



Software Tutorials

© Copyright TechSoft UK Limited 1995-2007

TechSoft UK Ltd.,
Falcon House,
Royal Welch Avenue,
Bodelwyddan,
Denbighshire, LL18 5TQ
U.K.

Tel : +44 (0)1745 535007
Fax : +44 (0)1745 535008
Email : email@techsoftuk.co.uk
Web site : www.techsoftuk.co.uk

All rights in this booklet and the program are reserved. Reproduction, adaptation, or translation, without the prior written permission of TechSoft UK Limited is prohibited, except as allowed under the copyright laws.

The program described in this booklet is subject to continuous development and improvement. All information of a technical nature and particulars of the program and its use (including the information and particulars in this booklet) are given by TechSoft UK Limited in good faith. However, TechSoft UK Limited cannot accept any liability for any loss or damage arising from the use of any information or particulars in this booklet.

All trademarks acknowledged.

Roland, CAMM 1/2/3, MODELA, RotoCAMM, STIKA are trademarks of Roland Digital Group.

Microsoft®, Windows®, Windows NT®, Vista®, Internet Explorer are U.S. registered trademarks of Microsoft Corporation.

CONTENTS

1	INTRODUCTION	4
	About this Booklet	4
	Software Overview	4
	Educational Use	4
2	SYSTEM REQUIREMENTS	5
3	INSTALLATION	5
4	SPECIAL FEATURES	6
	Text and Fonts	6
	Bitmaps and Vectorisation	6
	Fills and Patterns	7
5	OUTPUTTING	8
	Printers / Lasers / Print and Cut Systems	8
	Knife Cutting / Engraving / Milling / Plotting Devices	8
6	2D DESIGN V2 HELP	9
7	TUTORIALS	10
	Tutorial 1 - Screen Layout, Menu Selection, etc.	10
	Tutorial 2 - Setting Up the Software to Suit your System	11
	Tutorial 3 - Basic Drawing, ie., lines, circles, arcs, curves, etc.	12
	Tutorial 4 - Object Selection and the Marquee Box	14
	Tutorial 5 - Editing the Drawing	16
	Tutorial 6 - Transformations	19
	Tutorial 7 - Line Styles and Line Colours	21
	Tutorial 8 - Using Fills	23
	Tutorial 9 - Creating New Fills	26
	Tutorial 10 - Text	30
	Tutorial 11 - TechSoft Fonts	35
	Tutorial 12 - Loading a Bitmap Image and Clipping It	38
	Tutorial 13 - Clipping an Image to Fit a Shape	40
	Tutorial 14 - Bitmap to Vector Conversion	42
	Tutorial 15 - Contours	47
	Tutorial 16 - Double Lines	50
	Tutorial 17 - Construction Points	52
	Tutorial 18 - Scaling and Drawing to Scale	54
	Tutorial 19 - Grouping and Adding	56
	Tutorial 20 - Dimensioning and Layers	58
	Tutorial 21 - 3D Effects and Exploding	61
	Tutorial 22 - Exploding and Making Paths	64
	Tutorial 23 - Coordinate Data Entry	67
	Tutorial 24 - Closing Boundaries (for Boundary Fill and Contour)	69
	Tutorial 25 - Setups and Customising the Software	71

1 INTRODUCTION

About this Booklet

2D Design V2 can be used without reference to a printed manual. Most functions are self-explanatory and *Help* is always available. However, to achieve the best results in the shortest time, it is recommended that you carefully work through the 2D Design V2 tutorials in this booklet. The tutorials are intended as a practical guide to using the software on a day to day basis, not as a deep technical reference. For technical reference information use the *Help* facilities within the software.

Printing this booklet

This booklet is primarily intended to be used as a printed reference, and has been formatted as such. Users wishing to follow the tutorials “heads up” on screen are advised to follow the tutorials from the *Help* facilities within the software.

Software Overview

In general there are two types of data for drawing packages, bitmap data (typically used in paint type packages) and vector data (typically used in engineering or architectural draughting packages).

Paint packages colour in the “dots” on screen to form an image. They are great for simple drawings, or editing scanned or photographic images.

Vector drawing packages store the drawing as a series of objects, eg., lines, rectangles, circles, etc. Only the relevant coordinates are stored, so that when the image is reproduced (either on screen or on a print-out) it can be to a set size, or accurately scaled without loss of definition.

2D Design V2 is a powerful and sophisticated hybrid drawing package which allows vector drawings to be created, and bitmap images to be loaded and incorporated into designs. 2D Design V2 covers many key areas of graphic design, but is also excellent for technical draughting and design. For those wishing to run CAD/CAM systems, 2D Design V2 has its own integrated drivers for output devices such as Roland CAMM 1, STIKA, MODELA, RotoCAMM, etc. It is also the perfect complement to laser cutters, print and cut systems, etc.

Educational Use

2D Design V2 is easily capable of professional work, but because of its ease of use it is also widely used in education. In fact 2D Design is the standard CAD software for the vast majority of UK secondary schools. It is ideal for use at Key Stage 3 up to degree level. It covers the Graphic Design, CAD and CAD/CAM elements of the syllabus, and it is used as a tool for all graphic elements in project work. Whenever a sophisticated package such as this is used in education, however, there is always the risk that younger students may find it daunting. 2D Design V2 deals with this problem by allowing the user to easily customise the software, and save the simplified setup as a named file. In this way several different setups can be saved with facilities to suit different age/ability groups, or different topics.

2 SYSTEM REQUIREMENTS

1. 2D Design V2 will run on any Windows system using Windows 2000, XP, 2003 or Vista. (Version 2.00 will also run on Windows 98 if Internet Explorer V5 or later is installed, or on Windows ME, though future upgrades of the software are unlikely to run on these systems.)

Although the software should run on the minimum specification computer for any particular operating system, large drawings, particularly those with large or numerous bitmaps, may benefit from a higher specification machine to improve speed.

2. 2D Design V2 requires a **minimum** screen display of 800 x 600, though a screen resolution of 1024 x 768 or greater is strongly recommended. To change the screen resolution, from Windows you normally choose *Start > Control Panel > Display > Settings*.

3 INSTALLATION

2D Design V2 is a licensed product and must only be used on computers for which a licence is held. The software may be supplied on a CD or it may be downloaded. A separate licence file (.lic) is also required. This may be supplied either on a CD, a floppy disk or it may be emailed to you. The licence file will be required when the software is first run (if the licence file is not available the software can only be run in Demo mode). **Keep your licence file safe, as it may be required for future upgrades.**

If installing from a CD, on insertion of the CD into the drive the installation program will normally auto-start. If for any reason the installation disk fails to start automatically, choose *Start > Run*, then type d:\setup (adapt this as appropriate if using a CD ROM drive other than d) and press ENTER on the keyboard.

If you are installing 2D Design V2 for the first time, choose *New Installation*. If you are updating an existing copy of 2D Design V2, choose *Update Installation*. By choosing *Update Installation* you will avoid having to license your software again as the existing licence file will not be overwritten.

Follow screen prompts through to completion of installation. Immediately after installation, run the software (choose *Start > All Programs > TechSoft Design Tools > 2D Design V2*, or use the desktop shortcut icon), and follow the prompts to install your licence file.

Licence upgrades (eg., for new device extensions, or from single user to site), may often be done by simply installing a new licence file (obtainable directly from TechSoft). To install a new licence file, choose *Help > Software Licence* then click on *Update Licence*.

4 SPECIAL FEATURES

Text and Fonts

2D Design V2 has some very powerful text facilities. It is possible to draw text at any size and orientation, and each individual character within a word or phrase can have its own settings. Thus letters can be drawn back to front, upside down, and at any size if desired. Text can even be made to flow along complex profiles - not just curves, but any shape or combination of shapes.

Most drawing packages support coloured text but 2D Design V2 also allows each font (or each character) to have a different coloured outline using lines of any thickness, even dotted or dashed lines. The fill colour does not just have to be a single colour either, any fill pattern (no matter how complicated), or even bitmaps can be used. Although text parameters such as colour and outline style can be set “on the fly”, it is often useful to pre-set a font so that it can be used again and again. This is easy to do in 2D Design V2 as it incorporates a special “Font Design” mode. In this mode any existing font may be loaded and modified. Not just colours and fills though, even the shape of individual characters may be modified to create your own custom font. In fact you can draw up a whole font of your own if you wish. Fonts created this way can be saved as a TechSoft font, and then used within 2D Design V2 as any other font.

Also supplied in the TechSoft font format are a range of single line (or “stick”) fonts ideal for use in engraved or laser cut designs, etc.

Bitmaps and Vectorisation

Bitmap images can be used in 2D Design V2 in a number of ways. Images can simply be loaded directly as drawing elements and then accurately scaled to size if required. A typical use might be to add a photograph or scanned image to an item of packaging.

2D Design V2 also has sophisticated clipping routines which allow bitmap images to have an outline drawn to “cut out” or “mask” parts of the image. Thus, for example, the image of a person could be cut out of a group photograph then re-scaled and used as part of another image. Another example might be to automatically trim a photograph to fit on the panel of a box.

Bitmap images may be converted to vector images. Normally bitmaps do not scale well, particularly when making them bigger, as the pixels start to become visible. By converting the bitmap to a vector equivalent this problem may be avoided. Bitmap to vector conversion works best on simple images, such as clipart with a limited number of colours, or monochrome scans (it does not normally work well for photographs). 2D Design V2 can also trace or contour around bitmaps to create either graphic effects or sophisticated cutting paths.

Although not intended as a bitmap editing program, 2D Design V2 has many functions to control the appearance of the bitmap. For example, a bitmap’s colours may be reduced, its resolution may be reduced, or it can be changed to monochrome or greyscale, etc.

By combining bitmap and vector graphics, incredibly sophisticated images can be created with ease.

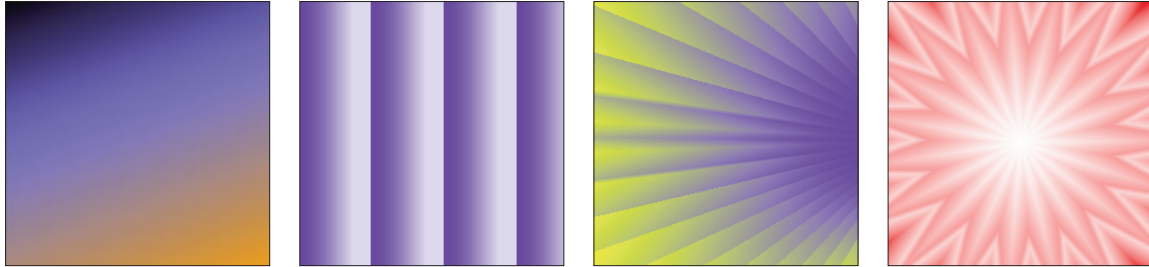
One word of caution when using bitmap graphics is to remember your output device. 2D Design V2 can output to many more devices than just printers, but not all devices (eg., milling systems) can output bitmaps.

Fills and Patterns

Fills are generated in three ways - when objects such as rectangles, circles, double lines, closed beziers, etc., are drawn; when “flood filling” pre-drawn boundaries; or when drawing text. 2D Design V2 can fill objects with simple hatch or solid fills, or with graduated, texture, or pattern fills.

Graduated Fills

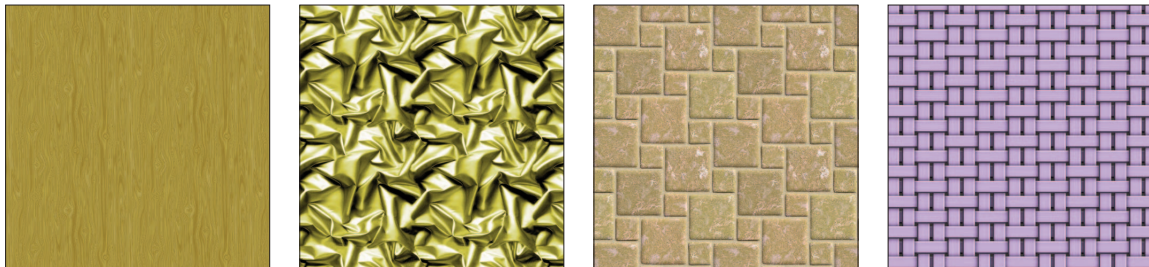
These can be just simple blends from one colour to another. However, by defining numerous options and settings, very sophisticated complex graduations can be created.



Examples of Graduated Fills

Texture Fills

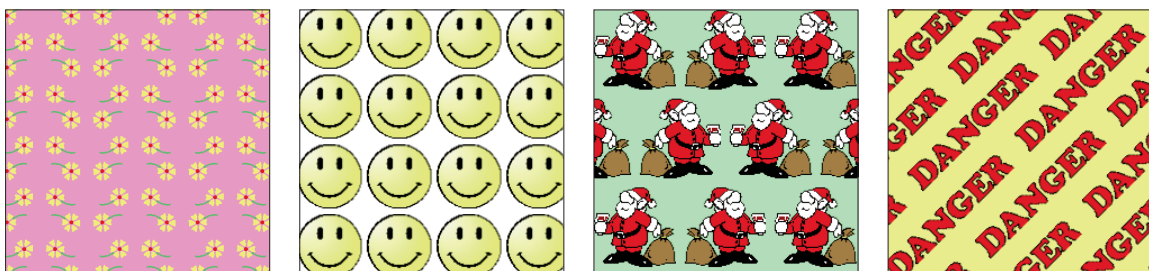
Texture fills are created from bitmap images, such as simple bitmap drawings, photographs or scans. Texture fills are normally used to create a background effect within a fill. One bitmap may be used across the whole fill, or the bitmap may be repeated in a number of ways. With a suitable bitmap, by flipping it left/right and top/bottom, a continuous seamless texture can be created to simulate wood grain, fabrics, stones, etc. A wide range of suitable bitmaps are supplied with the software for this purpose.



Examples of Texture Fills

Pattern Fills

Pattern fills provide a comprehensive way of using virtually any drawing as a fill. Images can be vector or bitmap (or a combination). There are exhaustive ways of configuring the pattern to create stunning fill images.



Examples of Pattern Fills

5 OUTPUTTING

Output from Windows software is normally done using special Windows printer drivers, either supplied with Windows, or by the device manufacturer, through a *File > Print* option. Whilst this works fine for many output devices, it often does not allow the software enough control over the output when driving many CNC machines such as cutting/engraving/milling/plotting type devices. 2D Design V2 therefore offers two options, the standard *File > Print* for output via Windows drivers (see **Printers / Laser Cutters / Print and Cut Systems** below), and the additional *File > CNC Output* for output via TechSoft's own built-in CNC device drivers (see **Knife Cutting / Engraving / Milling / Plotting Devices** below). Where a TechSoft CNC device driver is available, you are strongly recommended to output via *File > CNC Output*.

Further comprehensive details regarding output to individual machines, and how to get the best out of them, are detailed in the Inset Packs included with most CNC machines supplied by TechSoft.

Printers / Laser Cutters / Print and Cut Systems

When outputting to a printer such as a laser, inkjet, etc., or a laser cutter such as a TechSoft LaserCAM, or a print and cut machine such as a Roland VersaCAMM, set the Windows printer driver up in the normal way and use *File > Print*.

It is good practice to first set the screen drawing area to match the print device to be used.

To do this choose the *Layout* icon from the upper icon toolbar (or *Setup > Drawing > Layout*).



Choose *Match current printer*, in the *Layout* dialog box. If you do not match to the print device, output can still take place, but you may find that the drawing does not come out where expected on the media, or the drawing may be tiled across several sheets.

Changes to device settings must be made in the printer driver itself. These settings may be accessed by choosing *File > Print Setup*, or *File > Print*, and then *Properties*. If necessary, fine adjustments to the position of the drawing on the media, and to the line thickness printed, can be made using *File > Print Options*.

If you wish to retain your chosen layout for future sessions, choose *Setup > Set As Default* or *Setup > Save Setup*.

Knife Cutting / Engraving / Milling / Plotting Devices

2D Design V2 uses its own built-in drivers for many CAMM 1, STIKA, MODEL A, RotoCAMM, plotters, etc.,. If your output device is listed (see *Setup > CNC Devices*), use *File > CNC Output* rather than *File > Print*. The result is an enhanced output quality, and the ability to make use of many special machine features, such as controlling cutting modes, depths of cut, feed rates, etc., where appropriate. Additionally, output settings are saved with the drawing file. (N.B. Users can still use standard Windows device drivers by using *File > Print* if preferred.)

Although it is possible to set the appropriate output device from the *CNC Output* dialog box itself, it is good practice to always begin work by choosing the *Layout* icon from the upper icon toolbar (or *Setup > Drawing > Layout*) to select the appropriate output device and match the media size, etc., to it. If you wish to retain your chosen layout for future sessions, choose *Setup > Set As Default* or *Setup > Save Setup*.



Further details of using the built-in drivers are in the TechSoft Inset Packs supplied with machines.

6 2D DESIGN V2 HELP

Help is a standard Windows feature. *Help* gives you easy access to detailed information on every menu item, tool, dialog box, button and feature in 2D Design V2.

You can access *Help* in the following ways:

1. Choose *Help > Help Contents*.
2. Click on the *Help* button in a dialog box for help on that dialog box.
3. With any menu item highlighted, press the *F1* key to see a *Help* window describing that menu item.
4. Choose *What's This?* from the upper icon toolbar or *Help > What's This* or press *Shift + F1* to display the Help cursor. Then click on any tool to see a *Help* window describing it.

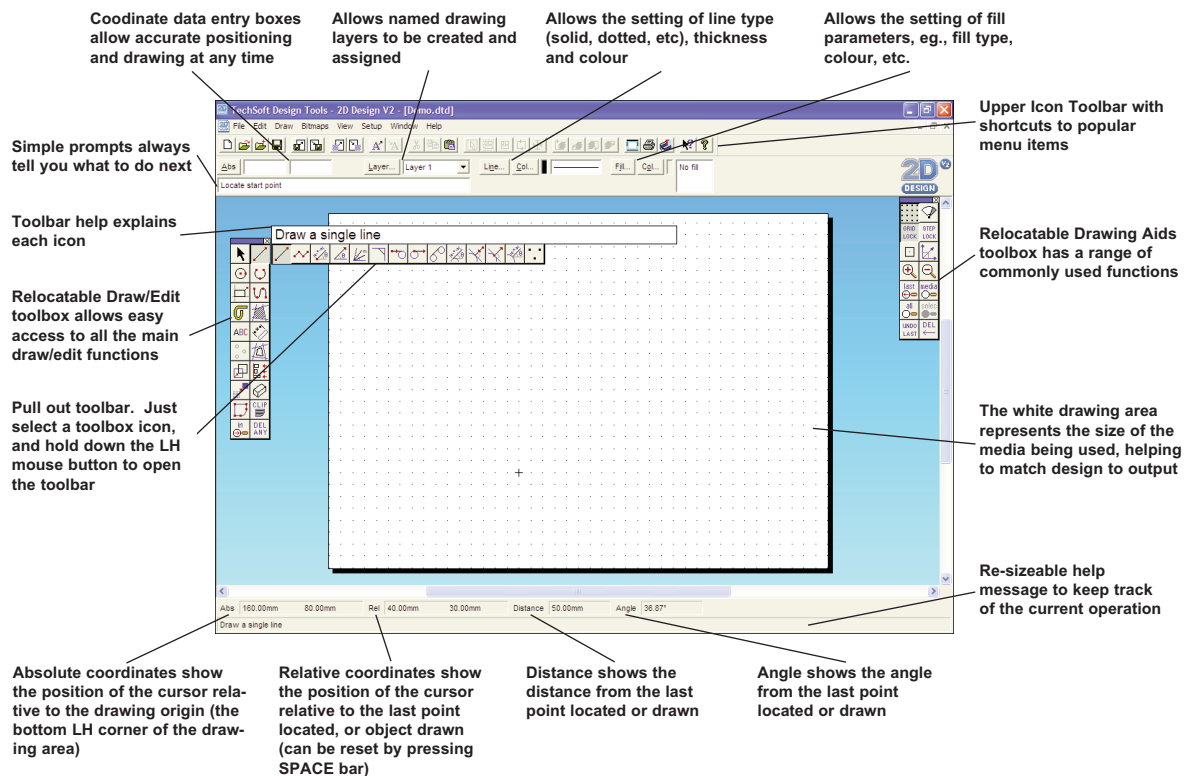


7 TUTORIALS

TUTORIAL 1 - Screen Layout, Menu Selection, etc.

The 2D Design V2 program window provides a clear view of the current drawing, various information areas, and a selection of icons with tools to cover the most common drawing, editing, and display functions.


1. Start up 2D Design V2 (*Start > All Programs > TechSoft Design Tools > 2D Design V2* or use the desktop shortcut icon) and familiarise yourself with the screen layout as shown below.



2. Menu items are normally chosen from the menu bar or the toolbox, using the mouse (although many keyboard alternatives are available). To choose an item from the toolbox, position the pointer over the appropriate icon and click the LH mouse button. Some items in the RH toolbox (the *Drawing Aids* toolbox), such as *Grid*, will cause the icon to stay selected (on) until it is switched off by clicking on it again.
3. Many of the items in the LH toolbox (the *Draw/Edit* toolbox) have pull out toolbars. These are activated by positioning the pointer on the icon then pressing and holding the LH mouse button for a short while. The pointer can then be dragged along the icon bar until the required icon is highlighted, then the mouse button released. This selects the item, and changes the icon in the toolbox to that chosen.
4. Most menu items, eg., text, grid, etc., have a related dialog box for settings. To access these dialog boxes, double click on the appropriate icon with the LH mouse button, or click on the icon with the RH mouse button.










TUTORIAL 2 - Setting Up the Software to Suit your System



During the course of this tutorial you will set the software to suit your normal requirements. You will then save these values as the default.

1. Start up 2D Design V2. Choose the *Layout* icon from the upper icon toolbar (or *Setup> Drawing > Layout*). The default setting is for A3 paper. Most people will normally set the drawing screen to match the printer/plotter/cutter/miller they are using. If you have an A4 printer you may wonder why you would change from the standard A4 paper size. In fact most printers cannot print to the edges of the paper, so if you set to match your printer, a grey dotted rectangle will appear, showing the actual printing area. If you stay within this rectangle, you should not “lose” any image when printing. (This feature depends on the correct values being set in the Windows printer driver, which is obviously out of TechSoft’s control!) Use the dialog box to select the printer/CNC device/material size you will be using most often, then click *OK* to close. 
2. You may wish to investigate some of the options under *Setup > Drawing* or *Setup > Customise*. Any of the options set may be saved as default values in the next step. At this stage however, it is probably better to leave these options, and to come back to them after working through the other tutorials. (**Tutorial 25** deals with setups further.)
3. Choose *Setup > Set As Default*. Click *OK* on the warning dialog box. Close down the software completely, then restart it. You will see that it starts up with the *Drawing Layout* settings you have made. (Any other settings made from the *Setup* menu, eg., the type of grid, will also have been saved.)

N.B. If you ever wish to return to the factory default settings, choose *Help > Restore Factory Defaults*, then *Setup > Set As Default*.

TUTORIAL 3 - Basic Drawing, ie., lines, circles, arcs, curves, etc.

1. Choose the *Single Lines* icon (LH toolbox).
Move the cursor around, over the white area. (N.B. You can draw over the blue area, but it will not be printed or output.) Notice the changing coordinates at the bottom of the screen. Move the cursor to a position where you wish to start a line, and click the LH mouse button. A moving line should now appear. To “finish” a line click the LH mouse button again. Carry on drawing a few more lines. (To help with this tutorial, ensure that some of them crossover each other.) 
2. Choose the *Connected Lines* icon from the *Lines* toolbar (LH toolbox, click and hold on the *Lines* icon). Move the cursor to a start point, and click the LH mouse button. To “fix” a line section, click the LH mouse button again. A new moving line should now appear from the end of the fixed line. To “finish”, either double click the LH mouse button (this will “fix” the moving line), or click the RH mouse button (this will finish at the last fixed line). Try drawing a few lines finished in different ways. You will notice that although a grid is showing, the lines are not starting and ending on grid positions. 
3. Choose the *Grid Lock* icon (RH toolbox).
Now draw a few more lines. The ends of the lines will now be fixed to grid positions. 
4. Choose the *Step Lock* icon (RH toolbox).
Now draw a few more lines. Again the ends of the lines appear to be free. However, they are not entirely free as will be seen after the next two steps. 
5. Choose the *Zoom in* icon (LH toolbox).
Note the prompt reading *Locate one corner of zoom box*. Move the cursor approx. 1 grid square (10mm) below and to the left of any “corner” that you have drawn, then click the LH mouse button. The prompt will change to *Locate opposite corner of zoom box*. Move the mouse to pull out a box up to the right, about 30mm square (three grid squares), then click the LH mouse button. That area will now be redrawn to fill the screen. 
6. Choose the *Connected Lines* icon again (LH toolbox).
Draw some more lines. Notice that when the mouse moves, the cursor moves in small steps between the grid dots. In fact the default step spacing is 1mm. 
7. Choose the *Step Lock* icon again (RH toolbox).
This time step lock will be deselected and the cursor will be free to move to any position. Thus, there are three lock options, grid lock, step lock, and no lock. 
8. Choose the *Zoom Last* icon (RH toolbox).
This will restore the previous zoom level, in this case the full drawing screen. (You might also like to try the effects of the *Zoom+* and *Zoom-* icons in the RH toolbox at this point.) 
9. Choose the *Radial Lock* icon (RH toolbox).
As you continue to draw connected lines you will find that any line drawn is now constrained to 45 deg steps. Double click on this icon with the LH mouse button and a dialog box will appear. This allows the start angle and step angle to be set. Try the effects of different settings. Many other icons have dialog boxes accessed in the same way. Alternatively, dialog boxes may be accessed by clicking with the RH mouse button. Try clicking on the *Grid* icon with the RH mouse button. 

10. Choose the *Single Lines* icon again from the *Lines* toolbar (LH toolbox, click and hold on the *Lines* icon). Draw a few lines. 
11. Choose the *Attach* icon (RH toolbox) and ensure that *Grid Lock* and *Radial Lock* are off. The cursor will change to a small square. Position the cursor square to overlap the end of any line, and click the LH mouse button. The start of the line being drawn will automatically start exactly from the end of the selected line. Position the cursor over the end of a different line, and click the LH mouse button again. You do not have to be absolutely accurate in your positioning, as long as the square is over the line. It is possible to change the size of the attach target box or the type of points being attached to, from the attach dialog box (double click on the icon). Try setting attach to intersections as well as end points, and try drawing lines between intersections. Remember, just make sure that the intersection is inside the attach target box. 
12. So far you have only drawn lines. Try some of the other drawing functions - circles, arcs, shapes and paths. Follow prompts, and use *Help* for further explanation.
13. Try deleting and undoing as described below.

Simple mistakes may be undone by clicking on the *Undo Last* icon in the RH toolbox. This undoes the last operation, either drawing, transforming or deleting.



Once undone, the icon becomes *Redo Last*. Clicking on this effectively undoes the undo. *Redo Last* is cleared by any further drawing or deleting operation.



Also in the RH toolbox is *Delete Last*.

This deletes back one object each time it is chosen. (*Undo Last* restores a deleted object, but only the last one deleted!)



Most other delete functions are in the LH toolbox accessed from the *Delete* toolbar (click and hold on the *Delete* icon):

Delete Any allows you to point to an object and delete it.

Delete Part deletes any part of a line, arc, circle or bezier curve back to the closest intersection points from the locating point.

Delete by Box allows you to draw a simple rectangular box that will delete any items inside or crossing it.

Delete by Lasso allows you to draw a complex shape that will delete any items inside or crossing it.

Delete by Clip Path deletes any items inside or crossing a clip path (see **Tutorial 12** for more information about clip paths).

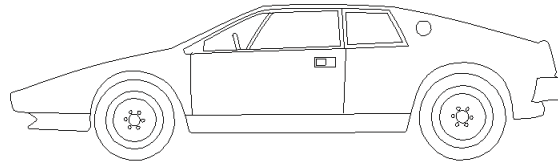
Pressing *Delete* on the keyboard deletes the current selection (see **Tutorial 4** for more information about selection).

Pressing *ALT + Delete* on the keyboard deletes the whole of the current drawing.

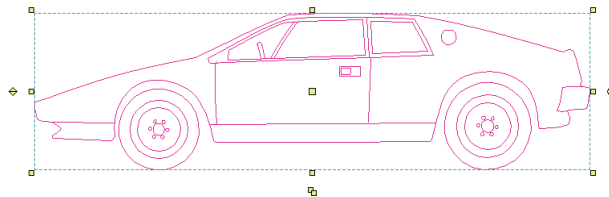
TUTORIAL 4 - Object Selection and the Marquee Box

As you will see in this tutorial, selection is carried out using normal Windows methods. Selected objects may be dragged, rotated, flipped, resized or copied quickly and easily.

1. Start up 2D Design V2, or close any open drawings (*File > Close*). Choose the *Open* icon from the upper icon toolbar (or *File > Open*), and load the drawing “Car.dtd” from the *Tutorials* directory. For the purposes of this tutorial only, choose *Help > Restore Factory Defaults*.



2. Choose the *Select* icon (LH toolbox). Move the cursor below, and to the LH side of the car. Press the LH mouse button, drag a box around the drawing, then release (alternatively *Select All* using the keyboard shortcut *Ctrl + A* or the *Select All* icon from the upper icon toolbar). The car will be highlighted in pink, and surrounded by a dotted box (a marquee box) with handles (yellow shapes).



3. Familiarise yourself with the marquee box functions, as described below.

The large centre square handle allows the box to be re-positioned. Clicking once on the handle with the LH mouse button allows the box to be moved around (*Grid Lock* and *Attach* still operate). A second click with the LH mouse button “drops” the box in its new position (or click the RH mouse button to cancel the operation.)

N.B. If the initial click is done with the RH mouse button, the handle will move and not the box. Subsequent operations such as flip and rotate will act about this handle. When the marquee box is de-selected, the centre handle will revert to its normal position.

The corner and edge square handles allow the box to be re-sized. Clicking with the LH mouse button allows the handle to move, clicking again redraws the object/s at the new size.

N.B. **Warning** - moving the corner and edge handles can alter the aspect ratio. In this case, arcs and circles (in this case the wheels) are converted to elliptical bezier curves, which can no longer have tangency properties, etc. Clicking in a corner handle with the RH mouse button, then moving, maintains the aspect ratio, keeping circles and arcs fixed.

The circular handle to the right of the marquee box allows the object(s) to be rotated.

N.B. This can be used in conjunction with the *Radial Lock* tool (RH toolbox).

The diamond handles, above and to the left of the box, flip the object(s) vertically or horizontally, and the double handle below the box copies the object(s), leaving the new copy selected.

Experiment with these handles to test the effects.

N.B. To undo a transformation (or any other drawing or editing operation), click on the *Undo Last* icon in the RH toolbox.

4. An individual object (single line, arc, etc.) can be selected by moving the pointer near it and clicking the LH mouse button. Clicking on another object in the same way will select the new object (de-selecting the first object). Clicking on an object with the RH mouse button (or SHIFT + LH mouse button) will "add" or "remove" the object from the selection by toggling its select state.

Multiple objects can be selected by dragging a select box around them with the LH mouse button. Dragging another select box in the same way will create a new selection (cancelling the first). Dragging a select box with the RH mouse button (or SHIFT + LH mouse button), will toggle the select state of the objects.

To de-select objects, move the pointer outside the marquee box and click the LH mouse button. Individual objects may be de-selected using the RH mouse button (or SHIFT + LH mouse button) as described above.

Try all of the above options on the car to get the feel of the selection process.

TUTORIAL 5 - Editing the Drawing

Selected objects may be easily edited (start/end/centre/nodes of lines/arcs/paths/text, etc., moved and modified).

1. Start up 2D Design V2, or close any open drawings (*File > Close*). Choose the *Open* icon from the upper icon toolbar (or *File > Open*), and load the drawing “Sammy.dtd” from the *Tutorials* directory. For the purposes of this tutorial only, choose *Help > Restore Factory Defaults*.

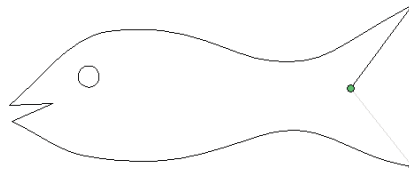


Dynamic Editing

2. Choose the *Select* icon (LH toolbox). Select the lower straight line forming Sammy’s tail. You will notice the *Property /Start Edit* toolbox open in the bottom RH corner of the screen.

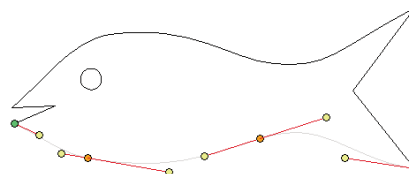


Click on the *Start Edit* button.



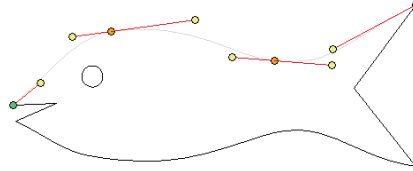
The line will turn grey, and a red and green circle will appear at the ends. These are the nodes of the line (defining points), green indicates the start point, red the end point. Click on the red node using the LH mouse button. The node will now follow the mouse freely around. Click again and the line will be repositioned at that point. Click on *Undo Last* (RH toolbox) to return the line to its original position. Now click on the red node again but using the RH mouse button. The line will still move, but is now constrained along its own path (so it can only get longer or shorter). Click again to place the line, then click on *Undo Last* to return the line to its original state. To remove the nodes, click “off” (away from) the drawing, (or click on *End Edit*). This will return the marquee box. Click off again to de-select.

3. Now select Sammy’s stomach curve by clicking near it, then click on *Start Edit*.

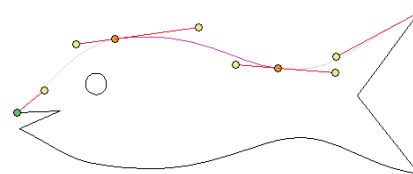


The curve will grey, and circles will appear on it to denote the nodes. (In this case these points are the original location points when the curve was drawn, green - start, red - end, and orange for all other defining points). Each node has two yellow handles (only one for the start and end points). Clicking on a node or a handle with the LH button allows that point to be moved around. Clicking on one of a pair of handles with the RH button, locks the angle of the handles and allows them to move together. Try a few of these options then click off to de-select.

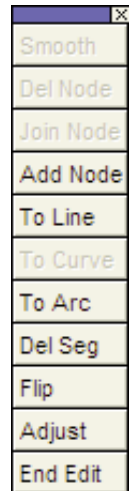
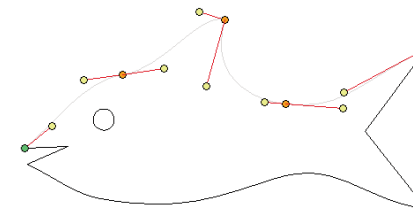
4. Now select Sammy's back curve and then click on *Start Edit*. You may have noticed that as *Start Edit* is selected, it is replaced by a longer option menu (so far with all the options greyed out). To activate these options, a node or line/curve section must be selected.



Move the cursor near to the centre section of Sammy's back and click the LH button. This section will turn pink, indicating that it is selected.



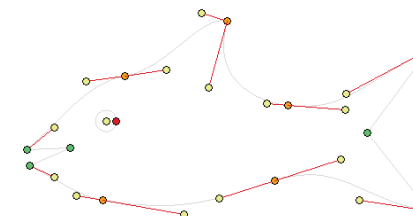
Click on the *Add Node* button in the *Edit Mode* toolbox. An extra node will appear on the selected curve. Click on this node with the LH mouse button and drag the node upwards. Click again to drop the node. Move the node and its handles until it looks something like the illustration below then click off the drawing to de-select it. You have now given Sammy a fin!



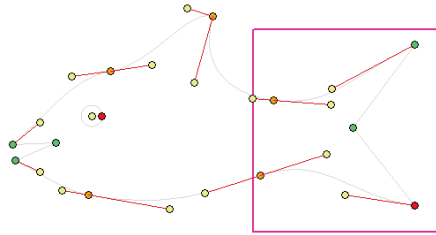
5. By now Sammy may be a bit of a mess. If so, close your drawing (*File > Close*) then choose the *Open* icon from the upper icon toolbar (or *File > Open*), and load the drawing "Sammy2.dtd" from the *Tutorials* directory.



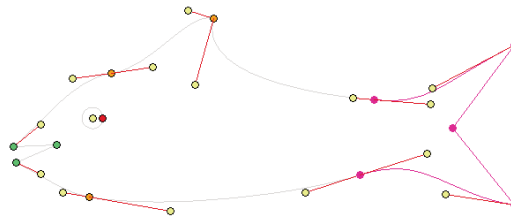
6. Choose the *Select All* icon from the upper icon toolbar (or *Edit > Select > All*, or press CTRL+A on the keyboard) to select the whole drawing. Click on *Start Edit* (in the bottom RH corner).



Drag a select box over Sammy's tail as shown below.



It is now possible to move the whole tail section. Click on one of the selected (pink) nodes and move the mouse until Sammy looks something like the illustration below, then click off the drawing to de-select it. In this way, very powerful editing changes can be made very easily.

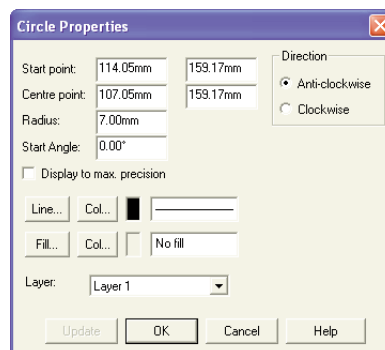


So far you have adjusted bezier curves, but all other drawing objects (circles, arcs, text, etc.) have nodes as well and many have control points. When selecting nodes or line/curve/arc sections the normal select rules apply. You can select multiple items by dragging a select box over them, and using the RH mouse button you can add or remove items from the selection.

Editing Object Properties

It is often important to be able to look at and maybe alter the properties of an object. Some properties such as layer, line type and fill, can be changed via the attributes bar at the top of the screen (see **Tutorial 7**). However, full control of an object's properties is available via the *Property* button.

- Click the LH mouse button near Sammy's eye to select it. Choose *Property* from the *Property/Start Edit* toolbox to open the *Circle Properties* dialog box.

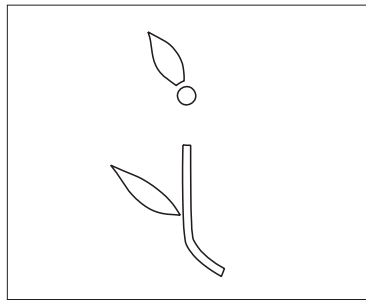


As you will see very comprehensive details of the circle are displayed. The values and settings may be edited if required. You might like to try altering the value of the radius or assigning a fill.

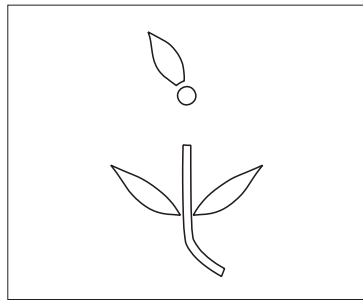
Changing properties this way only works for individual objects. If more than one object is selected the *Property* button will be greyed out.

TUTORIAL 6 - Transformations

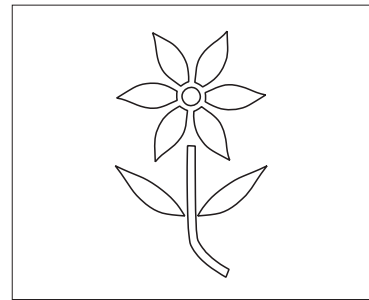
You have already tried simple transformations using the marquee box in **Tutorial 4**. There are different transformation functions available in the LH toolbox, *Move/Copy*, *Mirror Image*, *Rotate*, *Distort*, etc. All these functions operate in a similar way. First you must select the objects to be transformed using the *Select* option. Then choose the appropriate transform option (the objects will stay selected but the select box will disappear). Set/check the variables in the dialog box that appears, then follow the screen instructions. The following example illustrates their use.






a





b

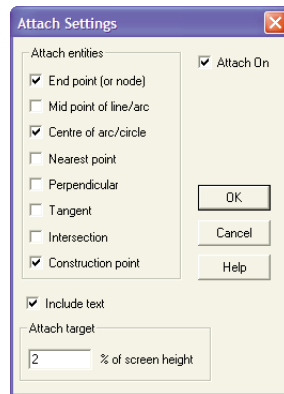


c

1. Start up 2D Design V2, or close any open drawings (*File > Close*). Choose the *Open* icon from the upper icon toolbar (or *File > Open*), and load the drawing "Flower.dtd" from the *Tutorials* directory. (See fig a.) For the purposes of this tutorial only, choose *Help > Restore Factory Defaults*. 
2. Choose the *Select* icon (LH toolbox). Select the leaf only, by clicking next to it, or by dragging a select box over it. 
3. Choose the *Mirror image* icon (LH toolbox, click and hold on the *Transform* icon). Ensure that *Repeat/Replace* is set to *Repeat*. Ensure that *Grid Lock* is on. At the prompt *Locate one point on axis of reflection*, move the cursor to co-ordinate position *Abs* (200, 160), then click the LH mouse button. At the second prompt *Locate another point on axis of reflection*, locate the cursor at co-ordinate position *Abs* (200, 100). The drawing should appear as in fig b. 

You will now repeat and rotate the petal around the circle. As the centre of the circle is not on a grid position we will need to set the software to automatically attach to its centre.

4. Choose the *Select* icon (LH toolbox). Select the petal only, by clicking next to it, or by dragging a select box over it. 
5. Ensure that *Grid Lock* is off, then click on the *Attach* icon (RH toolbox) with the RH mouse button (or double click with the LH button) to open the *Attach Settings* dialog box. 



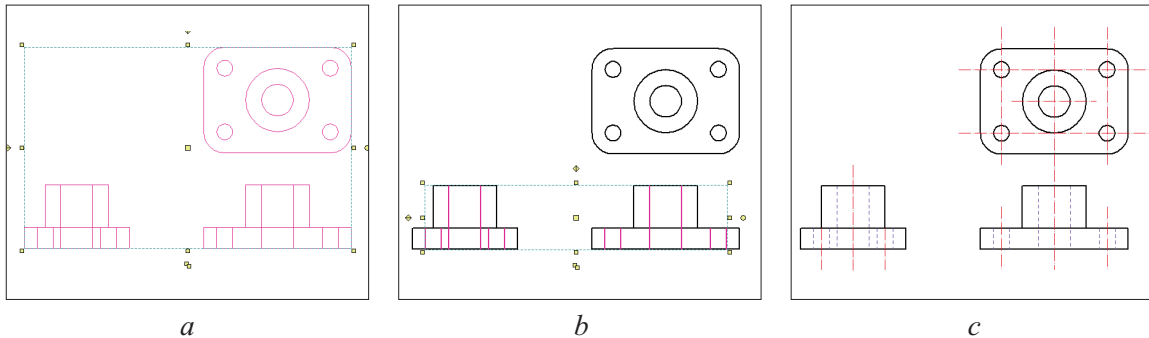
6. Select *Centre of arc/circle* then click *OK* to close the dialog box.
7. With the *Attach* icon still highlighted, choose the *Rotate* icon (LH toolbox, click and hold the *Transform* icon). Ensure that *Angle of rotation* is set to 60 deg, *Repeat/Replace* to *Repeat*, *No. repeats* to 5, then click *OK*. At the prompt *Locate centre of rotation*, move the cursor (now a square) over any part of the circle and click the LH mouse button. Click off to de-select. The finished drawing should now appear as in *fig c*.



It is good practice not to leave attach items set when you are not using them, as this can cause confusion if you are locating and attach to the wrong thing. Click on the *Attach* icon again with the RH mouse button and untick *Centre of arc/circle*.

TUTORIAL 7 - Line Styles and Line Colours

This tutorial will deal with drawing and changing line styles and colours.



So far, all the drawing done (if you are following these tutorials closely!) will be in solid black lines. To set a different line style or colour, new parameters are set from the attributes bar at the top of the screen.



If the line and colour settings are changed to, say, dashed with colour red, all subsequent lines will be red dashed lines. Existing lines may easily have their parameters changed as shown below.

1. Start up 2D Design V2, or close any open drawings (*File > Close*). Choose the *Open* icon from the upper icon toolbar (or *File > Open*), and load the drawing “Bracket.dtd” from the *Tutorials* directory. For the purposes of this tutorial only, choose *Help > Restore Factory Defaults*.

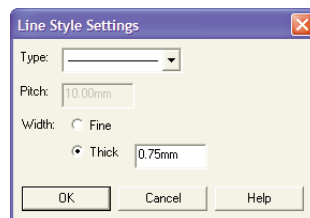
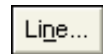


This drawing uses solid fine lines (the default setting). For visual reasons it is sometimes desirable to use thicker lines, eg., in this case it would be better if the main lines of the bracket were thicker than the centre lines to be drawn later.

2. Choose the *Select All* icon from the upper icon toolbar (or *Edit > Select > All* or press CTRL+A on the keyboard). See fig a. You will notice that the *Line...* and *Col...* windows on the attributes bar are now blank (indicating that the settings may be changed).



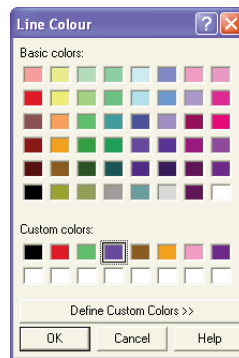
3. Click on the *Line* button on the attributes bar at the top of the screen. The *Line Style Settings* dialog box will open.



Select *Thick* and set the thickness to 0.75mm. Click *OK*. Click off the drawing to de-select it. You will see that all lines have been redrawn much thicker.

You may have noticed that some of the lines should be hidden detail lines (short dashes). You will now select these lines and change their settings and colour.

4. Ensure that the *Select* icon (LH toolbox) is chosen.
Select any one of the hidden detail lines (see the pink lines in *fig b* if unsure) by clicking on it with the LH mouse button in the normal way. Change to the RH mouse button and select the rest of the lines one at a time. Each will be “added” to the selection. (If a wrong line is selected by mistake, click on it again with the RH mouse button to remove it from the selection.)
5. With all the hidden detail lines selected, click on the *Line* button on the attributes bar again to open the *Line Style Settings* dialog box. Set *Type* to a short dash, *Pitch* to 6mm and *Width* to *Fine*, then click *OK*.
6. With the lines still selected, click on the *Col* button next to the *Line* button.
The *Line Colour* dialog box will open.



Choose the blue colour in the *Custom colors* section, then click *OK*. Click in a clear space to de-select the lines.

Whilst it is easy to change the line style and colour retrospectively, it is usually more sensible to use the correct settings in the first place. You will now draw some centre lines on the drawing.

7. Click on the *Line* button on the attributes bar at the top of the screen to open the *Line Style Settings* dialog box. Set *Type* to a long dash and a dot, *Pitch* 15mm, *Width* to *Fine*. Set the colour to *Custom color* red by clicking on the *Col* button next to the *Line* button.
8. Choose the *Single Lines* icon (LH toolbox), and ensure that *Grid* and *Grid Lock* (RH toolbox) are on. Draw in the centre lines as shown in *fig c*.



When creating or changing a line style you may have noticed that the first linetype in the list is *Invisible*, and you may have wondered what use an invisible line is. When drawing an object such as a filled rectangle, by default it will be drawn with a black line surrounding it. If this black line is not required, it may be set to invisible instead. (N.B. Invisible lines can have their on-screen appearance changed using the menu *Setup > Customise > Redraw Settings* - useful if you have forgotten they are there!)




TUTORIAL 8 - Using Fills

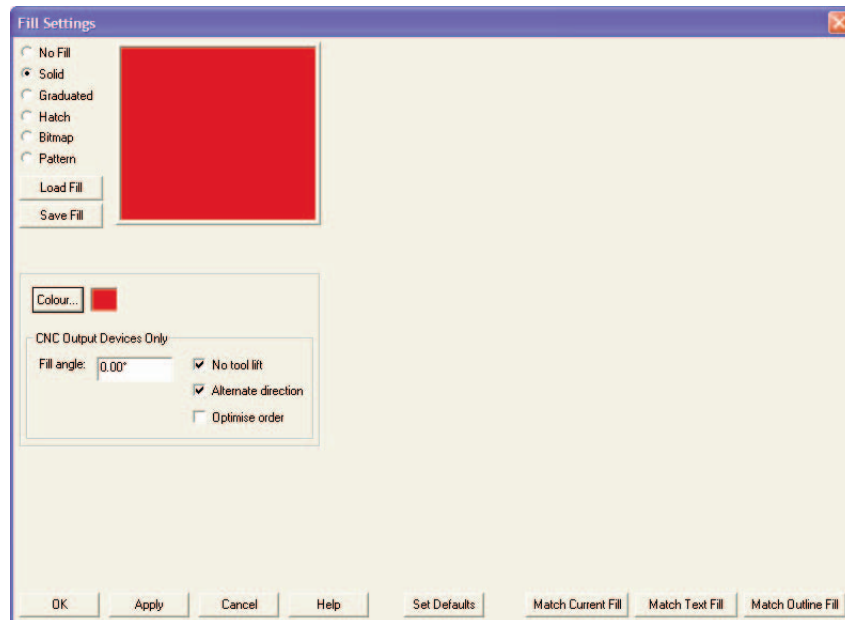
2D Design V2 has very powerful fill capabilities. Objects may be filled with simple hatch or solid fills, or with graduated, texture or pattern fills. This tutorial will show how to draw filled objects, and how to fill areas of existing drawings. For details on creating new fills see *Tutorial 9*.

Any closed object, eg., rectangle, circle, polygon, closed bezier, etc., can be given a fill as it is drawn. The current fill type is shown on the attributes bar at the top of the screen.



If the fill settings are changed to say, solid red, all new closed objects will be filled in solid red.

1. Start up 2D Design V2, or close any open drawings (*File > Close*). Choose the *New* icon from the upper icon toolbar (or *File > New*). For the purposes of this tutorial only, choose *Help > Restore Factory Defaults*. 
2. Choose the *Horizontal Rectangle* icon (LH toolbox). 
3. Follow the screen prompts to draw a couple of random rectangles. You will see lines only with no fill (ie., you will be able to see the grid through the rectangle).
4. Click on the *Fill* button on the attributes bar at the top of the screen. The *Fill Settings* dialog box will open. 



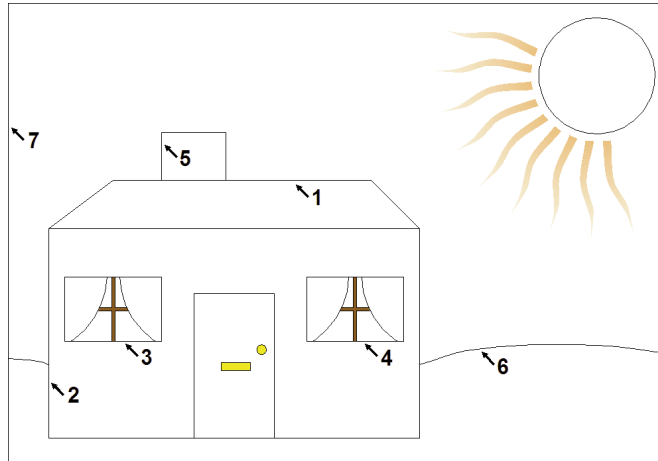
Select *Solid* and set the *Colour* to *Custom Color* Red. Click *OK* to close the dialog box. Draw some more rectangles and note the red fill with a black border. Draw some more closed objects, eg., circles, in different colours.

Drawing filled objects in this way is useful, but often you will have created an outline from a variety of lines, arcs, curves, etc., and you then wish to fill inside it.

5. Close your current drawing (*File > Close*). Choose the *Open* icon from the upper icon toolbar (or *File > Open*), and load the drawing “Cottage.dtd” from the *Tutorials* directory. Note that a few of the more “fiddly” parts of the drawing have already been filled.



6. Choose the *Boundary Fill* icon (LH toolbox).



From the *Boundary Fill settings* dialog box, click on the *Fill* button to open the *Fill Settings* dialog box. Click on the *Load Fill* button and load the fill “Tiles” from the *Fills* directory. Note the settings in the *Fill Settings* dialog box then click *OK* to close all dialog boxes. At the prompt *Locate one edge of boundary on side for fill*, locate at approximately point 1 shown above. To the question *Any islands*, answer *No*. The roof will fill with the tile texture at the size specified.

Double click with the LH button (or click with the RH button) on the *Boundary Fill* icon to bring back the dialog box. Click on the *Fill* button to open the *Fill Settings* dialog box. Click on the *Load Fill* button and load the fill “Bricks” from the *Fills* directory. Note the settings in the *Fill Settings* dialog box then click *OK* to close all dialog boxes. At the prompt *Locate one edge of boundary on side for fill*, locate at approximately point 2 shown above. To the question *Any islands*, answer *Yes* and locate at point 3, repeat for points 4 and 5, then answer *No*. The walls and chimney will fill, leaving holes for the windows and door. Note that an island can be internal or external, external islands are filled, internal ones are not.

Repeat the procedure above to fill with “Grass” at point 6 and “Sky” at point 7. (N.B. When filling the sky you could treat the “sun” as an island and not fill it, but as the sun will be fully filled later there is no need in this case.)

When the sky was filled you will have noticed that the sun was obscured. This is because parts of the sky outline were drawn after the sun, so the sky fill is also drawn after the sun, i.e., “on top” of it. It is however easy to correct as explained below.

7. Choose the *Select* icon (LH toolbox).



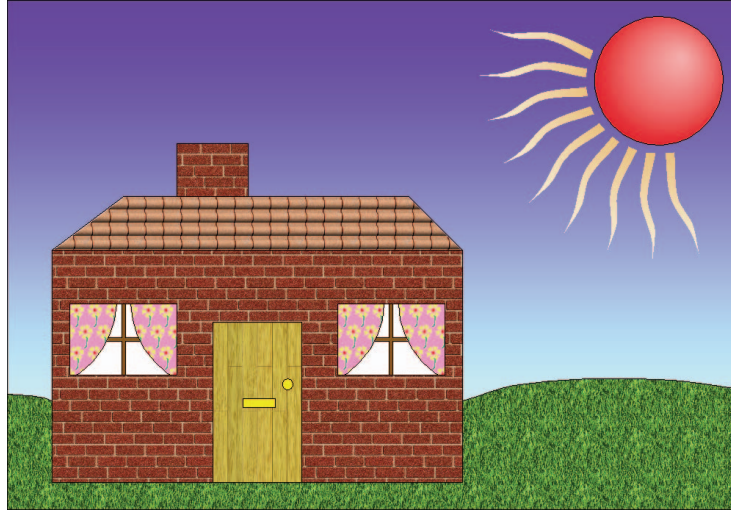
Move the cursor over the sky fill and click the LH mouse button to select the fill. The whole fill should be cross hatched in pink.

Choose the *To Back* icon from the upper icon toolbar.

The drawing data will be re-ordered so that the sky is now drawn first.



8. To finish the drawing, proceed as in step 6 to fill the sun with the fill “Sun”, the door with fill “Door” (don’t forget to select the knob and letterbox as islands), and the curtains with fill “Curtains”. Your drawing should now appear as below.

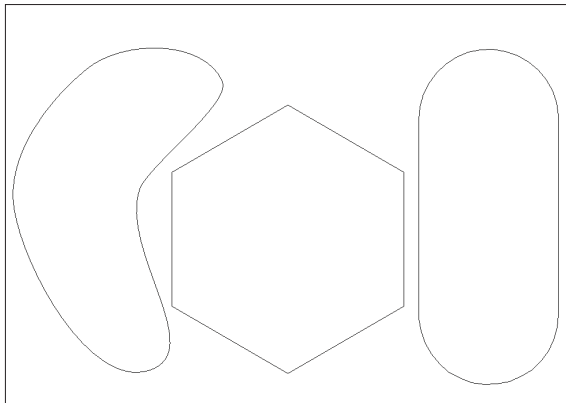


Changing fills once drawn is a very similar process to changing line types and fills (see *Tutorial 7*). You select the fill or fills you wish to change, then click on the *Fill* button on the attributes bar at the top of the screen to set the replacement fill.

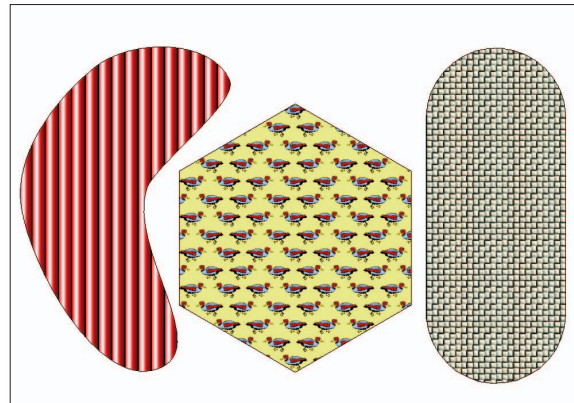
TUTORIAL 9 - Creating New Fills

2D Design V2 has a very sophisticated and powerful facility to use and create a variety of fill types from simple hatch or solid fills, to graduated, texture or pattern fills. These fills can be used when objects are drawn, as in-fills for pre-drawn boundaries and for filling text. The full range of possibilities is way beyond the scope of this booklet. A selection of fills is supplied with the software, but it is easy to create new fills and to save them for future use.

In **Tutorial 8** you used some fills that had already been created. In this tutorial you will create and save some fills of your own.



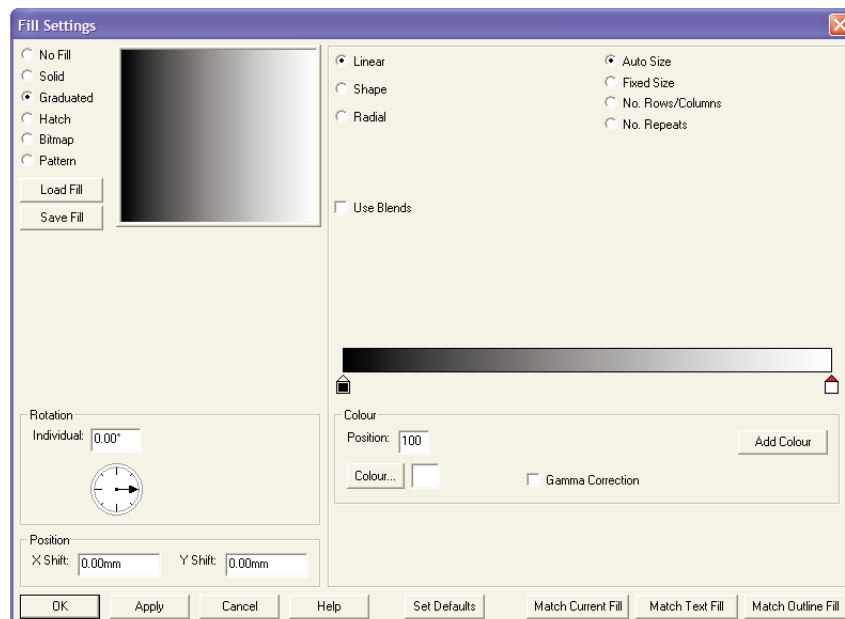
a



b

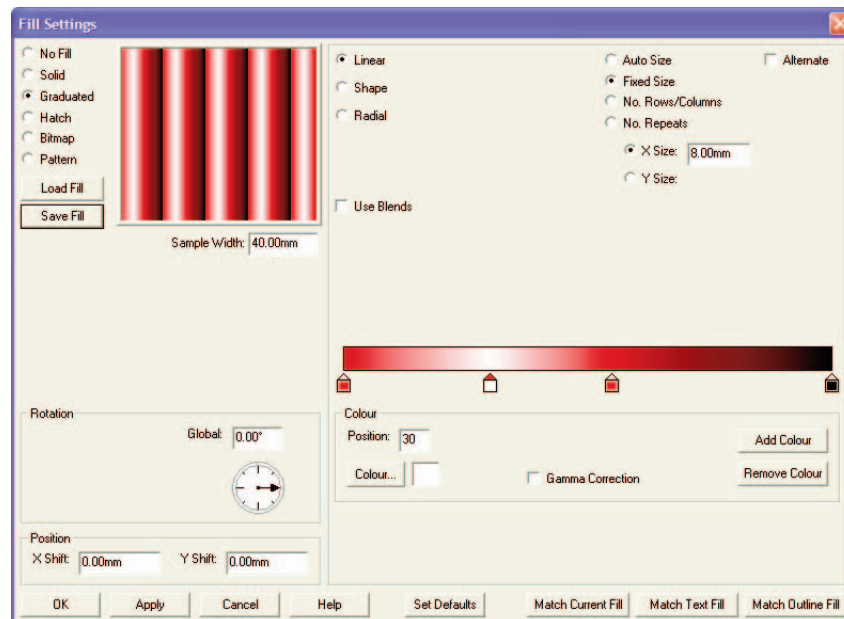
Creating a Graduated Fill

1. Start up 2D Design V2, or close any open drawings (*File > Close*). Choose the *Open* icon from the upper icon toolbar (or *File > Open*), and load the drawing “Shapes.dtd” from the *Tutorials* directory. (See fig a.) For the purposes of this tutorial only, choose *Help > Restore Factory Defaults*.
2. Click on the *Fill* button on the attributes bar. The *Fill Settings* dialog box will open. Select *Graduated*.



You will see a square sample window showing the current fill, and a rectangular colour bar that is used to set the fill colour parameters. Under the colour bar at each end is a small paint can which determines the colour at its position on the bar. Move the cursor over the black can, then click and hold the LH mouse button and drag the can backwards and forwards whilst observing the effect. You will notice that in the *Position* box a reading is given of the position of the can along the bar. Now drop the black can and try the same thing with the white can (the cans can be crossed over each other). Notice that the active can has a red pointer on top.

3. Move the cans back to their start points. Click on the LH can to make it active, then click on the *Colour...* button, to open the *Fill Colour* dialog box. Select Red from the *Custom colors* selection, then click *OK* to close. In the same way, change the colour of the RH can to black.
4. Click on the *Add Colour* button. This will open the *Fill Colour* dialog box. Select White from the *Basic colors* selection, then click *OK* to close. A new can will appear on the colour bar. Slide this can to position 30 (alternatively you can enter this value in the *Position* text entry box and choose *Apply*). Add another can, colour red, at position 55.
5. Select *Fixed Size* and change the value in the *X Size* text entry box to 8mm, then click on the *Apply* button to activate the setting. The *Fill Settings* dialog box should now appear as below.



6. Click on *Save Fill* and save the fill with the file name “Red Tubes”.
7. Try changing a few other variables to see the effect. In particular try rotating the fill by clicking on the dial in the *Rotation* section and spinning the dial around (or type in a value and *Apply*).

Creating a Pattern Fill

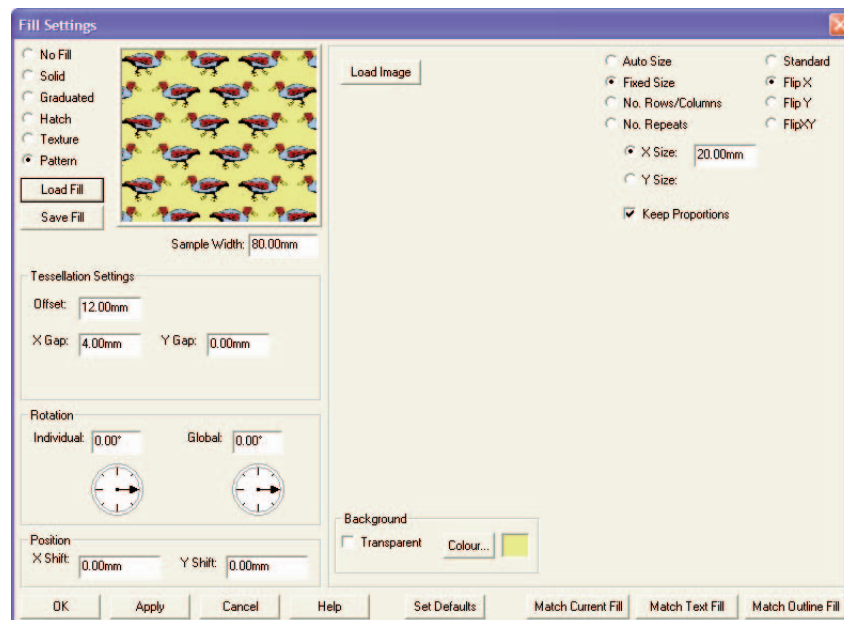
8. Select *Pattern*. Click on the *Load Pattern* button and load the image “Duck.wmf” from the *Patterns* directory.

Load Pattern allows any graphics file that 2D Design V2 can load to be used as the basis of a pattern fill.

9. The sample window represents a rectangle 40mm wide. This should give you an idea of scaling in the final drawing. In this case the window is a little small to get the full effect of the pattern. Change the *Sample Width* setting to 80mm then choose *Apply* to get a better view.
10. In the *Tessellation Settings* section, change the *Offset* value to 12mm, the *X Gap* to 4mm then click *Apply*. (The total repeat spacing for the ducks is 24mm - an *X size* of 20mm + an *X Gap* of 4mm. To get an even overlap, an *Offset* of half this, 12mm, has been set).
11. Select *Flip X*. This flips alternate images in the X axis.

If the fill is used as it is, the background (the space between the ducks) will be transparent, and any other drawing underneath will show through. You may like to try this later. In this case we will set a coloured background colour.

12. Untick *Transparent*. Click on the *Background Colour...* button to open the *Fill Colour* dialog box. Select the pale yellow from the *Basic colors* selection, then click *OK* to close. The *Fill Settings* dialog box should now appear as below.



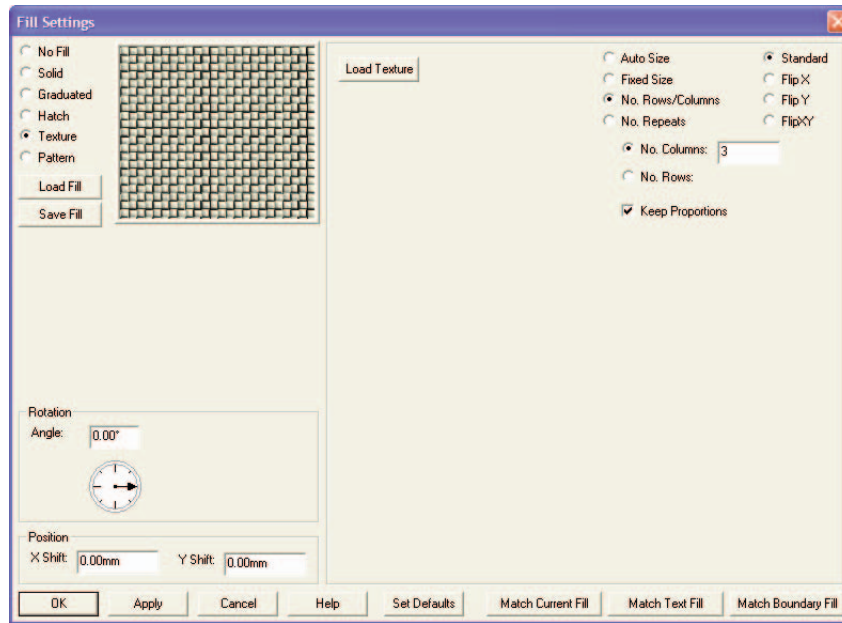
13. Click on *Save Fill* and save the fill with the file name “ducks”.

Creating a Texture Fill

14. Select *Texture*. Click on the *Load Texture* button and load the bitmap “Shiny Metal Weave.jpg” from the *Textures > Weave* directory.

Load Texture allows any bitmap file that 2D Design V2 can load to be used as the basis of a texture fill. In this case the texture is one of the library of textures supplied with the software.

15. Select *No. Rows/Columns*, and set the *No. Columns* to 3, then click *Apply*. The *Fill Settings* dialog box should now appear as below.



16. Click *Save Fill* and save the fill with the file name “Mesh”, then choose *Cancel* to exit the dialog box.

Having created some fill patterns you can now use them.

17. Choose the *Boundary Fill* icon (LH toolbox).

From the *Boundary Fill Settings* dialog box, click the *Fill* button to open the *Fill Settings* dialog box. Click on the *Load Fill* button and load the fill “Red Tubes” which you saved earlier. Click *OK* to close all dialog boxes. At the prompt *Locate one edge of boundary on side for fill*, locate the inside edge of the curved shape. To the question *Any islands*, answer *No* and the shape will fill. Double click with LH button (or click with the RH button) on the *Boundary Fill* icon to bring back the dialog box. Load the fill “Ducks” and fill the hexagon with it. Repeat the procedure to fill the lozenge with the fill “Mesh”. The drawing should now appear as in *fig b*.



You may have noticed that *Texture* fills only use bitmaps, whilst *Pattern* fills use any drawing (which could include a bitmap). On the face of it *Texture* fill is not really necessary. In fact whilst *Pattern* fills provides very powerful options, they are optimised for use with vectors and mixed drawings. *Texture* fills are optimised for use with bitmaps, so that when images are repeated they can form perfectly tessellated seamless fills.

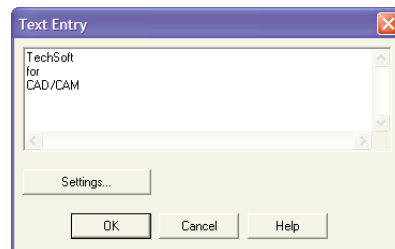
Fills can be used with a variety of drawing operations; drawing new closed objects (where the fill is set on the attributes bar), using boundary fill (where the fill is set in the *Boundary Fill Settings* dialog box), and text, (where the fill is set in the *Text Settings* dialog box). Each of these operations has its own settings, ie., changing a fill for text will not affect the settings for new closed objects. If you wish to quickly match one of the other fills (without saving and re-loading), the *Fill Settings* dialog box has buttons at the bottom to allow this.

Warning - A pattern fill is very powerful and can be used to create stunning graphical effects. Any drawing file can be used, in particular 2D Design files, and WMF vector files (commonly used for clipart) can be ideal. However, when a large drawing is used as the “pattern”, which is then repeated multiple times, drawing sizes can become very large, resulting in potentially slow redraw times and possible computer memory problems.

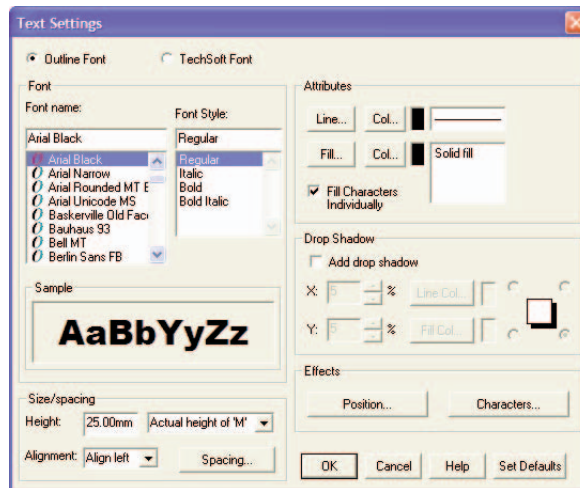
TUTORIAL 10 - Text

The text functions are very comprehensive. Text fonts may be in Windows Outline or TechSoft Font format (see **Tutorial 11** for more details of TechSoft Fonts). There are three basic text functions, *Linear text by variable* which allows the user to set all variables, font, sizes, spacings, colours, etc; *Linear text by box* which allows the user to pre-define font, colour, etc., then to apply the text to a user defined box; and *Text along a path* which allows text to flow around the outside or inside of a selected path object (normally a circle, arc, polygon or bezier curve).

1. Start up 2D Design V2, or close any open drawings (*File > Close*). Choose the *New* icon from the upper icon toolbar (or *File > New*). For the purposes of this tutorial only, choose *Help > Restore Factory Defaults*.
2. Choose the *Linear text* icon (LH toolbox). Ensure that *Grid Lock* (RH toolbox) is on. At the prompt *Locate start position for text*, move the cursor to position *Abs* (120, 200) approx., then click the LH mouse button. The following dialog box will open.



Type in **TechSoft<Return>for<Return>CAD/CAM** then click the *Settings* button. The following dialog box will open.



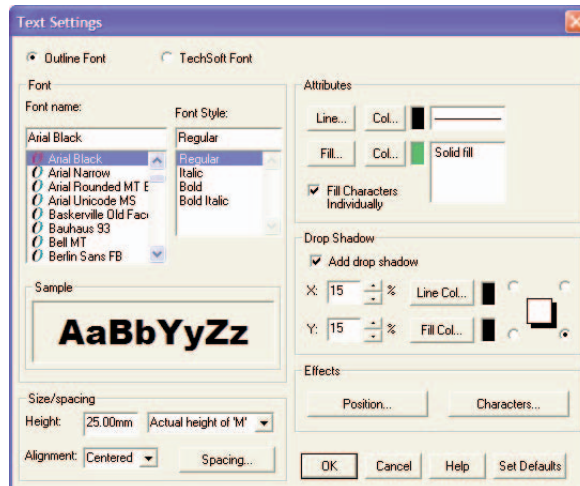
Ensure that the font is set to Arial Black (if not available choose another font), and *Height* to 25. Click *OK* on both dialog boxes. Your text should appear as below.

TechSoft for CAD/CAM

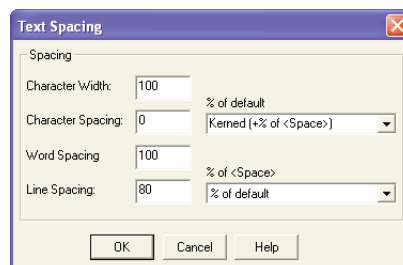
- Choose the *Select* icon (LH toolbox).
Move the cursor over the text and click the LH mouse button to select it. Notice the *Property/Start Edit* toolbox open in the bottom RH corner of the screen.



Click on the *Property* button. The *Text Entry* dialog box will open. Click on the *Settings* button to open the *Text Settings* dialog box.



Set *Alignment* to *Centered* then click on the *Col...* button next to *Fill...* and change the colour to *Custom color* green. Tick *Add drop shadow* and change the X and Y values to 15. Click on the *Spacing* button to open the *Text Spacing* dialog box

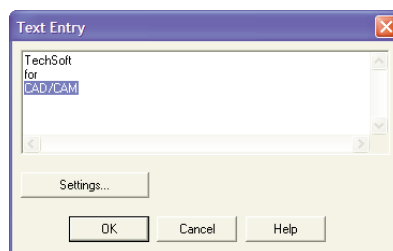


Set the *Line Spacing* to 80, then click *OK* to close all dialog boxes. Your text should appear as below.

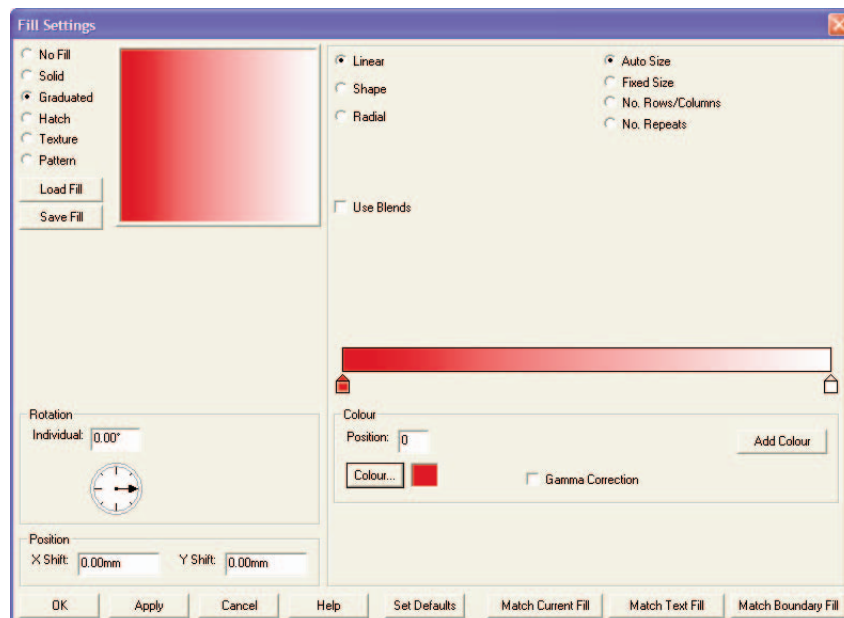
TechSoft for CAD/CAM

N.B. Obviously all the settings in steps 2 and 3 could have been made at one time, but one of the objectives of this tutorial is to show how text can be changed in different ways.

4. With the text still selected, click on the *Property* button again to open the *Text Entry* dialog box as shown below.



Highlight the words “CAD/CAM” (drag the text cursor over the characters so that they are highlighted in blue). Click on the *Settings* button to open the *Text Settings* dialog box. Change the *Height* value to 30, then click on the *Fill...* button to open the *Fill Settings* dialog box.



Select *Graduated*, then click on the *Colour...* button and set the colour to *Custom color* red. Click *OK* to close all dialog boxes, then click off to de-select. Your text should appear as below.

TechSoft for CAD/CAM

The above example has shown how to edit the properties of selected characters within a text phrase. Below is an alternative option for doing the same thing.

5. Select the text again, but this time click on the *Start Edit* button in the bottom RH corner of the screen. Each text character will be drawn with a yellow handle (it is possible to move each character by dragging the handle). You may now sub-select text characters. Use the LH mouse button to click on the letter *T*. Use the RH mouse button to click on the letters *e c h* in turn to select them (do not click on the handles).



With the letters selected click on the *Adjust* button in the *Edit Mode* toolbox in the bottom RH corner of the screen. The *Text Settings* dialog box will open. Change the *Fill...* colour to light grey and click *OK* to close all dialog boxes. The word “Tech” will turn grey. With the text still selected click away from the text to undo the sub-selection. Now sub-select the letters *S o f t* and set them to custom colour blue. Finally click away from the text a few times to completely de-select it. Your text should appear as below.



6. This example demonstrates just some of the powerful text facilities available. Close the current drawing (*File > Close*), then open the drawing “TextDemo.dtd” and observe some of the many other possible text effects.

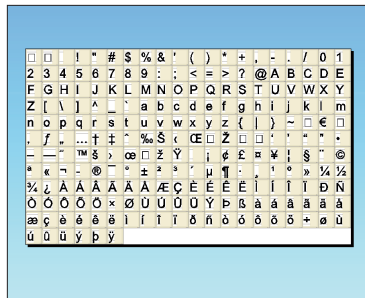
The “textdemo” file raises an important point regarding the transfer of files which use either Windows Outline fonts or TechSoft Fonts. When using any font, as drawings are created, edited, re-drawn, etc., the software refers back to the font data stored in the computer. If a drawing is saved and then loaded onto another computer, the text can only be reproduced correctly if the fonts used are installed on the second computer. If the fonts are not found, the text cannot be reproduced as the original. The “textdemo” file contains a variety of fonts unlikely to be found on your computer. To be able to display them correctly, the text was first selected, then “exploded” using *Edit > Explode*. This converts the text to a series of individual letter “shapes” (paths). Although the text properties are lost, the shape of each letter can now be modified using *Start Edit*, a useful feature in its own right. (N.B. Redrawing exploded text can be much slower than redrawing normal text, so text should only be exploded when really necessary.)

TechSoft fonts can only be used within 2D Design V2. When any drawing containing TechSoft fonts is transferred to another software package, via cut and paste for example, the text will be transferred as individual letter shapes.

TUTORIAL 11 - TechSoft Fonts

2D Design V2 comes with a range of TechSoft fonts. Most of these are single line fonts, primarily designed for use with engraving machines, laser cutters, etc. It is possible to create your own TechSoft font from scratch though this can be quite tedious. For most users a more suitable starting point would be to load an existing font (Outline or TechSoft), and alter the characters as required. This can then be saved as a TechSoft font. (Please note that copyright restrictions must be observed.)

This tutorial demonstrates how a standard font may easily be altered and saved as a TechSoft font.



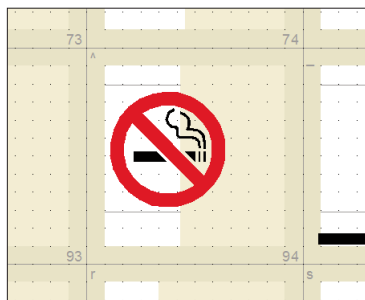
a



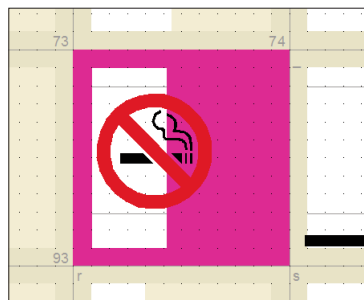
b



c







d




e



f

1. Start up 2D Design V2, or close any open drawings (*File > Close*). Choose the *Open Font* icon from the upper icon toolbar (or *File > Open Font*), and load the outline font *Arial* with *Font Style Regular*. (See fig a.) 
2. Choose the *Zoom in* icon (LH toolbox). Zoom in around the capital letter 'R' as shown in fig b. 
3. Choose the *Select* icon (LH toolbox). Move the cursor over any part of the letter 'R' and click the LH mouse button to select it. Click on the top diamond handle to flip the letter left to right. With "R" still selected click on the *Property* button (in the bottom RH corner of the screen) to open the *Single Line Path Properties* dialog box. Click on the *Fill Col* button and select the blue colour in the *Custom colours* selection. Click *OK* to close all dialog boxes, then click in a clear space to de-select. The letter 'R' will now be mirrored and blue. 
4. Choose the *Zoom Last* icon (RH toolbox). 

You will now select a rarely used character and replace it with a pre-drawn symbol.

5. Choose the *Zoom in* icon (LH toolbox). Zoom in on the character '^' (ascii code 94) as shown in fig c. 

6. Choose the *Delete Any* icon (LH toolbox).
Move the cursor over the ‘^’ character and click to delete it.



7. Choose the *Add* icon from the upper icon toolbar (or *File > Add*) and load the drawing “NoSmoke.dtd” from the *Tutorials* directory. Use the handles on the marquee box to adjust the size and position of the symbol (use the RH mouse button when moving the corner handles to ensure that the aspect ratio does not change) until it is roughly as shown in *fig d*, then click off the symbol to de-select it.

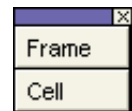


You will now need to adjust the width of the character cell to ensure suitable spacing of the symbol when it becomes a text character.

8. Choose the *Select/Edit Character Design Frame(s)* icon (LH toolbox, click and hold on *Select*). Move the cursor over the Character Design Frame with the symbol in and click the LH mouse button to select the frame. (See *fig e*.)



9. With the Character Design Frame highlighted, choose *Cell* from the *Frame/Cell* toolbox (now showing in the bottom RH corner of the screen).



10. Ensure that *Dynamic cell width adjustment* is selected then click *OK*. All frames will have a vertical red line showing the cell width, and a circular yellow handle (in the selected frame the handle will be pink). Click on the pink handle and adjust the cell width so that it extends slightly to the right of the symbol (do not hold down the mouse button). (See *fig f*). Click the LH mouse button to fix the cell width, then choose the *End* button in the bottom RH corner of the screen.

Choose the *Select* icon (LH toolbox, click and hold on *Select*) to exit the *Font Grid Edit Mode* (or *Edit > Font Grid Edit Mode*).



The font must now be saved before it can be used.

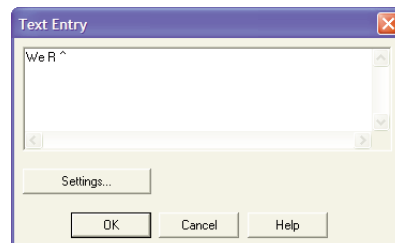
11. Choose the *Save Font* icon from the upper icon toolbar (or *File > Save As TechSoft Font*). Enter the name “Tutorial” and click *OK* to save the font.



12. Close the current drawing (*File > Close*), then choose the *New* icon from the upper icon toolbar (or *File > New*) to start a new drawing.

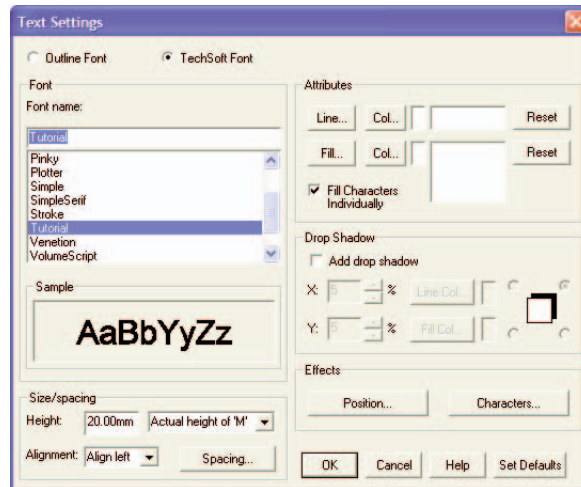


13. Choose the *Linear text* icon (LH toolbox).
At the prompt *Locate start position for text*, move the cursor to a position *Abs* (160, 140), approx., then click the LH mouse button. The following dialog box will open.



Type in **We R ^** then click the *Settings* button.

The following dialog box will open.



Select *TechSoft Font* then select “Tutorial” from the list. Click *OK* on both dialog boxes. Your text should appear as below.

We Я 

Using the same basic procedure as above, any font can easily be modified to suit your specific requirements.

TUTORIAL 12 - Loading a Bitmap Image and Clipping It

Clip paths are invaluable tools for graphic design work. They are user defined closed shapes which can be used to delete or hide parts of a drawing. The following example illustrates a common application.

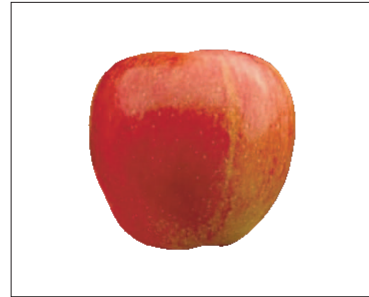
As part of a design, the image of an apple is required. The only apple image available is of an apple in a bowl of fruit, so it is necessary to "extract" the image of the individual apple from the rest of the fruit.





a





b




c

1. Start up 2D Design V2, or close any open drawings (*File > Close*). Choose the *New* icon from the upper icon toolbar (or *File > New*). For the purposes of this tutorial only, choose *Help > Restore Factory Defaults*. Ensure that *Grid Lock* and *Step Lock* (RH toolbox) are off. 
2. Choose the *Import Bitmap* icon from the upper icon toolbar (or *Bitmaps > Import Bitmap*) and load the image "Fruit.jpg" from the *Tutorials* directory. (See fig a.) The *Bitmap Image Size and Colour* dialog box will open. Click *OK* to accept the default values. 

To work more accurately it will be helpful to zoom in to the apple.

3. Choose the *Zoom in* icon (LH toolbox). Zoom in around the apple as shown in fig b. 
4. Choose the *Draw a Clip Path* icon (LH toolbox). Note that the *Closed Path Segment* toolbox has opened in the bottom RH corner of the drawing area. 

5. Choose the *Close Curve* icon from the *Closed Path Segment* toolbox. Move the cursor to any position on the edge of the apple and click the LH mouse button. Move the cursor about 15mm (see *Distance* at the bottom of the screen) along the edge of the apple (either direction) and click again. This will draw the first section of the clip path around the apple. Continue to move the cursor around the apple clicking about every 15mm. When the cursor is about 15mm from the start point click the RH mouse button to close the clip path (you could close the clip path with a double click of the LH mouse button but this will put in an extra unnecessary point). The clip path will be drawn as a thin grey line. 

The clip path drawn will probably be a close, but not exact fit to the apple. It is difficult to get a good fit when drawing around a shape as the curve may not always bend as required. The next step shows how to adjust the clip path to be an exact fit.

6. Choose the *Select* icon (LH toolbox).
Move the cursor to point to the clip path and click the LH mouse button to select the path.

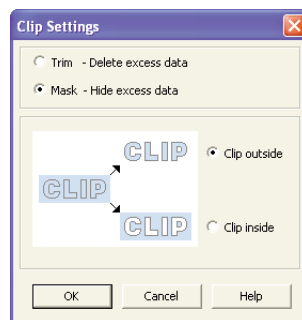


7. With the clip path highlighted, choose *Start Edit* from the *Property/Start Edit* toolbox (now showing in the bottom RH corner of the screen).



Move the nodes and the handles to get the best possible fit of the path to the apple.
You may also need to add nodes for small detail. (See **Tutorial 5** for more details of editing.) When you are happy with the fit of the clip path, move the cursor away from the clip path and click to leave edit mode (or click on *End Edit* in the bottom RH corner of the screen).

8. Choose the *Clip to a clip path* icon (LH toolbox, click and hold on the *Clip* icon).
Move the cursor to point to the clip path and click the LH mouse button to select the path.
The *Clip Settings* dialog box will open as below.



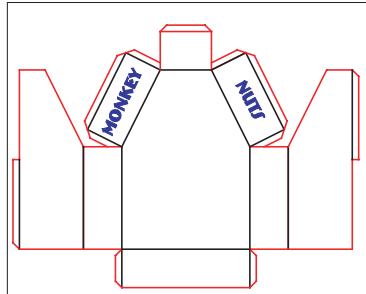
Ensure that *Mask - Hide excess data* and *Clip outside* are selected, then click *OK*. The excess data will be made invisible, leaving just the image of the apple (see *fig c*).

Either masking or trimming would have given the same visual effect. In this case masking was chosen as it may be useful to leave the original image available, to allow you to re-edit the clip path at a later time. (To re-edit the the clip path, simply select it, then choose *Start Edit* from the *Property/Start Edit* toolbox.)

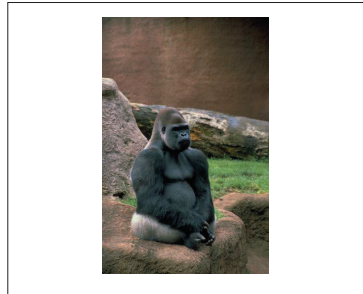
Although the example above clips a photograph, clipping works with any image. Clip paths are (by default) drawn in a fine grey line. By default they are always drawn on top of the rest of the drawing. They cannot be printed or output to CNC devices and so will not “spoil” your output. If you do not wish to see clip paths on screen, they can be made invisible by choosing *Setup > Customise > Redraw Settings*.

TUTORIAL 13 - Clipping an Image to Fit a Shape

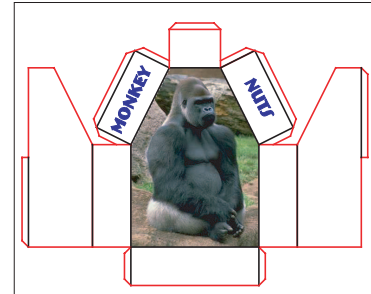
This tutorial demonstrates another common use of clip paths (see also *Tutorial 12*). When creating a net for a card box, a photograph is to be placed on the main panel. As the photograph is rectangular, it must be trimmed to fit.





a






b



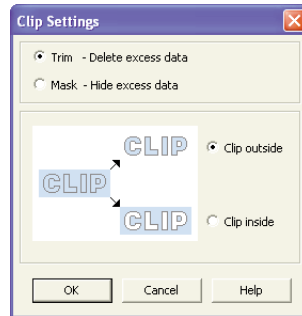
c

1. Start up 2D Design V2, or close any open drawings (*File > Close*). Choose the *Open* icon from the upper icon toolbar (or *File > Open*), and load the drawing “GorillaBox.dtd” from the *Tutorials* directory. (See fig a.) For the purposes of this tutorial only, choose *Help > Restore Factory Defaults*. 
2. Choose the *Import Bitmap* icon from the upper icon toolbar (or *Bitmaps > Import Bitmap*) and load the image “Gorilla.jpg” from the *Tutorials* directory. (See fig b.) The *Bitmap Image Size and Colour* dialog box will open. Click *OK* to accept the default values. 

You will see that the photograph obscures the box which will make accurate positioning difficult.

3. With the photograph still selected, choose the *To Back* icon from the upper icon toolbar (or *Edit > Arrange > Put to Back*), to rearrange the drawing order so that the box is drawn over the photograph. 
4. Choose the *Select* icon (LH toolbox).
Move the cursor to point to any line of the box and click the LH mouse button to select the box. Click on the centre handle of the marquee box then move the box to centre the main panel over the gorilla. Click again to “drop” the box (initially the image of the box will stay fixed while the marquee box moves, on the second click the drawing will be updated). It may take a few goes to get the positioning just right. Finally, move the cursor to a clear part of the drawing area and click again to de-select the box. 
5. Choose the *Create a clip path by locating a boundary* icon (LH toolbox, click and hold on the *Clip Path* icon). At the prompt *Locate a closed boundary for the clip path*, move the cursor to a position inside the main panel, close to an edge, then click the LH button. At the prompt *Any islands?* answer *No*. A clip path will be created around the central panel of the box. The clip box will automatically be selected (when de-selected it will be seen as a grey line). 
6. With the clip path still selected, add the photograph to the selection by clicking on it with the RH mouse button.

7. With both items selected, choose the *Clip selected object(s) to clip path(s)* icon (LH toolbox, click and hold on the *Clip* icon). The following dialog box will open.



Ensure that *Trim -Delete excess data* and *Clip outside* are selected, then click *OK*. The excess data will be deleted, leaving the panel filled with the photograph (see *fig c*).

Either masking or trimming would have given the same visual effect. In this case trimming was chosen as deleting the excess photographic data would make for a smaller file size when saved. (N.B. Not all “excess” bitmap data can be deleted as bitmaps are always stored as rectangles. The bitmap will be reduced to the smallest possible rectangle.)

Although the example above clips a photograph, clipping works with any image. Clip paths are (by default) drawn in a fine grey line. By default they are always drawn on top of the rest of the drawing. They cannot be printed or output to CNC devices and so will not “spoil” your output. However if you do not wish to see them on screen they can be made invisible by choosing *Setup > Customise > Redraw Settings*.

TUTORIAL 14 - Bitmap to Vector Conversion

Bitmaps are great for many reasons, but because the image is effectively made from coloured dots, they do not lend themselves to outputting to most CNC machines for cutting purposes. These operations normally require a vector line for the cutter head to follow. In addition bitmap images do not scale up well - if you start with a small image and enlarge it, the dots quickly become obvious and can spoil the effect. For these reasons 2D Design V2 has a built in bitmap to vector converter. The software can isolate different colours in an image and “trace” around them to produce a vector equivalent of the bitmap. However, whilst bitmap to vector conversion can produce great results, care should be taken with the source image. Conversion works best with relatively simple images with a few colours. A photograph, for example may have literally millions of colours in it and each patch of colour can be very complex. To make the mathematics of conversion realistic on a desktop PC, firstly the number of colours has to be reduced to a realistic level. This is done automatically in the software, though some manual input can be used to help the software “see” the required image correctly. The complexity of large bitmaps is also controlled automatically by effectively lowering the resolution of the image to a manageable size (this can be overwritten if you wish to have a more accurate result and are patient!).

Despite these reservations bitmap to vector conversion can be an invaluable tool for allowing machining of hand drawn images (when scanned), bitmap clip art, pre-printed images (eg., existing school logos), etc.



a



b



c

1. Start up 2D Design V2, or close any open drawings (*File > Close*). Choose the *New* icon from the upper icon toolbar (or *File > New*). For the purposes of this tutorial only, choose *Help > Restore Factory Defaults*.



2. Choose the *Import Bitmap* icon from the upper icon toolbar (or *Bitmaps > Import Bitmap*). Load the image “ManualCover.jpg” from the *Tutorials* directory (see *fig a.*) The *Bitmap Image Size and Colour* dialog box will open. Click *OK* to accept the default values.



The source material for this tutorial is an old workshop manual cover which has been scanned. The objective is to create a vector image that could be used to cut out one of the logos on a CNC machine.

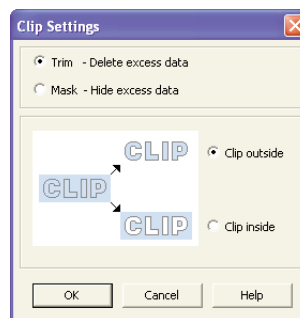
3. Choose the *Zoom All* icon (RH toolbox).



4. Choose the *Clip to a box* icon (LH toolbox, click and hold on the *Clip* icon). Ensure that *Grid Lock* and *Step Lock* (RH toolbox) are both off. Refer to *fig a*, then follow the screen prompts and draw the clip box from position 1 to position 2 (if you wish, you may zoom in further first).



The following dialog box will open.



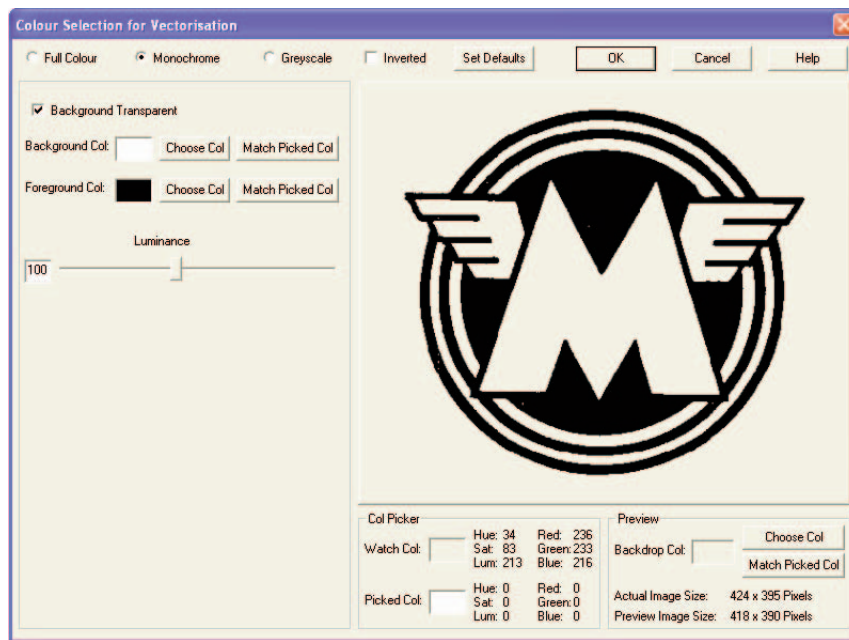
Ensure that *Trim -Delete excess data* and *Clip outside* are selected, then click *OK*. The excess data will be deleted, leaving only the logo (see *fig b*).

5. Choose the *Zoom All* icon (RH toolbox).



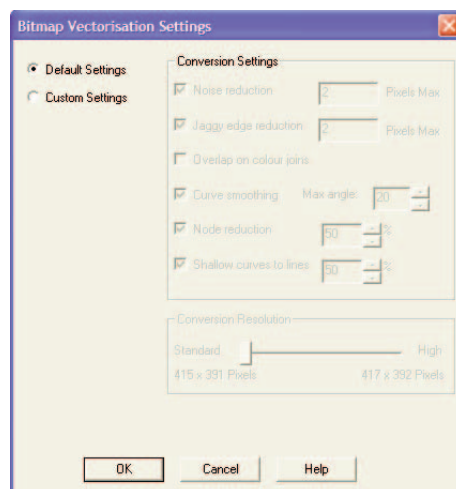
6. Choose the *Vectorise* icon (LH toolbox). At the prompt *Locate the bitmap for vectorisation*, locate the bitmap. After a time delay, the *Color Selection for Vectorisation* dialog box will open.





You will notice that although at a glance the bitmap appears to be just two colours it actually contains around 20,000 different colours. These will be mainly different shades of yellow and grey. The software has already reduced these to a more manageable number of colours by grouping together colours that are similar. However, as we just want a simple cutting path, we can do better by manually setting to monochrome to have just two colours.

7. Select *Monochrome*. The image will turn to black and white only. You will notice that there is some “noise” on the image (black speckles). These may well be removed automatically during the conversion process, but to help out, move the *Luminance* slider from side to side. As you move the slider to the right, more of the image becomes black and the noise increases, as you move it to the left more of the image turns white and the noise reduces but the image starts to disappear. In this case a good compromise value is around 100, so set the value to this and click *OK* to continue. The *Bitmap Vectorisation Settings* dialog box will open.



The default *Conversion Settings* have been found to give the best results for most bitmaps, but you may wish to experiment sometime later.

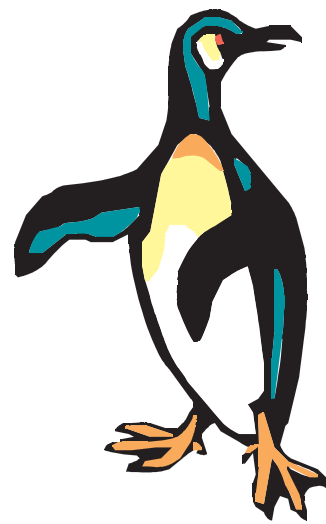
N.B. The *Conversion Resolution* section of the dialog box above may or may not be visible depending on how tightly you have clipped to the logo. By default the image is reduced to a sensible size for conversion as indicated at the LH end of the slider. The value at the RH end is the full resolution of the bitmap. Increasing the resolution may increase the quality of the conversion (it will also increase significantly the conversion time), but in a few cases it may also reduce it, as reducing the resolution can “smooth out” imperfections along edges. If the section does not appear this is because the image is already small enough.

Stick with the default values for now and click *OK* to continue. After a short pause the image will be changed to vectors. If you wish you may now edit the vector image to alter it in some way. Do this by selecting the image, then choosing *Start Edit* from the *Property/Start Edit* toolbox in the bottom RH corner of the screen.



Now to try a full colour conversion.




d

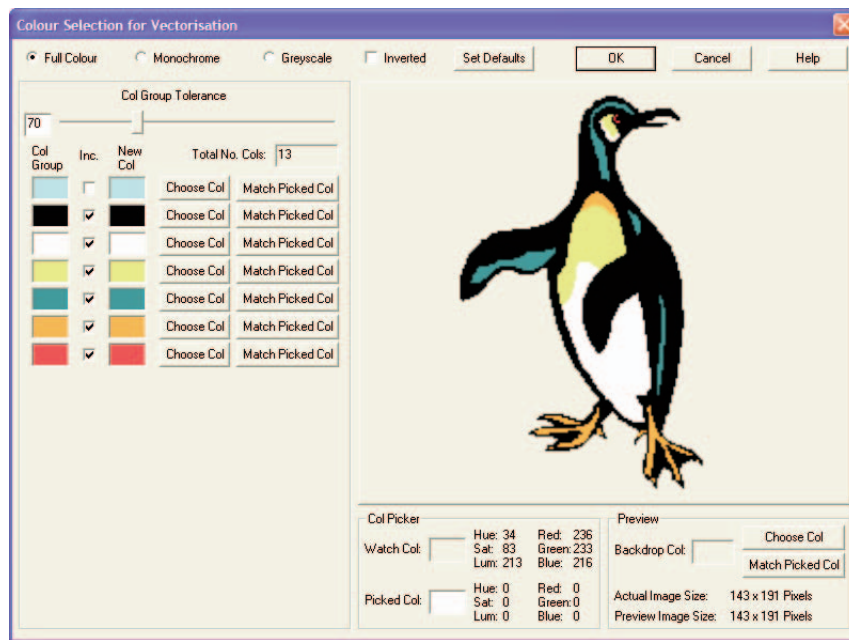


e

8. Close the current drawing (*File > Close*), then choose the *New* icon from the upper icon toolbar to start a new drawing. 
9. Choose the *Import Bitmap* icon from the upper icon toolbar (or *Bitmaps > Import Bitmap*). Load the image “Penguin.bmp” from the *Tutorials* directory (see fig d.) The *Bitmap Image Size and Colour* dialog box will open. Click *OK* to accept the default values. 

The source material for this tutorial is a small clipart image. As you can see, the pixelation at this size is marked.

10. Choose the *Vectorise* icon (LH toolbox). At the prompt *Locate the bitmap for vectorisation*, locate the bitmap. The *Color Selection for Vectorisation* dialog box will open. 



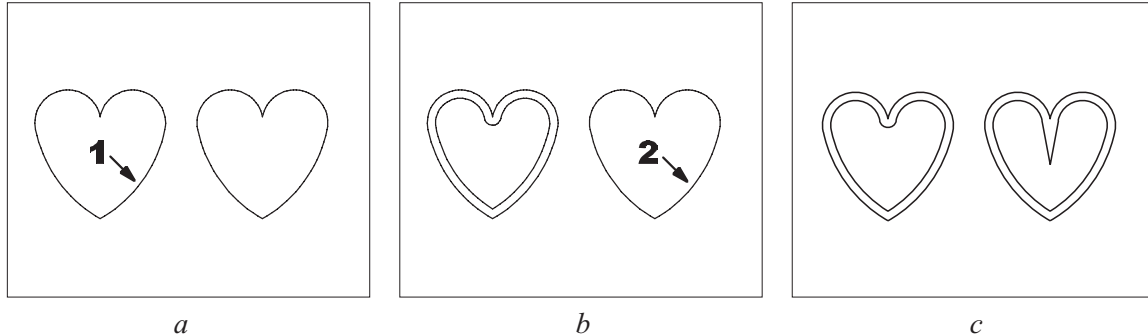
You will notice there are only 13 colours in the design. The conversion can easily handle this number of colours, although if the image was being produced for use in vinyl cutting it would pay to reduce the number further. With this image the background colour may be a nuisance, so as we just want the penguin image we will remove the background during conversion.



11. Move the *Col Group Tolerance* slider from side to side. As you move the slider to the left, more colours will be visible, as you move it to the right less colours will be visible. This is because the colours are combined in groups, the higher the tolerance the more colours will be combined into one group. In this case a good compromise value is 70, so set the value to this.
12. Untick the *Inc.* setting for the first colour in the list (a shade of pale blue). This will stop this colour from being converted and will leave only six colours in the design. Click *OK* to continue. The *Bitmap Vectorisation Settings* dialog box will open. Leave the default settings and click *OK* to continue. The penguin will now be converted to a vector form with the background removed. The image can be edited by selecting it, then choosing *Start Edit* from the *Property/Start Edit* toolbox in the bottom RH corner of the screen.

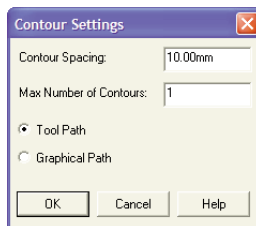
The ability to remove the background in this way is very useful. Often the background to a bitmap of this type is white. This can still be removed in the same way, though it is easy to forget to do so! (N.B. When removing backgrounds in this way it is possible to inadvertently remove other areas of the drawing in the same colour. These end up as “holes” in the drawing. These will become obvious if the image is placed over a coloured background.)

TUTORIAL 15 - Contours


The *Contour* drawing routine has a number of practical uses. It can be used to create a cutter diameter compensated toolpath for machining purposes; it can be used to create interesting graphical effects; or it can be used to “pick out” the outline of a complicated shape to create a single outline profile. The following examples illustrate these uses.



1. Start up 2D Design V2, or close any open drawings (*File > Close*). Choose the *Open* icon from the upper icon toolbar (or *File > Open*), and load the drawing “Heart.dtd” from the *Tutorials* directory. (See fig a.) For the purposes of this tutorial only, choose *Help > Restore Factory Defaults*. 
2. Choose the *Contour* icon (LH toolbox). The following dialog box will open. 



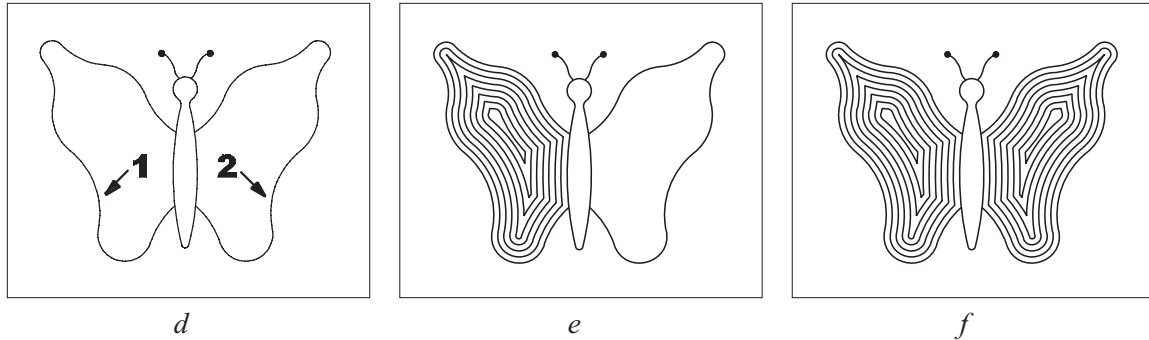
Ensure that the *Contour spacing* is set to 10mm, the *Max number of contours* to 1, and that *Tool path* is selected. Click *OK*.



3. At the prompt *Locate one edge of the boundary on side for contour*, move the cursor to position 1 approx., as shown in fig a, then click the LH mouse button.
4. In order to bring back the *Contour settings* dialog box, double click with the LH mouse button (or click with the RH mouse button) on the *Contour* icon (LH toolbox). Select *Graphical path* instead of *Tool path*, then click *OK*. 
5. At the prompt *Locate one edge of the boundary on side for contour*, move the cursor to position 2 approx., as shown in fig b, then click the LH mouse button. The drawing will appear as in fig c.

This example clearly demonstrates the difference between a *Tool path* and a *Graphical path*. A *Tool path* produces a radius around sharp corners. (The path is actually the locus of the centre of a cutting tool producing the shape, hence the name). The main purpose of the *Tool path contour* is to create toolpaths for subsequent machining using milling type systems (typically MODELAs and RotoCAMMs, etc.). If the tool follows the contour produced outside the shape, the shape will be cut out accurately. If the tool follows the contour produced inside the shape, a “hole” of the shape will be cut out.

The *Graphical path* more accurately follows the contour of the shape and is often preferred when producing graphical effects. (It will, however, sometimes lead to exaggerated profiles at corners as illustrated above.) Of course, *Tool path* can also be used for graphical effects if preferred.

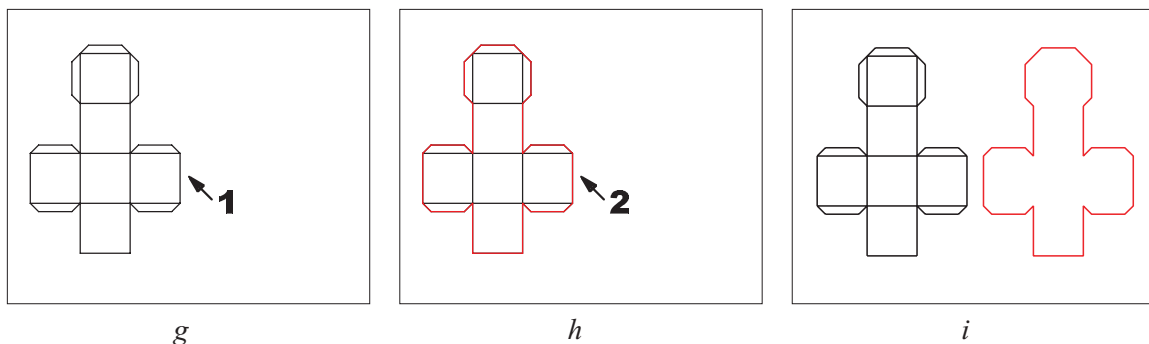
The next example illustrates the use of multiple contours for graphical effects.






6. Close the current drawing (*File > Close*), then choose the *Open* icon from the upper icon toolbar (or *File > Open*), and load the drawing “Butterfly.dtd” from the *Tutorials* directory. (See fig d.) 
7. Choose the *Contour* icon (LH toolbox). Ensure that the *Contour spacing* is set to 5mm, and the *Max number of contours* to 20, then click *OK*. 
8. At the prompt *Locate one edge of the boundary on side for contour*, move the cursor to position 1 approx., as shown in fig d, then click the LH mouse button. The drawing should appear as in fig e. Locate again at position 2 approx., as shown in fig d. The drawing should appear as in fig f.

In this example, the contour shapes will be the same whether *Tool path*, or *Graphical path* is used. The maximum number of contours was set at 20 to ensure that the shape would be fully filled. If you wish to fully fill a shape, choose a number slightly larger than you think you will need.

The next example illustrates the use of the *Contour* function to “extract” a boundary from a complex shape.



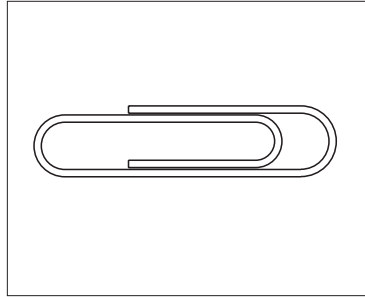
9. Close the current drawing (*File > Close*), then choose the *Open* icon from the upper icon toolbar (or *File > Open*), and load the drawing “Box.dtd” from the *Tutorials* directory. (See fig g.) 

10. Change the current line colour to red, by clicking on the *Line Col...* button on the attributes bar at the top of the screen, then choosing *Custom Color* red from the *Color* dialog which will open.
11. Choose the *Contour* icon (LH toolbox).
Ensure that the *Contour spacing* is set to 0mm, and the *Max number of contours* to 1, then click *OK*. 
12. At the prompt, *Locate one edge of the boundary on side for contour*, move the cursor to position 1 approx., as shown in *fig g*, then click the LH mouse button. The drawing should now have a red boundary.
13. Choose the *Select* icon (LH toolbox).
Move the cursor to position 2 approx., as shown in *fig h*, then click the LH mouse button. The new outline shape should now be selected. (N.B. If two objects are drawn over each other *Select* will first choose the last drawn, but re-clicking in the same place will progressively select earlier objects). Click on the centre handle and move the outline to its new position as shown in *fig i*. Click off to de-select. 

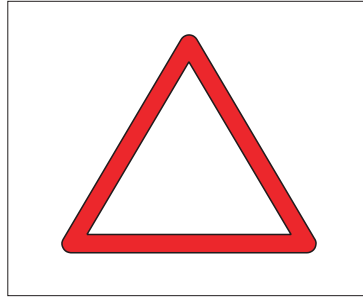
Apart from the obvious graphical applications, this operation is particularly useful for creating a cutting path for a CAMM 1 type system which uses a knife blade. In this case, the black lines can be scored and the red outline cut (at stage 12).

TUTORIAL 16 - Double Lines

Double lines are very useful drawing tools. They have a range of associated parameters which can be changed to create useful and interesting effects. Two examples are given below.



a

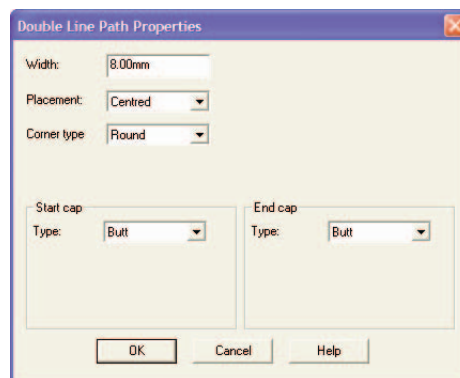


b



c




1. Start up 2D Design V2, or close any open drawing (*File > Close*). Choose the *New* icon from the upper icon toolbar (or *File > New*). For the purposes of this tutorial only, choose *Help > Restore Factory Defaults*. Ensure that *Grid* and *Grid Lock* (RH toolbox) are on.
2. Double click with the LH mouse button (or click with the RH mouse button) on the *Double Path* icon. The following dialog box will open.



Set the *Width* to 8mm, and the *Corner type* to *Round*, then click *OK*. Notice the *Path Segment* toolbox which will have appeared in the bottom RH corner of the drawing screen. By default this will be set to an *Open Line* path segment.





3. At the prompt *Locate start point*, move the cursor to co-ordinate position *Abs* (150, 180), then click the LH mouse button. Locate again at position *Abs* (340, 180).
4. Choose the *Open Arc* icon from the *Path Segment* toolbox in the bottom RH corner of the screen. Move the cursor to co-ordinate position *Abs* (340, 110), then locate.
5. Choose the *Open Line* icon from the *Path Segment* toolbox in the bottom RH corner of the screen. Move the cursor to co-ordinate position *Abs* (80, 110), then locate.
6. Choose the *Open Arc* icon from the *Path Segment* toolbox in the bottom RH corner of the screen. Move the cursor to co-ordinate position *Abs* (80, 170), then locate.



7. Choose the *Open Line* icon from the *Path Segment* toolbox in the bottom RH corner of the screen. Move the cursor to co-ordinate position *Abs* (290, 170), then locate. 
8. Choose the *Open Arc* icon from the *Path Segment* toolbox in the bottom RH corner of the screen. Move the cursor to co-ordinate position *Abs* (290, 120), then locate. 
9. Choose the *Open Line* icon from the *Path Segment* toolbox in the bottom RH corner of the screen. Move the cursor to co-ordinate position *Abs* (150, 120), then either double click the LH mouse button, or single click the LH mouse button then single click the RH mouse button, to finish. 

The drawing should now appear as in *fig a*. Before starting the next drawing you may wish to save the current drawing using the *Save* icon on the upper icon toolbar (or *File > Save*).



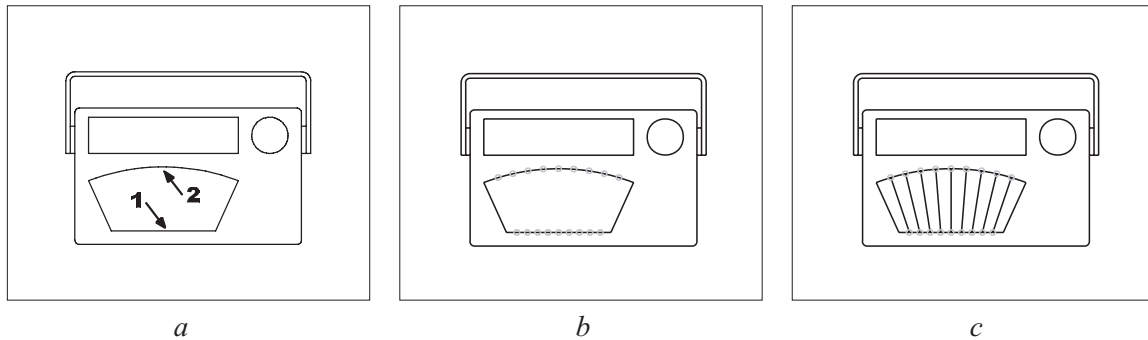
10. Press *Alt + Delete* (*Edit > Delete > All*) to clear the current drawing. Ensure that *Grid* and *Grid Lock* are on.
11. Set the fill to *Solid*, and the colour to *Custom Color* red, using the *Fill...* button on the attributes bar at the top of the screen.
12. Double click with the LH mouse button (or click with the RH mouse button) on the *Double Path* icon (LH toolbox) to open the *Double Line Path Properties* dialog box. Set the *Width* to 20mm, and the *Corner type* to *Round*, then click *OK*. 
13. Choose the *Close Line* icon from the *Path Segment* toolbox in the bottom RH corner of the screen. Move the cursor to co-ordinate position *Abs* (80, 40), then locate. Move the cursor to co-ordinate position *Abs* (210, 260), then locate. Move the cursor to co-ordinate position *Abs* (340, 40), then either double click the LH mouse button, or single click the LH mouse button then single click the RH mouse button, to finish. (See *fig b*.) 
14. Set the fill colour to black using the *Fill Col...* button on the attributes bar at the top of the screen.
15. Double click with the LH mouse button (or click with the RH mouse button) on the *Double Path* icon (LH toolbox) to open the *Double Line Path Properties* dialog box. Set the *Width* to 15mm, and the *End cap* to *Triangle - Width 15 - Height 15*, then click *OK*. 
16. Choose the *Open Line* icon from the *Path Segment* toolbox in the bottom RH corner of the screen. Move the cursor to co-ordinate position *Abs* (250, 60), then locate. Move the cursor to co-ordinate position *Abs* (250, 130), then locate. Move the cursor to co-ordinate position *Abs* (180, 80), then locate. Finally move the cursor to co-ordinate position *Abs* (180, 150), then either double click the LH mouse button, or single click the LH mouse button then single click the RH mouse button, to finish. 



The drawing should now appear as in *fig c*. You may like to try experimenting with other double line settings.

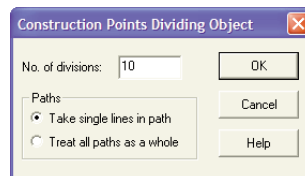
N.B. It is possible to convert a single line path to a double line path, and vice versa, by first selecting the path, then using *Edit > Path Conversion > Convert to Double Line Path* or *Edit > Path Conversion > Convert to Single Line Path* as appropriate.

TUTORIAL 17 - Construction Points


Construction Points are very important for helping to layout a drawing. They allow the user to specify points for location. For example, construction points may divide a line/arc/curve into a number of equal parts, or a construction point may be set a fixed distance along a line, etc. Once a construction point has been created it may be located using the *Attach* tool. Thus lines may be drawn to construction points, circle centres located at them, lines cut back to them, etc. It is important to remember that construction points, although marked on screen by a small grey circle, will not appear on any output device, and so will not “spoil” a printout. (Construction Points can have their on-screen colour/size changed, or can be made invisible using the menu *Setup > Customise > Redraw Settings*). The following example illustrates a simple application.

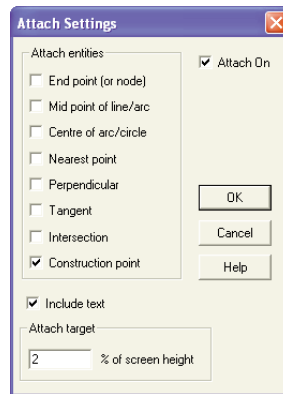


1. Start up 2D Design V2, or close any open drawings (*File > Close*). Choose the *Open* icon from the upper icon toolbar (or *File > Open*), and load the drawing “Radio.dtd” from the *Tutorials* directory. (See fig a.) For the purposes of this tutorial only, choose *Help > Restore Factory Defaults*. 
2. Choose the *Draw Construction Points which divide a given object* icon (LH toolbox, click and hold the *Const Points* icon). The following dialog box will open. 



Ensure that the *Number of divisions* is set to 10, then click *OK*.

3. At the prompt *Locate object*, move the cursor to co-ordinate position 1 approx., as shown in fig a, then click the LH mouse button. Locate again at position 2 approx. The drawing should appear as in fig b.
4. Double click with the LH mouse button (or click with the RH mouse button) on the *Attach* icon (RH toolbox). The following dialog box will open. 



Ensure that *Construction point* is ticked, and that all other *Attach entities* are not ticked, then click *OK*. Ensure that the *Attach* icon is on.

5. Choose the *Single line* icon (LH toolbox).

At the prompt *Locate start point*, move the attach cursor (now a square) over the bottom left construction point, and click the LH mouse button. At the *Locate end point* prompt, move the attach cursor over the top left construction point, and click the LH mouse button to draw a line.



6. Complete the drawing by connecting up the other construction points in a similar way, as shown in *fig c*.

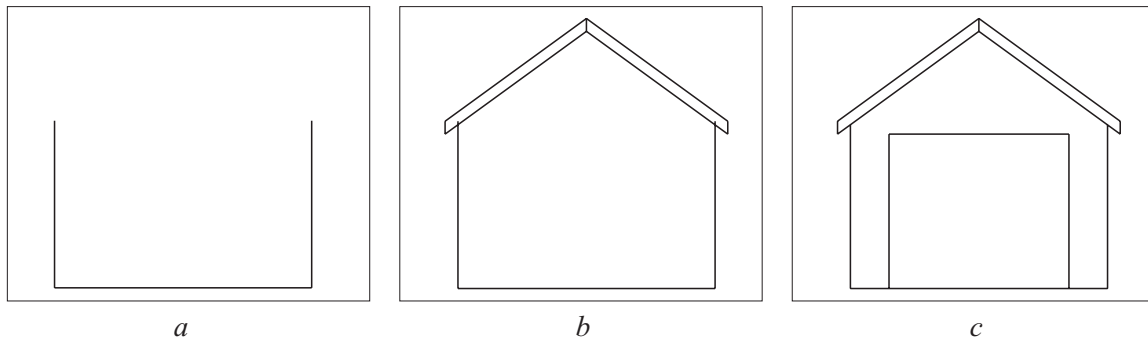
N.B. It is worth noting that apart from printing and plotting, construction points can be treated as any other drawing object, ie., they can be deleted, moved, copied, repeated, etc.

TUTORIAL 18 - Scaling and Drawing to Scale

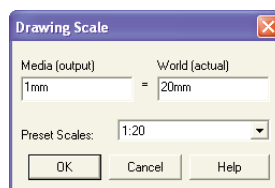
It is possible to set the paper/material size to represent very large sizes and work at full size. Thus you could effectively be drawing a full size aeroplane on a very large piece of paper. However if you did this, your printout may be tiled into hundreds, even thousands of pieces of A3 or A4 paper. Thus this practice is not recommended!

It is more normal to stick to a standard size piece of paper (normally the standard size for your printer or plotter), and to scale the drawing so as to fit onto the paper. Paper (media) sizes are set using *Setup > Drawing > Layout* (or choosing the *Layout* icon on the upper icon toolbar). The drawing scale is set using *Setup > Drawing > Scale*. The *Drawing scale* dialog box allows the *Media* (output or printed size) to *World* (actual size) ratio to be set. Thus if a scale of 1:10 is set, a line of actual length 100mm long will be printed 10mm long.

The following simple drawing of a garage should illustrate the point.



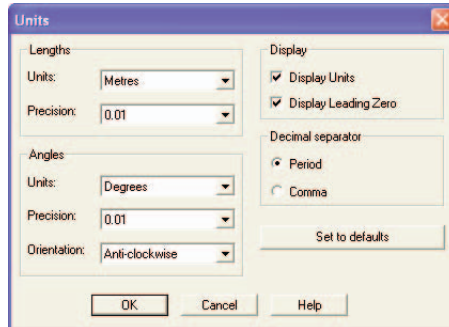
1. Start up 2D Design V2, or close any open drawings (*File > Close*). Choose the *New* icon from the upper icon toolbar (or *File > New*). For the purposes of this tutorial only, choose *Help > Restore Factory Defaults*. Ensure that *Grid* and *Grid Lock* are on (RH toolbox).
2. Choose *Setup > Drawing > Scale*. The following dialog box will open.



Choose a *Preset scale* of 1:20, then click *OK*.

It is possible to work in millimetres (the default unit), but this entails using lots of rather large numbers. It is therefore preferable to change the units to metres at this point.

3. Choose *Setup > Drawing > Units*. The following dialog box will open.



Set the *Length Units* to *metres*, then click *OK*.

4. Choose the *Connected Lines* icon (LH toolbox, click and hold on the *Lines* icon). Draw a line from *Abs* (2.2, 3.4) to (2.2, 0.8) to (6.2, 0.8) to (6.2, 3.4). (Click the RH mouse button to finish.) (See *fig a.*)
5. Draw a new line from *Abs* (2, 3.2) to (4.2, 4.8) to (4.2, 5) to (2, 3.4) and back to (2, 3.2). Draw a new line from *Abs* (4.2, 4.8) to (6.4, 3.2) to (6.4, 3.4) to (4.2, 5). (See *fig b.*)
6. Draw a new line from *Abs* (2.8, 0.8) to (2.8, 3.2) to (5.6, 3.2) to (5.6, 0.8). (See *fig c.*)
7. Choose the *Delete Part* icon (LH toolbox, click and hold on the *Delete* icon). Finish the drawing by deleting the part lines where the walls intrude into the roof.

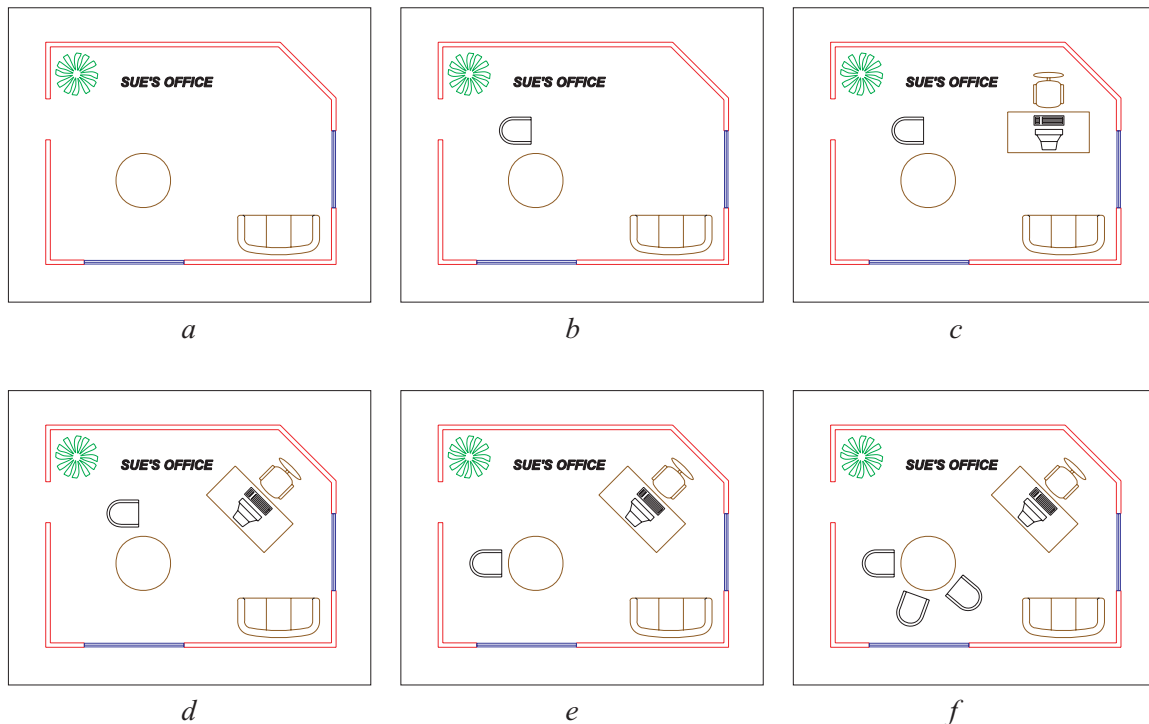






You might like to save this drawing and come back to it later after working through **Tutorial 20 - Dimensioning**. You can then add some dimensions and see how the scaling affects the dimension sizes.







TUTORIAL 19 - Grouping and Adding

Often groups of objects are more conveniently treated as one object. As in the example below, it is much easier to treat a chair as one object, rather than as a lot of individual lines. A group is formed by selecting the required objects, then “grouping” them. A group can be treated as a single object, selected, copied, deleted, etc. It is also possible for a group to contain sub-groups.

When loading a drawing using *File > Open*, a new drawing window is opened and various setup parameters, eg., paper size, units, etc., are restored. You may, however, wish to incorporate a pre-drawn (library) item into your existing drawing. This is done using the *File > Add* option. (*File > Add* is also useful for loading a file without affecting the current setup parameters.)



1. Start up 2D Design V2, or close any open drawings (*File > Close*). Choose the *Open* icon from the upper icon toolbar (or *File > Open*), and load the drawing “Office.tdd” from the *Tutorials* directory. (See fig a.) 
2. Choose the *Semicircular arc, locating end points* icon (LH toolbox, click and hold on the *Arcs* icon). Ensure that *Grid Lock* (RH toolbox) is on. At the prompt, first locate at *Abs* (2.60, 3.80) then at (2.60, 3.20) to fix a semicircle. (N.B. The drawing scale is 1:20 and units have been set to metres.) 
3. Choose the *Connected Lines* icon (LH toolbox, click and hold on the *Lines* icon). Draw a line from *Abs* (2.60, 3.80) to (3.00, 3.80) to (3.00, 3.20) to (2.60, 3.20), to form the outline of a chair. Turn on *Step Lock* (RH toolbox). 
4. Choose the *Contour parallel to a line, arc/circle or curve* icon (LH toolbox, click and hold on the *Contour* icon). In the *Contour Settings* dialog box, ensure that the *Contour spacing* is set to 0.06m, then click *OK*. At the prompt, locate at *Abs* (2.75, 3.75) approx., (2.35, 3.50) approx., then (2.75, 3.25) approx. This completes the chair (see fig b.) 

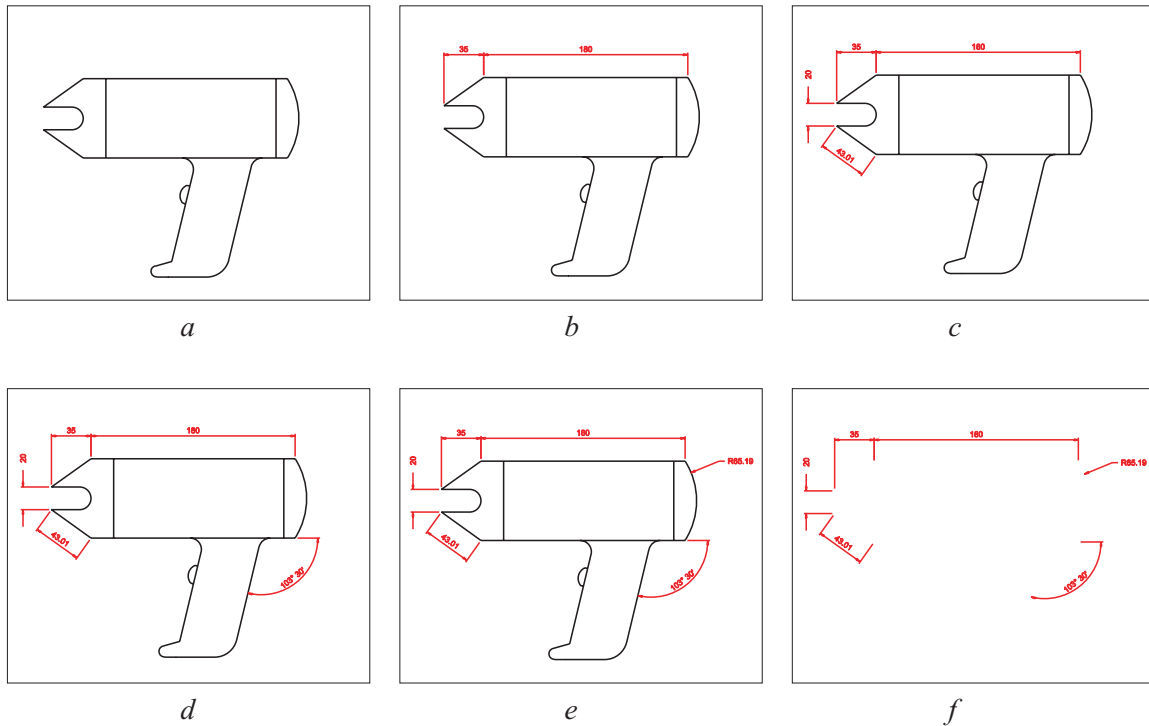
5. Choose the *Select* icon (LH toolbox).
Drag a select box from *Abs* (2.20, 3.00) approx., to (3.20, 4.00) approx., to select the whole chair. 
6. Choose the *Group* icon from the upper icon toolbar (or *Edit > Group*, or press *CTRL + G* on the keyboard. In future the whole chair can be selected by clicking near any of its component parts. 
7. Choose the *Add* icon from the upper icon toolbar (or *File > Add*) and load the drawing "Desk.dtd" from the *Tutorials* directory. A desk and chair set will be "added" to the drawing. (See *fig c.*) Note that the added drawing is automatically selected. 
8. Choose the *Radial Lock* icon (RH toolbox). Click on the rotate handle of the marquee box (the small yellow circle on the RH side of the box), with the LH mouse button. Rotate the desk until it matches the orientation in *fig d*, then click the LH mouse button again. Note that with *Radial Lock* on, rotation is constrained to 45 degree increments. Turn *Radial Lock* off. 
9. Choose the *Select* icon (LH toolbox). Ensure that *Step Lock* (RH toolbox) is off.
At the prompt *Select object(s)/transform/edit*, position the cursor near any part of the chair and click the LH mouse button. Click on the centre handle of the marquee box with the LH mouse button. Turn *Grid Lock* on. At the reposition prompt, locate at (2.00, 2.40). (See *fig e.*) 
10. Choose the *Rotate* icon (LH toolbox, click and hold on the *Transform* icon).
In the *Rotate Settings* dialog box, ensure that *Repeat/Replace* is set to *Repeat*, *No. repeats* is set to 2 and *Angle of rotation* is set to 70 degrees, then *OK*. Turn off *Grid Lock* (RH toolbox). Double click with the LH mouse button (or single click with the RH mouse button) on the *Attach* icon (RH toolbox) to open the *Attach Settings* dialog box. Ensure that *Centre of arc/circle* is ticked, then click *OK*. Ensure that *Attach* is on, then at the prompt *Locate the centre of rotation*, position the attach cursor over the circle (so that the circle cuts the attach target), and click the LH mouse button to locate. The drawing should now appear as in *fig f*. 

TUTORIAL 20 - Dimensioning and layers

2D Design V2 has a range of dimensioning functions sufficient to meet most needs. For some dimensions, it is important that exact points are located, eg, ends of lines. In these cases the *Attach* tool should be used to ensure accurate location. For other dimensions, a rough location is all that is required, eg., locating a circle to dimension its radius.

Layers are a useful way of keeping discrete parts of a drawing separated. In concept, layers can loosely be imagined as transparent drawing sheets, each with its own part of the drawing, and which can be placed over each other, or removed. A typical use for layers is to put dimensioning on a separate layer, so that if further work is needed on the drawing, the dimensioning layer may be turned off to remove the “clutter” of the dimensioning. In a similar way, if an object is to be cut, machined, or engraved, the dimensioning/notes/border, etc., may be “turned off” first.

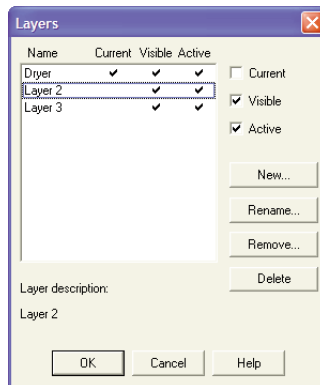
The following example illustrates the use of dimensions, and of putting dimensions onto a separate layer. (Whilst dimensioning does not have to go on a separate layer, it may often be useful to do so.)



1. Start up 2D Design V2, or close any open drawings (*File > Close*). Choose the *Open* icon from the upper icon toolbar (or *File > Open*), and load the drawing “Dryer.dtd” from the *Tutorials* directory. (See fig a.) For the purposes of this tutorial only, choose *Help > Restore Factory Defaults*.



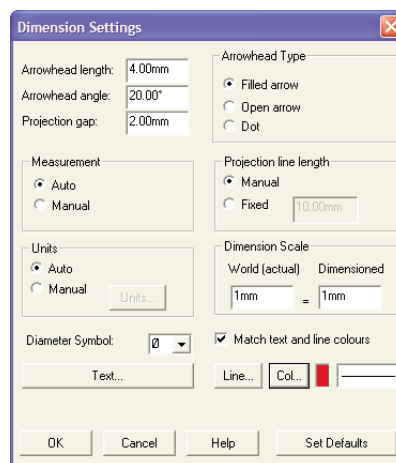
- Click on the *Layer* button on the attributes bar at the top of the screen. The following dialog box will open.



Note that the current layer is called “Dryer” and is active. Click on the line “Layer 2”, then click on the *Current* tick box to set this layer current. Choose the *Rename* button, and rename the layer “Dimensions”. Click *OK* to close both dialog boxes. Any new drawing will now be on the second layer called “Dimensions”.






N.B. Only one layer can be current. All layers not current can be made invisible, and/or inactive. All new drawing will take place on the current layer. Objects on layers which are not visible will not be drawn. Objects on inactive layers cannot be selected, whether visible or not. There is no practical limit to the number of layers possible.

- Double click with the LH mouse button (or click with the RH mouse button on the current *Dim Lines* icon (any dimension icon will do, parallel is the default). The following dialog box will open.



Ensure that *Match text and line colours* is ticked, then click on the *Line Col* button and select the *Custom Color Red*. Click *OK* to close the dialog boxes.

- Ensure that *Attach* (RH toolbox) is on and *Grid Lock* (RH toolbox) is off.

5. Choose the *Horizontal Dimension* icon (LH toolbox, click and hold on the *Dim Lines* icon). Position the attach cursor at position *Abs* (120, 230) approx., and click the mouse button to locate. Position the attach cursor at position *Abs* (300, 230) approx., and click the mouse button to locate. Turn on *Grid Lock*. Position the cursor at position *Abs* (200, 250), and click the mouse button to locate. The first dimension should now be drawn. Turn off *Grid Lock*. Position the attach cursor at position *Abs* (120, 230) approx., and click the mouse button to locate. Position the attach cursor at position *Abs* (85, 205) approx., and click the mouse button to locate. Turn on *Grid Lock*. Position the cursor at position *Abs* (100, 250), and click the mouse button to locate. The second dimension should now be drawn. (See *fig b.*) Turn off *Grid Lock*. 
6. Choose the *Parallel Dimension* icon (LH toolbox, click and hold on the *Dim Lines* icon). Position the attach cursor at position *Abs* (85, 185) approx., and click the mouse button to locate. Position the attach cursor at position *Abs* (120, 160) approx., and click the mouse button to locate. Turn on *Step Lock*. Position the cursor at position *Abs* (90, 155), and click the mouse button to locate. 
7. Choose the *Vertical Dimension* icon (LH toolbox, click and hold on the *Dim Lines* icon). Position the attach cursor at position *Abs* (85, 185) approx., and click the mouse button to locate. Position the attach cursor at position *Abs* (85, 205) approx., and click the mouse button to locate. Turn on *Grid Lock*. Position the cursor at position *Abs* (60, 220), and click the mouse button to locate. (See *fig c.*) Turn off *Grid Lock* and *Attach*. 
8. Choose the *Angular Dimension* icon (LH toolbox, click and hold on the *Dim Lines* icon). Position the cursor at position *Abs* (290, 155) approx., and click the mouse button to locate. Position the cursor at position *Abs* (260, 110) approx., and click the mouse button to locate. Position the cursor at position *Abs* (300, 120) approx., and click the mouse button to locate. (See *fig d.*) 
9. Choose the *Radius Dimension* icon (LH toolbox, click and hold on the *Dim Lines* icon). Position the cursor at position *Abs* (305, 220) approx., and click the mouse button to locate. Position the cursor at position *Abs* (330, 230) approx., and click the mouse button to locate. (See *fig e.*) 
10. Click on the *Layer* button on the attributes bar at the top of the screen. In the dialog box select the layer “dryer” and untick both *Visible* and *Active*. When the dialog box is closed, the main drawing will disappear, leaving only the dimensions. (See *fig f.*) You might try the same thing again, but making only the dryer visible.

You may now like to start again and try out the other dimensioning options available. You might also like to try the effects of changing some of the *Dimension Settings*.

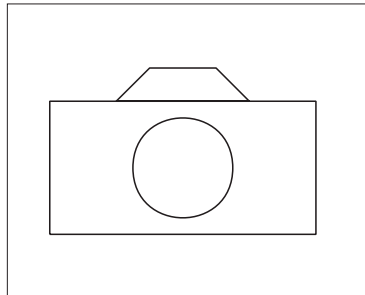
If a dimension is selected, then *Start Edit* chosen, it is possible to reposition the dimension control points. If *Property* is chosen, the *Dimension Settings* dialog box appears allowing changes to the dimension variables, or say the text content, just on the highlighted dimension. The ability to alter text content is very useful if non-standard dimensioning is to be used.



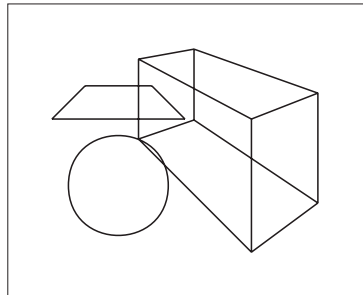
N.B. Whilst every attempt has been made to comply with accepted standards on dimensioning, drawings dimensioned manually must always rely on human interpretation of the “rules”. It may therefore, occasionally be necessary to modify computer generated dimensioning to suit individual requirements.

TUTORIAL 21 - 3D Effects and Exploding

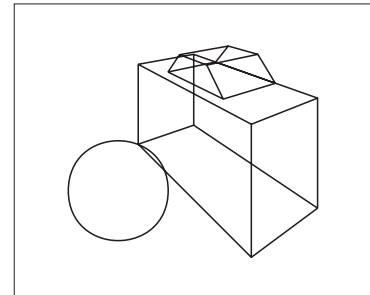
As its name implies, 2D Design V2 works with 2D drawing data. However it does have a range of *3D Effects* which make 2D drawings look 3D. The *3D Effects* functions operate in a similar way to the general transformation functions. First you must select the objects to be transformed using the *Select* option. Then choose the appropriate 3D effects option. The following two examples illustrate their use.



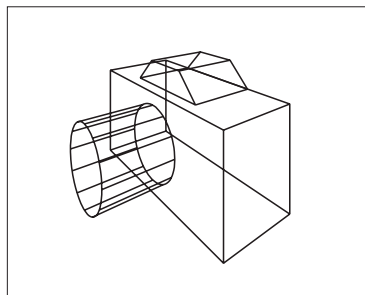
a



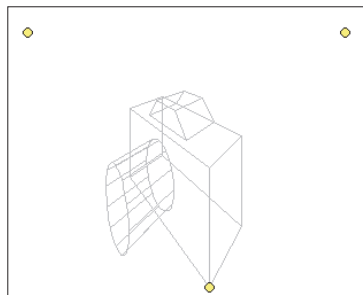
b



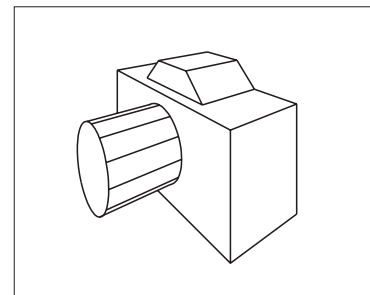
c









d







e






f




1. Start up 2D Design V2, or close any open drawings (*File > Close*). Choose the *New* icon from the upper icon toolbar (or *File > New*). For the purposes of this tutorial only, choose *Help > Restore Factory Defaults*. 
2. Choose the *Horizontal Rectangle* icon (LH toolbox) and turn on *Grid Lock* (RH toolbox). Draw a rectangle with corners at *Abs* (20, 20) and (180, 100). 
3. Choose the *Circle with a given centre and radius* icon (LH toolbox, click and hold on the *Circles* icon). Set the circle radius to 30mm, then click *OK* to close the dialog box. Locate the centre at coordinates *Abs* (100, 60). 
4. Choose the *Closed polyline* icon (LH toolbox, click and hold on the *Path* icon). Draw a trapezium with corners at *Abs* (60, 100), (80, 120), (120, 120) and (140, 100). (Click the RH mouse button to finish). (See *fig a*.) 
5. Choose the *Select* icon (LH toolbox). Select the rectangle by clicking next to it. 
6. Choose the *Perspective with double vanishing points* icon (LH toolbox, click and hold on the *3D Effects* icon). Set the *Finish depth* to 60, then click *OK* to close the dialog box. Locate the first vanishing point at *Abs* (10, 190), the second vanishing point at *Abs* (410, 190) and the reference point at *Abs* (180, 20). You should now have a 3D view of the rectangle. (See *fig b*.) 

7. Choose the *Select* icon (LH toolbox).
Select the trapezium so that it is highlighted. 
8. Choose the *Perspective with double vanishing points* icon (LH toolbox).
Set the *Start depth* to 10, the *Finish depth* to 60, and ensure that the option *Use last reference points* is ticked. When you *OK* on this dialog the trapezium will immediately be transformed to 3D. (See *fig c.*) 
9. Choose the *Select* icon (LH toolbox).
Select the circle so that it is highlighted. 
10. Choose the *Perspective with double vanishing points* icon (LH toolbox).
Set the *Start depth* to 0, the *Finish depth* to -50, and ensure that the option *Use last reference points* is ticked. When you click *OK* on this dialog box your basic 3D transformation will be complete. (See *fig d.*) 

The three objects have each been transformed into a “3D object”. As with all objects they can now be selected and edited, in this case by moving the control points to alter the perspective. As there are three objects they should all be selected together to ensure that they keep the same control points. The easiest way to do this is to “group” them before editing. (Grouping was dealt with in more detail in **Tutorial 19.**)

11. Choose the *Select All* icon from the upper icon toolbar (or *Edit > Select > All*, or press *CTRL + A* on the keyboard). The whole drawing should now be highlighted. 
12. Choose the *Group* icon from the upper icon toolbar (or *Edit > Group*, or press *CTRL + G* on the keyboard). 
13. With the whole drawing selected you will notice the *Property/Start Edit* toolbox in the bottom RH corner of the screen. Choose *Start Edit*. Three yellow control handles will be shown. Click on any of these and move them about to see the effect on the image. (See *fig e.*) 

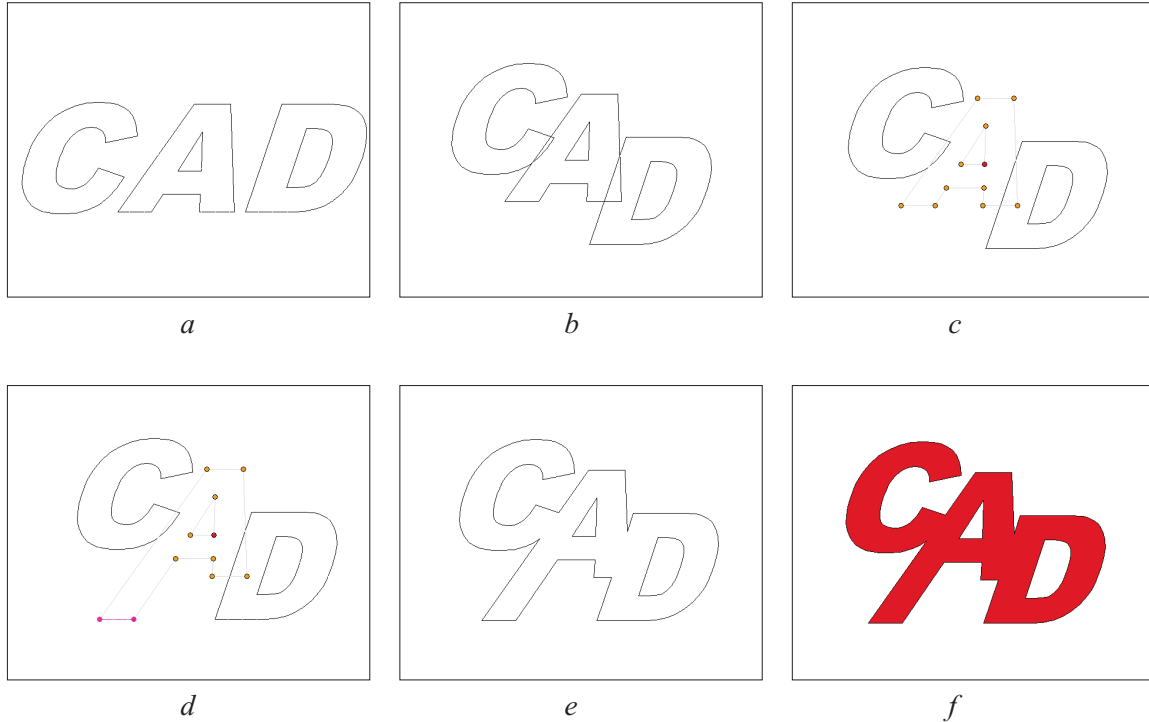
You may wish to delete the “hidden lines”. As 2D Design V2 is not a 3D package, there is no automatic facility for this. However, for simple drawings it can be achieved fairly easily by using the *Delete Any* and *Delete Part* functions. Before this can be done, however, each “3D object” must lose its “3D properties” and be *Exploded* into the individual lines/arcs/curves that it is made up from. The procedure is as follows.



14. As your drawing may by now be a bit of a mess, select *End Edit*, and close the drawing (*File > Close*). Choose the *Open* icon from the upper icon toolbar (or *File > Open*) and load the drawing “Camera.dtd” from the *Tutorials* directory. (This is the drawing as it was at the end of step 10.) 
15. Choose the *Select All* icon from the upper icon toolbar (or *Edit > Select > All*, or press *CTRL + A* on the keyboard). The whole drawing should now be highlighted. 
16. Choose the *Explode* icon from the upper icon toolbar (or *Edit > Explode*, or press *CTRL + E* on the keyboard). In the *Explode Settings* dialog box, set the option *Explode fully to simple objects*, then click *Continue*. The drawing should not look any different, but you will now be able to use *Delete Any* and *Delete Part* to remove unwanted lines. (See *fig f.*) 

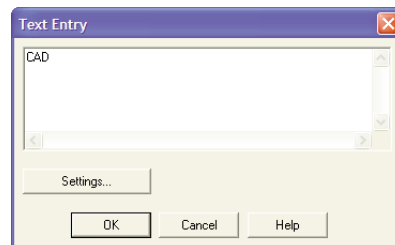
N.B. When exploding there is a choice between *Explode one level only* and *Explode fully to simple objects*. Within a drawing there may be groups, paths, 3D objects, etc., in almost any combination, eg., you might have paths within 3D objects within groups, etc. *Explode one level only* just explodes one level of grouping, paths, “3D objects”, etc., at a time. In the above example, the objects to be exploded were “3D objects”. If we had used *Explode one level only*, each “3D object” would have been exploded into lines and paths (the paths being the rectangle and the trapezium parts). If we had tried to use *Delete Any* on a line that was still part of an unexploded path, eg., the hidden lower back line, the whole path would have been deleted. In other circumstances this might be very useful, but in this case it was better to use *Explode fully to simple objects* so that all paths were fully exploded into their component parts.

TUTORIAL 22 - Exploding and Making Paths

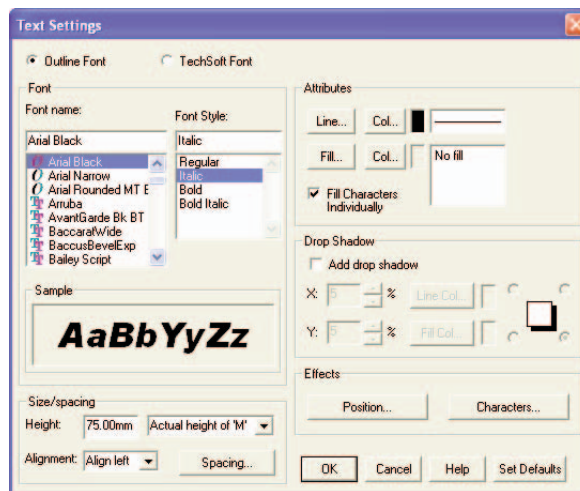
Many objects (text, double line paths, filled shapes, etc.) are actually a collection of smaller objects (lines, arcs, etc.). In fact sometimes the smaller objects are themselves collections of even smaller objects, eg., a dashed line is actually a collection of short lines. Sometimes it is useful to “break” these objects down into their component parts so that the individual parts may be edited.



1. Start up 2D Design V2, or close any open drawings (*File > Close*). Choose the *New* icon from the upper icon toolbar (or *File > New*). For the purposes of this tutorial only, choose *Help > Restore Factory Defaults*. 
2. Choose the *Linear text* icon (LH toolbox). Ensure that *Grid Lock* is on (RH toolbox). At the prompt *Locate start position for text*, locate at position *Abs* (110, 150), then click the LH mouse button. The following dialog box will open. 



Type in **CAD** then click the *Settings* button. The following dialog box will open.

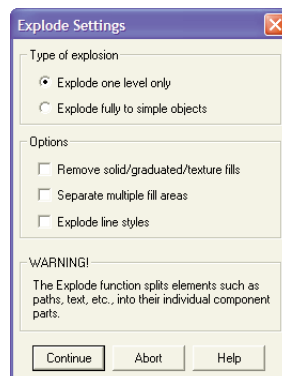


Ensure that the *Font* is set to *Arial Black*, *Font Style* to *Italic*, *Height* to *75* and *Fill...* to *No Fill*. Click *OK* on both dialog boxes. Your text should appear as in *fig a*.

- Choose the *Select* icon (LH toolbox) and select the text by clicking on it.



- Choose the *Explode* icon from the upper icon toolbar (or press CTRL + E on the keyboard). The following dialog box will open.




Ensure that *Explode one level only* is ticked, then click *Continue*.



- Select the letter **A** by clicking on it.

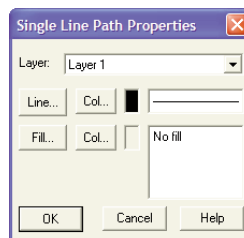
You will notice that only the individual letter is now selected, not the whole word, as the explosion process has removed the text properties and has simplified the data by one level. If the *Explode fully to simple objects* option had been chosen it would be possible to select each line that makes up the letter. (This can still be achieved by selecting the letter and exploding it again.)

- Click on the centre handle of the select box and drag the **A** to a position *Rel* (-30, -20), then click to fix the position.
- Select the letter **D**, drag it to a position *Rel* (-60, -50), then click to fix the position. Your drawing should appear as in *fig b*.

8. Select the letter **A** again. Click on the *Start Edit* button on the *Property/Start Edit* toolbox open in the bottom RH corner of the screen. Drag a select box around the two nodes at the bottom LH leg of the **A** (see *fig. c*). Click the *Grid Lock* icon (RH toolbox) to turn off grid lock.
9. Click on the left-most selected node with the RH mouse button. Drag the leg of the **A** down until it is level with the bottom of the **D** (see *fig. d*). Click again, then click off the drawing to de-select.
10. Choose the *Delete Part* icon (LH toolbox, click and hold on the *Delete* icon). Delete all the lines in the overlapping areas (be sure to get even the small lines). The drawing should now appear as in *fig e*. 

Having created a new shape it would be useful to combine the parts together so that they may be treated as one path so that they could, for example, be filled (as long as it is a closed path). This is different to just grouping the objects as was done in **Tutorial 19**. In grouping, all the objects remain completely unchanged, but when making a path the objects may be re-ordered, or have their direction changed, in order to form a continuous path where possible.

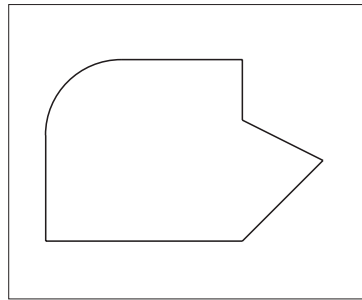
11. Choose the *Select All* icon from the upper icon toolbar (or *Edit > Select > All*, or press *CTRL + A* on the keyboard). The whole drawing will be selected. 
12. Choose the *Make Path* icon from the upper icon toolbar (or *Edit > Make Path*, or press *CTRL + H* on the keyboard). At the warning prompt click *Yes* to continue. 
13. With the object still selected, click on the *Property* button on the *Property/Start Edit* toolbox open in the bottom RH corner of the screen. The following dialog box will open.






You will see that the object is now a single line path. Click on the *Fill* button and in the *Fill Settings* dialog box set the fill to be *Solid* and the colour to be *Custom color* Red. Click *OK* to close all dialog boxes. Click off to de-select. The drawing should now appear as in *fig f*.

TUTORIAL 23 - Coordinate Data Entry

Some users occasionally wish to enter drawing data by typing in coordinates (although this is not the recommended method for general drawing, as it can be tedious!). At any time when the user is prompted to locate a point (drawing a line, selecting an object, defining a zoom box, etc.), it is possible to either type in coordinates or use the mouse. Values may be input in *Absolute* coordinates (measured from the drawing origin), *Relative* coordinates (measured from the last point located), or *Polar* coordinates (the distance and angle from the last point located). This tutorial deals with data input in this manner by creating the drawing below using only coordinate input. It also shows how individual entities may have their coordinates (and other properties) altered retrospectively.



a

1. Start up 2D Design V2, or close any open drawings. Choose the *New* icon from the upper icon toolbar (or *File > New*). For the purposes of this tutorial only, choose *Help > Restore Factory Defaults*. 
2. Choose the *Connected Lines* icon (LH toolbox, click and hold on the *Lines* icon). At the prompt *Locate start point*, move the cursor over the left hand coordinate entry box (at the top of the screen next to the *Abs* button) and click the LH mouse button. A text entry cursor will appear in the box. Type *120*, then press *TAB* (usually above *Caps Lock*) on the keyboard to move the cursor to the right coordinate entry box. Type *90*, then press *Enter* on the keyboard (or click on the *OK* button with the mouse). The drawing cursor should move to the bottom LH corner of the shape, ie., the absolute coordinates (120, 90). 
3. With the mouse, click on the coordinate type button currently reading *Abs*, to change it to *Rel*. (If you keep clicking on it, it will cycle around between *Abs*, *Rel*, and *Pol*). Now type in the coordinates (130, *Tab*, 0, *Enter*). The base line will be drawn horizontal, 130mm length.
4. Change the coordinate type button to *Pol* by clicking on the button with the mouse, or by pressing *ALT+P* on the keyboard. Type in the coordinates (75.42, *Tab*, 45, *Enter*). A line 75.42mm in length will be drawn at an angle of 45 deg.
5. Change the coordinate type button to *Abs* by clicking on the button with the mouse, or by pressing *ALT+A* on the keyboard. Type in the coordinates (250, *Tab*, 170, *Enter*). Change the coordinate type button to *Rel* by clicking on the button with the mouse, or by typing *ALT+R*. Type in the coordinates (0, *Tab*, 40, *Enter*), then (-80, *Tab*, 0, *Enter*). Three more lines will be drawn.
6. Choose the *Arc through two points, locating centre* icon (LH toolbox, click and hold on the *Arcs* icon). At the prompt *Locate first point*, type in the coordinates (0, *Tab*, 0, *Enter*). At the prompt *Locate second point*, type in the coordinates (-50, *Tab*, -50, *Enter*). At the prompt *Locate centre*, type in the coordinates (50, *Tab*, 0, *Enter*). 

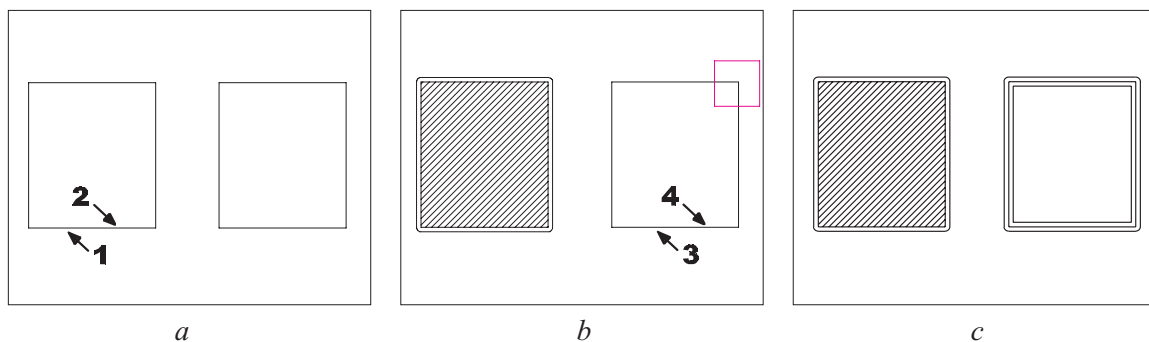
7. Choose the *Single Lines* icon (LH toolbox, click and hold on the *Lines* icon).
Type in the coordinates (0, *Tab*, 0, *Enter*), then (0, *Tab*, -70, *Enter*) to finish the drawing.
(See *fig a.*)







As you will have seen, entering a lot of data this way can be slow and requires great care. However, it can be very useful occasionally when a particular set of coordinates, or a certain dimension is required, eg., a line of length 76.48mm, starting at coordinates (53.76, 73.98), at an angle of 123.67deg.


TUTORIAL 24 - Closing Boundaries (for Boundary Fill and Contour)

The boundary fill and contour drawing routines rely on shapes having a closed boundary. In each case, once a shape has been located, the software proceeds to “trace” around the edge. This only works properly if the “tracing” routine finds a continuous boundary with no gaps or dead ends. If a gap or dead end is found, an “incorrect” contour may be drawn if using the contour routine, or if using the boundary fill routine, an “incorrect” boundary may be found, or an error message may confirm that the shape is *Not a closed boundary*. In certain circumstances the boundary finding routine may appear to go on forever (as it loops around an open shape), in which case pressing *Esc* will abort the routine. It may be obvious where the problem is, but sometimes, gaps may be too small to see, even on a maximum zoom. (Remember that the system is normally working to an internal resolution of 0.0000001mm.) Gaps usually occur where the drawing has not been fixed to a *Grid* or *Step Lock*, or the *Attach* tool has not been used. Below is an example of such a problem and how it may be overcome.



1. Start up 2D Design V2, or close any open drawings (*File > Close*). Choose the *Open* icon from the upper icon toolbar (or *File > Open*), and load the drawing “Boundary.dtd” from the *Tutorials* directory. (See fig a.) For the purposes of this tutorial only, choose *Help > Restore Factory Defaults*. 
2. Choose the *Contour* icon (LH toolbox). Click *OK* on the *Contour Settings* dialog box. At the locate prompt, move the cursor to position 1 approx., as shown in fig a, then click the LH mouse button. A contour should be drawn around the LH rectangle. 
3. Choose the *Boundary Fill* icon (LH toolbox). The *Boundary Fill Settings* dialog box will open. Click on the *Fill* button to open the *Fill Settings* dialog box. Select *Hatch* then click *OK* to close all dialog boxes. At the locate prompt, move the cursor to position 2 approx., as shown in fig a, then click the LH mouse button. To the question *Any islands?* answer *No*. The LH rectangle will now be hatched. (See fig b.) 
4. Choose the *Contour* icon again (LH toolbox). This time locate at position 3 approx., as shown in fig b. A contour will be drawn inside **and** outside of the rectangle (see fig c). 

This contour is “incorrect”. It has happened because somewhere there is a gap in the border and the boundary finding routine has turned back on itself, causing the contour to “leak” inside the rectangle.

5. Choose the *Delete Last* icon (RH toolbox) to delete the contour. 

6. Choose the *Boundary Fill* icon (LH toolbox). Click *OK* on the *Boundary Fill Settings* dialog box. Locate at position 4 approx., as shown in *fig b*. This time a message *Not a closed boundary* will be displayed. Note which lines are now coloured in pink (move the message box out of the way if necessary), then click *OK*.



What has happened is that the boundary finding routine has “traced” around the inside of the shape, but has stopped at the gap at one of the corners. It is now necessary to find the gap and close it. When locating on the inside of a boundary, the located section will not turn pink at first, but all subsequent sections will turn pink as they are found. The routine will turn clockwise at all junctions until the located section is found again, when it will also turn pink, completing the boundary. If at any intersection a turn cannot be made, the boundary is incomplete. In the example, the path is left along the bottom, up along the LH edge, right along the top, **stopping** at the top RH corner. Therefore that is where the gap is.

7. Choose the *Zoom in* icon (LH toolbox). Turn the *Grid Lock* (RH toolbox) on. Locate the zoom box as shown in *fig b*. You should now clearly see the gap.



8. Choose the *Zoom Last* icon (RH toolbox).



9. Choose the *Select* icon (LH toolbox).
Select the RH line by locating at coordinates *Abs* (390, 160) approx.



10. From the *Property/Start Edit* toolbox (now showing in the bottom RH corner of the screen) choose *Start Edit*. The lines node points will be displayed.

11. Turn *Attach* on and *Grid Lock* off (RH toolbox).

12. Position the cursor over the top (green) node and click the LH mouse button. Ensure that the attach cursor is over the end of the RH end of the top line and click the LH mouse button again. Finally, move the cursor well away from the drawing and click the LH mouse button twice to de-select the line.


The gap should now be closed. You may like to re-try steps 4 and 6 to double check.

All boundary finding problems can be dealt with in a similar way - first find the gap, then close it. As you have seen, the “pinking in” of boundary lines whilst finding a fill boundary, can be a useful aid to finding a gap. If using the *Contour* routine, and an “incorrect” contour occurs, consider using the *Boundary Fill* routine to help find the gap. Although the position of the gap is fairly obvious in the example given above, more complicated shapes may require more detective work.

There are many ways to close gaps or eliminate dead ends, far too many to list. For example, using the editing mode, node points could be repositioned using *Grid Lock* or *Attach* to ensure accuracy, as we have just seen, or lines/arcs could be extended (click the RH mouse button on a node) to ensure that they fully overlap. Any overlaps can be eliminated using *Delete Part*.

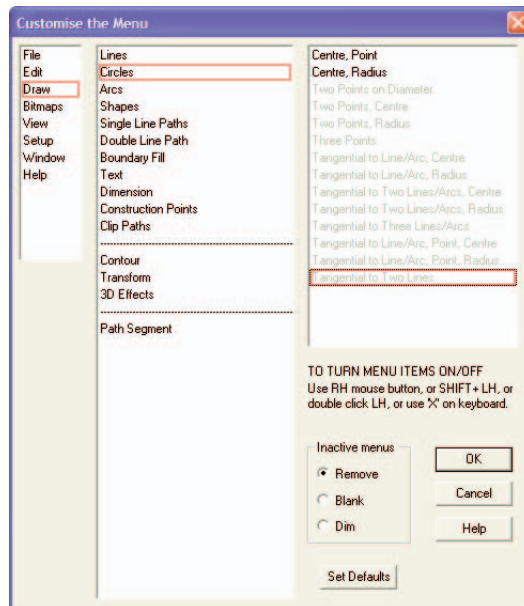
TUTORIAL 25 - Setups and Customising the Software

During the course of this tutorial you will see how easy it is to reconfigure the user interface to suit individual requirements or preferences.

1. Start up 2D Design V2, or close any open drawings (*File > Close*). Choose the *New* icon from the upper icon toolbar (or *File > New*). For the purposes of this tutorial only, choose *Help > Restore Factory Defaults*. 
2. Choose *Setup > Load Setup*. Load the setup file “Year7.cfg” from the *Setups* directory. The screen display will change to a much simplified version with larger text, and many menu items removed.
3. To return to the original setup, load the setup file “Standard.cfg” from the *Setups* directory, or choose *Help > Restore Factory Defaults*.

The process of creating and saving a user defined setup is very straightforward, as will be demonstrated by the following example.

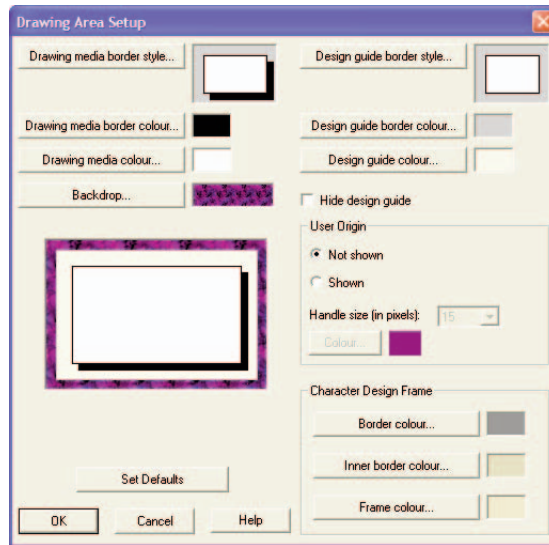
4. Click and hold on the *Circles* icon on the LH toolbox to inspect the *Circles* toolbar. Note that there are many circle drawing option icons.
5. Choose *Setup > Customise > Menu*. The following dialog box will open.




Select *Draw* in the first column, then *Circles* in the second column. Click on the third circle option, *Two Points on Diameter*, with the RH mouse button. The option will turn grey (inactive). Now grey out the rest of the circle options in the column (apart from the first two) by holding down the RH mouse button and “running down” the column. (To turn options back on again, re-click on them with the RH mouse button.) Finally click *OK* to close the dialog box.

6. Inspect the *Circles* toolbar again. Note that there are now only two options. Thus we have customised the *Circles* menu. All menu options in the software, not just the drawing options, can be “turned off” in a similar way.

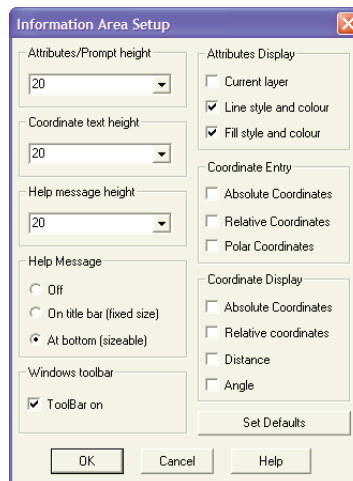
7. Choose *Setup > Customise > Drawing Area*. The following dialog box will open.



Click on the *Backdrop* button to open the *Fill Settings* dialog box. Click on the *Load Fill* button and load the fill “spaced out” from the *Fills* directory, then click *OK* to close all dialog boxes. The drawing background fill will change accordingly. (It can be useful to have a different background fill or colour for each setup, especially in education, so that it is easy to recognise the setup at a glance.)

8. Choose *Setup > Drawing > Layout*. (This is the same as choosing the *Layout* icon from  the upper icon toolbar). Set to *Standard size ISO A3*, and select *Portrait*. Click *OK* to close the dialog box. Note that the drawing area is now *Portrait*.

9. Choose *Setup > Customise > Information Area*. The following dialog box will open.



Set all the text heights to 20, deselect all the *Coordinate Entry* options, all the *Coordinate Display* options, and the *Attributes Display* option *Current Layer*. Click *OK*. Note the effect on the screen layout.

In a similar way, it is possible to change all the settings under the *Setup > Customise* sub-menus, eg., to make the toolbox icons larger, use *Setup > Customise > Toolbox*. It is also possible to change the scale, current units, etc., using the *Setup > Drawing* options, and the *Tools* and *Output route*, etc., for the various plotting devices using *Setup > CNC Devices*.

10. Choose *Setup > Save Setup*. In the *Save Setup Options* dialog box leave the *Include > Save Setup option in saved setup* option set, and click *OK*. (If this option is **not** ticked, the *Save setup* option will **not** be included when the setup is loaded later. Thus it will be difficult to overwrite this setup from itself. This may be of particular interest to educational users.) Give the setup a name of “Temp”, then click on *Save* to save it.

Whenever this setup “Temp” is loaded using *Setup > Load Setup*, all the values set in the *Setup* menu will be restored.

When a drawing is saved, all the settings available under *Setup > Drawing* (and the current CNC device settings if *Set for CNC device* is chosen in *Setup > Drawing > Layout*), together with all the current settings such as circle radius, text height, etc., are saved with the drawing. When the drawing is loaded normally using *File > Open*, all the settings saved with the drawing are restored. If you wish to load a drawing without changing the current settings, use *File > Add*.

The logo for TechSoft, featuring the word "TECHSOFT" in a stylized, blue, blocky font with a slight 3D effect and a blue outline.

TechSoft UK Limited
Falcon House
Royal Welch Avenue
Bodelwyddan
Denbighshire
LL18 5TQ

Tel : 01745 535007
Fax : 01745 535008
Web site : www.techsoftuk.co.uk
Email : email@techsoftuk.co.uk