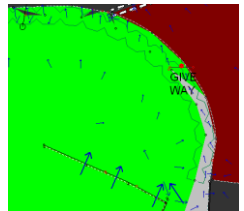
Cross sections

Cross section plots analyse either the ground model or the ground model and complex lines and points. You must have triangulated the model before creating a cross section plot. When the plot is created, it is created as a child of the ground model. You can show or hide it or, delete it by right mouse clicking on it in the Objects Control Bar.

To create a cross section, plot select Cross section from the Analysis menu. The cursor will change. Select the line on the model along which you want the cross section to be plotted. The Create Cross Section dialog will appear.

Note – cross sections do not have to be formed between points, they can be created anywhere on the survey.
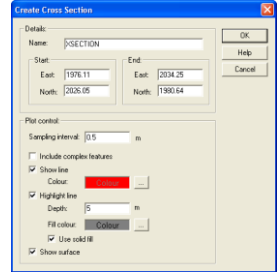
The start and end positions are listed. You can set the sampling interval along the line.

You can choose whether or not to include complex lines and points.

Note - If you include these features, RelMo treats them as solid blocks. This works well for such features as a wall, however for trees and fences which clearly are not either blocks or, solid, will cause false representation of what can and cannot be seen.

You can create a line along the terrain edge, to enhance the rise and fall of the section and you can create a skirt around the model of height and colour specified by the user.
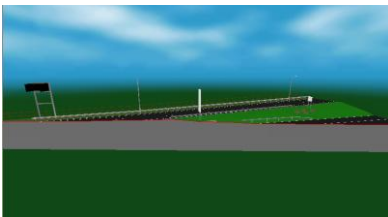
Finally you can choose whether to show the terrain. Click Ok and the plot will be created. To View the plot, right mouse click on it in the Control Bar and click on View X-Section.

To plot a cross section first, save the view. See page 168 (printing) for further details.

Profiles

RelMo 2008 allows you to create a profile (a type of section) along a line. The line can be straight or curved. The Profile tool creates a graph showing the levels along the line.

Select the line from which you wish to create the profile using Lines, Select Lines (alternatively you can draw a line on the surface of your model and then select it).

Once selected, right mouse click and select Create Profile View. A graph of the line will appear in a new tab as shown below.

It should be noted that the height is the height of each point on the line as indicated by the vertical lines below (there were 8 points on the line).

Some degree of planning will be necessary when surveying if profiles of camber, gradient or surface defects are going to be drawn. Note that these can be surveyed as points and joined with a line later.
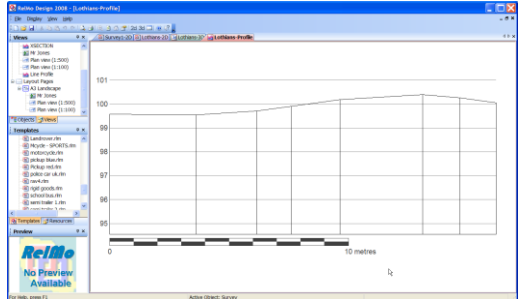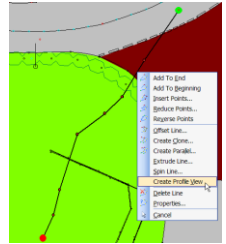
3D editing

General

Almost all editing that you do in 2D can be carried out in 3D. This can prove very useful when creating complex codes. You can swap between 2 and 3D at any stage. You can also create 3D views of a particular area and edit in those. See the chapter on views (page 157) for further details.

Sometimes you may find it easier edit in 3D. Almost all of the 2D editing facilities are available in 3D as well. Some things can only be done in 3D such as linking four points to form a panel, rotating panels and flipping triangles to name but a few.

Two 3D views are available. Orthographic (the standard 3D view) and locked Ortho mode. Locked Ortho mode is a 2D view of the 3D scene. In other words, you are locked directly above the survey. However you see textures instead of solid colours. Locked Ortho mode also has the advantage of infinite zoom. To change the Mode, select the appropriate mode from the View menu.

The way you move around the model in 3D view can be found on page 14. There are a number of Display tools to help you zoom in on the right area these are;

Show target –   places a target in the centre of the screen. This allows you to accurately zoom in on the area you wish to edit.
Show outline -   places a box around the active Object. Tab moves you between Objects.
Show axes –   displays the x, y and z axis

You can access these tools from the Display menu.

Editing in 3D

Most commands in 3D are the same as in 2D however there are a few differences.

3D points

In 3D, you need to click on a point as there is no snap to point feature. The size of 3D points can be altered. To enlarge the points select Enlarge Points from the Points menu. The points in the Active Object will be

displayed. To change the size of the points, from the Points menu, select 3D Point Size. You can alter the point size between the range stipulated.

Selecting Lines
To select a line in 3D, select the point that it is attached to it rather than the line itself. You can add, delete, unlink and move lines as you can in 2D.

Clipping planes
If you are doing close up work you may need to alter the clipping planes for example if the near part of the Object you are editing disappears. Alter the clipping planes from View, Options, 3D View as described on page 50. Do not enter a value 0.

Panels in 3D
Adding panels in 3D assumes that all four points are present. You add the panel between the points. See panels on page 127 for further information.

Moving in 3D
You can move Objects in 3D, however to keep them on the surface, you must angle the view so that the cursor is over the surface and hold down the Control key, see page 59 for further details.

Animating in 3D
You can animate in 3D. When you move the Object to be animated ensure that you angle the view so that the cursor is over the surface and hold the Control key down, see page 176 for further details.

Lighting

Introduction

The inclusion of multiple lights and shadowing of objects rather than just the ground model adds another level of realism.

There is a note of caution in that, if you intend to use multiple lights, you will ideally need a graphics card that handles shadow acceleration. RelMo uses OpenGL as its 3D rendering engine. OpenGL has been supplied by Microsoft since Windows 95$^{®}$ and is a commonly used set of functions. Many graphics card manufacturers have chosen to extend the core function supported by OpenGL and many now support additional hardware accelerated capabilities. These are made available through a series of extensions for which RelMo will search. Some Graphics cards however do not support these extensions, and in those circumstances, RelMo provides a software based rendering solution whenever it can.

Since RelMo 3D views use OpenGL, it follows that any limitations imposed by the particular implementation of OpenGL on your machine must be carried over into the same limitations within RelMo. The RelMo website carries a list of some of the more common cards and whether they support the necessary acceleration.

In RelMo you may have up to eight individual lights and a general ambient light. The reason you are limited to eight lights is to provide compatibility with every OpenGL system, since all must support at least eight lights.

There are several terms that we need to look at before we actually start to add and manipulate lights.

Positional lights

Positional lights have a particular location in space and can radiate light in all directions. You can limit the angle of the light cone to produce a tightly focused beam of light. Positional lights are positioned where you want them. By default the cone of light produced is set initially at 180 degrees pointing vertically downwards.

Directional lights

Directional lights can be thought of as providing light from a particular direction. The light emitted by such a light is assumed to be parallel and any calculations make this assumption. (Imagine the light rays emitted from the sun, because we are such a long way from the source, by the time they reach us the are in fact all but parallel i.e. they have the same direction hence a directional light source.

Directional lights are located in the same way as positional lights within RelMo, but the angle the position of the light makes with the centre of the surveyed area defines the direction of the light.

Directional lights radiate in all directions.

Shadows

The nature of the light defines how any shadows are produced. Shadows within RelMo are created by initially rendering the scene from the light's point of view and then overlaying the depth component part of that image over the normally rendered image to produce shadows. This can be a very expensive process computationally, unless special OpenGL hardware acceleration functions are available on the graphics card. RelMo uses such acceleration if it is available, but resorts to a much slower software implementation if these special extensions are not available. In addition the image generated for the shadow is limited in size otherwise too much memory would be utilised in producing the image.

Due to the nature of shadow generation and rendering a significant slowdown of the overall rendering process can be expected, especially with multiple shadows. Roughly $2n + 1$ times the rendering time for a simple (non-shadowed) scene can be expected where n is the number of shadow casting lights. A certain amount of experimentation is likely to be necessary to fully explore the use of shadows.

Directional lights, because the source is effectively located an infinite distance away from the surveyed area, are set so that the shadow image generated covers the entire area of the survey. With a large area, this is likely to generate a relatively low quality of shadow.

Using positional lights and reducing the light cone angle allows positional lights to generate much higher quality shadows.

Projection masks

Positional lights can also be set to use a projection mask which limits the field of view of the light. You can use custom built projection masks as these are simply images which are automatically overlaid in front of the light and projected onto the scene. A simple circular projection mask is built into RelMo and is used by default. Projection masks also help reduce one of the main limitations of OpenGL lighting. In OpenGL, the light falling onto a vertex of an object is used to calculate how much light falls onto the area of the shape that the vertex helps define. This means that if you have long thin triangles as part of the ground model for example, then light falling onto one vertex, but not the other two, causes the illumination of up to half the triangle. This is not always visually acceptable. Two solutions are possible;

Either reduce the size of the triangles involved by sub-dividing large triangles into smaller ones, or

use a larger cone of light but then use a light mask to reduce the effective field of view.

Quality

Lighting within RelMo uses one of two mathematical lighting models. You can choose to have the calculations performed assuming all the light rays emitted by a light are parallel (which is marginally quicker) or alternatively ask RelMo to perform the calculation by working out all the angles involved between the light, the objects illuminated by the light and the viewpoint. The second option produces more realistic results.

Also you have the option to ask RelMo to perform two sided lighting calculations which again results in more realism, but at the expense of slightly longer rendering times. Two sided lighting calculations use both sides of the triangle to work out how the light should be displayed.

Both the above options are available in the ambient lighting tab of the lighting dialog.

Lights as Objects

Lights are derived from Objects and share many of the same features. For example they can be moved around just like real objects and appear within the Objects Control Bar. They can also be animated and inserted into other animated objects so that they can move around the scene. Selecting the Object Properties dialog however does not display the normal object dialog but a specialised lighting dialog designed for lighting control.

RelMo always contains one default light which can be seen as part of the Root in the Objects Control Bar. Note that it is possible to delete this light in which case, if the ambient light is also turned off, you will not be able to view the survey. Deleting the light is therefore not recommended!

Adjusting the Ambient light

Whereas the main lighting properties allow shaded areas and highlights to be viewed, ambient properties enable objects that are in shade to be illuminated. The example below demonstrates this.

No Ambient light – only the area illuminated by the second light can be seen

Ambient light on

As the Ambient light already exists by default, in 3D view click on the lighting button. The lighting dialog will be displayed. Click on the General tab for Ambient light settings.

Ambient light
Enable ambient lighting simple allows the ambient light to be shown.

The ambient light colour can be changed to produce some interesting effects. Try a black light with the Cloudsnight bitmap as the background sky (View, Options, Three D View, Display background).

The Level slider bar will alter the intensity of the light with the slider to the right being the most intensive.

Background light
The background light can be altered in intensity and colour. Note that you can only alter the background light if you are displaying a background image such as one of the sky bitmaps. The two images to the right show different intensities of background light. Note

that the light on the model itself remains the same. Moving the slider to the right increases the intensity of the light.
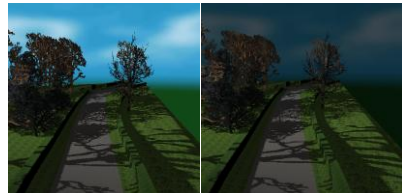
Fog
See page 154.

Lighting model
Two sided lighting calculations refine the way that shadows are cast. This however is at the cost of speed (more correctly smoothness) as twice the number of calculations have to be carried out.

Local Viewer lighting is another model that effects the way in which the light is calculated towards the user.

Both models will refine the way shadows are cast and viewed. Experiment with either or both of the models to see which suites your computer the best. Using them will improve shadow quality at the expense of processing power.

Special effects

Show Shadows allows Objects to cast shadows against the ground model and other Objects.

Using a light mask enables the user to project a light which displays an image. This can have interesting effects. For example the image to the right uses a non directional light with a mask set. The effect produces yellow, white, black and red lighting effects. The image is a bitmap of a lane 2 closed sign which is stored in the RelMo images folder. The mask is actually set in the Light 1, 2 etc. properties, not the General page.
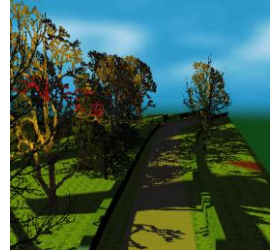
You can create your own masks using other software such as Paint Shop Pro.

Default

Clicking the 'Default' button will cause the current values to be used for all new surveys. Unless you select this option, new surveys will take their default lighting parameters from those stored in the default survey, (Codes.rlm).

Adding lights

A new Light can be created by selecting Create light from the View menu. Up to eight lights may be added. Like normal Objects, if you add a light to an Object which contains animation, the light will pick up the animation of the Object.

It is sensible to create and set lighting Properties in the 3D View. When you have added the light make it the Active Object and from the Display menu Select Show Outline. Provided the show source button is clicked you will be able to see the light and the direction in which it is pointing.
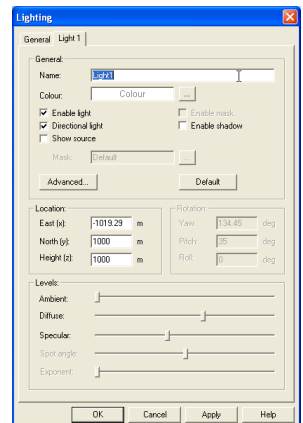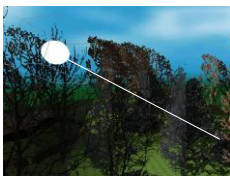
General

You can change the name of the light to something meaningful. You can also change the colour of the light.

Enable light has the same effect as switching a light on and off.

Choose between Directional and Positional lighting. Check the box for a Directional Light and leave it unchecked for a Positional Light. Directional and positional lighting are explained on page 146 and 147.

Show source will show the light source in 3D view as in the image on the previous page.

Enable mask is only available for positional lighting. If you enable a mask you can allow RelMo to use the default mask or select a mask from a separate source. See Special effects on the previous page for further explanation. To view a mask, you must check the use light masks box on the General page.

Enable shadows will allow this light to cast shadows. Show shadows must also be checked on the General page.

Advanced

This dialog allows you to control exactly how some advanced lighting and shadowing parameters are used by RelMo.

The Size option controls the size of the virtual light object so that you can physically select the light to move it around the scene as you would with a regular object. Increase the size to make the light larger. Note that the size has no effect on the amount of light displayed.

Shadows are created in RelMo by forming an image of the scene from the lighting position. This image is then processed internally to create the shadows seen by the viewer. The creation of the shadow images involves RelMo in calculating the depth of field at which various features are located. If the features are too close to one another, then RelMo cannot distinguish between them and fails to display shadows correctly. This is particularly noticeable in software shadowing where depths of fields are limited to 256 levels for various technical reasons.

To alleviate this problem, you can set the shadow clip range using this dialog. The depth of field levels are logarithmic, with the far planes much closer together than the near planes, altering the near clip plane in particular has a greater effect. For example, if you don't require shadows to be generated until at a distance of 100m from the light source, then setting the near clipping plane to 100m will mean that the depth of field calculations start at 100m.

The shadow offset control allows you to manually set an offset to the shadow image when it is applied to a scene so that any remaining visual artefacts can be 'pushed away' from the real scene and thereby hidden from view. Some experimentation may be required for these values which will be largely dependent upon the position of the light source and also the orientation of the scene illuminated by that light.

The attenuation factors control how the intensity of light falls off with distance.

All these controls can be played with to reach the desired effect.

Location
This is the Eastings, Northings and Height of the light. Note it is not related to your survey points. 0 east, 0 north will place the light at the centre of the survey at whatever height you specify.

Like any other Object in RelMo you can use the Move command to physically move the light using the mouse in 3D view.

Rotation
These settings apply to positional lights. By default the light will be pointing down. Alter the pitch, yaw and roll angles to point the light in the right direction.

Levels
Level controls are used to shape and alter the intensity of the light.

Ambient
Controls the intensity of the light.

Defuse
Softens or hardens the boundaries of the light when no mask is applied.

Specular
Alters the way the light reflects off the surface

Spot angle
Alters the width of the cone

Exponent
Alters the depth of the light.

Position
The position controls allow you to adjust the position of the light source relative to the centre of the survey. You can display a small sphere in the 3D scene which shows you exactly where your light source is positioned by checking the Show source box.

Intensity
The intensity parameters control the proportion of the directional and ambient lights. The Effect parameter controls how much light is available for reflectivity properties of the material. In other words the effect of the specularity and shininess properties set in the textures dialog for each material used. Adjusting these figures can give interesting effects!

Fog
Fog is set using the fog parameters within this dialog. Generally the colour of fog is set to be the same as the background colour. Distant objects then merge gradually into the background.

Two fog modes are available, the exponential version uses the density parameter to determine the amount of fog. The linear version uses the start and end fog positions to determine zero and 100% fog respectively.

A small amount of fog allows more realistic scenes to be displayed, since distant objects tend to be viewed with a slight amount of haze in real life.

Info Pages

Introduction

Info Pages are HTML boxes that can be attached to objects. They can contain written information and pictures. In the 3D environment, you can use the cursor to change when it moves over an Object which has an Info Page. Clicking on the Object will then display the page.

Note - Info Pages will only be available where Internet Explorer 5 or later is installed on your computer.

Displaying a new Info Page
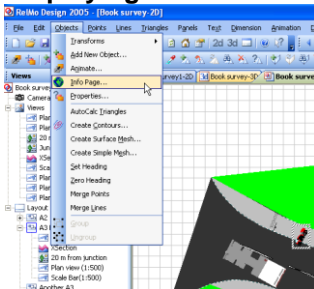
Make the Object you wish to add the Info Page to the Active Object and, from the Objects menu click on Info Page. The Info page will be displayed.

Editing the box

Right mouse click on the page and select Create New, a new blank Info Page will be displayed.

Adding text

Right mouse click and select Insert text. A text box will be displayed in the page. Double click in the box to edit it. You can move the text box about, bring it to the front or back and lock its position by right mouse clicking and selecting the appropriate command.
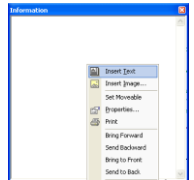
Adding pictures

You can add a picture by right mouse clicking on the box and selecting Insert Image. The Picture dialog box will be displayed. Use the Browse button to find the picture on your computer.

Once in the page, pictures can be resized by grabbing the corner handles. You can also move the picture about, bring it to the front or back and lock its position by right mouse clicking and selecting the appropriate command.

Saving the box
When you have finished editing the box, right mouse click and select Quit Edit.

Close the Window by clicking on the cross in the top right corner. You will be prompted to save the changes.
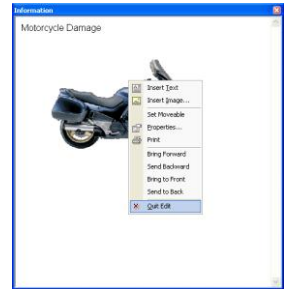
Setting the cursor active
In 3D view, from the View menu select Track Object Info. When the cursor passes over an Object that contains an Info Page, it will change as shown in the picture below, left mouse click to display the Info page.
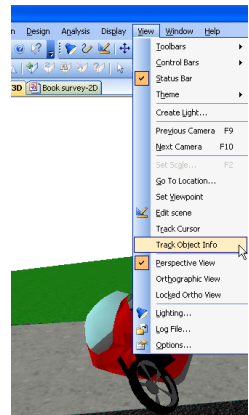
3D Viewer
RelMo3, the 3D Viewer program that you supply to clients to view your files, supports Info pages. You can choose whether to include Info Pages, when you use the Pack and Go Wizard (see page 190).

Views

Views are an important part of RelMo. Views are used to switch to different locations. To capture 2D scale images for plotting and, because views are 'live' or active, they are constantly updated as you make changes in the main 2 and 3D screens. Because they are live, you can also switch to a View and edit in that view. The changes will then be reflected in the main model.

Views can also be renamed to give meaning to that view. Views are also supported in the 3D viewer program.

If your survey contains animation, you can watch the animation from any view you have created.

Views represent the view from a static point. To create moving views, see the section on Cameras on page 186.

Creating 2D scale views
Setting up the scale
2D views are usually created for plotting purposes. You can add as many views at different scales to a single plotted sheet. For further information on plotting and printing see page 168.

The first step is to set the scale of the view you wish to save.
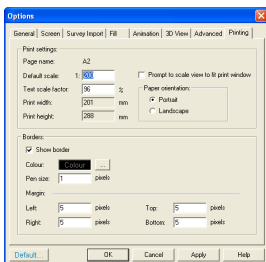
From the View menu select Options and click on the Printing tab. Set the scale of the view you wish to save. If you are saving your view for printing purposes and want RelMo to set the scale as large as it can for the printed sheet, check the Prompt to scale view to fit print window option. This means that although you may save a 1:500 view, when you add the view to the plan Layout Page, you will be asked whether you want to rescale it to the largest size it can fit in the Print Window (see page 167 for further details).

Note – Scale to fit will result in some strange scales and you are advised to add a scale bar from the Templates Symbols library if using this option. The other options in this Window are dealt with in the Printing chapter on page 168.

Getting the view
In 2D view, select the Views Control Bar. Cameras, Views and Layout pages will be shown.
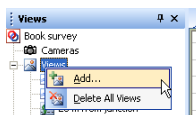
Right mouse click on Views and click Add.

An outline box will appear on the main 2D plan. You can move the box by dragging it with the left mouse button. You can resize it by dragging a corner in or out and you can rotate it by grabbing the handle at the top of the box.

Change its position until you have the required view and click the Return Key. The view will be saved and named Plan view with its scale.
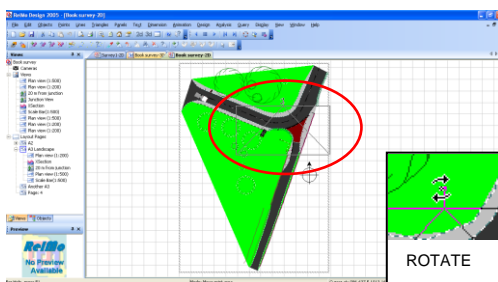
You can switch to this view by double clicking on it. You can zoom in or out from this view or return to the full screen view by
clicking on the Home button or the F6 key. Note that even if you alter the view by zooming, if you double click the View in the Control Bar again, you will be returned to the view you originally captured.

Once the view is saved, any updates or changes you make to the plan will be updated in the saved view.

Deleting a view
Right mouse click on the view on the Control Bar and click Delete.

Options
Once you have saved the view, you can change some of the properties. Right mouse click on the view in the Views Control Bar and click on Properties. The View Properties dialog will appear.

The description tab allows you to alter the name of the view and gives information about the view including any excluded objects.

To exclude an object so that it will not be displayed in the view click on the Edit excluded objects button. This will bring up the Excluded Objects dialog. Right mouse click on the Object you wish to exclude from the view and click Hide Object. Hidden Objects appear with a red cross through them.

Excluded objects will only be hidden from that view. If you take an identical view and do not exclude the object, you will have two views, one with the object displayed and one with.

Excluded Objects will not be printed.

The plot data tab displays the scale, width, height, rotation, centre east and centre north of the plot area. If you alter this data, the changes will be reflected both the Layout view and the printed output but, not the normal 2D view.

The display tab allows you to make changes to what is displayed. Two options are given, changes that will be reflected in the printed output and on screen and, Screen options only.

An animation preview can be shown in 3D views, these can also be plotted out by checking the button. You can choose to specify a time at which the animation ends. This allows you to show the animation up to a particular point. The number you enter is the global finish time from the animation Properties. See page 182 for further details.

Remember 2D Views are predominantly for printing, however they are also useful for editing because they are 'live' and thus changes made in the view are also made on the main plan.

Creating 3D views

In the same way as you create 2D Views, you can also create 3D views. Again, 3D views are 'live' and can be edited. Changes made in the view will be reflected in the main plan. It is worth restating that Views are also supported in the 3D Viewer program.

To save a 3D view, navigate to the position in 3D and on the Views Control Bar, right click on Views and click add. The current 3D view will be added to Views and a new view will appear in the Views tree on the Control Bar with the name 3D view. You can now change the name and certain other properties by right mouse clicking on the name. The View Properties dialog will appear.

You can change the name of the view in the Description tab which also gives the position of the view.

You can also choose to exclude any Objects from the view by clicking on the Edit excluded objects button. This will bring up the Excluded Objects dialog. Right mouse click on the Object you wish to exclude from the view and click Hide Object. Hidden Objects appear with a red cross through them.

The size tab allows you to unlock the aspect ratio and stipulate an exact size. This will be reflected if you use the view in any printed output.

The display tab allows you to alter the print and screen options. The top option relate to both screen and printed output in which case what you see on screen will be what you get in the printed output.

You can show an animation preview in 3D views, these can also be plotted out by checking the button. You can choose to specify a time at which the animation ends. This allows you to show the animation up to a particular point. The number you enter is the global finish time from the animation Properties. See page 182 for further details.

You can choose whether to show the shadows and use the projection masks (see the section on lighting, page 146, for further details). If you check the 3D text button, 3D text will be displayed and plotted.

You can also alter the screen only options, in which case only the screen will be affected. The 3D only options affect only what is seen in the 3D view. The printed output remains unaffected.

Viewing from a defined point at a defined height
To set up your 3D views, you may find it useful to use the set Viewpoint option. This option allows you to define a point in 3D view with the mouse and then define a second point to define the direction in which you wish to look.

To use this command set the height of the eye from the View Options menu. Select the Advanced Tab and set the height of the eye in the Set Viewpoint box. Apply the changes.

In 3D view, select 'Set Viewpoint' from the View menu. The cursor will change to a cross. Click on the point where you wish to view from and then the point that you want to look at, the screen will display the new View. It is worth mentioning that you are not locked into that position and can move around from that point. When you are happy with the view, save it in the way described above.

Note – The Set Viewpoint command does not work if you have added a camera and have turned on the Track Camera command in 3D. If this is the case, simply turn off Track Camera from the Display menu and then create the view.

Printing and plotting

Introduction

The Layout Pages give the user much of the power of CAD to create their plans having prepared them in a digital terrain modelling interface.

You will need to set a number of options before you can usefully print plans on your printer. However once done, you should not have to repeat any of the setup steps unless you change your printer or plotter.

First and foremost you need to decide which printer(s) you want to use for printing plans. It is recommended that the drivers for those printers are installed on your computer. RelMo supports any printer which has standard Windows® drivers. You can also create a PDF file of your plan by printing to a PDF printer such as Adobe Acrobat.

The general principle is to set up a number of templates for different sizes of paper in your Codes survey. Because you set them up in Codes, they will become available for each new job that you start. You can then customise the location date etc for that particular job.

A number of layout templates are included in the Codes survey supplied with the software and these can be altered to suit your own printer. They are unlikely to print out perfectly without some amendment because each printer manufacturer seems to have different paper leads and margins.

You can also create your own templates from scratch and, provided you do this in the Codes survey, they will be available for all new jobs.

The next section looks at creating an A3 layout template from scratch.

Creating your template layout page

Open the Codes survey

Open the Codes survey and go to the Views Control Bar. Layout templates are created in the Codes survey so that they are available for all new jobs.
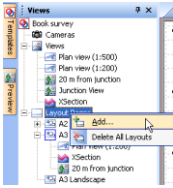
Add a new layout
Right mouse click on Layout Pages and click Add. A new page called page 1, 2 etc. will appear below the layout pages. Right click on this page and select Properties to rename the page with a more descriptive name such as A3 HP Laser. Click OK.

Associate the page with a printer/plotter
Right mouse click on the page again and click on print setup. A standard printer dialog box will appear.
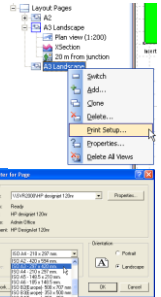
This allows you to assign a printer to this particular page. Select the printer, page size and orientation where appropriate. Click OK. Your layout page on the main part of the screen will now resize to reflect the paper size you have chosen.

Once you have associated the page with the printer you can build up a template to reflect your corporate image by adding standard boxes, text and company logos. You can zoom in and out by using the wheelie mouse. Alternatively you can use the magnifier button and the home button to zoom in and return to 100% respectively.

Adding an outside border
From the View menu select Options and click on the Printing tab.
Check the border check box and select the colour and weight of the border. Make sure you click on the Default button to ensure the changes are saved for all future jobs. The border will be displayed in the Layout Pages.

Adjusting the margins for the Printers paper feed
You can alter the margins to try and compensate for those printers that insist on producing a larger leading edge or do not align your plot centrally on a piece of paper. Ensure that borders are turned on and print a sheet. If the margin's need to be adjusted do so by going to View, Options and clicking on the Printing tab. Adjust the margins and print another sheet. When you are happy, click on the Default button to ensure the changes are saved for all future jobs. This is a matter of experimentation.

Add boxes to your layout

You now need to add boxes, text and company logo to reflect your corperate image. Any text can be ammended or added to on a per job basis.

The best method is to add a series of standard boxes and then add separate text boxes on top.

To add a box, click on the box tool on the toolbar. Using the mouse, drag out a box on the layout page. Use the wheelie mouse to zoom in and out as necessary.

You can change the line and fill colour of your object by clicking on the line and fill buttons. For no fill, uncheck the fill option by going to the objects Properties, (see below).

Once you have set the colour and fill Properties, you can set this as the default style for future boxes etc by right mouse clicking on the object and clicking on Set Shape Defaults. All future objects will now be created in this style.

You can inspect and alter the Properties of your box by either right mouse clicking on the object and clicking on Properties or with the box selected, clicking on the Properties button.

You can use the alignment tools to ensure that your boxes are correctly aligned. Select the boxes by dragging a box round them with the left mouse button or by clicking on each box individually whilst holding down the shift key. Right mouse click and select the Alignment options.
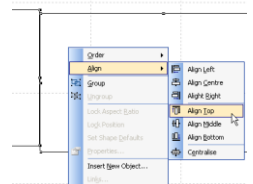
Once you have set up your boxes, you can group them by, again selecting the boxes with the left mouse button whilst holding down the shift key. Right mouse click and, click on Group.
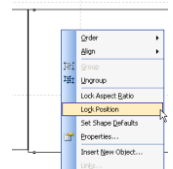
Note -You can Copy and Paste boxes (and any other objects).

Finally, as these boxes are going to form your corporate image, you can lock them in position, select the boxes, right mouse click and click on Lock Position.

Add text to your layout

Once you have your boxes, you need to add your default text. To add a text box click on the text box tool and drag out a box using the left mouse button. You can leave boxes empty for the later addition of text.
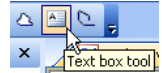
Set the font using the text toolbar. You can alter the font and size, use bold, italic or underline, left right and justified. You can also alter the line spacing.

To change the margins, click on the Properties button. Check the Draw Outline check box. Set the width of the line and the colour.
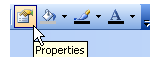
From Properties, you can also set the font etc. by clicking on the Font tab.
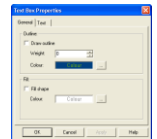
To edit text in a text box, double click on the box. To change the size of a text box, single click on the text box and drag the handles with the left mouse button held down.

You can change the font, border and fill colours of your text box by clicking on the Font, line and fill buttons. For no fill, uncheck the fill option by going to the objects Properties.

Adding a Company Logo

You can add a company logo to your template. Right mouse click on the main plan area and click Insert New Object.

The Insert Object dialog will appear. Choose create from file and browse to the image you want to insert. Click OK and the image will be imported. By default the aspect ratio is locked. To unlock, right mouse click on the Object. We recommend that you do not use the 'Link' button. Once your logo is correctly positioned, right mouse click and Lock Position.
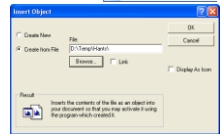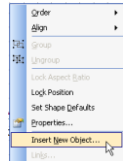
Setting the print area

When you are happy with the general layout, you need to add a Print Window. This is the window that any plans, 3D views and photos will drop into. Zoom out until you can see the whole sheet and select Set Print Window from the Display menu. This causes a white rectangle to be displayed on screen. This rectangle represents the area into which RelMo will insert the plans, images and 3D views.
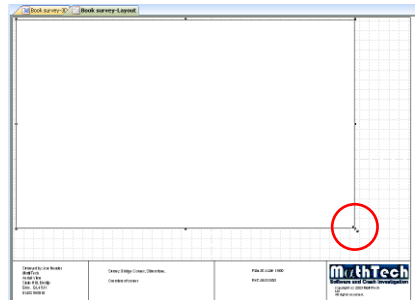
Drag the window to the required size using the mouse. When you are happy, click the return or Enter key. The Print Window will disappear. Usually you will want the print area to cover all of the parts of the page which are not already used for text.

Setting the print scale factor

On a small number of older computers you may find that text you have added on one line spills over onto two lines when you go to Print Preview or, you print the plan. You can correct this by setting the Text scale factor. This value is set on the Printing page of the Options dialog under 'Text scale factor'. To set this option, go to View, Options, Printing.
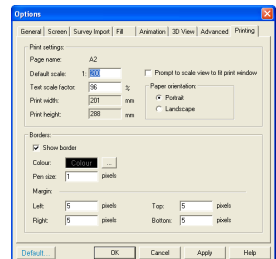
Try using Print Preview to preview your page. Note the relative size of the text in Print Preview compared with the Layout page. If any text has dropped over onto a second line in the Print Preview box, reduce the scale factor. Remember to click the Default button.

Saving the template
When you are happy with your changes, save the Codes.rlm survey and RelMo will automatically include your customised template pages in all future jobs. Note that they will not be available in previously created jobs.

Making a new template available to older jobs
If you want to make the template available to older jobs, Create a new layout page in the old job and associate it with the printer. In Codes, open the Layout Page you want to copy and, from Edit, Select All. From Edit, click on Copy and then swap to your old job. Open the layout page and Edit, Paste. The text and any bitmaps etc will be copied into the old job.

Creating plans
Before you create your plans you need to create your Views. See page 157 for details on creating views.

All your text, arrows etc. will be added in the Layout pages. This is because the page is already scaled to your printer and thus fonts, arrows and any boxes you add do not have to be scaled further.

Inserting your views into the layout page
Open the Views Control Bar. Drag the views that you wish to plot onto the appropriate Layout page.

Double click the page and your views will now appear in the centre of the Print Window that you set up when creating the template.
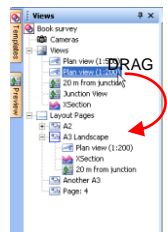
Moving and resizing your views
Left mouse click on your plan in the Layout page. You can now drag the plan around the page. You can also move the plan outside the Print Window.

You can also resize the plan by grabbing any of the black handles that appear around the edge. Because the plan is to scale, when you resize it you it will not shrink or grow, what will happen is you will see more or less of the job at the same scale.

Altering the plan

Adding a border
Click on the plan you want to alter and right mouse click. The Properties page will be displayed.

The General tab allows you to add a border and fill colour. The weight of the border (in pixels) and colour can be altered. A fill colour can be added if required.

The Description tab allows you to alter the description of the object. It also gives information on the coordinates of the plot, whether the view has been rotated, the plot scale, its size and whether any Objects have been excluded.

Excluding Objects from the printed output.
You can choose to exclude specified Objects within your plan from the printed output. For example if you want to produce a plan showing an area before the Object was there and then another with the Object there, there is no need to produce two Digital Terrain Models one with the Object and one without. You can produce one plan with the Object in place, take your scale views, drag them into the Layout pages and then produce two views, one where you force the Object to be hidden and, one with it shown.

To hide or exclude an Object from the printed output, double click the view that contains the Object, the Properties dialog will be shown. Click on the Edit excluded objects button. A list of all Objects included in the view will be shown. Right mouse click on the Object(s) you wish to exclude.

Excluded Objects will appear crossed out in the list.

Altering the scale and rotation of a plot

The plot data allows you to change the scale, width, height, rotation and the centre. This information relates to the original plot box, thus altering this information will alter the area of the view that you see in the plan.
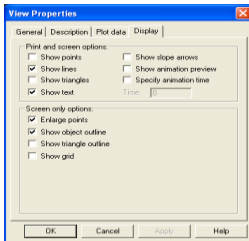
Altering the printed output

The display tab allows you to alter the print and screen options. The top options relate to both screen and printed output in which case what you see on screen will be what you get in the printed output.

To produce a line drawing plan from a coloured in model, Show the lines but do not show the triangles. To produce a full colour plan, check the Show triangles box.

Show text relates to any text added in the main 2D window rather than text added in the Layout page.

Show slope arrows relates to the slope direction arrows which can be turned on from the analysis menu (see page 141). For the slope arrows to be displayed, the Object containing the triangulated surface *must* be the Active Object at the time of printing.

Show animation preview will show the preview of any animation on the screen and plan. You can specify the number of redraws from View, Options and clicking on the animation tab.

Specify animation time allows you to show an animated Object at a particular time in the animation sequence. Check the box and enter a time.

You can also alter the screen only options, in which case only the screen and not the printed output will be affected.

Inserting views that stretch to fit the page
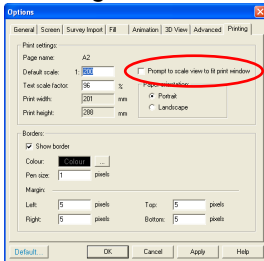

If you want RelMo to set the scale as large as it can for the printed sheet, check the Prompt to scale view to fit print window option. This means that although you may save a 1:500 view, when you add the view to the plan page, it will ask whether you want to resize the plan to fit to the largest size it can for the page. This may result in some strange scales and you are advised to add a scale bar from the Templates library.

You need to set this option before you drag your View into the Layout page.

Creating 3D views

On the Views Control Bar drag the 3D view that you wish to plot onto the appropriate Layout page.

Double click the appropriate Layout Page and your view will now appear in the centre of the Print Window that you set up when creating the template.
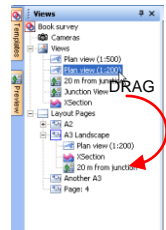
Moving and resizing your 3D view

Highlight the plan by left mouse clicking on it in the layout page. You can now drag the 3D view around the page. You can also move the view outside the Print Window.

You can also resize the view by grabbing any of the black handles that appear around the edge. Unlike plan views which do not alter their scale when you resize them, 3D views behave like normal pictures and consequently shrink or grow.

By default the aspect ratio of a 3D view is locked. You can unlock it by right mouse clicking on the view and selecting Properties, and clicking on the size tab.

Altering the printed output of your 3D view

Either click on the view you wish to alter and right mouse click on Properties or, double click on the view. The Properties page will be displayed.
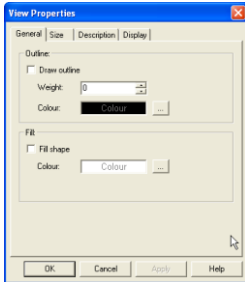
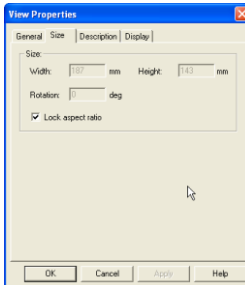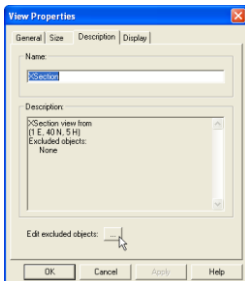The General tab allows you to add a border and fill colour. The weight of the border (in pixels) and the colour can be altered.

The Size tab gives information on the image statistics and allows you to lock and unlock the aspect ratio.

The Description tab allows you to change the name of the image and gives details of the view. You can choose to exclude any of the Objects within the View from the printed output. See page 169 for further details.
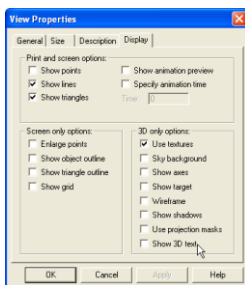
The display tab allows you to alter the print and screen options. The top option relate to both screen and printed output in which case what you see on screen will be what you get in the printed output.

Show points, lines and triangles is self explanatory.

Show slope arrows relates to the slope direction arrows which can be turned on from the analysis menu (see page 141). For the slope arrows to be displayed, the Object containing the triangulated surface *must* be the Active Object at the time of printing.

Show animation preview will show the preview of any animation on the screen and plan. You can specify the number of redraws from View, Options and clicking on the Animation tab.

Specify animation time allows you to show an animated Object at a particular time in the animation sequence. Check the box and enter a time.

You can also alter the screen only options, in which case only the screen and not the printed output will be affected.

You can choose whether to show the shadows and use the projection masks (see the section on lighting, page 146, for further details). If you check the 3D text button, 3D text will be displayed and plotted.

You can also alter the screen only options, in which case only the screen will be affected. The 3D only options affect only what is seen in the 3D view. The printed output remains unaffected.

Add text to your plan
You now need to annotate the plan. Before you do this, we suggest that you lock all your plans, 3D views, photos etc. in place by right mouse clicking on each one and selecting Lock Position.

Adding text
To add a text box click on the text box tool and drag out a box. Text boxes will remain the size that you specify rather than shrinking to fit the text when you click out of them.
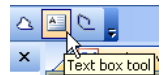
Set the style of the text from the text toolbar. You can alter the font, size, style, colour and spacing of the text. You can also add a line and fill colour to the text box. (To clear the fill or line colour, right mouse click on the text box and select Properties. Un-check the line and fill boxes).
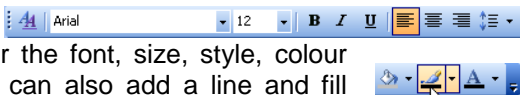
Add the text. You can add multiple text lines by clicking the Return (enter) button to start a new line. You can rotate text by grabbing the handle at the top (only true type fonts can be rotated). You can also edit existing text by double clicking on the text box.

To change the margin, (the distance between the edge of the box and the text), click on the Properties button.

Adding arrows
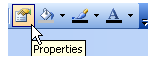You can add arrows to your plan by using the arrow tool. Note that Dimension Arrows which automatically generate the distance are added in the main 2D window (see page 122).

Adding an arrow
Select the arrow tool and then click on the plan and drag out the arrow with the left mouse button. (The base of the arrow is the first point created).
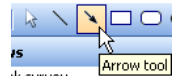
Changing the Properties of an arrow
To change the colour of an arrow use the line colour button.

To change the weight or type of arrow, double click on the arrow. The Line Properties dialog will be displayed. You can choose the size of any arrow head and alter the style of the start and end.

The styles include;
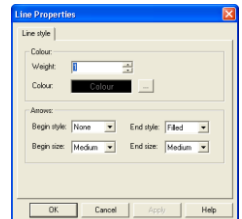
⟶▶	Filled
⟶▷	Outline
⟶⟩|	Dimension
⟶|	Line
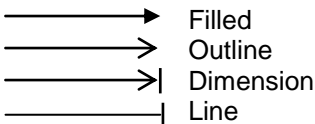
Adding a scale bar and or north symbol

A number of scale bars and a simple North symbol are supplied as either templates or complex points. You can also create your own template scale bars and north symbols, see templates (page 67) for more information.

An example of a 30 metre scale bar is shown to the right.
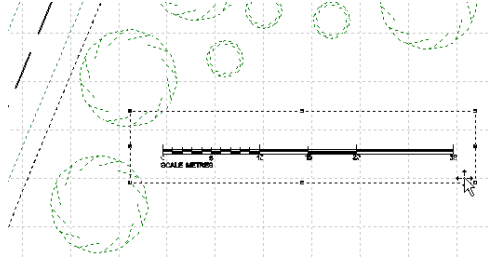
Animation

Introduction

An Object or group of Objects can be animated. Animation can be created in 2D or 3D. In 3D you need to position yourself so that the surface along which you are animating is behind the Object you wish to animate.

To animate an Object first ensure that that it is the Active Object. Ensure that the Object is rotated and facing the right direction.

If the terrain is sloping, we suggest you Auto-Level the Object by selecting Auto-Level from the Objects Transform menu. The Object will automatically try and level itself across the surface.
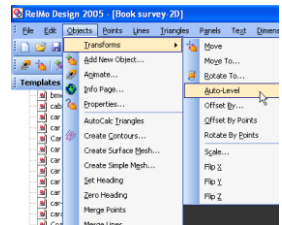
Note - On some extremely uneven surfaces it may not be possible to level the object perfectly.

Once level click on the Animate button. You now need to move the Object to the next point along the path you want the Object to follow by dragging the Object with the left mouse button held down. Once you drop the Object in its next position the animation control box will be displayed.

In 3D, if you want the Object to stay on the ground, follow the same procedure as above but in addition, hold the Control key down. Provided the surface is behind the mouse the vehicle will stay in contact with the ground.

Animation control box

Once you have moved the Object in animation mode, the Animation Control Box will appear. The features of the box are described below.

Time

Global start time - The time at which the Object will start to move from the previous position

Global finish time - The time at which the Object will arrive at the new current position.

The diagram below illustrates global start and global finish.

Start	Position 1
Global start	Global finish
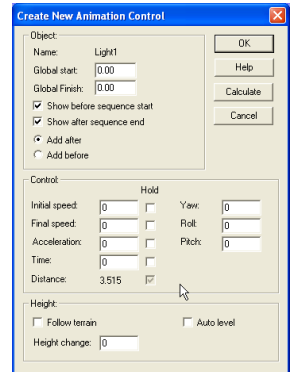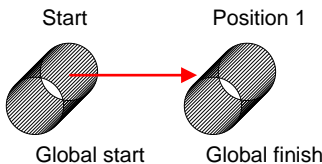
Start and finish behaviour

Show before sequence start – If this box is checked, the Object will be shown in its start position before any animation starts.

Show after sequence ends – If this box is checked the Object will be shown in its finish position after any animation ends.

Add after and add before - This allows you to either animate from the start to the end or, from the end to the start.

Speed and acceleration

The rate at which the Object moves must now be added. You must choose two quantities from those listed. Distance is calculated by the software. When you have selected your two quantities check the boxes and the program will calculate the others.

Note – RelMo uses SI units (metres per second, metres etc.)

To convert miles per hour to metres per second, multiply by 0.447
To convert kilometres per hour to miles metres per second, divide by 3.6

Initial speed - The initial speed in metres per second.
Final speed - The final speed in metres per second.
Acceleration - The acceleration in metres per second^2.
Time - The time in seconds.
Distance The distance is calculated by the software.

Yaw, Roll and Pitch
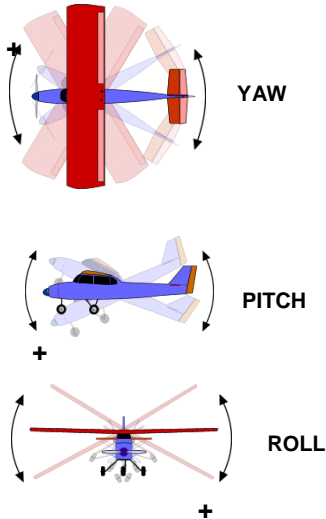
The pitch, (x), roll, (y) and yaw, (z) axes for an object are defined using the right handed orthogonal rule. By default all objects are created with the y-axis pointing vertically up the screen. The x-axis is then to the right and the z-axis is at right angles to the other axes and points out of the screen. A positive roll value will therefore rotate the object to the left, and a positive pitch angle will rotate the front of an object downwards. For consistency within the program a positive yaw rotation will rotate the object clockwise.

Remember that all Objects are created with their heading, 0 up the screen. If your Object behaves unusually, rotate it so that the 'front' is pointing up the screen and from the Object menu, select Zero Heading.

Height
There are a number of Options for height.

Follow terrain will cause the object to follow the terrain.
Follow terrain plus a height change will cause the Object to change height at the start of the sequence and then move.
Change height without follow terrain will cause the Object to change height smoothly whilst moving, achieving the new height by the end of the move.

Auto-level

Auto level will allow an object to react to any curves or bumps in the terrain by attempting to pitch and roll the object to align with the triangulated surface below. On very bumpy terrain, this feature may not be entirely effective.

Once the information has been entered, click OK and your Object will move to the new position. Now move the object to the next position and repeat the process.

Once you have completed the animation you can refine it using the move position command.

Note – When Auto Level is selected the Pitch and Roll boxes are greyed out. This is because pitch and Roll are controlled by the Auto Level function and manual entries cannot be made.

Pausing animation

You can pause the animation so that the Object you are animating remains stationary for a specified time period.

Using the Animation dialog, bring your Object to rest (final speed 0) at the point where you wish to pause the animation. From the Animation menu select Pause Animation. The Insert Pause dialog will be displayed. Fill in the time of the pause in seconds.
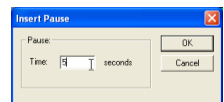
RelMo will create an additional animation control as shown on the right. Note that the speed, acceleration and height boxes are greyed out, however you can still alter Yaw, Roll and Pitch.
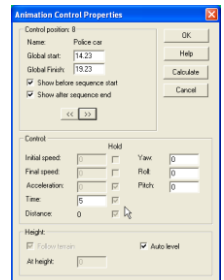
Freezing animation

You can choose to freeze an animation at a particular point in time. When you do this, the animated objects will move directly to that point. Note that the animation does not play up to that point, it simply moves everying to that point. Escape or play to return to normal.
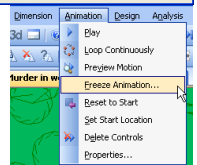
To freeze an animation, select Freeze Animation from the main Animation menu. The Freeze Animation dialog will appear. Enter the time at which you wish to freeze the animation so that when it plays it stops after a defined number of seconds.
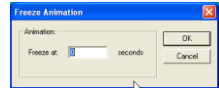
Amending animation

Move Position
You can amend and refine you animation sequence for any position. Whilst in animation mode, right mouse click and use the Go To command to go to the animation position you wish to amend. Once at the position right mouse click again and select Move Position.
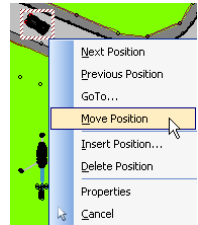
You can now refine the position of your Object using the mouse or arrow keys. (Hold down shift to rotate).
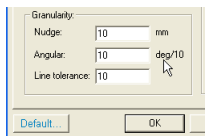
Note - To increase or decrease the amount an object moves for each mouse click, change the Granularity (Nudge and Angular) by selecting the Screen tab from View, Options.

When you make changes, time, acceleration rates etc. will automatically update.

Note - Having made amendments, and if you wish to add further animation, go to the final position if not already there and right mouse click and select Add Position. Pick up the object and continue as normal.

Amending speeds
Again whilst in animation mode go to the position you want to amend by right mouse clicking and using Go to, then call up the Properties of that position by right mouse clicking and selecting Properties. Make any alterations and click on calculate. This will recalculate each position.

If you don't know the position, go to a position (not the first) and call up Properties. Now use the forward >> or reverse << keys to move to the correct position.
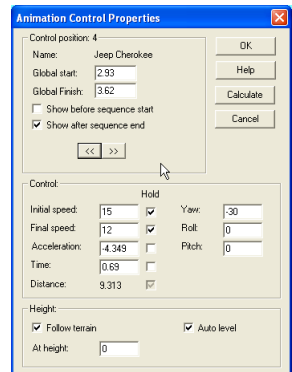
Note - Having made amendments, and if you wish to add further animation, go to the final position, right mouse click and click Add Position.

Inserting a position
You can Insert a position in an animation that you have created. This is usually done to refine your animation after you have first created and viewed it. Whilst in animation mode go to the position adjacent to the one where you want to add a position. Right mouse click and select Insert Position.
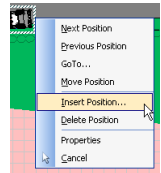
You will be asked whether you wish to add the new position before or after the current position. Select the appropriate one and click OK. The Object will be repositioned midway between the current position and the position before or after depending which you selected. The speeds will reflect the speeds from the position before and after the new position. You can now refine the position by using the Move Position command.
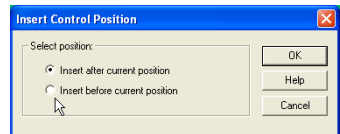
Deleting a position
You can delete an individual animation control point. To delete a control point go to the position you wish to delete. Right mouse click and select Delete Position. The animation position will be deleted.
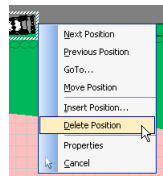
Creating an animation along a line
New for RelMo 2008 is the ability to make an object follow a line. The limiting factor is that the speed along the line must be constant. The feature is particularly useful for motorcycles as RelMo can automatically create the roll in bends.

The first step is to create a line on the model which the Object is to follow. This can be done using the line tools such as Create Parallel to create a line parallel to the kerb.

Next, drag in the Object, for example a motorcycle, from the Vehicle Templates. Ensure that this Object is dropped into the Object containing the line and not the Root Object.

Make the Object containing the line, (*not* the Object to be animated), the Active Object and, on the Objects Control Bar, right mouse click on the Object to be animated and click on set Animation path.
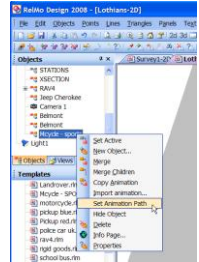
The cursor will change and you will be able to select the line that the Object will follow as shown in the screen shot below and to the right.
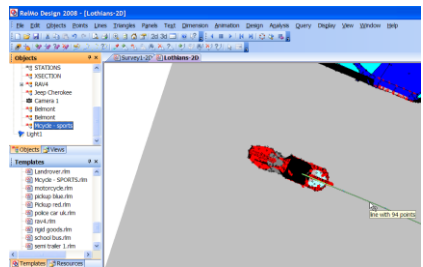
To select the line, left mouse click on it. The animation dialog box will appear.

You can delete any existing animation contained within the Object by checking the box. You can set a start time. This is the global start time in relation to any other Objects in the model. The speed can be set in metres per second. You can select whether the object should auto pitch and roll, following the undulations of the parent surface or, in the case of motorcycles to auto-roll in bends. Finally you can select whether the object is to follow the terrain.
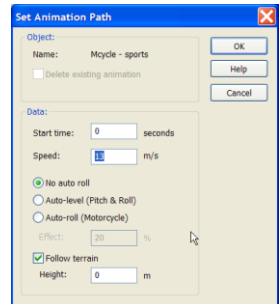
You can string together a number of separate lines and add to the sequence by repeating the above procedure ensuring that Delete existing animation is unchecked. Probably the best way to do this is to create one line and then use the Break Lines command to create separate segments each of which can have a different animation.

Playing an animation
Animations can be played in 2 and 3D. Double clicking the stop button resets the animation.

Preview Animation

You can preview the animation in 2D and 3D. In either 2 or 3D, from the Animation menu select Preview Motion. The animated Objects will be redrawn along their path at the interval set in the in the Animation Options (see page 48).
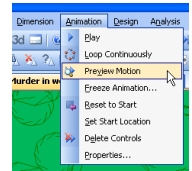
To increase or decrease the number of redraws, from the View menu select Options and click on the Animation tab. Alter the calculations per second value where a larger number will result in less redraws.
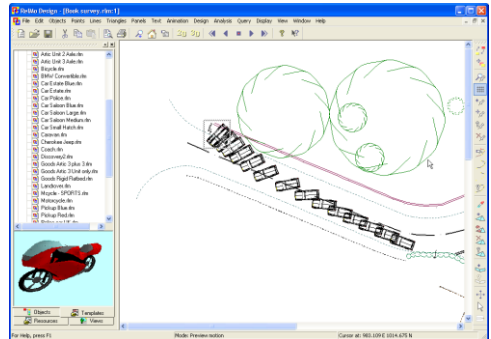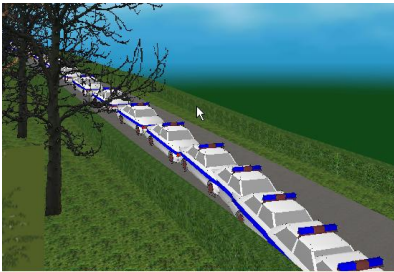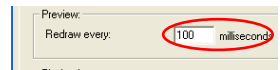
Adding a second animation to interact with the first

If you have two animated Objects that need to meet at a particular point, the following may prove useful.

Animate your first Object. This should be the Object with the longest animation time. Ensure that one of the animation positions is at the point where the two objects are to meet. Refine the animation and then using Animation Properties, go to the position where the two objects are to meet and note the global finish time for that position. Leave the Object in that position and escape out of animation.

Now make the second object Active and animate the second objects entire sequence ensuring that one of the positions is where the Objects will meet. When finished, go to the position where the vehicles meet using the Animation Properties dialog and change the global finish time to that of first object which you noted earlier. Click calculate and use the << and >> buttons to review each position, the timings for which should have changed automatically. Click OK and play the animation.

If you make further changes to either object, you will need to repeat the process as the global time will also have altered.

Importing animation

You can import animation from other programs which output their animation in the RelMo format. Such programs include Madymo and some Incident Data Recorders.

To import an animation, place the Object to be animated on the model at the start position. In the Objects Control Bar right mouse click on the Object you wish to import the animation to and click on Import animation. The Import Animation dialog will appear. Navigate to the animation file output by the third party program and click OK. The animation is automatically imported. To view the animation sequence click Play.
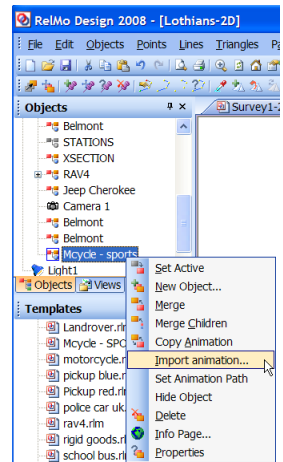
Troubleshooting animation

Animating over missing triangles may cause objects to speed up or veer off course because the distance cannot be calculated – Create a triangle where one is missing.

Animating over multiple triangles where manual triangulation has been undertaken and two triangles overlap may cause objects to speed up or veer off course because the distance cannot be calculated – Delete the triangles and manually create new ones that don't overlap.

Having moved to a new animation position, the speed from the previous position has been forgotten – Right mouse click and use Previous position to move back two or three positions, then use Next position to move forward again. When you can move forward no more, click Add position to add a new position. Move the object as normal and the speed from the previous position should be remembered.

If you have problems whilst animating, the easiest Option is to delete the animation using Delete Controls from the Animation menu.

Cameras

Introduction

Having animated, it is also possible to fly round the survey as the animation is played.

Rather than allowing the client free and unfettered access, you can control the path by adding a Camera. Cameras are added from the Views Control Bar. Right mouse click on cameras and click Add. A new camera will drop into the centre of the Active Object.

If you add a camera into an existing object that already has animation, the camera will acquire the same animation properties as that object and will therefore move with it.

Adding the camera to an Object that already has animation.

Make the Object containing the animation Active. Right mouse click on cameras in the View Control Bar and click Add. A red arrow will appear in the centre of the Active Object. Make the camera Active and use the Object Move command to position the arrow looking the correct way. Change its height using the Object Properties command.

To view the Animation from the camera position, go to 3D and select Track Camera, from the Display menu. Play the animation. If multiple cameras are being used click on the camera from which you want to view the animation in the Views Control Bar or use F9 and F10 to switch between cameras.

Adding a camera and creating an independent path.

Make the survey the Active Object. Right mouse click on cameras in the View Control Bar and click Add. A red arrow will appear in the centre of the Active Object. Make the camera Active and use the Object Move command to position the arrow looking the correct way. Change its height using the Object Properties command.

Animate the camera as you would any other object.

To view the Animation from the camera position, go to 3D and select Track Camera, from the Display menu. Play the animation. If multiple cameras are being used click on the camera from which you want to view the animation in the Views Control Bar or use F9 and F10 to switch between cameras.

Renaming cameras

It may be useful to rename cameras to something more meaningful to your job. Right mouse click on cameras in the Views Control Bar and click Properties. You can set the properties of the camera including changing its name.

Creating Videos

Introduction

RelMo 2008 allows you to create video files which can be played in a media player or, using 3rd party software turned into DVD files.

Your computer will need codec software to compress the video files. Windows is supplied with such software and further codec software is available on the web. Two particularly good formats are MPG4 and XVID.

Set up the defaults from the View, Options, Animation dialog (see page 48 for further details).

Once you have added your animation and any cameras, you can create your videos. You are not restricted to creating videos from camera positions. You can equally create videos of 'fly bys' across the model.

Creating a video

Go to the camera position from which you wish to create a video. From the Animation menu click on Create Video.

The Create Video dialog box will appear. Navigate to the place you wish to save your video, (video files have the file name extension .avi), give it a name and click Save.
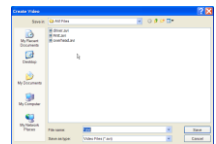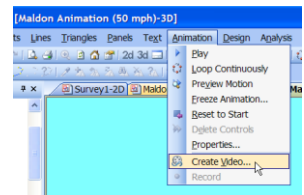
The screen will resize to reflect the format set up in Options, Animation.

To create the video, click on the Play button. Once you have finished recording, click on the stop button.

To exit animation mode, from the Animation menu Click on Create Video. The 3D screen will resize to normal.
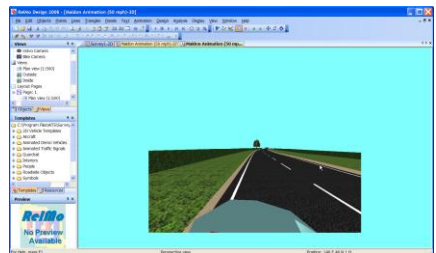
The video file can be viewed in Windows Media Player or similar software.

Ortho photos

Ortho photos are large photos of terrain taken from the air. These have been rectified so that when laid over the corresponding national mapping agencies 3D point data, the photo corresponds to the land.

In the UK, the Ordnance Survey can supply X, Y and Z coordinate data for any part of the country and, most of the country is now available as ortho photographs.

Ortho photos are usually supplied by the square km and in a number of resolutions. The higher the resolution of the photo, the higher the price.

Once loaded, the surface of the photo can be broken up and points added to allow the user to add 3D objects and designs.

To load an ortho photo, you need to know the Northing and Easting of the bottom left and top right of your Survey data. If you have too much data, you can set a filter in the import dialog box to only import points for a specified area North and East.

Now make a new texture in the normal way with your ortho photo as normal and click on the set size button. The dialog to the right will appear.

Enter the northing and easting of the bottom left and top right corner.

The software will work out the remaining boxes and allocate bits of the image to the appropriate triangles.

Now all that remains to be done is to triangulate the model.
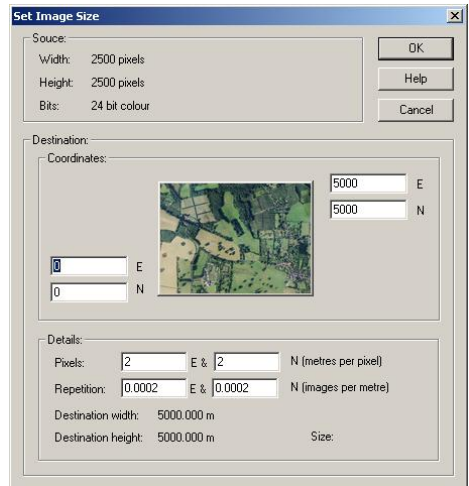
Set the survey Active. Select AutoCalc triangles from either the Object or triangle menu. Select the image that you called your ortho photo and check the ortho photo rendering box. Click OK.

Distributing animation files

Pack and Go
Prior to using the Pack and Go wizard, reduce the file size as described on page 202.

From the File menu in 2D, select Pack and Go.

Use the next button to step through the various stages
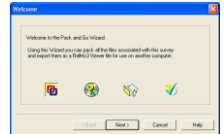
Follow the steps in the Pack and Go Wizard. You have a choice of what files to Pack. You can include RelMo3, the Viewer program and help files. Each time you update RelMo, you should also update the Viewer program and, redistribute the new copy to your clients. The sky bitmap and Info Pages can also be included.
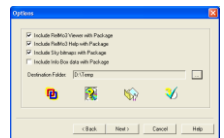
Browse to the folder you wish to save your work in or, click the Create Folder button and type in the name of your new folder. Click OK and then Next.
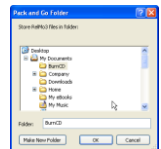
A list of all the files will be displayed. You can add further files by using the Add button. Also included is a DLL file, IJL15.DLL. Not all computers have this file which is used by RelMo and the Viewer so it is supplied in the Pack and Go job as standard.
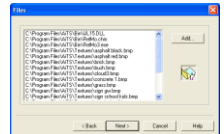
Click the next button and click finish. The files will be copied to your folder. Your job filename extension will have been changed from a RelMo file (.rlm) to a Viewer file .rlv.

Burn the folder to a CD and distribute with the usual caveats about the specification of the computer the end user will require.

Your client simply needs to copy the folder to their hard drive and double click on RelMo3.exe and then Open the file you have sent them.

See page 192 for instructions on how to use RelMo3. These pages may be photocopied and sent out to end users. A copy is also available in Adobe format from www.relmo.co.uk.

RelMo3 Instructions to end Users

Introduction

The RelMo 3D viewer allows anyone to view 3D animations created by RelMo. You cannot view 2D plans and you cannot carry out any editing of the model other than changing the lighting conditions.

The viewer and associated job files are supplied to you on a CD created by the RelMo user. Copy these files to a folder that you create on your hard drive, do not run them from the CD.
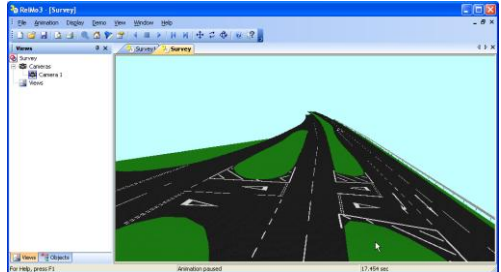
Note - The minimum spec for a computer to run the animation smoothly is a Pentium 2.5Gh processor with 512Mb of Ram a 128Mb graphics card with a CD drive and wheelie mouse. Animations will run on slower processors with smaller graphics cards, however they may appear jerky. If the RelMo user has used multiple lights and shadows, you will also need a graphics card which supports hardware shadowing. Visit www.relmo.co.uk for a list of graphics cards.

The RelMo 3D viewer program is freeware, in other words, you can distribute and use it free of any fee.

The environment

To open a file, from the file menu click open and open the file you wish to view. The file will be loaded into RelMo3.

The Creator can control what you view by adding any number of cameras. You can see these cameras, by clicking on the Views tab of the Control Bar to the left of the screen. When you play an animation, you are guided along the path of the camera. You can swap between cameras by double clicking on the camera you want.

CAMERAS

CONTROL BAR
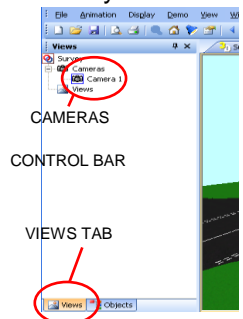
VIEWS TAB

Below the Camera icon is the Views Icon. If the creator of the survey has produced specific static views, they will appear here. Static views may represent the view seen from a specific position and height. Double click on the view to see it displayed on the main screen. You can move around from this position. To return to a Camera view, double click the Camera.
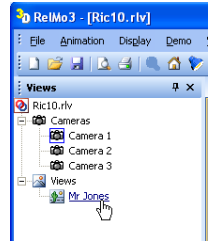
If the Control Bars are not shown on screen you can display them. From the View menu, click on Control Bars and then the appropriate Bar.
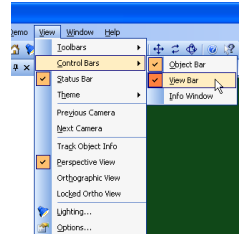
By default the Control Bars will be displayed on the left of the screen. The small Autohide pushpin in the top right corner can be toggled to permanently display the Control Bar or to hide it at the edge of the screen. When the pushpin is down the Control Bar is locked. When it is on its side, the Control Bar will hide itself.
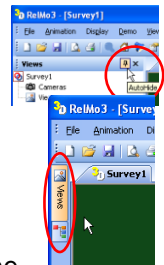
To display the Control Bar in Autohide mode, guide the mouse over the appropriate tab on the left of the screen.

To play an animation
If the creator has added animation, click the play button on the main toolbar. To pause an animation, click stop. To proceed in increments click the increment button to step through the animation. To reset the animation double-click the stop button.

Before you play an animation you can choose to view it from any of the camera views by double-clicking on the appropriate camera and then clicking play. You can 'look around' whilst watching an animation by using the mouse and left mouse button and dragging it across the screen.

Free movement

Getting to a static position

Your movement is not restricted to the path taken by a camera. To move around the scene without restriction first from the display menu, uncheck the Track Camera button.

You will be repositioned 100 metres above the survey. Use the wheel of the wheelie mouse to zoom in and out. (Holding down the Control key will increase the rate at which you zoom in).
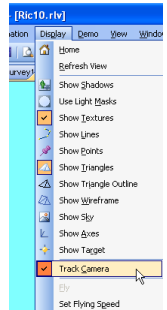
To change your position use Shift and left mouse or ⊕ to drag the survey about the screen.

Left mouse only or ⊕ rotates the survey about your eye.

Control and left mouse or ⇄ moves you about the centre of the survey.

Free Flight

You can fly around the scene in free flight. Use the following keys,

F2   Fly or stop Flying
F4   Set Fly speed increments
Control + A   Speed up in increments
Control + Z   Slow down in increments (you can use this command to stop)
ESC   Escape from Fly mode

You can control your heading and pitch using either the arrow keys or the mouse with the left mouse button depressed.

If you get lost, stop flying (ESC) and click on the home button 🏠.

Whilst flying, at the bottom of the screen you are given feedback. This includes, pitch (where a negative figure is down), heading, speed in metres per second and the number of frames per second.

Pitch: -3° Heading: 338° at 0.5 m/s (32.0 frames/s)

Display options

You can choose whether or not to display the textures, lines, points, and triangles. Normally, you would not choose to turn off the textures or triangles, however, lines are not normally displayed in 3D, turning them on will often reveal original survey data that may be of use, similarly with points.

Show wireframe, simply shows a wireframe view of the model and show triangle outline simply shows the outline of the triangles that make up the surface of the model. Show sky, shows a clouds background where this has been supplied by the file creator.

Show axes displays an X, Y and Z pointer that may help you with your navigation and show target shows a target to assist you with zooming in on a particular point.
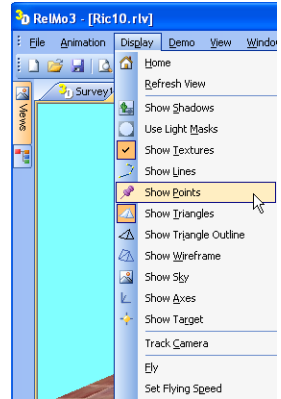
Info Pages

Introduction

Info Pages are HTML boxes that can be attached to objects by the creator. They can contain written information and pictures. The Creator can choose whether or not to include any Info pages they have created with the files they have supplied to you. The Creator should tell you if Info box data is included with the file.

Setting the cursor active

From the view menu select Track Object Info. When the cursor passes over an Object that contains an Info Page, it will change as shown in the picture to the left. Left mouse click to display the Info page.

An example Info page.
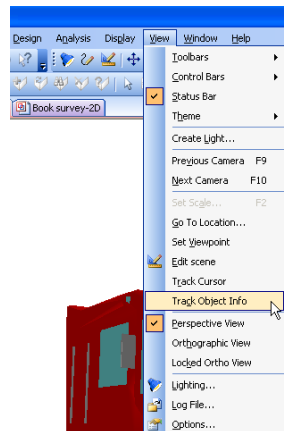
Printing images

You can print any 3D views. The various options can be found on the File menu.

You can either print the whole Window or, a rectangle which you drag out with your left mouse button. Print preview options are available for both of these options.

You can also Save an image to your computer.
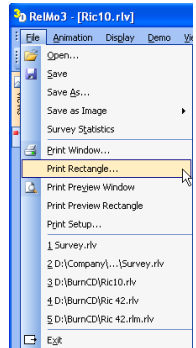
Altering the lighting
Introduction

If your survey contains multiple lights, you will ideally need a graphics card that handles shadow acceleration. RelMo uses OpenGL as its 3D rendering engine. OpenGL has been supplied by Microsoft$^®$ since Windows 95$^®$ and is a commonly used set of functions. Many graphics card manufacturers have chosen to extend the core function supported by OpenGL and many now support additional hardware accelerated capabilities. These are made available through a series of extensions for which RelMo will search. Some Graphics cards however do not support these extensions, and in those circumstances, RelMo provides a software based rendering solution whenever it can.

The RelMo website carries a list of some of the more common cards and whether they support the necessary acceleration.

It will help to have an understanding of some lighting terms before we begin to manipulate lights.

Positional lights

Positional lights have a particular location in space and can radiate light in all directions. The angle of the light cone can produce a tightly focused beam of light. Positional lights can be positioned by the creator of the survey.

Directional lights

Directional lights can be thought of as providing light from a particular direction. The light emitted by such a light is assumed to be parallel and any calculations make this assumption. (Imagine the light rays emitted from the sun. Because we are such a long way from the source, by the

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AiTS International   **196**

time they reach us the are in fact all but parallel i.e. they have the same direction hence a directional light source).

Shadows
The nature of the light defines how any shadows are produced. They can be a very expensive process computationally, unless special OpenGL hardware acceleration functions are available on the graphics card. Where not present RelMo resorts to a much slower software implementation.

Projection masks
Positional lights can use a projection mask which limits the field of view of the light.

Lights as Objects
RelMo always contains one default light which can be seen as part of the Root in the Objects Control Bar. Note that it is possible to delete this light in which case, if the ambient light is also turned off, you will not be able to view the survey. Deleting the light is therefore not recommended!
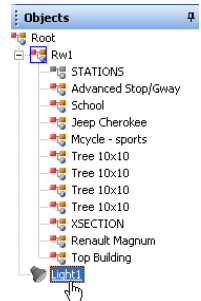
Adjusting the Ambient light
Whereas the main lighting properties allow shaded areas
and highlights to be viewed, ambient properties enable objects that are in shade to be illuminated. The example below demonstrates this.

As the Ambient light already exists by default, in 3D view click on
the lighting button. The lighting dialog will be displayed. Click on the General tab for Ambient light settings.

No Ambient light – only the area illuminated by the second light can be seen
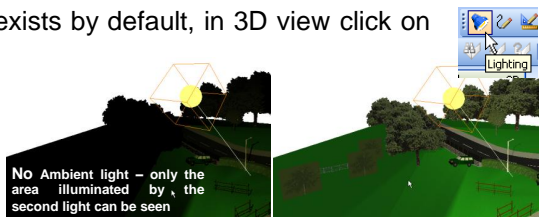
Ambient light
Enable ambient lighting simple allows the ambient light to be shown.

The Level slider bar will alter the intensity of the light with the slider to the right being the most intensive.

Background light
The background light can be altered in intensity and colour. Note that you can only alter the background light if you are displaying a background image such as one of the sky bitmaps. The two images to the right show different intensities of background light. Note that the light on the model itself remains the same. Moving the slider to the right increases the intensity of the light.

Lighting model
Two sided lighting calculations refine the way that shadows are cast. This however is at the cost of processing power. Local Viewer lighting is another model that effects the way in which the light is calculated towards the user. Using these models will improve shadow quality at the expense of processing power.

Special effects
Show Shadows allows Objects to cast shadows against the ground model and other Objects.

Using a light mask enables the user to project a light which displays an image as shown to the right.
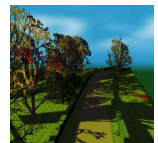
Directional and positional lights

Where a creator has included lights, their intensity and direction can be altered in the Viewer program.

General

You can change the name of the light to something meaningful. You can also change the colour of the light.

Enable light has the same effect as switching a light on and off.

Choose between Directional and Positional lighting.

Check the box for a Directional Light and leave it unchecked for a Positional Light. Directional and positional lighting are explained previously.

Show source will show the light source as a large point.

Enable mask is only available for positional lighting. If you enable a mask you can allow RelMo to use the default mask or select a mask from a separate source. See Special Effects on the previous page for further explanation. To view a mask, you must check the use light masks box on the General page.

Enable shadows will allow this light to cast shadows. Show shadows must also be checked on the General page.

Advanced

This dialog allows you to control exactly how some advanced lighting and shadowing parameters are used by RelMo.

The Size option controls the size of the virtual light. Increase the size to make the light larger. Size has no effect on the amount of light displayed.

Clipping can be altered for example, if you don't require shadows to be generated until at a distance of 100m from the light source, then setting the near clipping plane to 100m will mean that the depth of field calculations start at 100m.

The shadow offset control allows you to manually set an offset to the shadow image when it is applied to a scene so that any remaining visual artefacts can be 'pushed away' from the real scene and thereby hidden from view. Some experimentation may be required for these values which will be largely dependent upon the position of the light source and also the orientation of the scene illuminated by that light.

The attenuation factors control how light the intensity of light falls off with distance.

All these controls can be played with to reach the desired effect.

Location gives the Eastings, Northings and Height of the light. Note 0 east, 0 north will place the light at the centre of the survey at whatever height you specify.

Rotation applies to positional lights, the pitch, yaw and roll angles can be altered to point the light in the right direction.

Levels controls are used to shape and alter the intensity of the light.

Ambient controls the intensity of the light. Defuse softens or hardens the boundaries of the light when no mask is applied. Specular alters the way the light reflects off the surface. Spot angle alters the width of the cone. Exponent alters the depth of the light.

Position allows you to adjust the position of the light source relative to the centre of the survey. You can display a small sphere in the 3D scene which shows you exactly where your light source is positioned by checking the Show source box.

Intensity controls the proportion of the directional and ambient lights. The Effect parameter controls how much light is available for reflectivity properties of the material. In other words the effect of the specularity and shininess properties set by the creator in the textures dialog for each material used. Adjusting these figures can give interesting effects!

Fog

Fog is set using the fog parameters within this dialog. Generally the colour of fog is set to be the same as the background colour. Distant objects then merge gradually into the background.

Two fog modes are available, the exponential version uses the density parameter to determine the amount of fog. The linear version uses the start and end fog positions to determine zero and 100% fog respectively.

A small amount of fog allows more realistic scenes to be displayed, since distant objects tend to be viewed with a slight amount of haze in real life.

Further help

You can find attritional help and information at www.relmo.co.uk. No telephone or email support is available for users of the Viewer program.

Saving, Backup and File sizes

Saving

It is recommended that you save your file on a regular basis.

Backup

RelMo automatically generates a back-up of your last 'good' save. This file has the same name as your working file with _bak appended to the end. The file is saved as a hidden file in the same folder as the survey you are working on. It is a standard rlv file and can be opened, save and renamed at any stage.

You will need to ensure that Windows Explorer is set to show all file types to view a hidden file. From the Tools Menu select Folder Options and on the View Tab select Show hidden files and folders.

Reducing file size

On completion of your job and prior to using the pack and go wizard it is recommended that you take the following action to deduce the size of the file.

Remove any unused codes and textures

From the resources ControlBar, right mouse click on Codes and select Remove Unused. Save your work.

Remove any unused Layout pages

From the Views ControlBar, right mouse click on any unused Layout pages and click Delete. Save your work.

Delete the backup file

Delete the backup file from the working directory.

Creating a PDF file

You can create a PDF file of you plan for archive purposes. To do this you need to have a PDF printer installed such as Adobe Acrobat.

From the Layout Page, click on Print, and from the Print Dialogue select your PDF printer. Click OK. You will be asked for a file name, give your plan a name and click OK. Your plan will be saved to a PDF file.
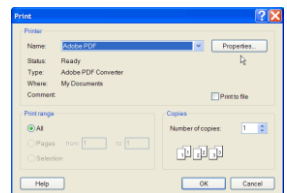
Data Protection and Integrity

Protecting your survey

You can choose to protect your survey to stop other parties from making alterations by entering a password which prevents any changes from being saved. If you Save As, the password will be transferred to the newly named file.

To password protect your survey, from the File menu select Protect Survey. The Protect Survey dialog will be displayed.
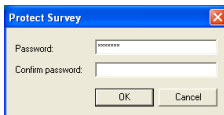
Enter and confirm your password. When you click OK, your survey will be protected.
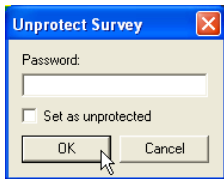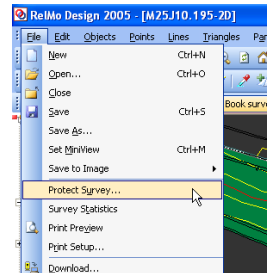
When you try to Save, the Unprotect Survey dialog is displayed. To save the changes enter your password and click OK. To unprotect the survey and save the changes enter your password, check the Set as unprotected check box and click OK. You work will be saved and the file will become unprotected. If you click OK without entering a password, the save will be prohibited. You can still close the survey, but you must click no to Save Changes.

Log File

RelMo produces a log file which can be viewed and printed. To view the log files go to the main View menu and select Log File. An example is produced on the following page.

Note that log files are created on the fly and, although you can delete or add lines and save the file, the next time it is created, any deletions or additions will be lost.

The log file is an integrated part of RelMo, not a separate file. If you send a document to another user, the log file can be viewed by them. RelMo3 does not support the viewing of log files.

Each time the survey is opened or saved, the Log file stores the date and time and the user that is logged onto the computer.

Other data that is stored includes,
- o Import data such as station setups, 0 setting the horizontal angle, backsight station creation.

- o Where the user uses check observations, the differences are listed. Such check observation differences are, in the surveying world, an indication as to the integrity of the survey.

- o The difference is based on the following equation

- o
$$difference = \sqrt{\text{Northings}^2 + \text{Eastings}^2 + \text{Height}^2}$$

- o Where the value for the Northing, Easting and Height is the difference between the current backsite observation and, the initial set-up.

- o Triangulation data is stored including the number of points inserted during triangle optimisation.

- o All alterations to points including deletion, insertion, movement and alteration of codes are recorded. Alteration to line codes are not recorded.

An example file is produced on the following page.

RelMo Log File: C:\Program Files\AiTS\Logs\Book survey.rlv.log
Created on: Wednesday, 27 October 2004 at 08:25 for user: RicW (0300200)

Data:
1001 211103 12:15 Version 5.20 survey file created (User: RicW)
2010 211103 12:15 Importing C:\Program Files\AiTS\Surveys\Samples\Rw1.001 into object Rw1 (User: RicW)
2000 211103 12:15 Station A created at: 1000.000 E, 1000.000 N, 100.000 H
2001 211103 12:15 Moved to station A at: 1000.000 E, 1000.000 N, 100.000 H. Backsight to B: 0.000 deg.
2000 211103 12:15 Station B created at: 1000.000 E, 1024.062 N, 99.707 H
2005 211103 12:15 Check Obs to station: B: 0.010 difference (0.009 E, 0.003 N, 0.002 H)
2011 211103 12:15 Completed. 149 points 15 lines 0 errors
3000 211103 12:15 Triangulation begun in object: Rw1.
3002 211103 12:15 Triangle optimisation: 0 points inserted for crossing lines.
3002 211103 12:15 Triangle optimisation: 12 points inserted during 4 iterations.
3002 211103 12:15 Triangle optimisation: 2 external triangles removed.
3001 211103 12:15 Triangulation completed in object: Rw1. 718 triangles created in 0.761 s. 0 duplicate points ignored. 0 errors.
1003 211103 12:24 Survey file saved as D:\RelMo Training\Resources\Book survey.rlm (User: RicW)
1003 211103 12:30 Survey file saved as D:\RelMo Training\Resources\Book survey.rlm (User: RicW)
1003 211103 12:34 Survey file saved as D:\RelMo Training\Resources\Book survey.rlm (User: RicW)
1003 211103 13:27 Survey file saved as D:\RelMo Training\Resources\Book survey.rlm (User: RicW)
1003 211103 13:29 Survey file saved as D:\RelMo Training\Resources\Book survey.rlm (User: RicW)
1002 271103 09:23 Survey file opened. (User: RicW)
1003 271103 10:37 Survey file saved as D:\RelMo Training\Resources\Book survey.rlm (User: RicW)
1002 271103 14:44 Survey file opened. (User: RicW)
1003 271103 14:47 Survey file saved as D:\RelMo Training\Resources\Book survey.rlm (User: RicW)
1002 031203 10:10 Survey file opened. (User: RicW)
1003 031203 12:12 Survey file saved as D:\RelMo Training\Resources\Book survey.rlm (User: RicW)
1002 031203 12:52 Survey file opened. (User: RicW)
2050 031203 12:55 Rw1: Point code WR2 at (968.539, 924.336, 101.369) moved to (968.740, 924.244, 101.603) (User: RicW)
1003 031203 13:06 Survey file saved as D:\RelMo Training\Resources\Book survey.rlm (User: RicW)
1002 091203 13:31 Survey file opened. (User: RicW)
1003 091203 13:47 Survey file saved as D:\RelMo Training\Resources\Book survey.rlm (User: RicW)
1002 101203 13:16 Survey file opened. (User: RicW)
1003 101203 13:22 Survey file saved as D:\RelMo Training\Resources\Book survey.rlm (User: RicW)
1002 200404 11:11 Survey file opened. (User: RicW)
1003 200404 11:11 Survey file saved as D:\RelMo Resources\Book survey.rlv (User: RicW)
1002 051004 08:43 Survey file opened. (User: RicW)
2052 051004 09:23 Root: User created point deleted. Code SBAR50 at (1037.475, 1014.669, 100.000) (User: RicW)
1003 051004 09:23 Survey file saved as D:\RelMo Resources\Book survey.rlv (User: RicW)
2050 271004 08:24 Rw1: Point code RAPO at (985.185, 992.690, 100.413) moved to (983.802, 990.193, 100.413) (User: RicW)
2052 271004 08:24 Rw1: Original survey point deleted. Number 0 with code RAPO at (990.437, 990.379, 100.416) (User: RicW)
1003 271004 08:25 Survey file saved as D:\RelMo Resources\Book survey.rlv (User: RicW)

Import data formats

XYZ File Format
RelMo supports both the import and export of an extended XYZ file format. This is an ASCII based file format and most of the features supported by RelMo files can be created using this format. In turn this permits third party developers to create files suitable for use within RelMo. At present a number of manufacturers have developed or are developing output formats suitable for direct import into RelMo.

A full description of the RelMo extended XYZ format is available to Developers on request from support@mathtech.co.uk.

To import a RelMo XYZ file, from the File menu select Import. The Import dialog will be displayed. Select XYZ Standard and click on Open. The status bar at the bottom of the screen will report the progress of the import.

Standard XYZ files
Most software can output an XYZ file. The format of XYZ files is as follows:

Any blank line or line beginning with the character # is ignored. Points are defined using a five or more field comma delimited line, i.e. PointNo, xCoord, yCoord, zCoord, code, [code2, code3 etc]

Each point must be on a separate line. The code is used by RelMo to determine either the point type, or link type. Using a number as the postscript (e.g. KC1, KC2 etc) instructs Relative Motion to generate a link using the link code (e.g. KC). You may also use multiple codes to create multiple links attached to the point.

```
EXAMPLE FILE....
# this is a comment line and is ignored
1, 0, 3.45, 100, KC1
2, 1.2, -4.44,100, KC1
3, -2.33, -4.44,100, KC1
4, 0, 1,100, KC1
5, 1, 1, 100, KC1
6, 2, 1.5, 100, KC1
7, 3, 1, 100, KC1
```

To import an XYZ file, from the File menu select Import. The Import dialog will be displayed. Select XYZ Standard and click on Open. The status bar at the bottom of the screen will report the progress of the import.

Raw XYZ files
The format for Raw XYZ files is very simple and imports only the points, without any point or line code information. It is designed for importing 'point clouds' as generated by laser scanning technology.

Any blank line or line beginning with the character # is ignored. Points are defined using a three field comma delimited line, i.e. xCoord, yCoord, zCoord

To import a Raw XYZ file, from the File menu select Import. The Import dialog will be displayed. Select XYZ Raw and click on Open. The status bar at the bottom of the screen will report the progress of the import.

Mesh XYZ files
These files are used in conjunction with ortho-photos. With mesh files no triangulation of the model is required. Mesh files containing XY and Z coordinates can be supplied with the appropriate ortho-photo from Getmapping to name one of the many suppliers.

DXF
DXF files up to AutoCAD version 12 are supported. This includes LINES, POINTS, POLYLINES, 3DFACE, CIRCLE, ARC & TEXT entities only.

To import a DXF file, from the File menu select Import. The Import dialog will be displayed. Select DXF and click on Open. The status bar at the bottom of the screen will report the progress of the import.

When importing DXF files, RelMo will maintain the layer structure of the original file, by generating a new Object for each CAD layer.

DXF deals with curved lines by adding multiple points and joining them with straight lines. Because the number of points added is large, the lines still appear curved. In addition, the large number of additional points created by DXF files causes a huge number of unnecessary triangles to be generated. In saying this RelMo can filter large numbers of these points out by using the filter tools in the Survey import box in Options, (see page 43).

LSS

LSS load files are supported. You will need to replicate your LSS codes library in RelMo. Surface codes are not supported nor are textures or colours.

To import an LSS file, from the File menu select Import. The Import dialog will be displayed. Select RelMo/LSS and click on Open. The status bar at the bottom of the screen will report the progress of the import.

Line and offset files

You can import line and offset files written in a text editor such as notepad. The following format should be used.

Any blank line or line beginning with the character # is ignored.
Points are defined using a four or more field comma delimited line, i.e.:
Baseline, offset, height, code [,code2, code3 etc]

Each point must be on a separate line. The code is used by RelMo to determine either the point type, or link type. Using a number as the postscript (e.g. KC1, KC2 etc) instructs RelMo to generate a link using the link code.

If height information is not available, RelMo will assign the default height to the point. It is important however to include the delimiting comma.

```
EXAMPLE FILE....
# this is a comment line and is ignored
0,0,100,CRS
0, 3.45,, KC1
1.2, -4.44,, KC1
-2.33, -4.44,, KC1
0, 1,, KC1
1, 1,, KC1
2, 1.5,, KC1
3, 1,, KC1
4, 1,, KC1
```

To import a Line and Offset file, from the File menu select Import. The Import dialog will be displayed. Select Line and Offset and click on Open. The status bar at the bottom of the screen will report the progress of the import.

TERRAMODEL users – Exporting XYZ files

Introduction
With the new Complex 3D Codes, you can save a lot of time if you can import into RelMo and retain your point code information. This will ensure that fences, lampposts, walls, white lines etc actually come out as 3D objects without further work.

With DXF data, point and line codes are lost. The answer is to export from your own software as a XYZ file.

By default points in XYZ files are expected to be in the order - Easting, Northing, Height. With some 3rd party software this may not always be true. To change the point order to Northing, Easting, Height set the appropriate option in the Filter dialog accessed from the Import dialog

First Step
Change your RelMo codes to match your own codes. Open the Survey 'Codes' in c:\program files\AiTS\bin. From the Resources Control Bar, open the Lines Tree, Change the Properties of the Codes to match your own. Do the same in Points and save the changes.

In Terramodel
An export script is needed to create a suitable xyz file. Terramodel will call it a .pts file.

File>Export>Export Script Manager.
1. Select New, give it a name and select 'Export to disk', the format is ASCII points
2. Complete the 'export to file' box with a destination of your choice
3. In the 'output format' box type P,E,N,Z,D with commas and no spaces
4. Tick 'show this page at runtime'
5. Select next and ignore the point settings dialogue box, remove the tick from 'show this page at runtime'
6. Select Finish.

When importing into RelMo choose xyz format and then use the 'all files' option to see the .pts file

CARS/SDR Map users – Exporting XYZ files
Introduction

With the new Complex 3D Codes, you can save a lot of time if you can import into RelMo and retain your point code information. This will ensure that fences, lampposts, walls, white lines etc actually come out as 3D objects without further work.

With DXF data, point and line codes are lost. The answer is to export from your own software as a XYZ file.

By default points in XYZ files are expected to be in the order - Easting, Northing, Height. With some 3rd party software this may not always be true. To change the point order to Northing, Easting, Height set the appropriate option in the Filter dialog accessed from the Import dialog

First Step

Change your RelMo codes to match your own codes. Open the Survey 'Codes' in c:\program files\AiTS\bin. From the Resources Control Bar, open the Lines Tree, Change the Properties of the Codes to match your own. Do the same in Points and save the changes.

In Cars
1. Tools/Database editing/Point COORDS.
2. Select ALL at the bottom of the screen.
3. Select OK.
4. In the next window that opens select FORMAT REPORT.
5. Select the NEW button.
6. Type the name into the highlighted REPORT NAME field.
7. Change Index 1 to Point.
8. Index 2 to Eastings
9. Index 3 to Northings.
10. Index 4 to Height.
11. Index 5 to Code.
12. It doesn't matter too much about the field widths but it is suggested that you use 10 and 4, they do need to be set.
13. The Tail needs to be set to a comma (,) and don't bother with the last one, i.e. the Code, that can remain ""
14. Once completed select CANCEL.
15. Make sure the previously created report is visible in the Report Name field.
16. Select OK.
17. Put a tick in the TEXT file field. Type the path and the file name with the XYZ extension.
18. Press the Enter key twice. This will have then created the file in the location you selected in the file name field.
19. (Once you've created the format you can use it again and don't need to repeat the procedure)

In RelMo

New Job/Import.

Select XYZ and navigate to the file. You may need to select "All Files" to find it if you haven't changed it to XYZ.

The data should import and draw the lines as long as your codes are correct. If you need to edit them you can do that in WordPad or suchlike and then import them.

Geotronics/Landscape users – Exporting XYZ files

Introduction

With the new Complex 3D Codes, you can save a lot of time if you can import into RelMo and retain your point code information. This will ensure that fences, lampposts, walls, white lines etc actually come out as 3d objects without further work.

With DXF data, point and line codes are lost. The answer is to export from your own software as a XYZ file.

By default points in XYZ files are expected to be in the order - Easting, Northing, Height. With some 3rd party software this may not always be true. To change the point order to Northing, Easting, Height set the appropriate option in the Filter dialog accessed from the Import dialog

First Step

Change your RelMo codes to match your own codes. Open the Survey 'Codes' in c:\program files\AiTS\bin. From the Resources Control Bar, open the Lines Tree, Change the Properties of the Codes to match your own. Do the same in Points and save the changes.

In Landscape
Open the job you wish to export in Landscape

Go to the Print Menu
1. Select COORDS as the style
2. Select DEFAULT as the printer
   print 0 lines per page
   leave 1 lines after header
   leave 0 lines between Bodies
   leave 1 lines before Footer
3. Setup is Header
4. The print job to file - enter the path including the name for the file,
5. use .txt for the extension
6. The job will be saved, exit landscape
7. Open saved txt file using Excel, RelMo needs columns 1 to 5 inclusive, delete the rest
8. save as .csv file (means Comma delimited)
9. exit Excel
10. change file extension from .txt to .xyz (or use all file types when you import in RelMo)

In RelMo
New Job/Import.
Select XYZ and navigate to the file. You may need to select "All Files" to find it if you haven't changed it to XYZ.

The data should import and draw the lines as long as your codes are correct. If you need to edit them you can do that in WordPad or suchlike and then import them.

Export data formats

XYZ files

RelMo supports both the import and export of an extended XYZ file format. This is an ASCII based file format and most of the features supported by RelMo files can be created using this format. In turn this permits third party developers to create files suitable for use within RelMo. At present a number of manufacturers have developed or are developing output formats suitable for direct import into RelMo.

It also allows RelMo users to export files and send them to other RelMo users in a very efficient file format.

A full description of the RelMo extended XYZ format for Developers is available on request from support@mathtech.co.uk

To export a n XYZ file, from the File menu click on As XYZ. You will be prompted for a file name and location for the Save.

An example of a section from a RelMo extended XYZ file is produced below.

```
# RelMo XYZ Format File.
# Generated using RelMo v6.00

[Codes]
SBAR30=P:30 metre scale bar,5,512,0
PNT=P:Default point,0,0,0
PBOL=P:Pedestrian bollard - Black,5,64,0
SL5=P:Streetlamp 5 high,5,16744576,0
PT2010=P:Tree - 20 high 10 spread,5,0,8
NULL=P:Null point,0,16777215,0
PT0705=P:Tree young 7 high 5 spread,5,0,8
PT1620=P:Tree - 16 high 20 spread,5,0,8
PTLB0803=P:Tree leafless HQ 8 high 3 spread,5,0,8
PTLB1507=P:Tree leafless birch 15 high 7 spread,5,0,8
STN=P:Station,2,4194432,0
=P:,5,0,0
LINE=S
KC=S:Kerb curved,3,1,8421440,0,0
KS=S:Kerb straight,2,1,8421440,0,0
LINE=S
LINE=S
DEF=S:Default line,0,1,0,0,0
WR=S:Wall to right of surveyed point In brick 2 high,6,1,4210816,0,0
Asphalt Black=A:Asphalt Black.bmp,3355443,0,0,0,0,1.000,1.000,0.000,0.000
grass=A:grass.bmp,4227072,0,0,0,0,1.000,1.000,0.000,0.000
Concrete 1=A:Concrete 1.bmp,12632256,0,0,0,0,1.000,1.000,0.000,0.000
Asphalt Red=A:Asphalt Red.bmp,128,0,0,0,0,1.000,1.000,0.000,0.000
SIGN 'SCHOOL'.BMP=A
CLOUD3.BMP=A
```

```
[Config]
Scale=500
Colour=16777215
Image=cloud3.bmp
AngView=60.0
ClipNear=1.0
ClipFar=2500.0
Ambient=50
AmbCol=16777215
Flags=1315933

[CodeObject]
Name=WR
Type=10
Flags=2

[Points]
1,0.000,0.000,0.000,DEF
2,1.500,0.000,0.000,DEF
3,3.000,0.000,0.000,DEF.:RGB4210816
4,3.000,-0.250,0.000,DEF

[Triangles]
2,12,7,8,16512,1.000000,1.000000,brick.bmp
2,8,11,12,16512,1.000000,1.000000,brick.bmp
2,11,8,9,16512,1.000000,1.000000,brick.bmp
2,9,10,11,16512,1.000000,1.000000,brick.bmp

[Panels]
2,6,7,5,8,16512,0,brick.bmp
2,5,8,4,9,16512,0,brick.bmp
[EndObj]
```
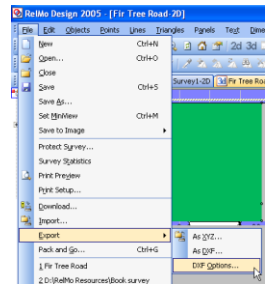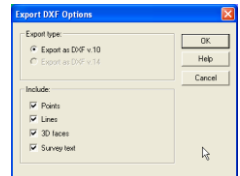
DXF files

You can export as a DXF file. This dialog allow you to control some of the aspects of the DXF file created during the export process. RelMo only supports a limited subset of the features recognised by AutoCAD®. At present these features are all contained within the DXF version 10 definition, so later versions are not explicitly supported. You should find however that later versions of AutoCAD® should recognise earlier versions and display them correctly.

To export a DXF file, from the File menu first click on DXF Options and set those entities that you wish to export (usual all of them). Then from the File menu click on As DXF. You will be prompted for a file name and location for the Save.

An example of a DXF file is produced over.

```
0
SECTION
 2
HEADER
999
RelMo DXF file output
999
Generated using RelMo v6.00
 9
$ACADVER
 1
AC1006
 9
$EXTMIN
 10
932.536
 20
922.026
 30
97.391
 9
$EXTMAX
 10
1048.973
 20
1032.403
 30
109.932
 9
$AUNITS
 70
1
 9
$ANGDIR
 70
1
 9
$LUNITS
 70
2
 9
$LUPREC
 70
3
 0
ENDSEC
 0
SECTION
 2
TABLES
 0
TABLE
 2
LTYPE
 70
1
 0
LTYPE
 2
CONTINUOUS
 3
Solid line
 70
0
 72
65
 73
0
 40
0.0
 0
LTYPE
 2
DASH
 3
Dash
 70
0
 72
65
 73
2
 40
1.0
 49
0.5
 49
-0.5
 0
LTYPE
 2
DOTDOT
 3
Dot
 70
0
 72
65
 73
2
 40
0.4
 49
0.2
 49
-0.2
 0
LTYPE
 2
DOTDASH
 3
DotDash
 70
0
 72
65
 73
4
 40
1.3
 49
0.8
 49
-0.2
 49
0.1
 49
-0.2
 0
LTYPE
 2
DASHDASH
 3
DashDash
 70
0
 72
65
 73
4
 40
1.6
 49
0.8
 49
-0.2
 49
0.4
 49
-0.2
 0
ENDTAB
SEQEND
```

Changes to RelMo 2008 SP1

o   Underline and strikeout text are now supported throughout RelMo, not just in the Layout Pages. An additional toolbar icon for strikeout text has been added to the Layout Page format toolbar.

o   Survey text 'remembers' the last user font, style, colour etc so that additional items of survey text are consistent without superfluous user interaction.

o   Point numbers can be displayed in 2D views. RelMo index numbers or original survey point numbers are supported. Bear in mind RelMo index numbers are only created when the file is saved and may well change between sessions due to addition and deletion of points. (They are initially created with the index number of 0) Also if an object wasn't created from an XYZ or 001 file import, then it will not have original survey point numbers and nothing will be displayed – *this is not a bug.* Display of point numbers is controlled by two new commands in the points menu – Show Point Numbers and Point Number Display. Show point numbers is also an option in the Display menu. The Point Number Display command allows the user to change various settings. NB: point numbers are not be displayed in plans, since this would require the program to save the current active object when displaying a view. Without a file format change, this is not an option.

o   Control bar panels now work whether or not they are docked to the main window. Floating toolbars can now be used.

o   In 3D views (especially RelMo3) complex points were not always displayed. This has been fixed.

o   When adding an animation control point, if the user selects 'AutoLevel' then the pitch and roll boxes are greyed out since these are obviously ignored if the program is going to calculate it's own values.

o   Point and line symbols can be converted into proper RelMo objects – a copy is created and placed into the root object.   This can be accessed from the context menu in the Objects Control Panel.

o   Play in Reverse or Play Backwards command is now available in full screen mode.

o   The wrong command for Show Triangles was linked in RelMo3. This has been fixed.

o   Plain coloured (no texture) triangles were not consistently displayed in 3D views unless a 3D symbol was also present in that object. Usually a texture was visible on the plain text coloured triangles. This has been fixed.

o   Tool bar icons for the Show 3D triangle and Show 3D Text commands have been added.

o   In RelMo3 files (*.rlv) Windows did not always display the correct RelMo3 document icon in Windows Explorer. This has been fixed, BUT will require an administrator to run the program and then close it down, otherwise the relevant parts of the registry cannot be updated.