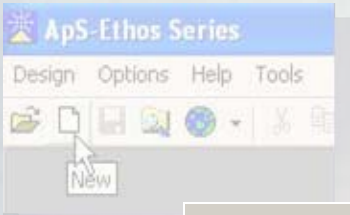

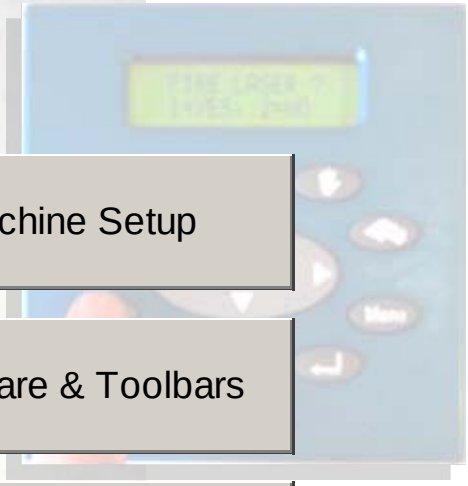

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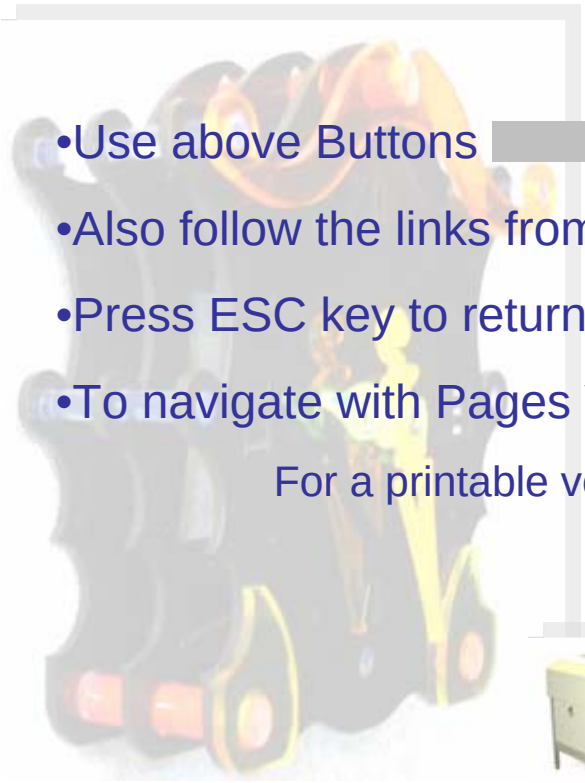

- Use above Buttons to navigate this document,
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Table of Contents

Introduction

Aim of this Manual

This manual is written for and on behalf of CAD CAM Technology Ltd.
It is written to assist the teacher and student alike.
The aim is not only to train the teacher, but also equip the class with ready to make curriculum-based projects.
Whilst getting to know the laser cutting machine, the teacher can get started right away and present the material.
The manual is written in very plain, easy-to-understand English, so the student and the teacher can easily read and comprehend it.
The projects are designed to be easily manufactured, using very little material
All the exmplar projects have a personal component, e.g. a name etched, or an individual design possibility.
It is left to the teacher's discretion to use more or less material, or even to add an extra degree of complexity to the project.

Project 1 – Design a key Fob

This is a quick tutorial to understand the basics of the APS Ethos software. Great introductory exercise to get to know the tools and add a little personal element to it.
It uses very little material and is a good way to start designing.

Project 2 – engrave on Denim – on request

This unique project uses the properties dialog and introduces the students to raster engraving, using the Properties dialog box and setting up levels of grey. This is very popular with clubs, because you can engrave almost any image onto denim with impressive results.

Project 3 – Develop a Case for a USB memory stick – advanced users

This is an exercise in scaling and designing around the electronics PCB. Great exercise!

Project 4 – Turn a Tattoo image into a vinyl sticker

This is an activity that shows how outlines of an imported image can be transformed into a vector using the Edge Detect tool. From there it can be manipulated into beautiful designs that can be transferred onto anything engraveable.

Project 5- The Personalised CD

This project is an excellent way to make use of APS Ethos to create a design that not only requires some creativity, but also leaves room for the student to store his coursework. It makes use of the program features such as the polar grid, circular text and manipulation of text. The CD and the case can be engraved on the laser cutting machine. The CD is engraved by using a low powered beam to etch around the outer rim of the disk, leaving lots of space for recording data on the inside.

- Sample files provided

Note from the Author

Personally, I have had lots of fun getting to know this locally build Laser CNC. I am a teacher, enthusiastic most of the time, working on a variety of CNC machines, but I have learned this machine a lot faster than I would have any other machine.
Why?
Laser cutting is just so quick and versatile and a lot simpler to set up in comparison to other methods of CNC.
The custom software is brilliantly composed and is simple to use, yet intricate enough to design to the maximum. There are many little tools and additions that will help to give the user freedom in creativity.

Because the student edition software is distributable, it encourages the student to design and prepare his work remotely. Definitely a bonus!

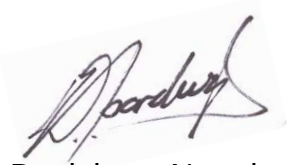
Once you know your way around the machine, designed projects that would normally take hours to set up and machine off, practically takes moments to load and cuts faster, with very little material wastage. The cutter does not break or get blunt either!

Laser cutting is more economical on materials, because it can cut very close to the side of the material and can leave a very clean inside edge that can be excellent for slot-together components.
(I always keep all the leftover bits and use them again for key fobs etc.)

Good news is also that for advanced cutting and effects information there are also courses given and advanced training on laser cutting techniques. Please mail the author for more information on training, tips and tricks, and some freebee files and curriculum ideas.

I believe that this manual is of great help to teachers and students to make the most of your new quality laser machine. May you enjoy the projects and the ease of manufacturing your designs using APS Ethos Design Software.

Many thanks for all the help from technical people at CCT, published articles and half term breaks to do the fun stuff.



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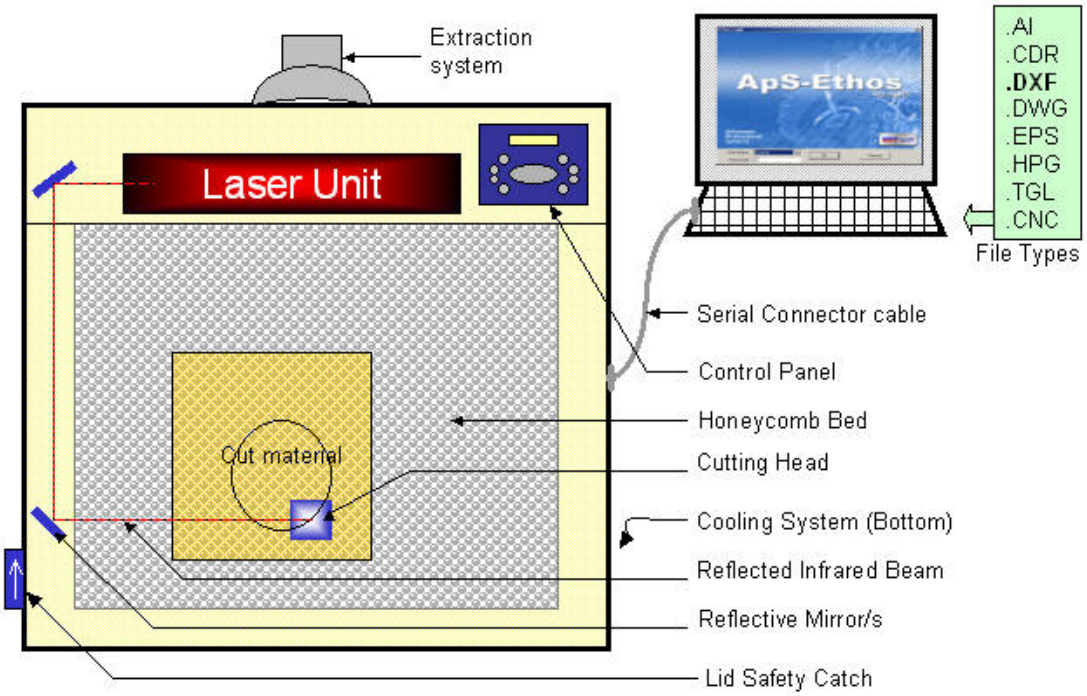
(D&T Teacher and author)

noordwyk@gmail.com

My Mobile number: 07979011119

SETTING UP THE LASER CUTTER HARDWARE



FB7 SERIES LASER CUTTER

The entire system can be broken up into the following elements:

- The machine: This is the frame containing the laser tube, optics, control board, keypad, honey comb bed and an (optional) rotary axis.

- The computer: this needs to be a windows based machine with a RS232 or USB connection that will drive the laser machine. It can be networked or a standalone machine.

- The software: The software contains an interface to do both vector and raster based cutting. It allows for importing and exporting design, vector-based cutting composing, as well as raster-based laser marking.
- With the addition of some extra tools, this software is unparalleled for flexibility and ease of use. It allows the operator to do basic operations with ease, allowing the user to grow in skill with advanced tools as complex designs demand.

- The material manager: Every type of material that is cut differs in its nature. To get the best results, every material and its cutting effects can be set up in the material manager. Doing this provides a reference for regular cutting, saving lots of time.

SETUP QUICK REFERENCE

To get started, do the following checks:

1. Ensure Serial/USB Cable is plugged in at PC and Laser Machine.
2. Laser Cutter Fume Extraction Hose is fitted
3. Laser Machine is switched on, and ON LINE
4. PC is switched on, with:
    a. Code Key fitted,
    b. APS Ethos Program installed
    c. Cutter driver files installed

Launch APS Ethos program,

Enter the **Password** and Press **OK**.

- Note: For Detailed Specifications, Instructions on Setting up and a complete Maintenance Schedule, there is a detailed Technical User Manual

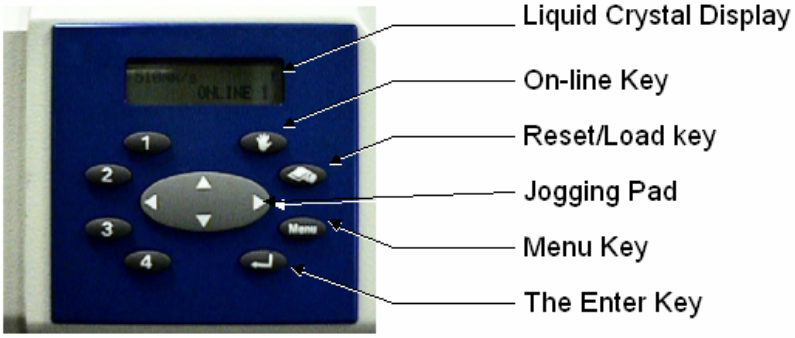
HARDWARE:

The Laser Cutting Machine

The Control Panel of the Laser Cutter

To set up material for cutting:

1. Turn the Machine on
2. Press the **Online** key
3. Press the **Load** Key
4. Set the Cutter on the Zero or **Origin of the material** by using the Jogging Key
5. Press **Enter**
6. Move the Cutter to the **Extent** of the material you want to cut by using the **Jogging Key**
7. Press **Enter**



The Control Panel

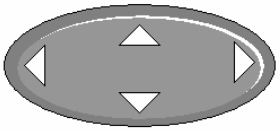
To

operate this machine is really very simple. We only really use four keys on the keypad.
The purpose of this page is look at the controls on the Laser Cutter Machine in more detail.

The Liquid Crystal Display

The LCD contains two lines of 16 characters each. The LCD provides cutter status information during operations and displays menu options for the configuration of the cutter.

The Jogging Pad



Jogging Pad

The Jogging keys are mostly used to move the cutting head in different directions when in off-line mode and in Set Media (material size) mode.

The use of the jogging keys varies according to the operation in progress.

The Reset/Load Key

This key is used to set the zero point of the material, to reset the cutter, or to abort the cut in progress or to re-cut the last file.

The On-line Key

The on-line key toggles between on-line and off-line operation.
Selecting off-line (the LCD display will show the selected mode) will suspend all operations in progress. Pressing the on-line key while the cutter is off-line will bring the cutter on-line again, resuming the suspended operation.
When the cutter is Offline, the Jogging keys can be used to move the cutter head.

The Menu Key

The Menu key is used to select one of the menus.
Pressing the Menu key will make the cutter go off line and suspend all operations in progress.
Pressing the Menu key repeatedly will display the different menus one by one. As the menu options are on a loop, pressing the Menu key when the last option is displayed will automatically return you to the first option.

For more about menus, see the Help Menu in APS Ethos

The Enter Key

The (ENTER) key is used to select the item currently displayed on the LCD screen.

The 1 and 2 Keys

The use of the 1 and 2 keys varies according to the operation in progress; their use is displayed on the LCD as appropriate. We mostly use them

together with the Jogging Pad when firing the laser in Off-line mode. We do this to either align the beam or to score a sheet of material.

The 3 Key

The 3 key is used while the cutter is off line to fire the laser. Pressing the 3 key once will prompt you to press 1 (yes) to turn on the laser or 2 (no) to exit. Pressing the 3 key again or going on-line will return the laser cutter to normal operation.

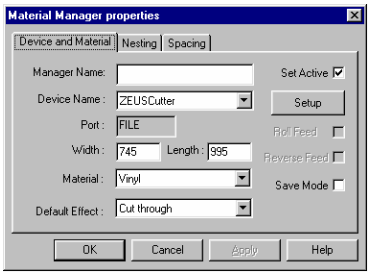
If the head is not moved using the Jogging Pad for approximately eight seconds, this mode is switched off automatically.

The 4 Key

The 4 key is not currently used.

SETTING UP EFFECTS ON THE MATERIAL MANAGER

The Material manager is the part of the program that stores the following settings on materials:



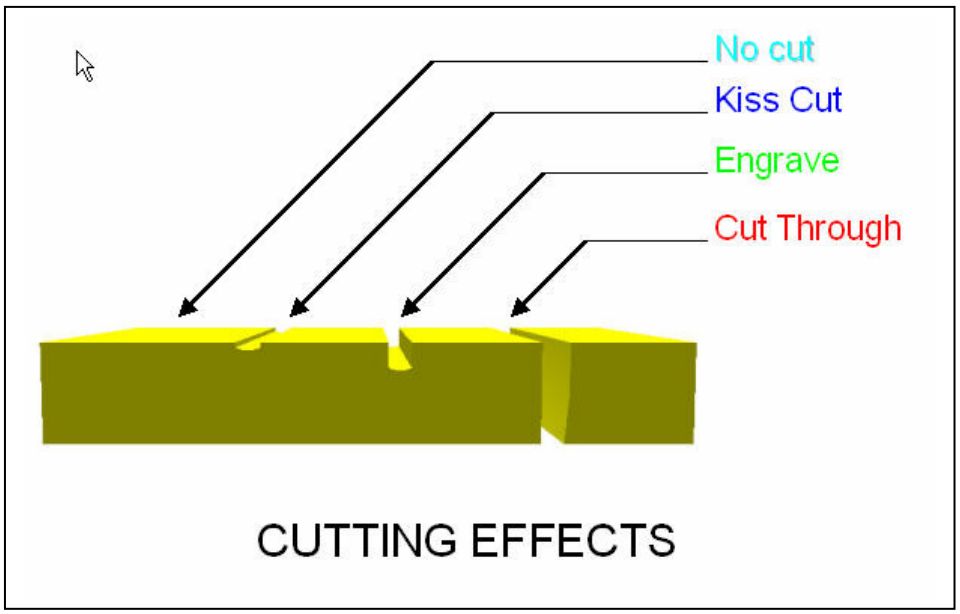
- The type of **Cutter** (machine) used
- The type **material** that is cut
- The **extent** (size) of the material
- The layout (nesting) of the objects being cut
- The **spacing** between multiple objects
- The cutting **Effects** according to their colour.

This data is loaded on to the cutter (laser machine itself) when it is switched on and communicating with the APS Ethos program. (online)
First of all, let us see what is meant by “cutting effects”.

Understanding Effects

In the setting up of the Material Manager, the two approaches are either to set the different cutting **Effects**, or the different **Material** properties.
Because there are so many different materials and so many individual preferences to cutting effects, the operator has to experiment a little.

Below are some guidelines that will assist in setting up the material library.

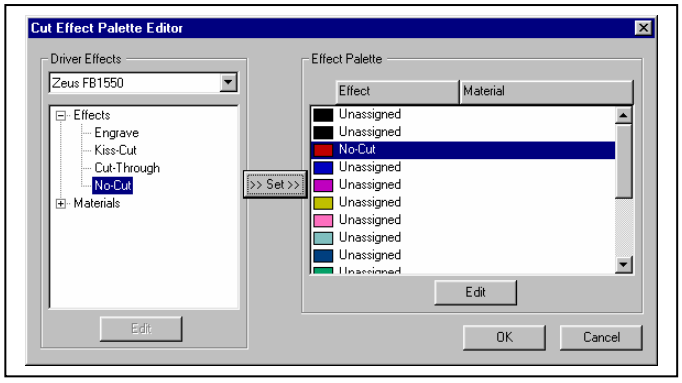


Note: If you make changes to the output of material or effects, APS Ethos will always give a popup window that prompts you to delete the old material manager that is loaded on the Cutter.
Do not stress!
The program then sends the new updated settings from the computer onto the machine again.

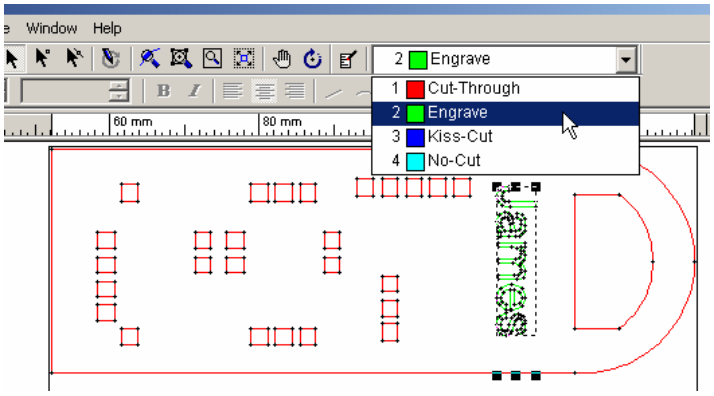
ASSIGNING AN EFFECT TO A DESIGN

Material Effects are assigned by colour. Therefore when a material effect is assigned all objects in the design with that colour will automatically be assigned with that effect.

This option can be selected from the Tool Menu or the top toolbar icon: **Edit Cut Effect**.
This will display the Cut Effect Palette Editor dialog.
By selecting the Driver Effect combo a list of installed cutters will appear. Select the cutter to be used and the Effects and Materials tree control will appear in the dialog.

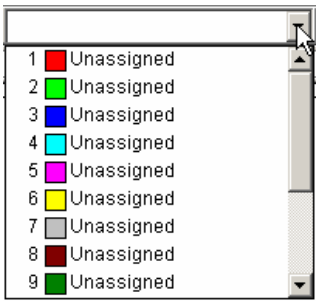


Select effects and then select the effect to be applied. On the effect palette section select the colour the effect is to be assigned to, then select Set.
That colour will then be assigned with the selected effect.



Once an effect has been assigned to a colour, then all objects of that colour will use that effect when cut. When objects are selected, the colour and their effect are displayed on the top toolbar.

Any objects selected that have not been assigned an effect will be displayed as **'unassigned'**.

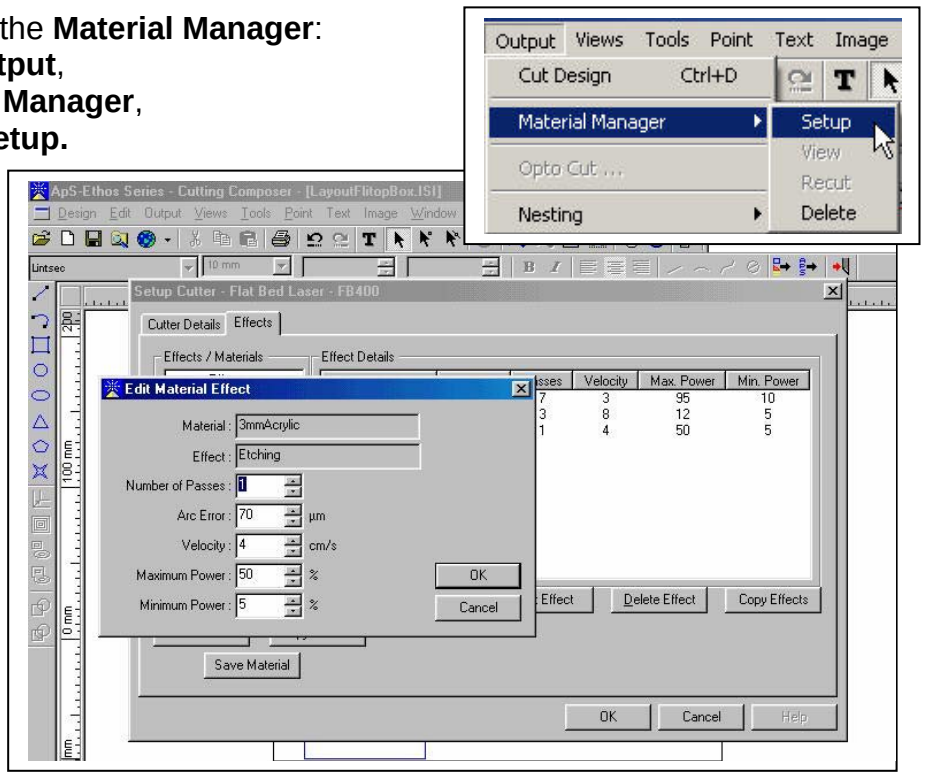


Note: If you do not assign an effect in the Material Manager, the program will suggest an effect, but it will be a general one without the proper setting for your specific material.

It is good to know that when designs are saved, the assigned effects are saved with them.

SETTING UP THE LIBRARY IN THE MATERIAL MANAGER

To get to the **Material Manager**:
Click: **Output**,
Material Manager,
Select **Setup.**



This table of materials and their effects takes time to set up in the beginning, Some experimentation on your behalf is needed to get the best effects.
An example library on file is supplied to help you. The settings are for a 30 watt laser.

The various settings on this spreadsheet are interesting and worth taking a look at; See LaserCuttingSettings.xls

Note: In industry the aim is always to optimize production by saving time.
The settings for bulk production would be set for single passes, high power, and high speed.

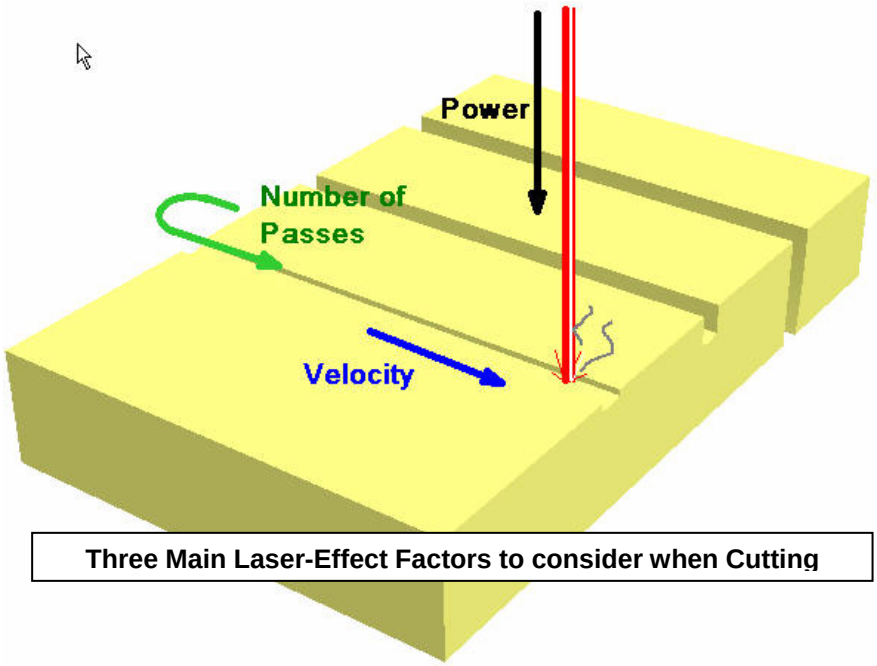
For accurate and well-finished polymer and organic cuts, better results are often achieved with lower power and slower speeds.

It is recommended that the operator use a small piece of material and a simple design as a test cut
Have a play and do not be afraid to experiment.

CUTTING MATERIALS

Factors that affect the cutting of materials are:

- The **type** and **density** of material being cut.
- The **thickness** of the material being cut.
- Does the material have a peel-off **protective layer**?
- Is the material thermosetting or thermoforming?
- What is the **Wattage,** or the **Model** of the Laser Cutter?
- What strength or percentage power should I use?
- How fast should the cutting head move across the material surface?
- How many passes should the cutter make before it is cut through?
- Is the cutting Head set to the right Focus?
- Are the optical lenses perfectly clean?



Three Main Laser-Effect Factors to consider when Cutting

Velocity

This is the maximum speed at which the laser will cut.
By reducing the velocity, the depth of cut will be increased.

Maximum power

That is the maximum power output of the laser during cutting. If the cut is too deep, even at maximum speed, then reduce the power. Also, if the cut depth is correct but the cut edge quality could be improved then try reducing both the power and the speed.

Minimum power

During cutting, at corners, the power of the laser is controlled so that the quality of cut remains as constant as possible even when the laser is accelerating and decelerating. When the laser reaches a very slow speed, for instance on very tiny curves, the minimum power setting prevents the power from reducing to below zero. This is the minimum power output the laser will reach so that it doesn't cut blotches in the corners of objects.

EXTRAS:

Below is a list of materials and tips as given by the technical manual

Material	**FB710 & FB1510**		**FB730& FB1530**	
	Engrave	Cut	Engrave	Cut
Paper				
Card				
Vinyl				
Ruby & amber film				
Retro-Reflective material				
Sand blast masking material				
Magnetic vinyl				
Plywood 1 mm				
Plywood 3 mm				
Balsa wood 1-3 mm				
Balsa wood 4-8 mm				
Acrylic 3 mm				
Acrylic 6 mm				
Glass				
Natural fibres				
Man-made fibres				
Stencil materials (Polyester Film)				
Leather				
Rubber				
Parachute material				
Air Bag Material				
Mirror silvering				

NB Cutting straight lines is significantly different to cutting curved objects, in particular small objects which have a lot of small radii. The two shape types need treating quite differently.

As a basic rule, objects comprising of lines only may be cut with maximum power and speed.

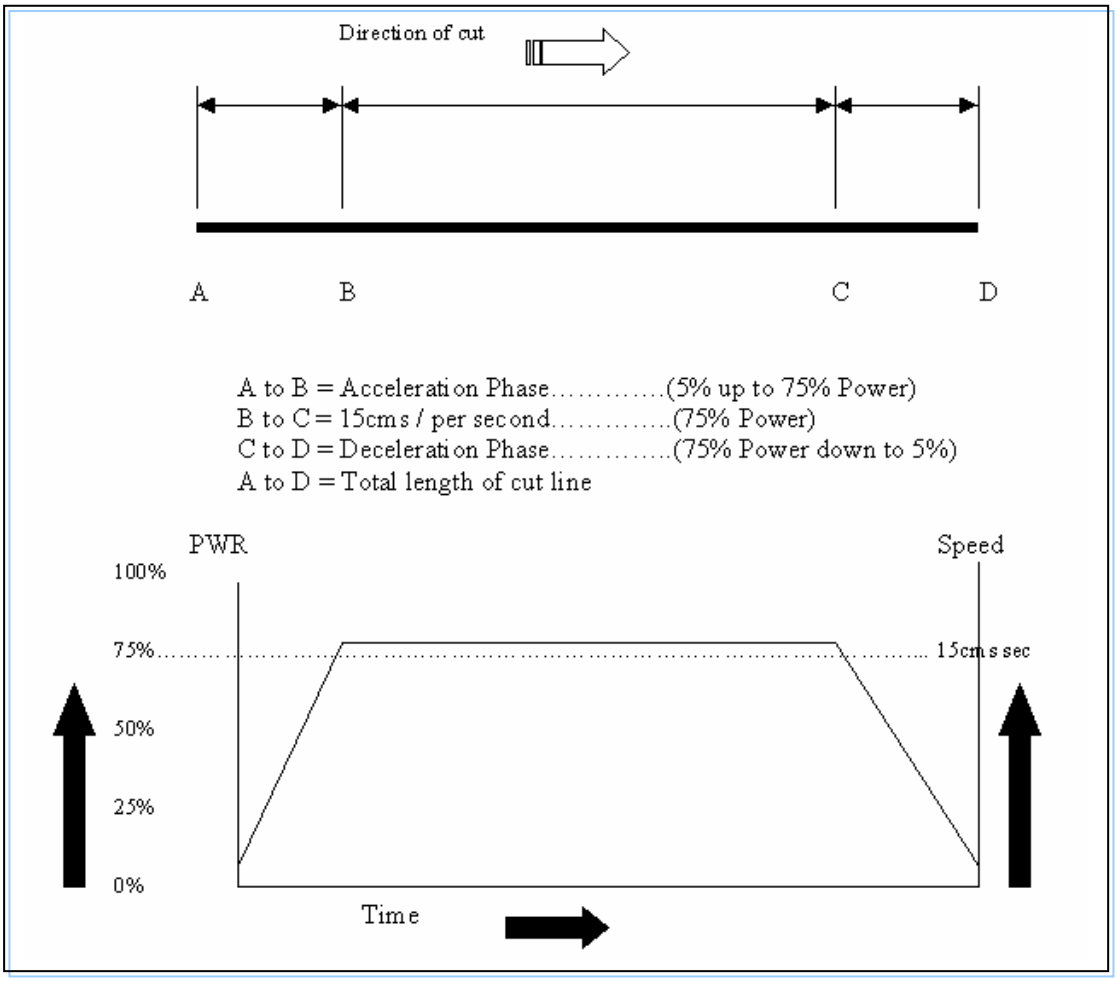
Objects which are complex in terms of shape, generally with small radii are best cut at speeds of up to 12cms/sec max, using a minimum power of 5% and a maximum power to suit.

If, for example, the maximum power is set to 50% and the minimum power is set to 5% then the only time the laser will output 50% power is when the cutter attains the set speed command.

If, for example the maximum power and minimum power are both set to 50% then the laser will output 50% power, regardless of whether or not the command speed is actually reached.

Understanding the effect of adjusting these 3 parameters is essential for good clean cutting.

Example - Cutting a Line at 15cms / per sec @ Max Power 75% & Min Power 5%



If the line were cut, for example at 75% max and 75% min laser power, then during the acceleration and de-acceleration phases the laser power would still be at 75%, which would be excessive and cause some over cutting of the material during this period.

The auto laser power ramping is a feature of Cad Cam Technology and its cutting philosophy. As the machine's actual speed fluctuates during cutting, so does the laser power to give an even depth of cut. This will allow, for example "Kiss Cutting" where the material is mounted on for example a paper laminate and the material only is cut leaving it still mounted on the paper post cut.

SAFETY INFORMATION

(These are Extracts from the technical data provided)

Ventilation

The cutter has its own extraction system however, good ventilation of the cutting area is strongly recommended in the event of extraction failure. The cutter must not be left cutting unattended at any time.

Noise

The noise level does not exceed 75 dBA.

Fire Precautions

The cutting area must be provided with a carbon dioxide fire extinguisher. All people working near the cutter must know how to use a fire extinguisher.

Training

It is best that all cutter operators receive some degree of training before using the cutter and that they all read the user manual.

Cutting Materials

The operator must ensure that the materials to be cut are suitable and do not produce toxic gases when laser cut. The ventilation and extraction system must also be in good condition before any cutting takes place.

Extraction System

The operator must ensure that the extraction system is working correctly, with no obstructions in the pipelines. If the laser cutter is operated with a blockage in the extraction system, this could reduce the effectiveness of the extraction system and lead to local contamination of the air and a possible Health and Safety hazard.

SAFETY DEVICES

There are three safety devices to protect the operator from the laser beam as follows:

Polycarbonate Safety Cover

The polycarbonate cover is 6mm thick. In the unlikely event of a severe misalignment of the laser beam, the cover will tolerate a maximum of 25 Watts of beam intensity for a period of approximately 12 minutes.
When the cover is lifted the cutter stops immediately and then goes off-line via an electromechanical interlock. It bubbles when cut and produces a very strong odour to warn the operator

Electromechanical interlock

The safety cover operates an electromechanical interlock. The laser beam is stopped once the safety cover starts to open, and the cutting head halts almost immediately afterwards. The cutter then goes off-line. The laser cutting head cannot be moved whilst the safety cover is open.
You can only get the cutter to go online if the cover is closed again. Only then will the machine continue with the cutting operation.

Mechanical Shutter

A mechanical shutter is also linked to the safety cover. This provides a physical barrier to the beam whenever the cover is lifted. The shutter provides continuous protection in the event of electrical malfunction and requires no maintenance.
When the safety cover is closed, the micro-switches are closed, the mechanical baffle is open and the cutter is in cutting operation mode.

All machines sold by CADCAM Technology Ltd. carries the CE mark.

10 SAFETY COMMANDS

1. The laser will give off invisible Infra Red radiation and scattered light, do not let your eyes or skin get exposed to it

2. Do not let the machine operate unattended at any time.

3. Make sure that the fume extraction is working properly before you cut any material.

4. When you open the cover, don't bump your head.

5. When you close the cover, mind your fingers

6. Some materials produce hazardous gas when it is cut, check with the material supplier that the resulting fumes that's given off is not too hazardous.

7. The fumes must be extracted properly with the exhaust system

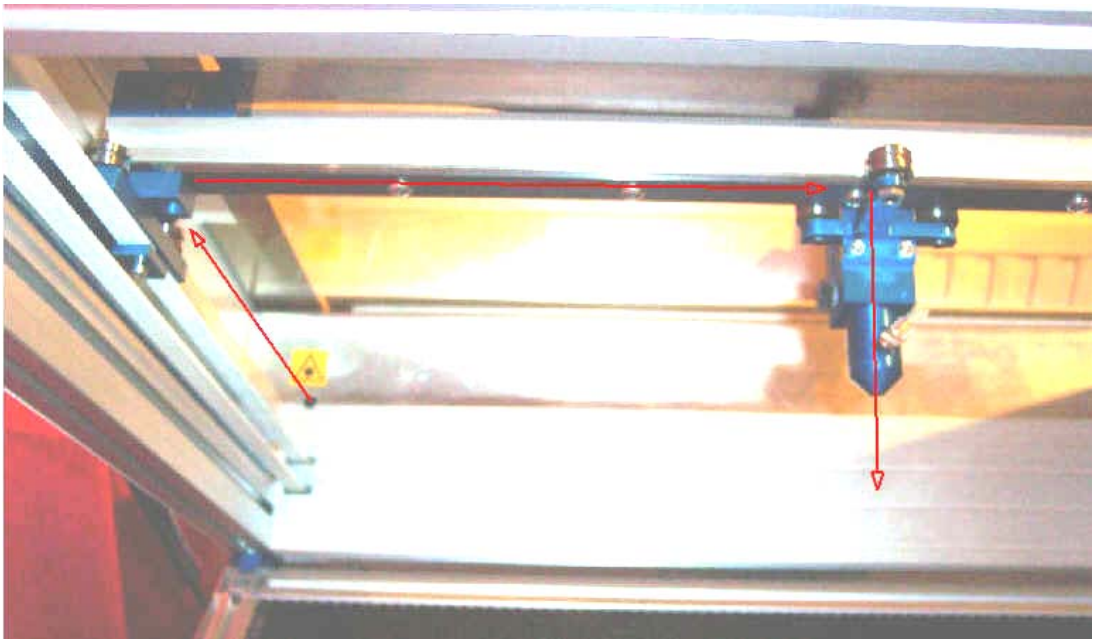
8. Do not remove or disconnect any of the safety devices.

9. If anybody makes design changes to the machine, they have to make sure it gets reclassified and labeled again.

10. All the electrical enclosures (i.e. doors and cover pods must be opened by trained service personnel)

How to align the laser beam

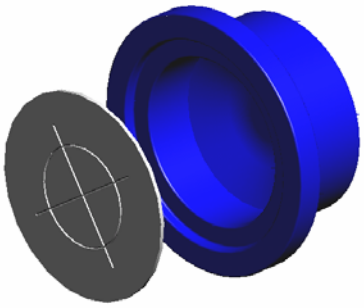
In this section we will look at the process of alignment of the laser beam.



Because laser cutting is such a precision science, a fair understanding of its working can ensure that one gets good service from the cutter.
One of these concepts is alignment. The beam has to bounce off three mirrors before it hits the material being cut. If only one of these is not perfectly perpendicularly aligned with the other, it will affect the performance of the machine.

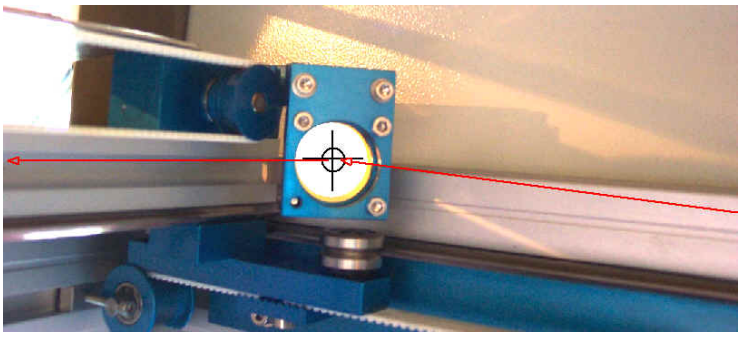
Checking laser alignment is therefore an important part of the service task after the machine was moved, or after extensive cutting.

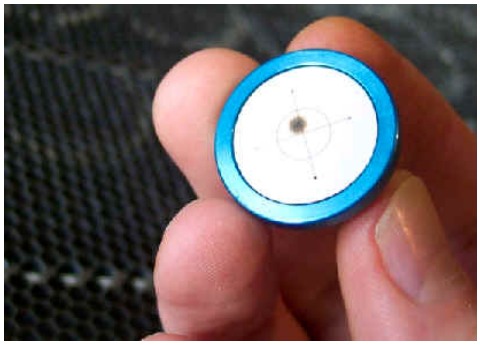
What you will need to check the alignment is the alignment tool, a target and possibly an allen key, all supplied with the machine. (You can make your own card targets, it is supplied as one of the sample files with the software.)



This little cap fits neatly into the frame where the mirrors are housed. In turn the target fits into the cap.

The target gets fitted as close to the source as possible, then to the next mirror along the beam towards the cutting head.





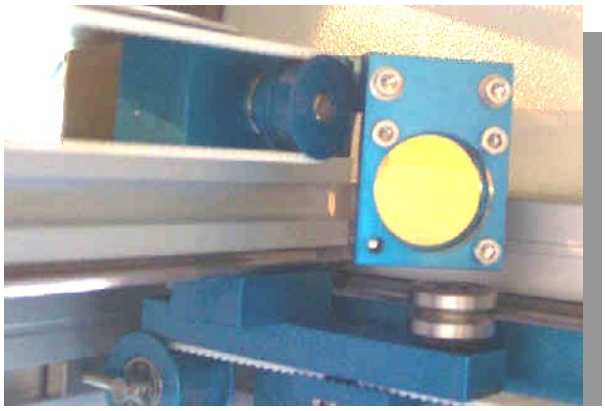
It is important at this stage to mention that the more recent models have red pointer dots. If the red dot and the IR-laser are aligned, theoretically it should be true all round if the laser checks to be true at the furthest point from the source.
Older models without the little red light should be checked by firing the laser along both the axes.

To start the process, let's first put the machine in the right mode:

1. Switch the machine on.
2. Press the **ONLINE** button to take the machine offline. The following screen is displayed:

3. Press the **number three key**
4. Press **number one key** to activate the laser (it will not fire yet).
5. When you press **UP** or **DOWN** on the keypad, the laser will fire at 50% power.
6. After the little target is singed, press the **number two key**
7. Cancel Laser Fire mode and remove the target from its holder.

If the beam is more than 2mm from the centre, it needs adjustment.



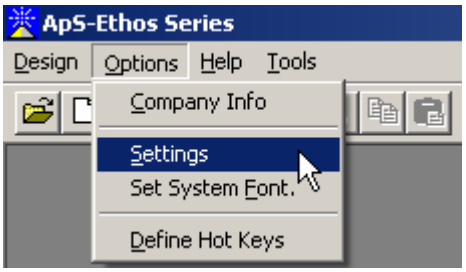
Use the correct size allen key and make small adjustments to the setscrews. The slightest adjustment will have an influence on the alignment. Do not set or bend the **lens retaining clip** at he back .

Note: If you are in doubt about making adjustments, do not hesitate to give us a call or we can make an appointment to have the machine adjusted to perfection.

Environment settings in APS Ethos

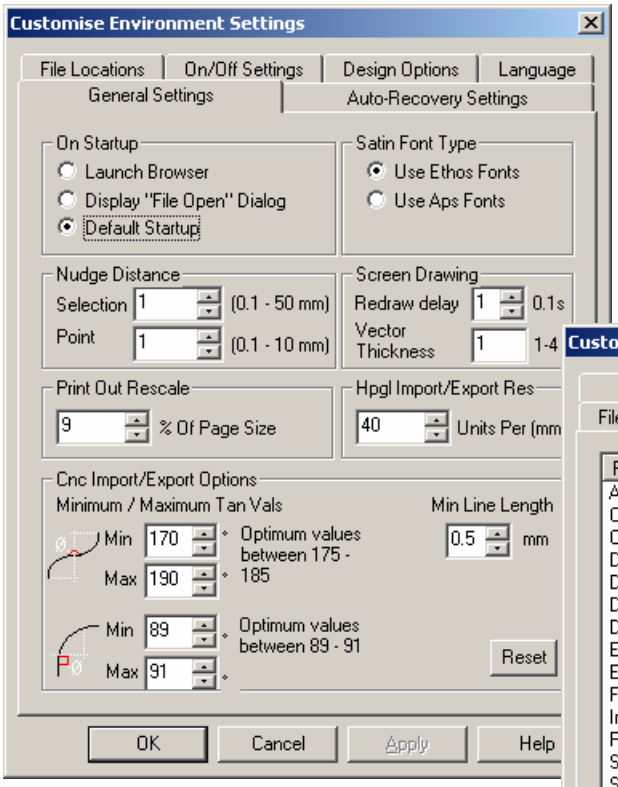
The following screenshots and images are shown only to check that the machine is set up properly. It is not intended for regular users, but only for advanced users or supervisors when re-setting properties.

The **General Settings Dialog** is accessed as follows:
In APS, select **Options** on the Menu Bar, click on **Settings**.
This must be done prior to opening any designs.

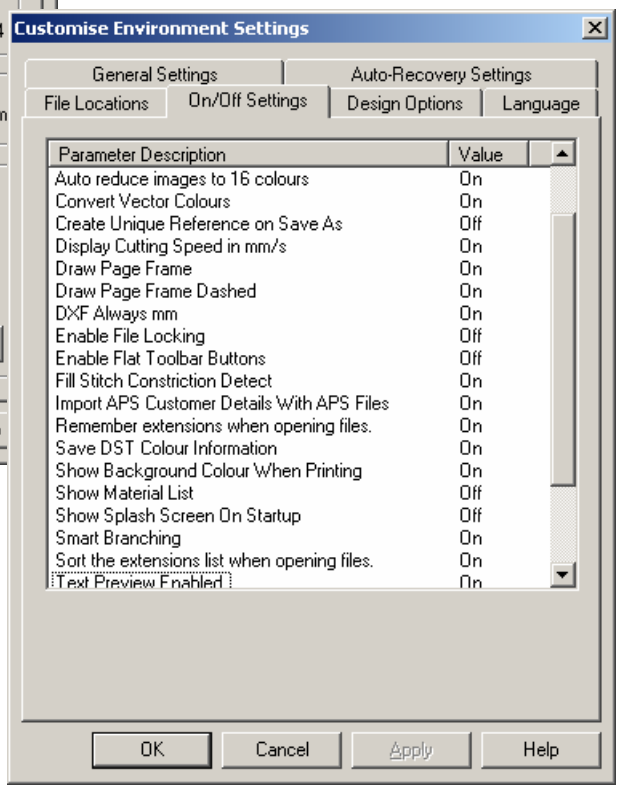


The next two tabs of the **Environment Settings** dialog are the most important to have at the correct setting:

Things you might want to change is the **On Startup** setting.



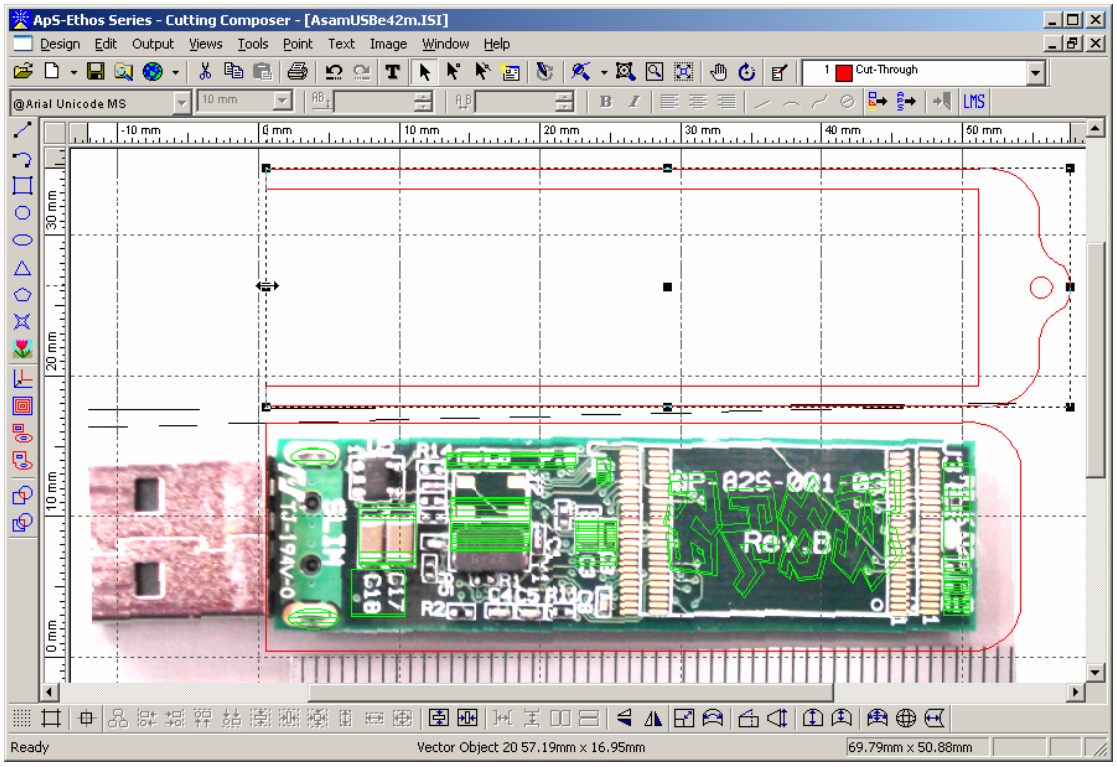
A tab to select is the **Environment settings** I prefer to have the Page Frame selected and view it as dashed, so that I can assume where the marking would take place, without having to do trace outlines.



SOFTWARE:

APS Ethos v9 Schools Edition

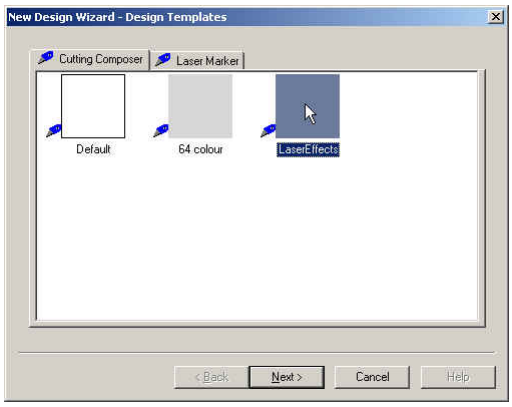
The excellent thing about the software is that it can act as a CAD program to design as well as output designs to the Laser cutter.
It can be freely distributable in a school, or for students to use at home, requiring only an annual registration code.
The interface has grown so much and has a spread of interesting tools that will enable the user to manipulate and enhance any design to give it a professional touch.



The Cutting Composer screen has most of the familiar toolbar icons.
Users with limited experience will agree that the menu and toolbar items don't seem altogether alien.
It is packed with intuitive icons and tools to satisfy most any design intent.
Icons and buttons have tooltips that are informative and make it easy to understand. Users can become acquainted with the cutting composer after just a short period of time. The ability to import a photo, scale it and design around it works wonderfully. To grab the outlines of an image and transfer it into a vector cut is just as easy, no more expensive 2D software!

Program interface and toolbars

The easiest way to get to the design composer window is to click on the dropdown toolbar button. Select New cutting/Drawing Design.

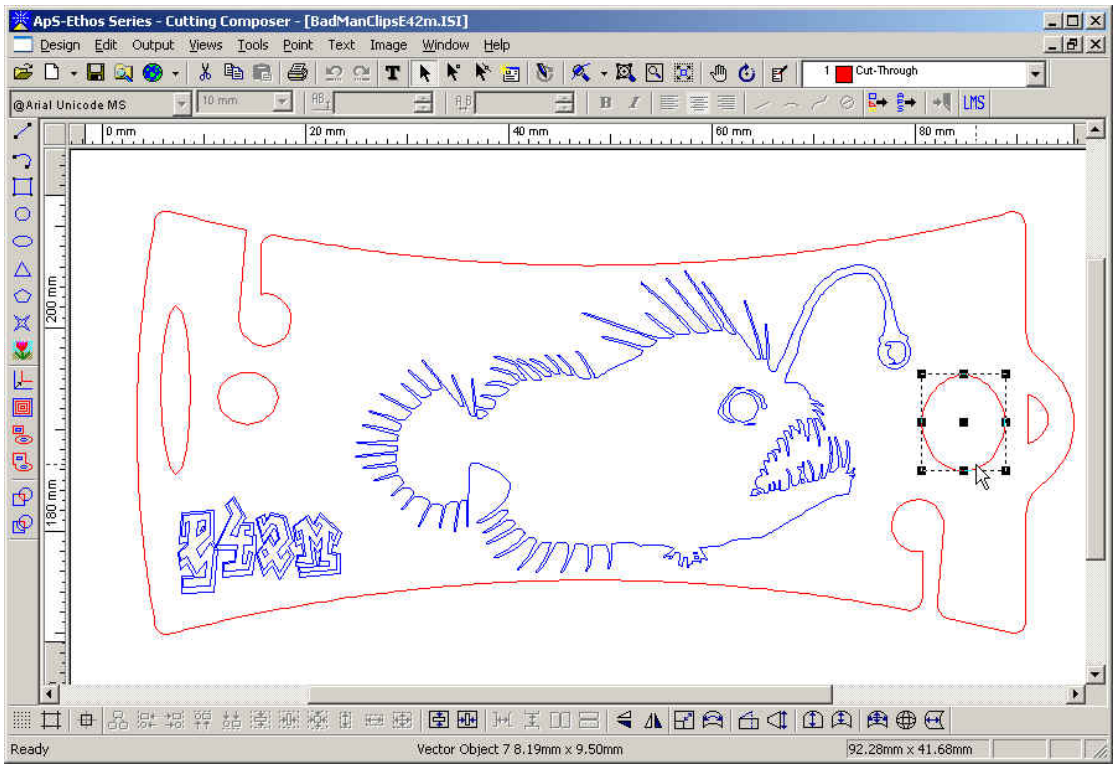


Alternatively one can activate this dialog box simply by clicking on the New Button.

In this box we can store templates for easy access.

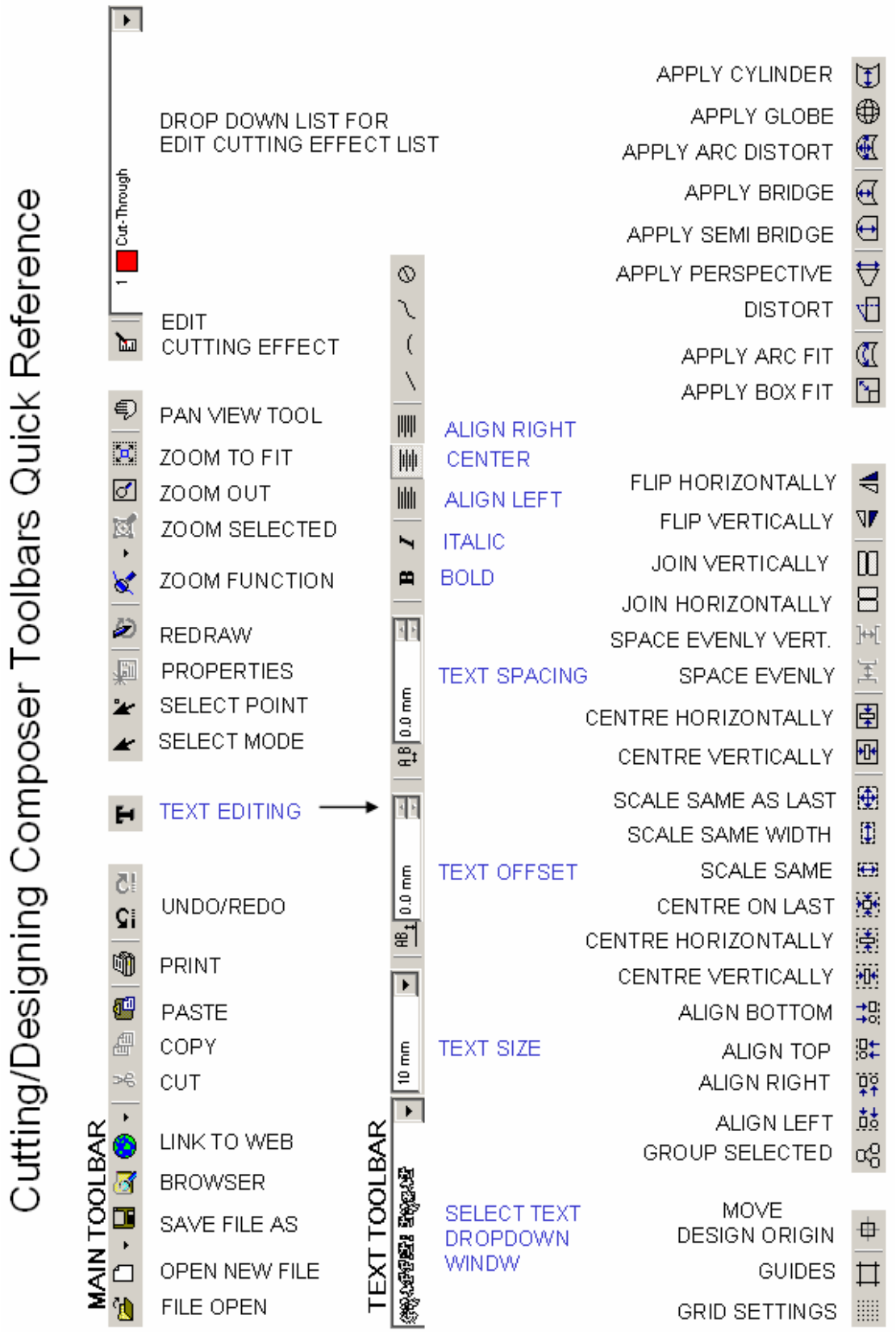
To avoid going to the Database, just double-click on the chosen option.

Below is a screenshot of an open design. It features the activated toolbars and ruler.



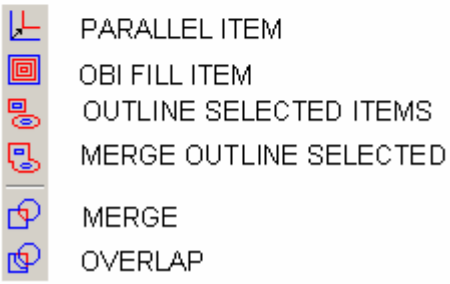
On the next page is an overview of the individual toolbars.

Toolbars used in APS Ethos:



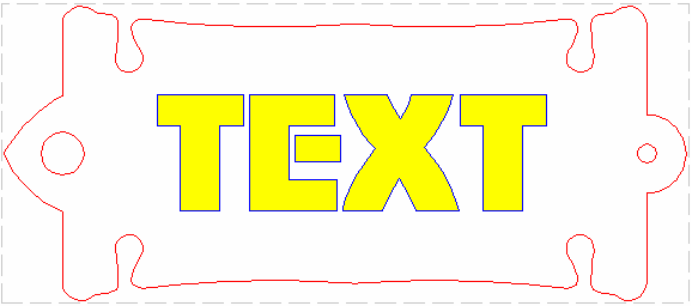
Vertical toolbars arranged on the left hand side

DRAWING LINE TOOLS



ADDING LINE FEATURES

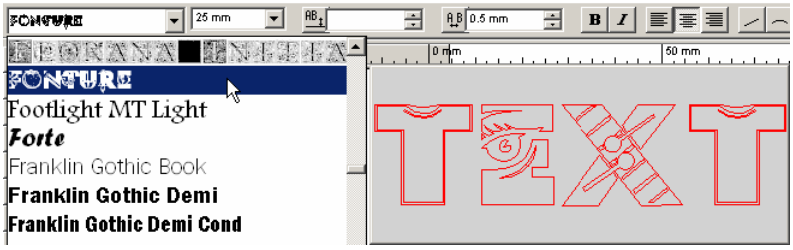
WORKING WITH TEXT



APS Ethos has amazing text manipulation capabilities, Below are some features

Text Previewing

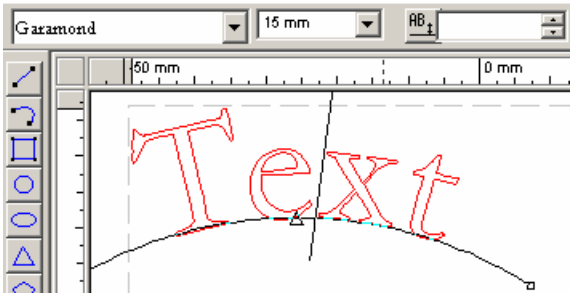
When editing an existing text object it is now possible to see a quick preview of the text in the other font styles from the font list. Create some text and select all the characters.
Now select the font list and scroll down the fonts. This will then show a dynamic preview next to the font list.



The preview shows a sample of the selected text in the style highlighted in the list.
If you select part of the text then only this part will be changed in the preview. The preview also shows the text on the original path, for example on an arc.
This previewing feature is an option and can be switched off using the registry options in the main options dialog.

Text Copy and Paste

APS allows the user to paste text from other applications via the Windows clipboard directly into a design or into the text tool.
For example, using Windows WordPad some text can be typed in and copied to the clipboard using the standard copy function. When the paste button is pressed in Ethos the text is automatically created with a default block font at 10mm height.



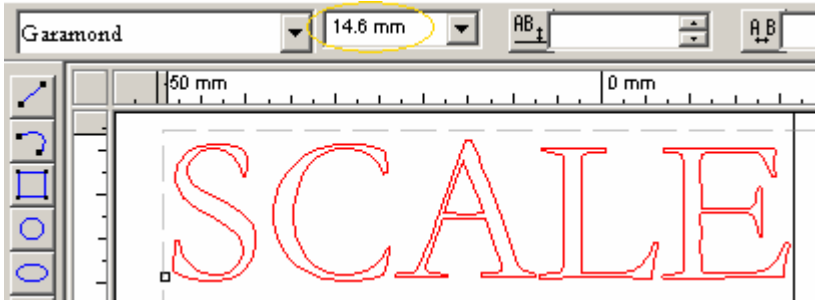
The font and height settings can be controlled by first of all selecting the text tool, the example below shows an arc placement at 15mm in the Garamond font style.
Pressing the paste button will now paste the text into the tool, the text will adopt the font style, height, and placement.

Tip : This feature is useful for utilising spell checking facilities in other packages, e.g. prepare the spell checked text in MS-Word, then copy and paste it into Ethos.

Text Scale

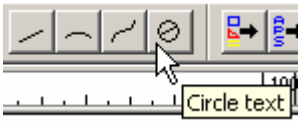
When scaling a text object using the selector tool the text object will automatically record the height change in the text object. (In previous versions scaling a text object and then editing it with the text tool would cause the text height to revert to it's original size.)

In this example some text has been created at 15mm, and is being scaled proportionally using the selector tool.
When the text tool is now selected the text height is automatically adjusted to reflect the scaling.

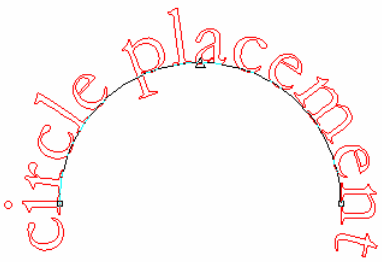


Note ; this will only work if the scaling is performed using the corner control points of the selector tool (scaled the same in the height and width).
If the text is stretched then the change will not take effect.

Circle Placement



This handy tool lets the user type along a circular path.
It is done by clicking the button as shown.
Drag the circle using the mouse to lay the circular path. Anchor points can be dragged to adjust them.



When entering text using circle placement, the default is a centre placement (not edge).

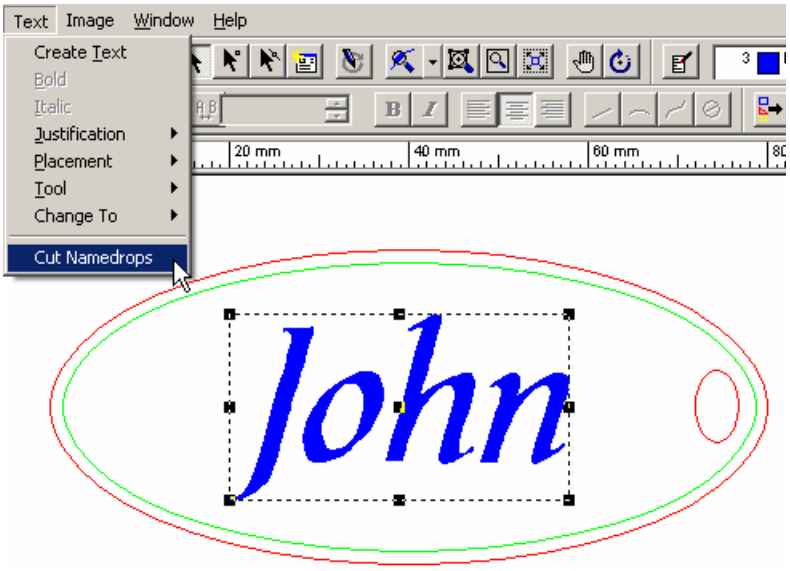
To get the edge placement hold down the CTRL key

Text – Offset and Spacing Graphics

Two graphic symbols have been added to indicate the offset and spacing settings. This makes it much clearer to the user as to which setting will perform which function.

Cut Name Drops

Wouldn't it be great to cut a class set of medals, or merge your staff list for key holders? You can do this using **Name Drops**.
This new feature is intended to be used when outputting a list of names or any other text to the laser cutter.



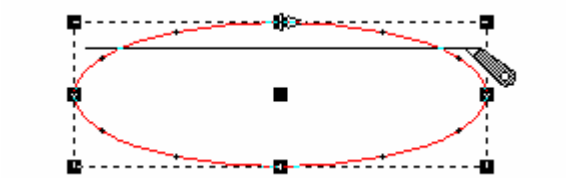
Let's say this design above was being cut:
The text in the centre of the design needs to be changed for every new
Select the text, and then select **Text** and **Cut Namedrops**.

This list dialog will then appear.
You should now enter the names which will appear at the text location.
When **OK** is pressed the system will replace the selected text and output the modified design to the cutter
(one by one down the list).

Hint: Avoid text get too long.
You should use the "**Condense Width**" option in the Text->Placement menu.
Doing so will limit the text length to the input base line of the text.
(using line or arc text).

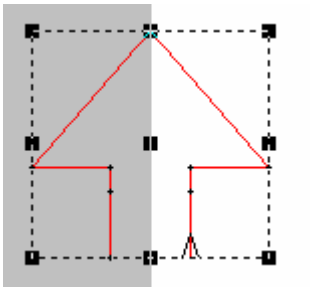
OTHER (ADVANCED) TOOLS USED IN DESIGN

Vector Slice



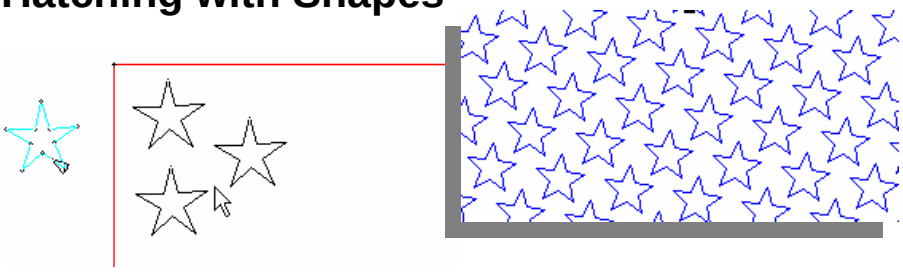
Vector slice allows the user to slice an object in order to have separated points. The separate vectors can then be changed individually. Vector Slice is ideal for folds in card, or areas where different cutting effects are required from a single drawn object. To use it select **Tools,** from menu, then **Vector Slice**.

Object Reflection (Mirror an image)



This feature is handy when designing symmetrical objects. Just design one half and reflect the other half. To use: select **Tools,** then **Object Reflection**.

Hatching with Shapes



On some occasions it would be very handy to fill a shape with an array of the same smaller objects, like bricks on a wall or a particular pattern.
To do this, simply select the larger shape, hold **SHIFT,** and select the smaller shape or text. On the Menu bar, select **Tools** then **Hatching**. You can choose **Open Vectors** or **Closed Vectors.** (open Vectors leaves the overlapping lines open, whilst Closed Vectors simply close off the overlapping bits)
After this selection the small shape will stick to the pointer. To complete the Hatching, click inside the larger shape with the now trailing smaller shape as if to lay them in a pattern. On the third click, the pattern will multiply and fill the entire area of the larger shape.

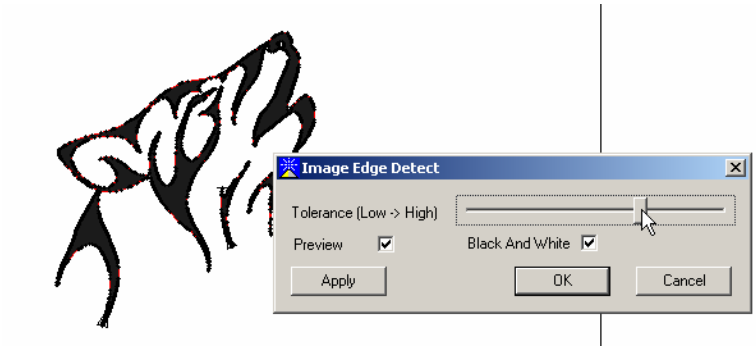
IMAGE TOOLS USED TO VECTORISE OUTLINES

Vector Trace

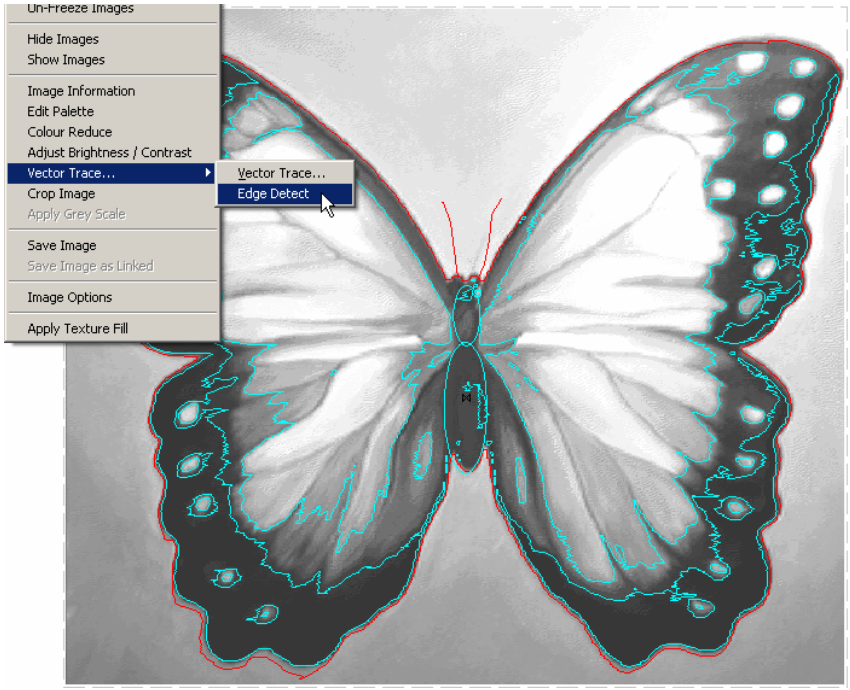
This tool is a clever way to use the outline of an image and cut, or engrave it. The little dropper tool allows the user to trace the outline of a single shade in an image by clicking into it.
To do this, select
Image, **Vector Trace**, **Vector Trace**

Image Edge Detect

This amazing tool is one of my favourites.
This tool allows the user to import a picture and automatically detect the edge to create a vector outline. It is very simple to use and allows you to determine the best threshold tolerance on faded edges.

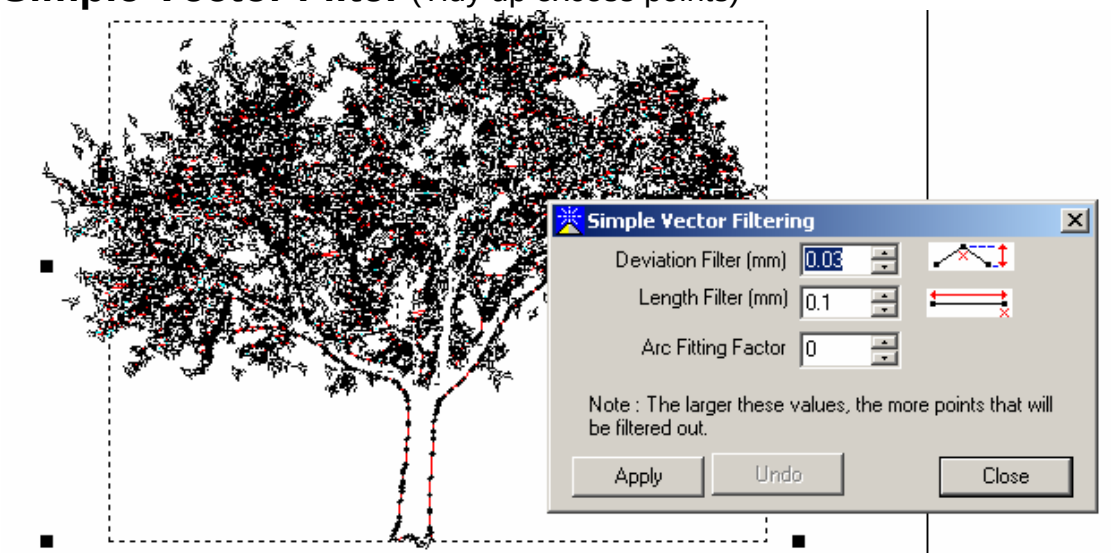


The **Black and White** box is to allow the user to swiftly change the image for better shade discrimination.
It is very visual and the effect is instant.
Using a well defined shape produces the best results.
For more lines and definition with graduated lines, use the tool more than once on different tolerance levels.



To activate this tool, Select **Image** on the menu bar, go to **Vector Trace** and click on **Edge detect**

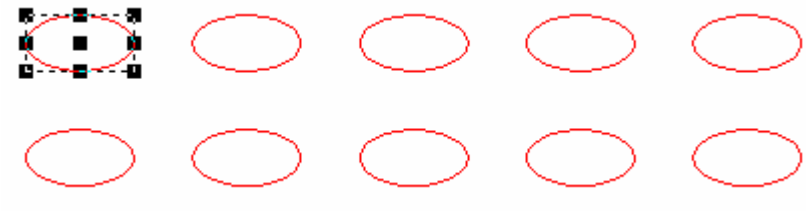
Simple Vector Filter (Tidy up excess points)



In some instances, an image can be traced and the resulting vector is so detailed, that when shrunk, has too much detail. Therefore to avoid excessive big files with too many points, simply select **Tools** then **Simple Vector Filter**.

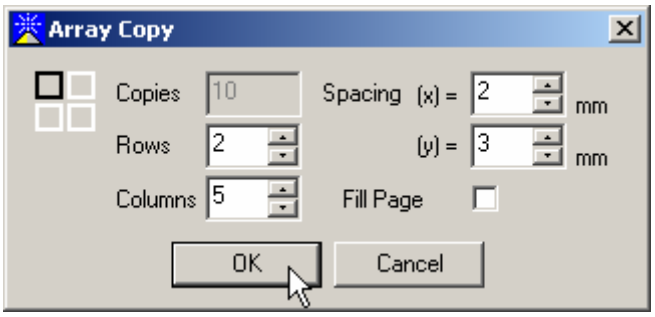
The Dialog box suggests the default setting, but it gives the user freedom to experiment and see changes.

ARRAY COPY

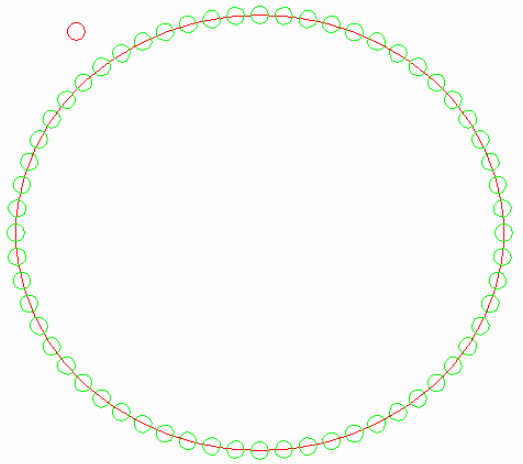


This tool lets the user duplicate shapes within a specified array.

To activate the dialog box,
go to the menu bar,
select **Tools**, then **Copy**, and **Array**.

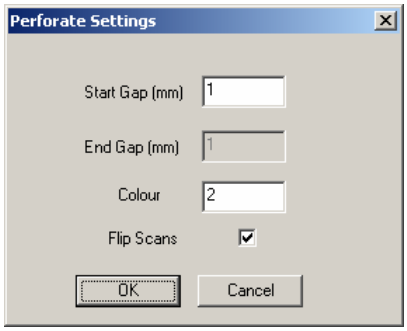


Copy to Perforate



This tool enables the user to perforate a line using a specified shape.

In this instance we have a big circle that is perforated with the small circle on the top left.

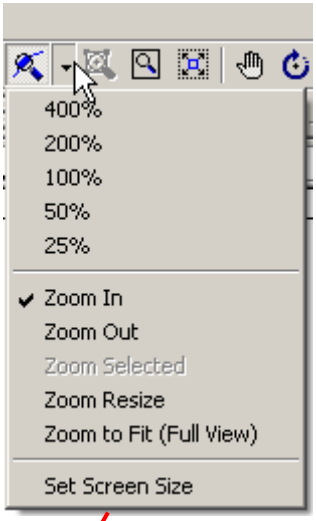


To do this, select both items, on the menu bar select **Tools**, then **Copy**, and **Perforate**

Add Shadow

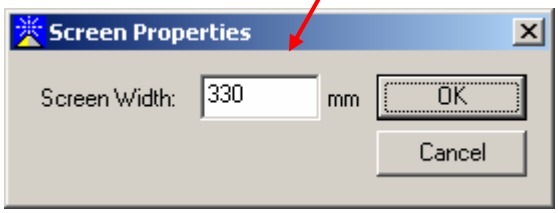
This feature transforms any item by adding a shadow that can be dragged and added to enhance appearance. This is great for text and borders. Simply select the item/s, click **Tools** on the Menu Bar, then **Add Shadow**. Position the shadow where you want it and click to secure it down.

Zoom Tools



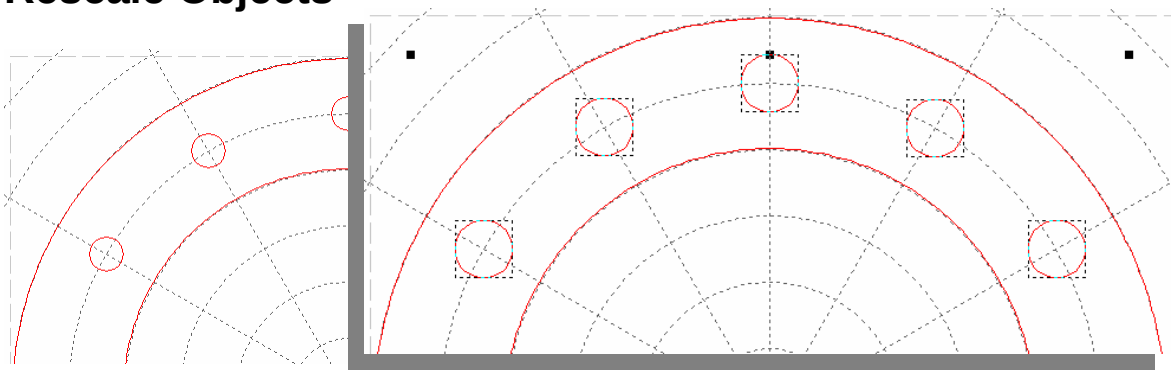
To be successful in design the user should be able to visually access any sized shape or point effortlessly. For that reason this dropdown zoom button adds more functionality by allowing choices of scale zoom as well as an option to make the design appear the exact design size.

Every screen differs in size, therefore if the user selects **Set Screen Size**, you can quickly calibrate the computer screen. Measure the horizontal length of your screen and enter it into the box as shown below. Selecting 100% will now give you a true representation of the design size.

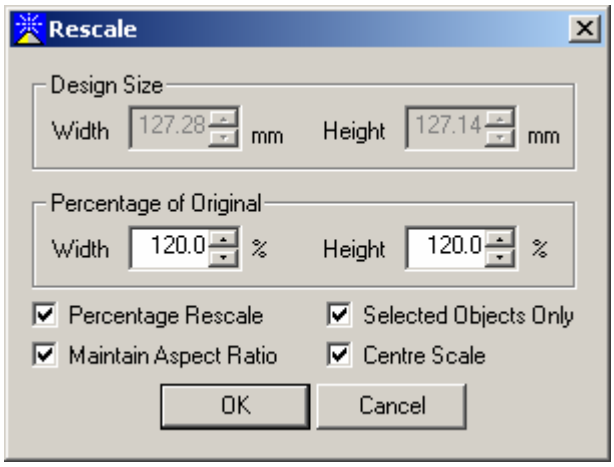


Zoom Resize allows the design page size to be changed to fit the design. In turn, the design is also zoomed to fit the screen

Rescale Objects



The software has the ability to rescale an entire design, selected items, or even scale elements in their respective positions as illustrated above.



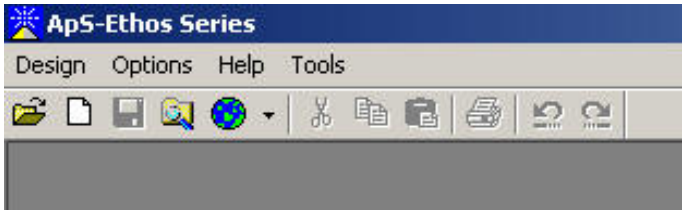
The Rescale dialog is found when you select **Edit** on the menu bar, and click on **Rescale**.

This dialog allows the user to scale according to measure or a percentage of the size.

With **Percentage Rescale** selected, one can centre scale objects in their respective positions.

IMPORT AND EXPORT DESIGN

In this Section we are going to look at the different ways to customize the APS Ethos program to suit your unique needs.



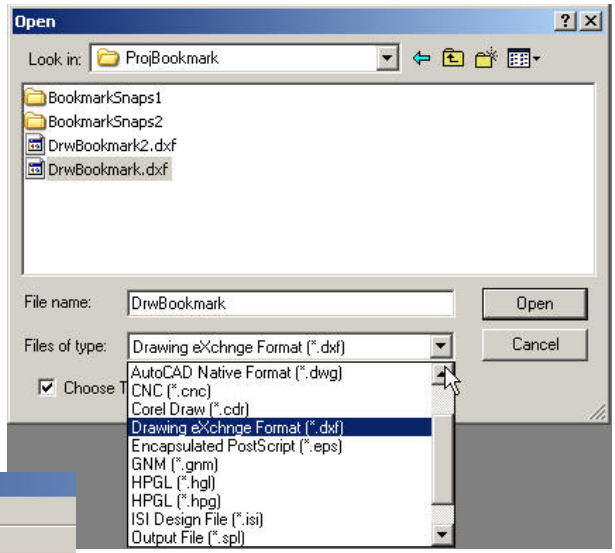
This is the view of the Menu bar, and the basic toolbar buttons you see when you have opened the program.

APS Ethos is initially **designed for Industrial** use, and benefits from a **built in database.** The option to organize design files is therefore available, but the use of it is optional.
In Education, the database is seldom used, but if necessary, different users can benefit greatly from this feature. (See APS Ethos v9 Change notes.)

Importing a new design

Importing a new file is as simple as opening any other. There are **two ways** to do this:

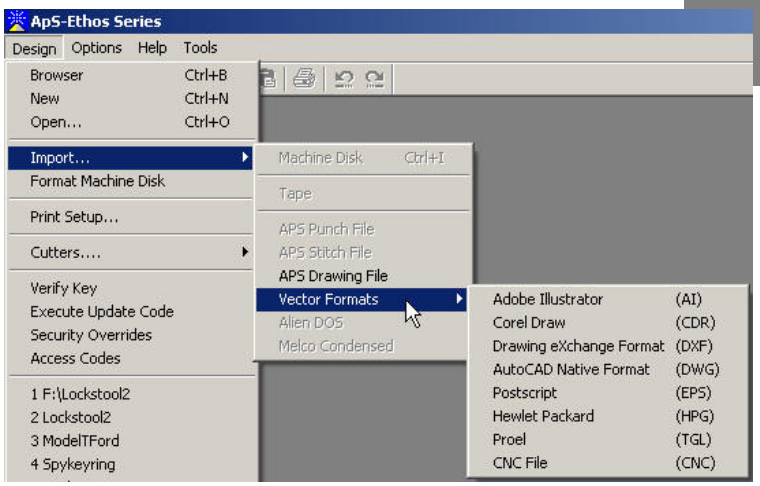
First Way: Click on **Open**



It will take you to the Default storage of designs:
C:\Program Files\ethos\Designs

You can (1) navigate to your own file location, or

(Tips on how to change this feature on next page)



(2).Or: Go straight to the **Import** Feature:

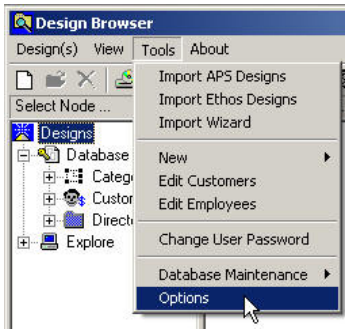
Select: **Design, Import, Vector Formats**, and select the type of file from a dropdown list, This allows you to specify the exact file type and the location.

CUSTOMIZING THE APS-ETHOS PROGRAM

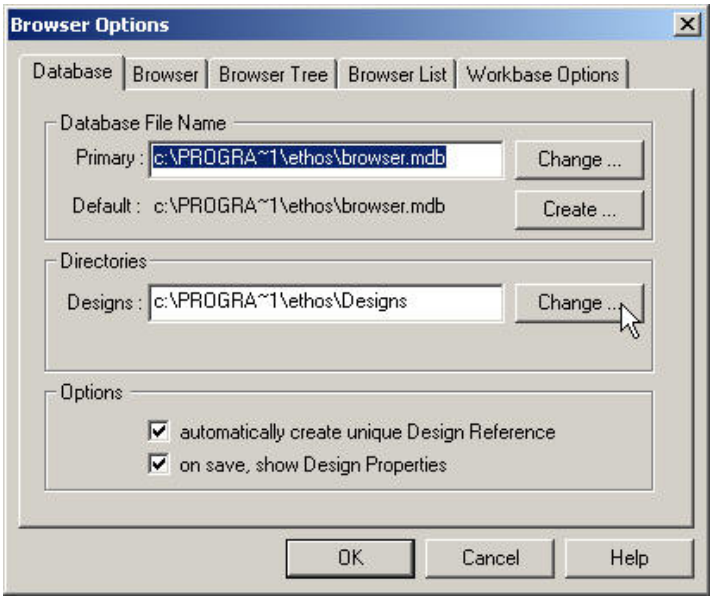
Change the Default File location:

Everyone has different preferences where they want to store their files, so here is how to change it:
The default path for the storage of designs is:
C:\Program Files\ethos\Designs

Click on the **Browser** Button



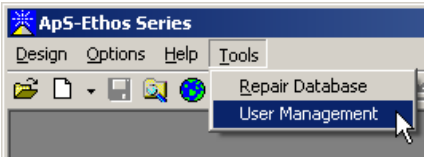
On the Browser menu bar,
Select **Tools**, click on **Options**



This tabbed window will appear:

You can change the location to store your designs in the **Directories** section.

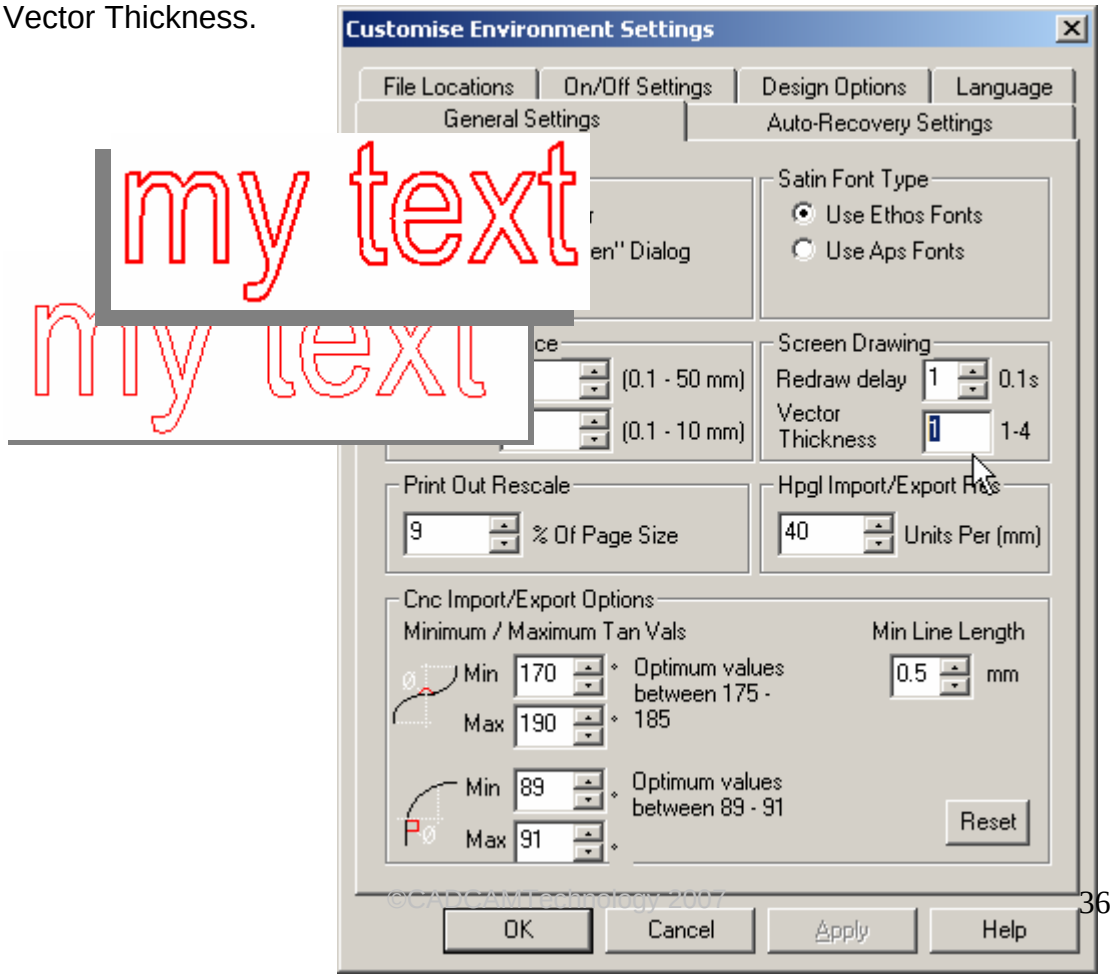
(More information to set up the browser is located on the software CD)



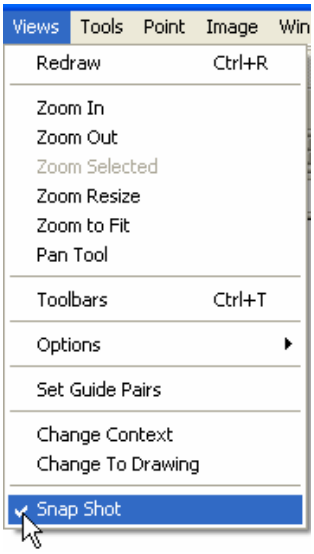
Changing the password
This is located in the **Browser** under the **Tools** menu.

Students can't see on the interactive board?

The teacher can set the Screen Vector Thickness by selecting Options from the Main Menu and click on Settings. Go to the General Settings tab edit Vector Thickness.



Using Snap Shot View

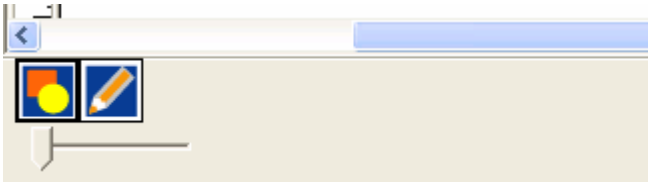


The Snap Shot View function is a very handy way to see the sequence of a cut.

The handy filmstrip view will show frame by frame the order of each individual cut.

To activate the Snap Shot View,
Select **Views** from the Menu Bar,

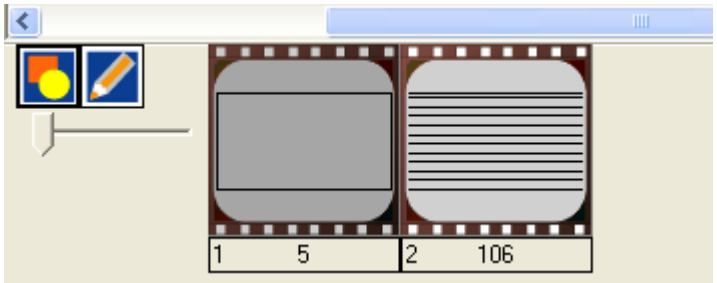
Click on **Snap Shot.**
The snapshot toolbar will appear at the bottom left hand corner of the screen.

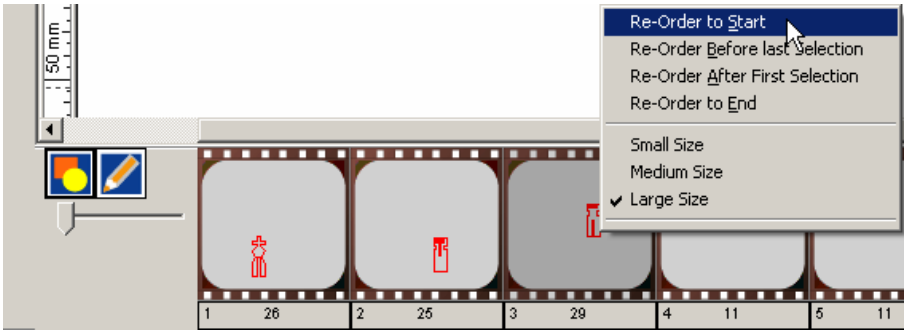


To see the frames in the sequence of order, click on the Left button to **refresh** the frames.

You can **select** and **delete** frames, **drag-and-drop** them to change the order. (Remember to refresh/update it afterwards.)

If you have a **rotary axis** installed on the machine, it is necessary to delete the first frame, and retain the raster scan lines only.

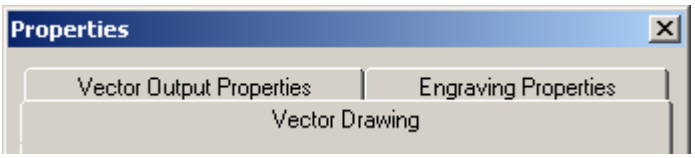




Right click on the filmstrip and see how easy you can Re-Order an object.

SETTING PROPERTIES
Drawing and Cutting Systems

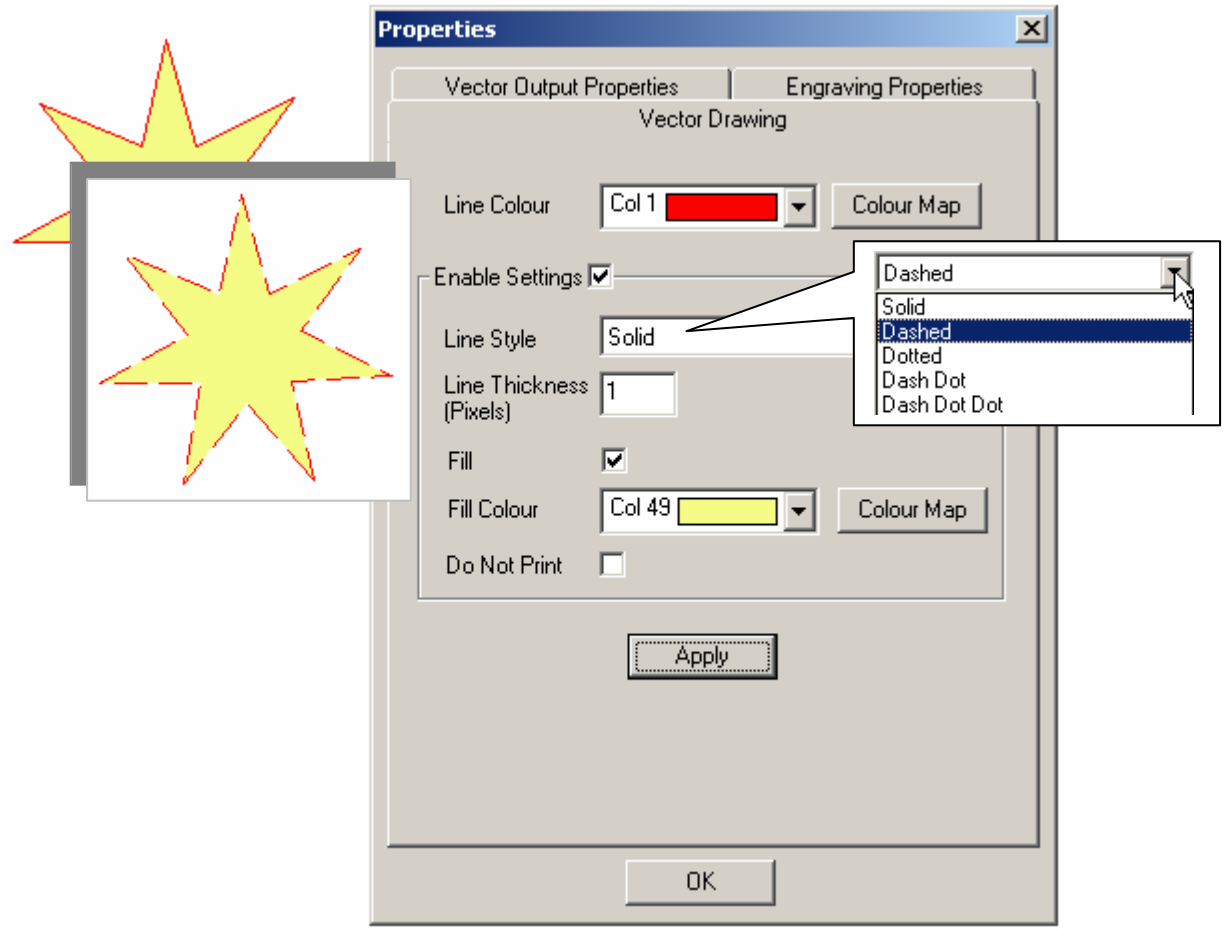
The properties of lines in a design are important.
It can be placed in three categories:



How they are **Viewed**, **Printed** and how they will be **Engraved** by the machine.

Vector Drawing Properties [Drawing & Cutting Composer]

It is now possible to edit the drawing properties of vectors and vector text to give enhanced screen and printing appearance.



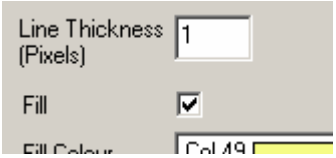
Above is a simple example of a starburst drawn with Ethos.

Select the shape and choose **Edit->Properties**. Or click on the button.
You will now see a properties form as shown above.
The main colour of the object is shown in the "**Line Colour**" setting. The colour can be re-assigned by picking another colour from the drop down list or a new colour can be mixed using the "**Colour Map**" button.
Checking the "**Enable Settings**" box will allow you to choose further vector drawing properties.

Line Style for printing and viewing

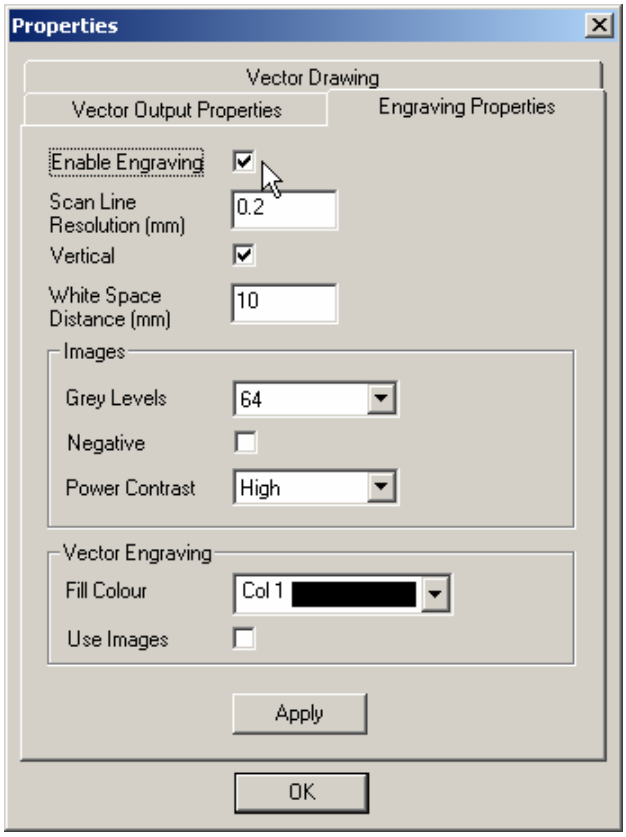
Line Thickness - this is applied with the Line Colour. It is measured in

pixels or dots. The value you choose will depend on the output device. This is most relevant when printing, below is a quick look up table for printers with a 600 dpi resolution.
Here is a quick look up table for the thickness value.



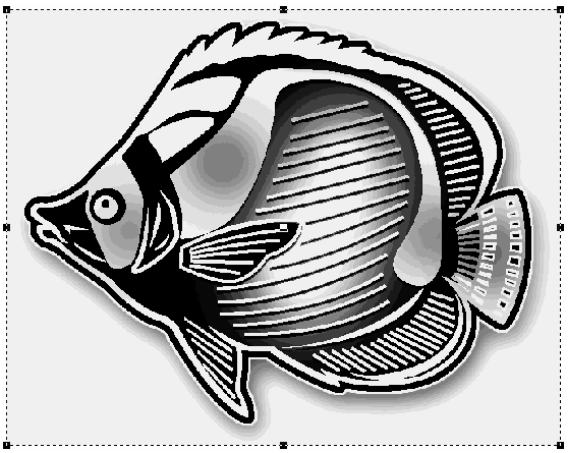
Value	Inches	mm
1	Single pixel line.	
37	1/16	1.6
75	1/8	3.2
150	¼	6.3
300	½	12.7

Since the resolution of the screen is different to a printer, the software will only display a representation of the thickness. The thickness will appear correct on the printed output.
Fill – this option allows a vector to be filled with the colour defined by "**Fill Colour**".
Do Not Print – this option will hide an object when printing. It is useful when adding guides or construction objects to a design.
Things to remember:
1) You must set the "**Enable Settings**" to ON. Then press **Apply** to save the settings to the selected object.
2) If you change the colour mix of, say, colour 1 then all vectors using colour 1 will also change colour. There are 256 vector colours available.
3) The line thickness value will only be used on "**Solid**" line styles. Dashed lines are limited to single pixel width.



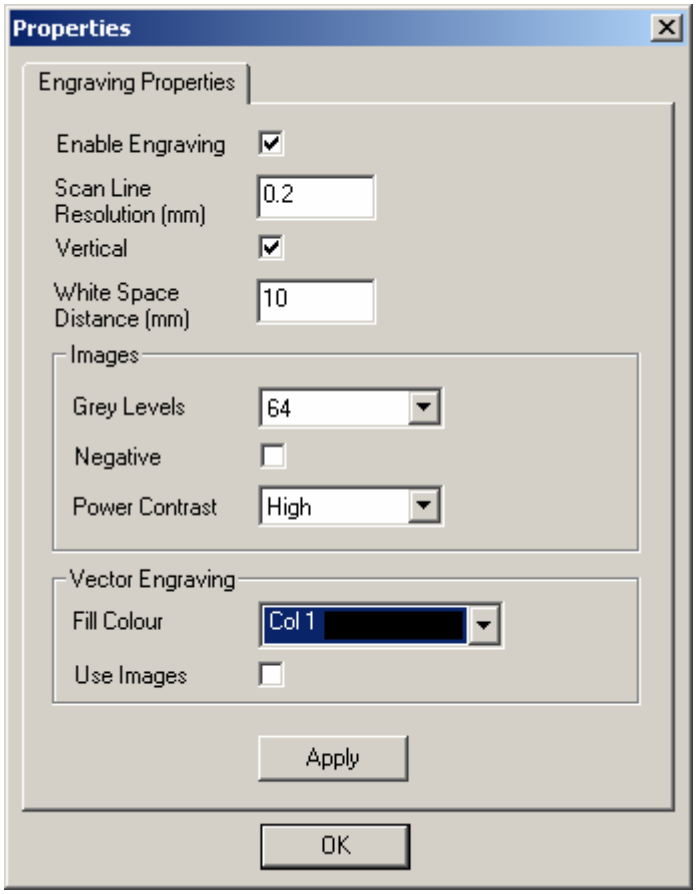
Line Style Engraving Properties

This setting is used when raster engraving an image such as a photo (see next page)
It is now easier to specify engraving settings for a design (without it being necessary to switch to the LMS engraving module).
Properties can now be assigned to individual objects without the need to create extra complex engraving data.
Example Image (fish image is a TIF file installed in Ethos\Images)
Selecting the image then select Edit, Properties to show the following settings form (also accessed by new button on toolbar).



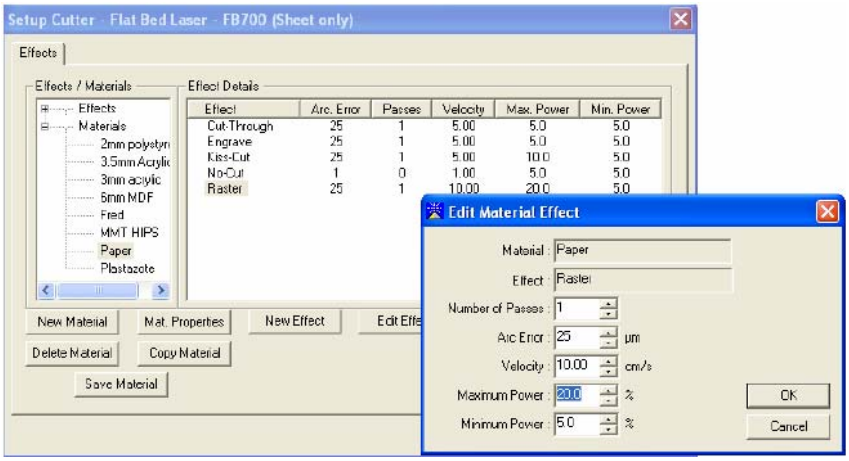
Click on **Engraving Properties** tab if it is not already visible.
To enable an image for engraving the "**Enable Engraving**" check box should be set to ON.
The "**Scan Line Resolution**" is the distance between the laser lines as it scans back and forth across the image. A setting of 0.2 will give a good definition. Higher values will produce a lined appearance (less dense coverage).

The "**White Space**" setting is the space added to either end of the scan lines to allow the laser cutting head to accelerate to the correct speed before laser firing begins. In most cases 10mm is adequate. In the future, if the laser head speed is increased this value may also need to be increased.



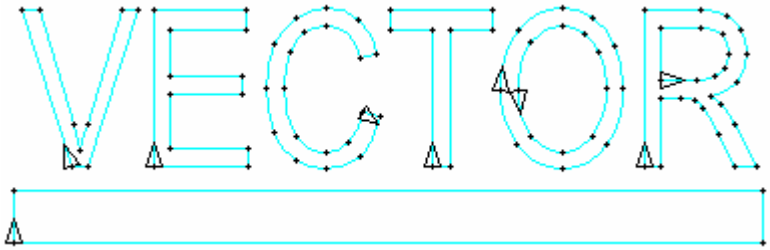
The "**Vertical**" setting should usually be left ON. This setting dictates whether the engraving is made by up and down motions or side to side. For laser machines other than the 400 series, the engraving motion is more efficient in the vertical axis.
The "**Grey Levels**" setting is used at output time and indicates the colour reduction to be applied to the grey scale image. For example the default of 64 will produce up to 64 different laser power levels, while
16 will only produce up to 16. The value you choose will be dependent on the image you are engraving (photos may require 64 greys while a flat colour clip art may only require 16). A lower value can significantly reduce the amount of data sent to the laser machine, and, depending on the image, may not have a significant effect on the engraving results.
The "**Negative**" setting is usually OFF, but when engraving on dark materials (such as denim) should be set to ON to invert the colours of an image.
The "**Power Contrast**" setting is an output parameter which will process the laser powers used by the image to enhance the final engraving results. Usually on tonal images the "**high**" value gives excellent results but you may

find that you will need to drop this value down for more flat colour images which use less colours.
The "**Fill Colour**" and "**Use Images**" are not used in this case and should be left as they are (see vector examples below).
In this example the default settings are adequate and the "**Enable Engraving**" is checked.
Press Apply to assign these settings to the image. If you have imported a colour image then it will be automatically converted to a 256 grey scale image when the settings are applied. Press OK to exit the dialog.



When the design is "**cut**" by pressing the  button the software will create or use the laser effect called "**Raster**" to determine the minimum and maximum powers to be used on the grey colours. The default powers for this effect are 5% and 20%. If you find this does not give you the correct results then you should edit the effect in the normal manner and change the powers accordingly.

Engraving Vectors



Using the same engraving properties it is also possible to engrave-fill closed vectors and text.

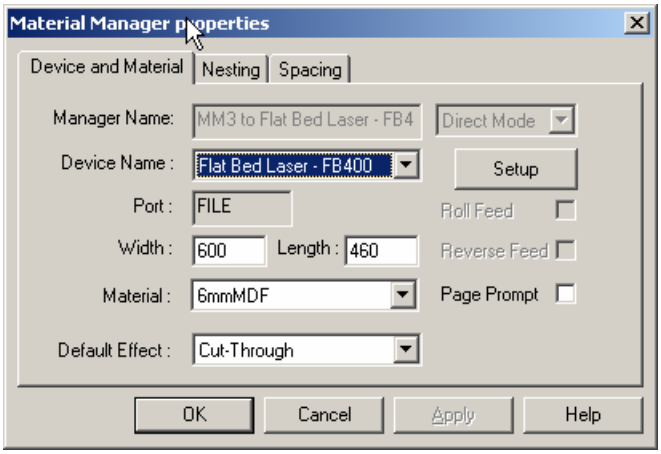
This example shows some text underlined with a thin vector rectangle.
The colour of these objects has been set to "**No-Cut**" to avoid them being cut out by the laser (although you can engrave & cut if you wish).

Select both objects and then press the  button. Next, select the "**Engraving Properties**" tab and enable the engraving option, then press "**Apply**". Press **OK** to exit the dialog.
When the design is cut the objects will be engrave-filled with "colour 1" which is the maximum power from the "**Raster**" effect in the Material Manager.
The intensity of the engrave fill can be controlled by using the grey levels in the "**Fill Colour**" drop down list, for example a grey level of 128 will give a lighter result halfway between black and white (each object can have it's own fill colour).

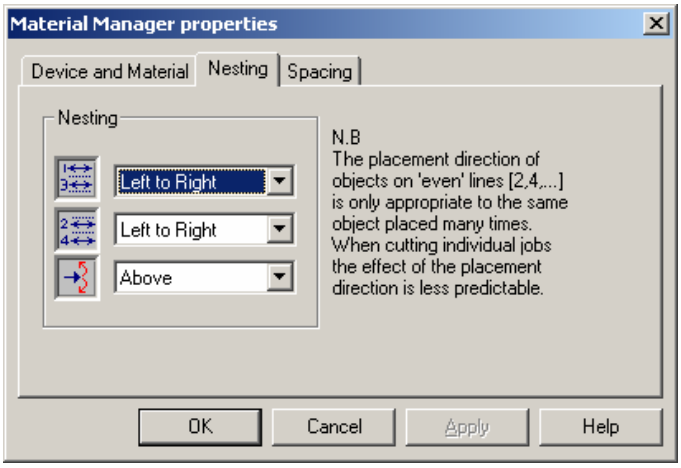
How to cut a Design

The purpose of this page is to inform you on the technical terms used to selectively send single or multiple designs to the cutter.
(This feature is disabled if no USB HASP key is present)
To send a design to the Laser Cutter,
On the menu bar, Select **Output**, **Cut Design**, or alternatively select the toolbar icon 

A popup window will appear with three tabs:
Material Manager**, Output** and Selection

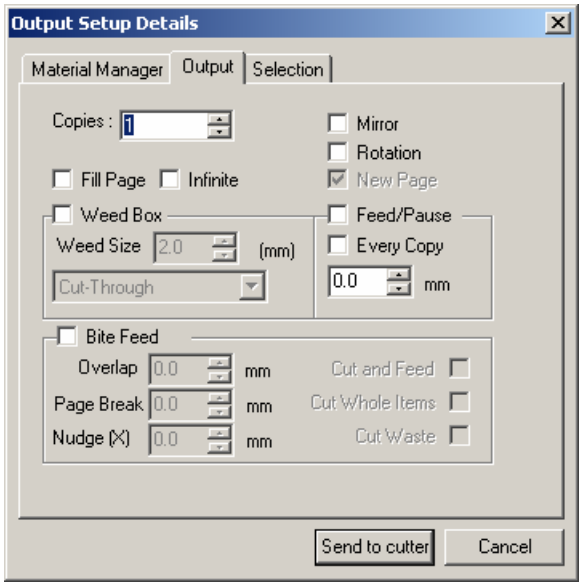


Nesting
This tab determines the position of every next design when cut on a sheet. It also determines the position and cutting order of subsequent designs cut on the same sheet/roll.
The first setting determines the direction of cut on the first and subsequent odd numbered rows. The second setting determines the direction of cut on the second and subsequent even numbered rows.
The third setting determines whether the first design is cut starting from the bottom of the sheet (nearest the cutting head), with subsequent rows cutting above that or from the top, with subsequent rows cutting below it (starting at the top of the sheet or specified roll area, and working its way back down to the bottom of the roll/sheet.



Output Tab

Copies
This is the number of copies to be cut.
If the cutting area on the material is not large enough to fit all of the copies, then once the area is full, the cutter will automatically be thrown off-line and a screen prompt will appear requesting you to insert new media. This will continue until all of the copies have been cut.



Fill page
This setting fills the set area on the machine with as many copies as possible. The number of copies cut will be counted and displayed on the screen once the cutter has finished the first one.

Weed box
Cuts a box around each design or object(s) cut, dependant upon the options chosen in the Selection tab. This is a handy tool to eliminate sharp edges when sheets are stored again after cutting

Weed size
The margin allowed between the extents of the design area and the weed box.

Mirror
This flips the design over to cut in reverse. .One can use this setting when you are cutting the underside of an object such as acrylic mirror.

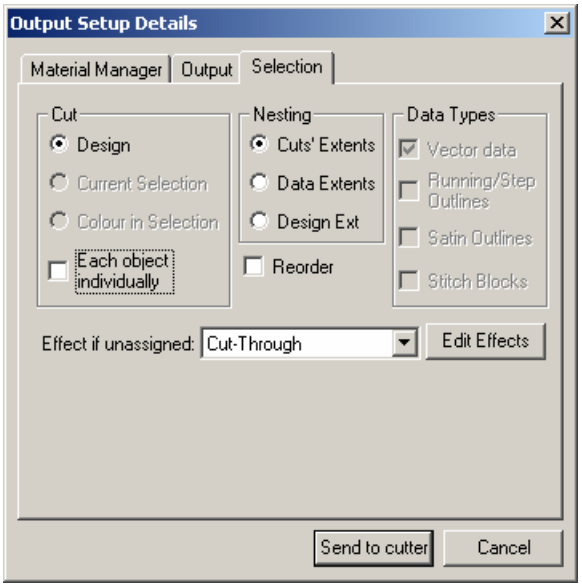
Rotation
This is a three state button.
Off (no tick) Leaves the orientation of the design as it is on screen.
On (tick) Rotates the design by 90 degrees.
Grey (tick) Leaves Ethos Cutting Artisan to decide on the most economical way to cut.

The default setting is Off.
When using rotation one can accidentally waste material on large deigns, especially when there are more than one operator working on the machine and left the box ticked

The Selection Tab

Cut Section

Design
Cuts the entire design (excluding any objects assigned with the 'Don't cut' effect)

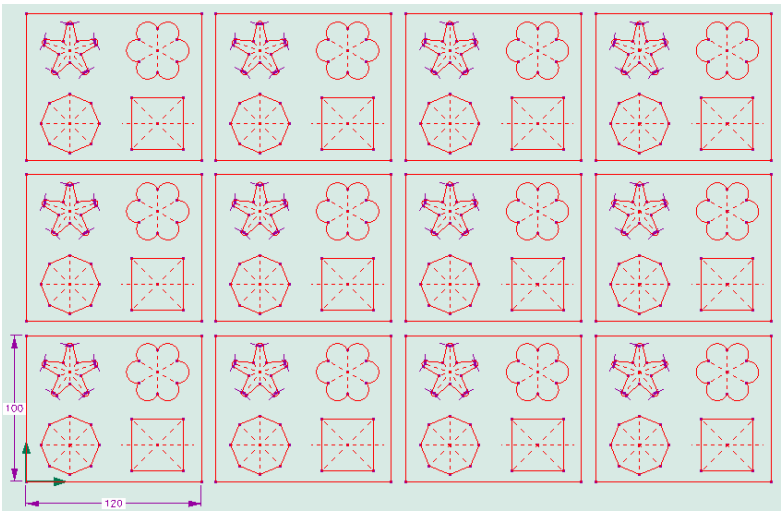


Current Selection
This setting is often used.
This cuts only the objects in a design, which have been selected. If no objects are selected, then this option will not appear in the list.

Colour in Selection
This selection will cut every object that has the same colour as the current selected lines in the design. This option will only appear if the object(s) selected are of a single colour.

Each Object Individually
This button will separate each object and cut them individually, thus losing the spacing and relationship of the objects to each other, but possibly saving material if the objects are not spaced properly.

Nesting Section
(Additional to auto page nesting)



Cuts extents
The area to the extents of the objects to be cut.

Data extents
The area covered by all of the objects in the design regardless of whether they are to be cut. (i.e. no-cut)

Design extents
The area covered by the entire design, allowing for margins and areas of the design where no data appears.

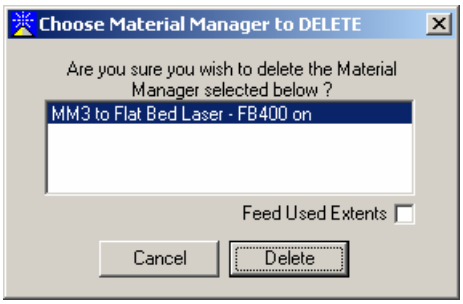
Effect

This is the effect that will be used by the laser if there are no effects defined in the design. (i.e. cut through)

Cutter set-up

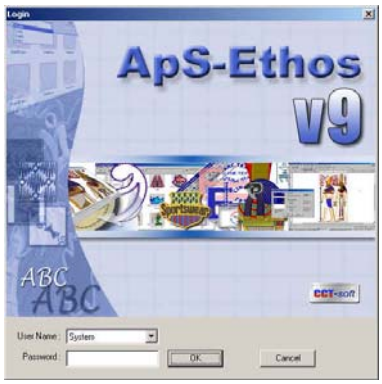
This button will take you to the Material Effects setup dialog enabling material effects to be created or edited. (See Next Page)

Note: if the machine is online and has had an output, the existing material manager needs to be erased from the buffer memory, and it will ask you to delete it. It is in temporary memory, so do not be alerted when this message pops up.



Project 1:

How to design a personalised Key tag

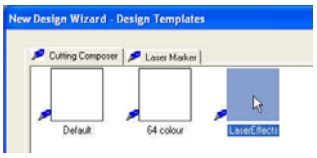


In this activity we will make a key fob that is engraved with a personalised message.

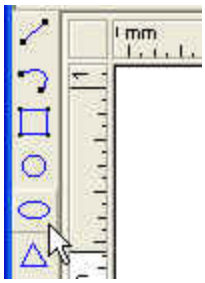
We are going to use **APS-Ethos software** to design and make the laser cut object.

The idea is to get to know all the design tools and add a bit of creativity into it to produce a decorative personalised product.

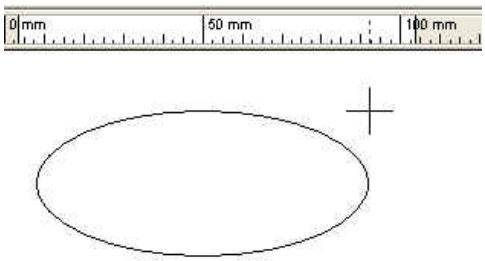
Lets start by opening up a New Design.
Click on **New Cutting Drawing Design**.



The **New Design Wizard** will pop up and present you with options. Double click on **Laser Effects.** (Doing this will give us a screen that has the effects already assigned from previous settings, also it will skip the screens that require data for customers and other stuff.)

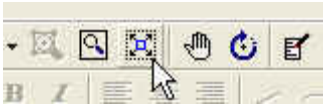


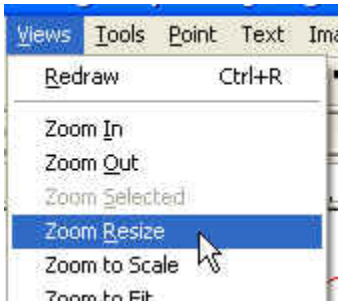
For the sake of this exercise, we are going to use the elliptical tool to draw an ellipse for the shape of the key fob.



Use the guides as a ruler to draw your ellipse and resize it so it will be a suitable size. A handy size would be between 60-80mm in length (X) and 30mm wide (Y).

To view the design better, click on the **Zoom To Fit** button.

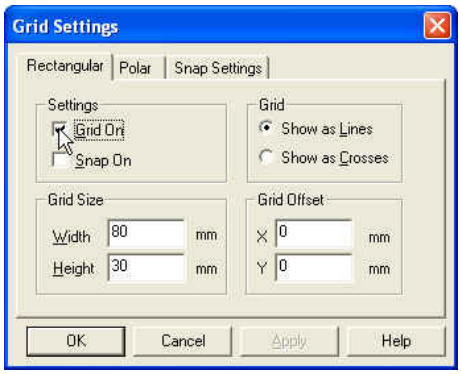




You can Also resize the page area as well as the design in one go. To do this, select **Views** on the menu bar, then click on **Zoom Resize.**

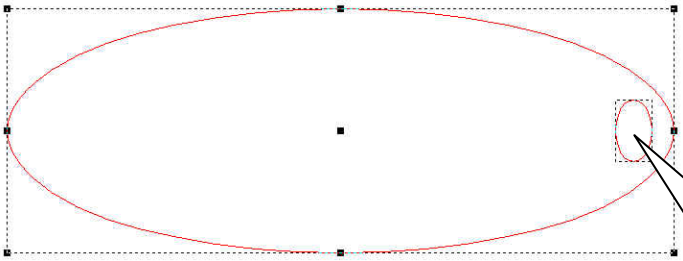
Now the page and the design is a good size to add detail without scrolling.

In order to make full use of the ruler and guidelines, you can easily move and re-postion the Zero Point, (also known as the Design Origin).
This button is located on the bottom left corner.

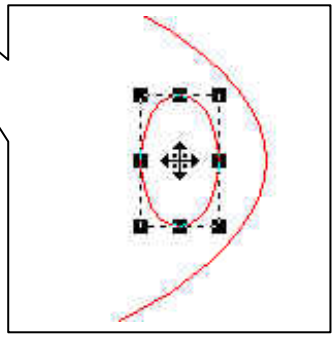


The button right in the corner will activate the grid settings. This is very handy to activate the grids, for measuring during the design process. The grids can be any size. It can even create rectangles to aid in the design of boxes and joints.
An additional feature is to have a polar grid that can come in very handy when designing circular things such as clocks. (See the CD engrave tutorial.)

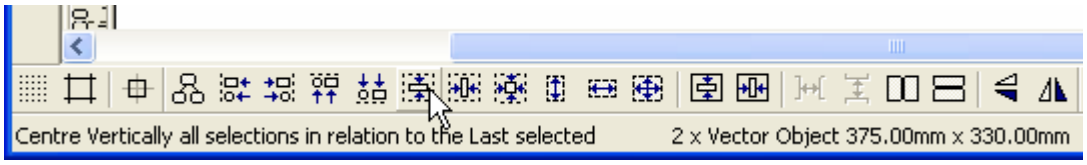
For our key ring hole to hook up, lets draw another ellipse.



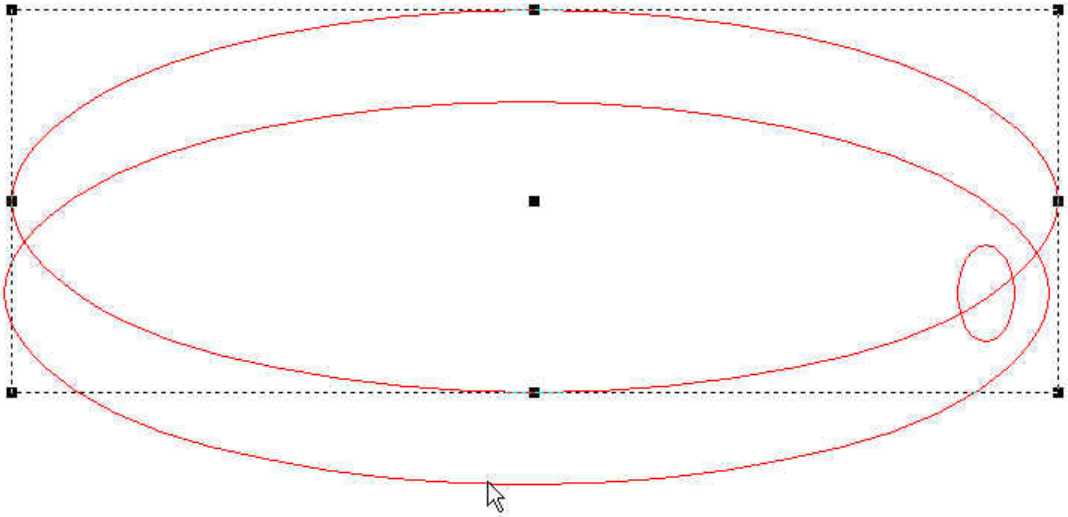
Position the small ellipse far enough from the side to allow the split ring without the material breaking off.



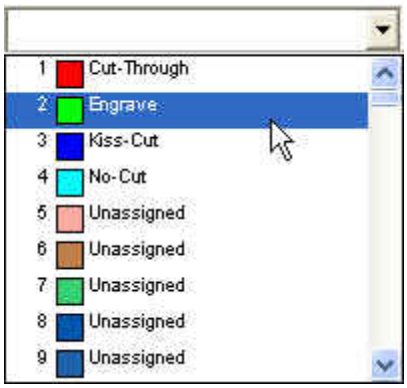
A smart way of getting the two ellipses to align so that they are vertically aligned, is to use the buttons at the bottom. These handy little tools allows one to select items and position the objects with the last selected. Click non the small ellipse, hold **shift**, click on the big ellipse and press the Centre Vertically Button.



All these little features are very handy, especially with manipulating text. Play around with them to get to know how they could help you in designing things. The mirror feature is especially handy when designing for engraving on the back of transparent materials.



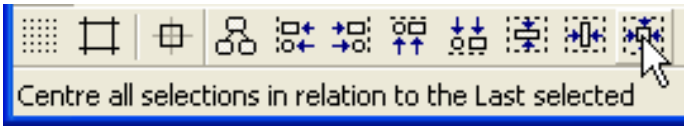
Let us make a line that will be engraved inside the rim. Select the ellipse, copy and paste it so you have two. (Ctrl+C, Ctrl+V)
Drag the new ellipse by the corner to make it smaller.



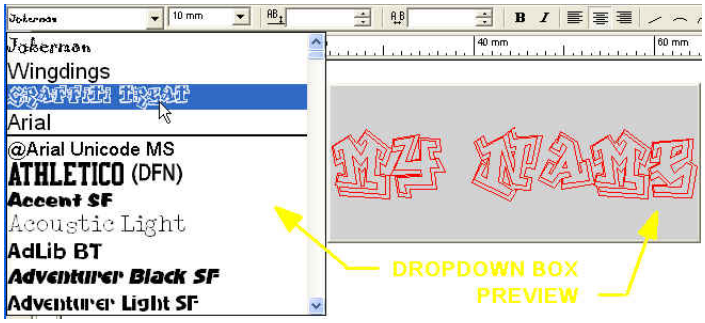
Use the dropdown box in the upper right toolbar to select the new ellipse's property to **Engrave**.
(If the effects are not specified yet, you can easily get back to it later to specify the laser effects for each colour.)

You will need to centre the two ellipses.
Select the smaller green ellipse by clicking on it, hold the **Shift** button, and then select the second bigger ellipse.

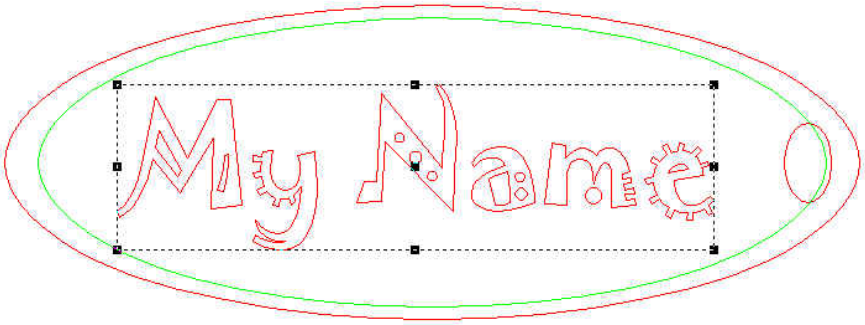
Use the Centre button on the bottom toolbar to get them centred perfectly



Adding text is the next step. This is where we can use the many ways to be creative.
Click on the **Text** Button to add the lettering.



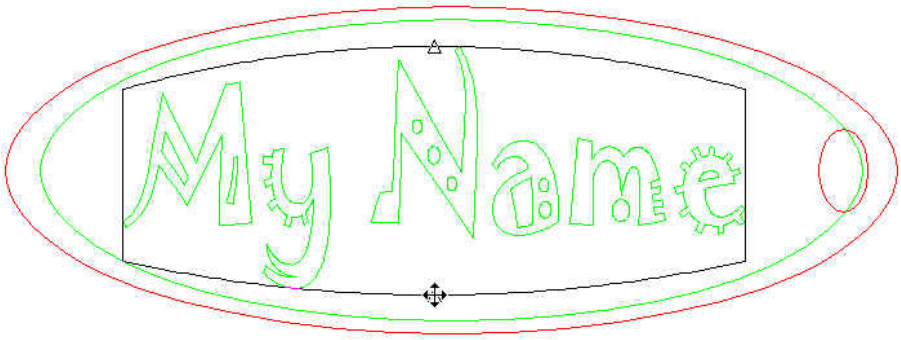
The Text feature works like most other programs: Select the font you would like to use, then the size and click on the spot you would like it placed. Type the wording, and it will give you a preview of what it would look like.



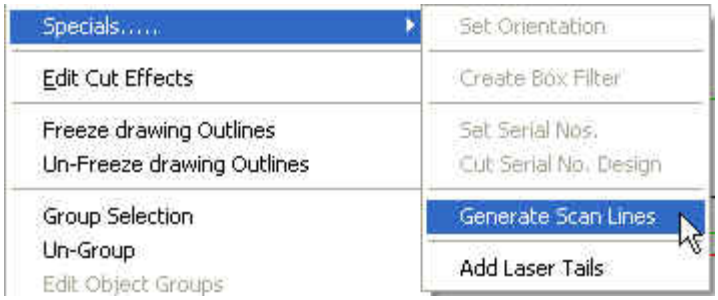
Once you have the basic text typed in, you can change it back into a set of lines. Click on the **Select** button to have text change into vectors.

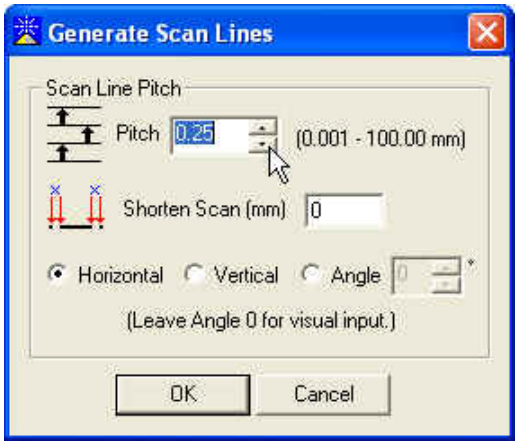
The toolbar at the bottom has many interesting features. Select **Apply Semi Bridge**.

Drag out the rectangle sides to make the text a little fatter.



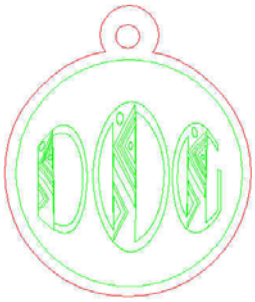
The last step for this text is to fill the artwork with etching to give it more texture. On the Menu bar, click on **Tools**, **Specials**, then select **Generate scan lines**





A selection box will pop up that looks like this one on the left.
Input and select the values as shown on the left.
(Depending on the size of the machine, your teacher will tell you what the best setting would be between horizontal or vertical radio buttons.)
Click on **OK**.

If you feel like you want different challenge, there are as many options as there are shapes and features.

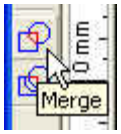


Let's try to design something like these dog tags

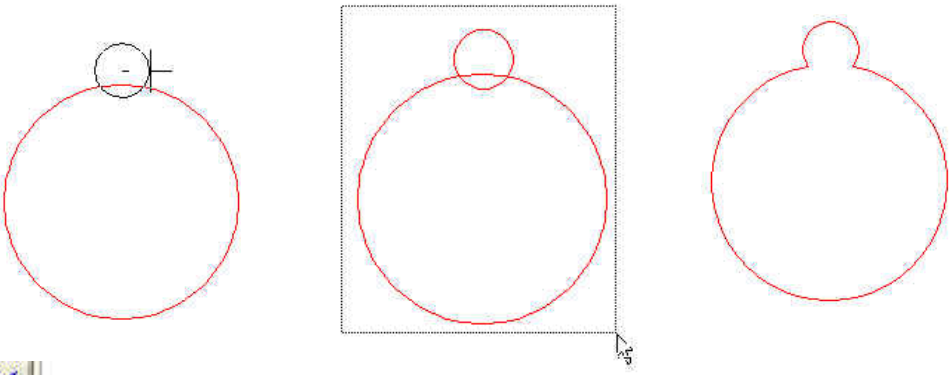
We can start by doing the round one first

Select the **Circle** button on the left toolbar to draw a round shape. You can even drag it to create a spherical object.

Draw a second smaller circle on top of the design.
Select both the circles by dragging a box around them, or simply by pressing **Ctrl+A** on the keyboard.



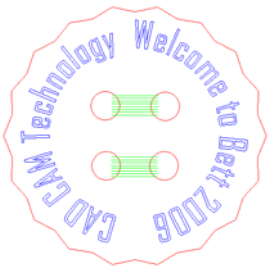
Use the **Merge** button to let the two objects fuse into each other.



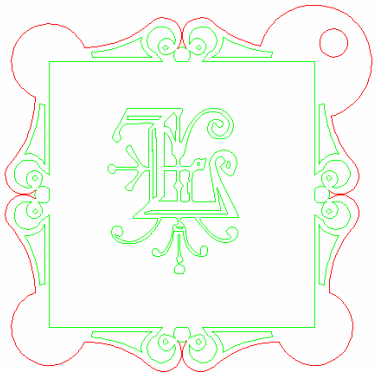
The second "doggie" tag was made using the **Star** button

The head shape was a letter from symbolic fonts such as Wingdings or Webdings. If you surf the internet, there are many fonts with figures and frames.
Be creative and see all the great things that you can make.

Buttons?
Made with writing text on a circle.



Picture frame?



Put all those scraps of material to good use.

Project 3
Develop a Case for a USB memory stick

This project is an engineering activity for more advanced users.
It is an exercise in scaling and designing around the electronics PCB.

The idea behind this project is to develop a case for a USB memory stick by layering pieces of acrylic to encapsulate the device.

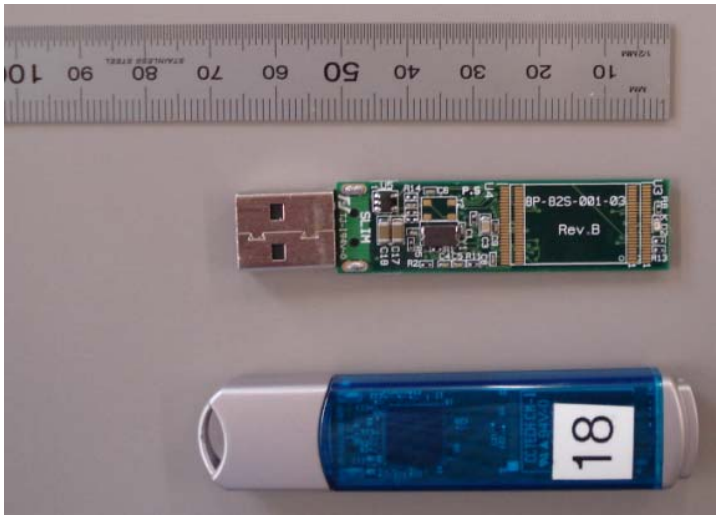
This is a low cost project as it uses only a small amount of material, requiring a fair bit of skill, depending on the circuit board shape and form.

Design elements such as scale, tolerance and the use of layers provide a fair challenge to students.

Project 3

Develop and manufacture a case for a USB memory stick

The first step in making this exciting project is to hunt down a broken MP3 player, or a memory stick that needs some “pimping –up”

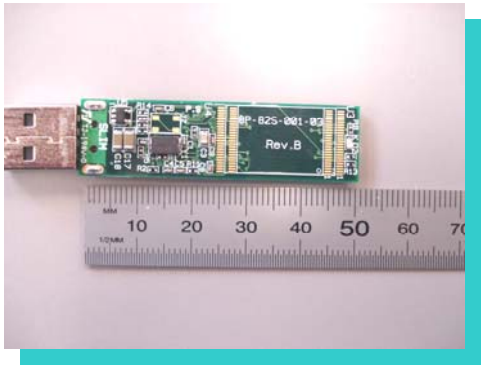


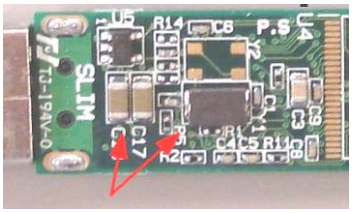
Memory sticks are cheap and some can easily be opened and stripped of their shells.

Take a photograph of the item you wish to develop a case for. The picture has to be laid flat and the camera directly perpendicular to the table surface. A good idea is to lay a ruler next to the object to indicate the scale of the PCB that needs to be captured.

If the camera is in Macro Mode, the image will appear very crisp and it will reveal amazing detail, the problem is that it also distorts the image due to the angle of the lens. I normally take a good quality picture from a distance and just crop the picture. Experiment a little.

If a close up shot is too fuzzy, hold the camera a little higher and crop the picture later.

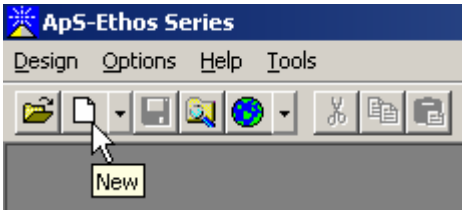




Take a picture of the side that has the most protruding elements that you wish to cover.
These bits can be embedded into the laser cut material later, it all depends how thin the designer wants to make the encapsulating layers of acrylic.

Image brightness and contrast settings can be adjusted either in your image editing software, or in APS Ethos that has this facility built into the software.

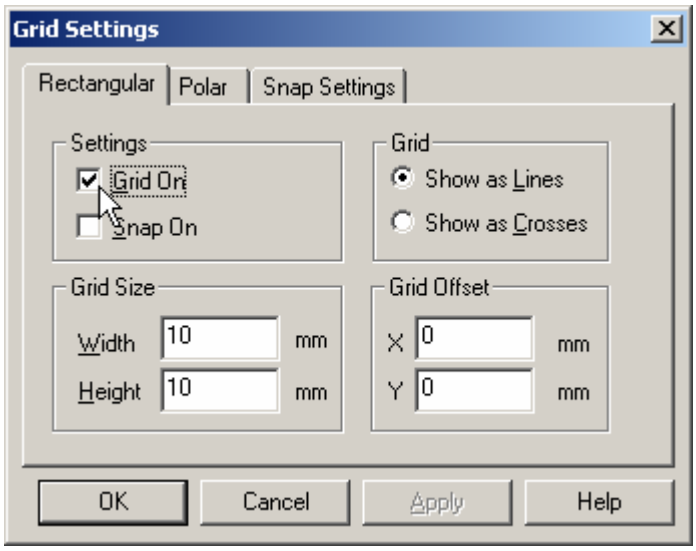
Design time…



Open a new design in APS Ethos.

Double-click on the "**LaserEffects**" icon to skip the New Design Wizard

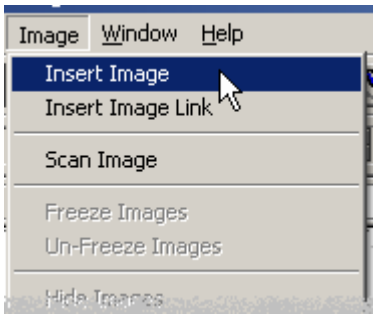
Create a grid on your design area. This will help us to resize the picture later. The Grid button is found at the bottom left corner on the APS design page.



The **Grid Settings** Dialog will appear.

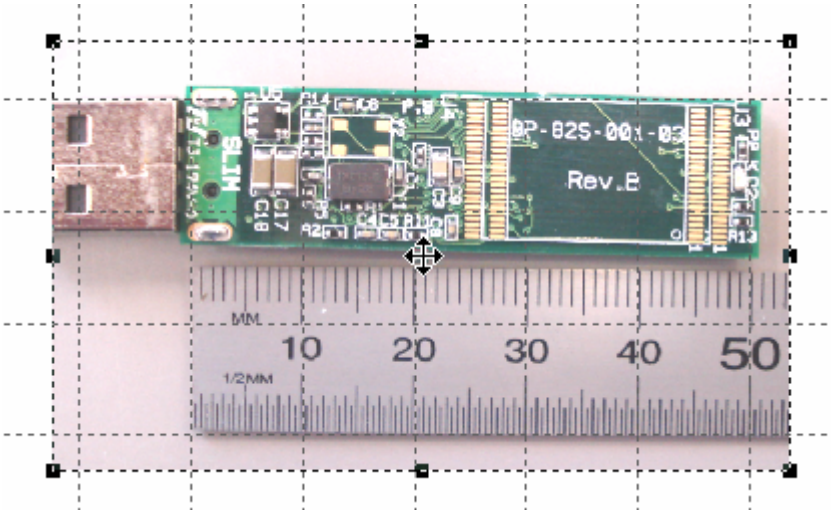
Tick the "**Grid On"** box and if necessary, select the grid size that will best suit your design. (Default settings shown here normally does the trick.)

Click on **OK** to accept these settings.



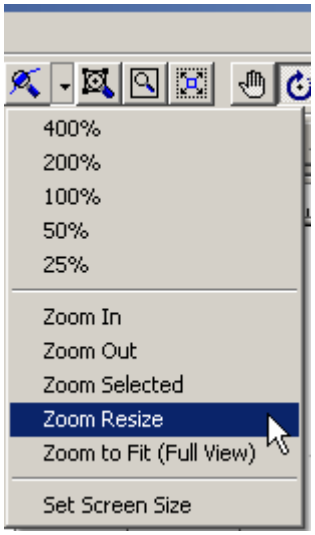
On the Menu Bar, select **Image** and click on **Insert Image**.

Select the file in the browser to bring the USB photo into the design grid.



Resize the image behind the grid so that the ruler on the photo matches up with the grid.

If necessary, use the **Rotate** button to align the project perfectly.

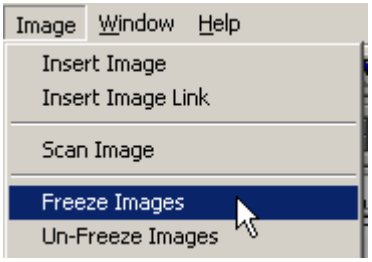


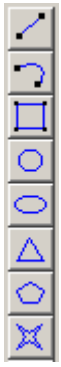
For a better view, zoom in so that the design dominates the page.

Zoom Resize works well, as it crops the page size to the design size for a god view in a compact page size.

It is found under **View** on the menu bar, or as a dropdown button on the toolbar.

Once the image is set up under the grid, select **Image** on the Menu bar and click on **Freeze Image**. This will prevent the photo being accidentally moved or resized whilst designing the layers for the outer case.



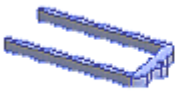


The Design tools can now be used to create the case design. There are a number of tricks that can be employed here.

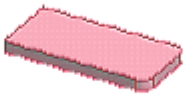
Merging shapes and **Vector slice** come in very useful to add detail to a design. Good symmetry can be maintained if the designer makes use of the alignment buttons on the bottom toolbar. **Object reflection** is useful too. (see the manual)

Using Third Party Software

Third party software can also be used to create the design, then this is a good time to import it if you have an existing design.



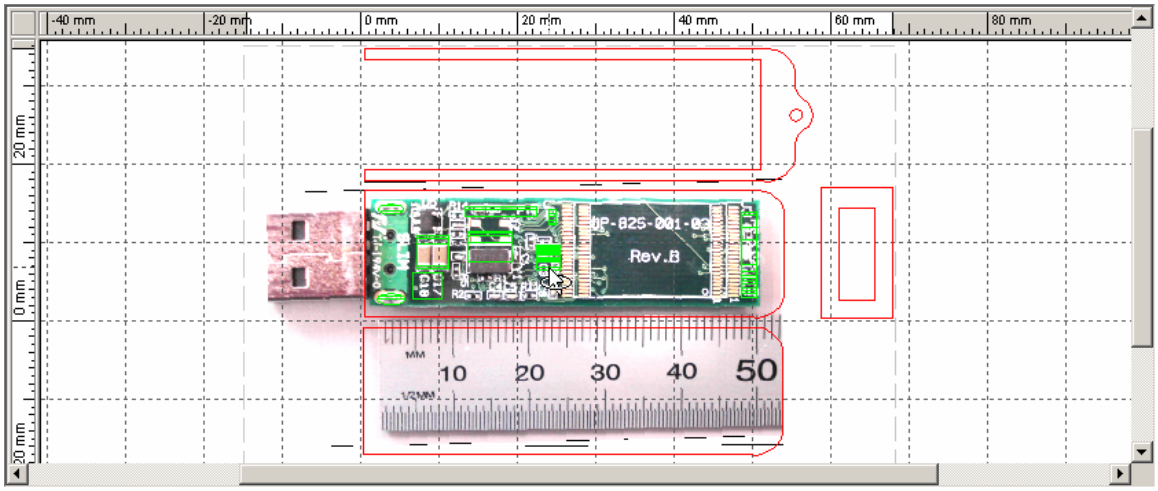
AsamMiddle.des



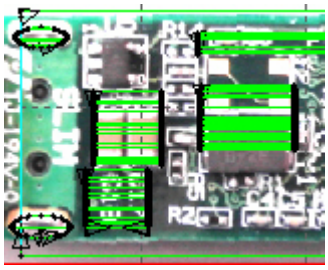
AsamOuter.des

AssamDrawing.dra

APS supports a large number of formats. DXF normally works for all and this format imports quite well.



The above illustration shows four parts that makes up the USB cover:
The case parts are cut from 3mm acrylic. In the topmost part, points were edited to accommodate the hole where a string can loop through at the back end of the USB memory stick.
The one side part is drawn on the photo with some engraved areas in green.
On the right hand side is a rectangular collar that slides on the connector end of the USB.

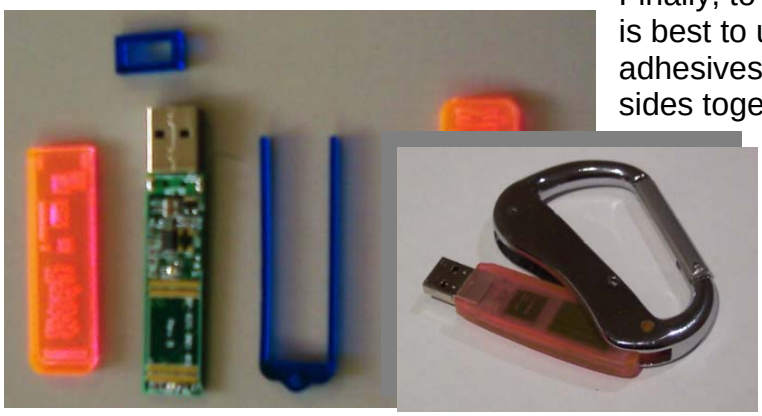


The green areas on the left are shapes filled with scan lines to cut depressions into the cover so that the lid fits snugly.

Notice that once it is complete,
The designer should flip this section to  mirror the part of the design that will be facing the PCB.

Importantly, the raster lines need to be very compact and at a high power setting, this is to create enough depth to house the bulky parts of the board. The above engineering is a challenge for those that need to go ultra thin in their design.

There are two ways to add raster lines, Tools>Specials>Generate Scan Lines, or in the Properties Dialog. 

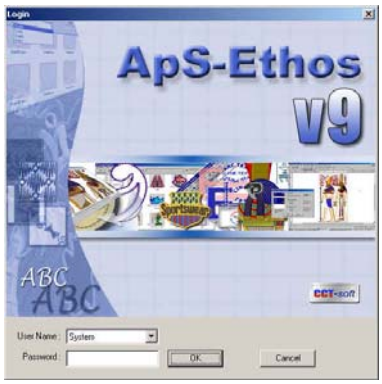


Finally, to complete the project, it is best to use good quality adhesives or resin to bond the sides together.

A brand name such as Araldite® works well and can be finished off after setting to produce an impressive result.

Project 4:

Turn a tattoo into a laser etch design



In this activity we will take an image and turn it into a design to be rastered, or .

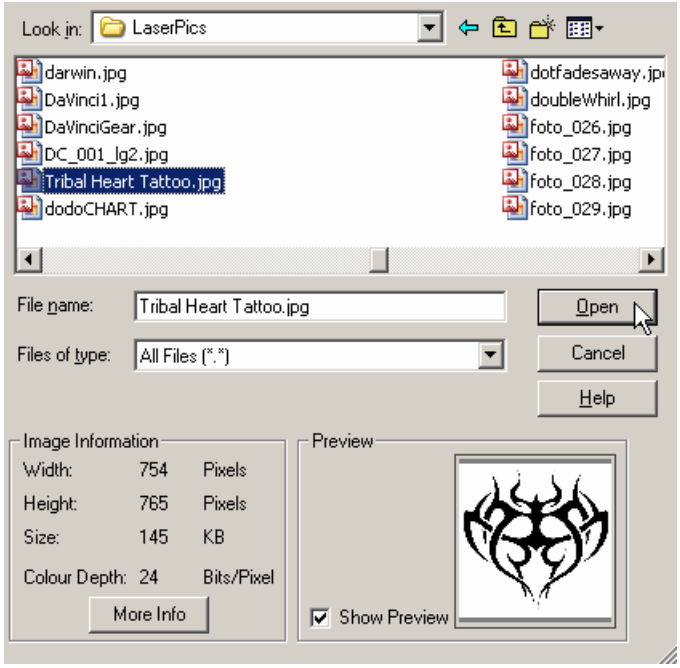
We are going to use **APS-Ethos software** to design and make the laser cut object.

The idea is to get to know some more design tools and add a bit of creativity into it to produce a decorative personalised product.

Lets start by opening up a New Design.
Click on **New Cutting Drawing Design**.

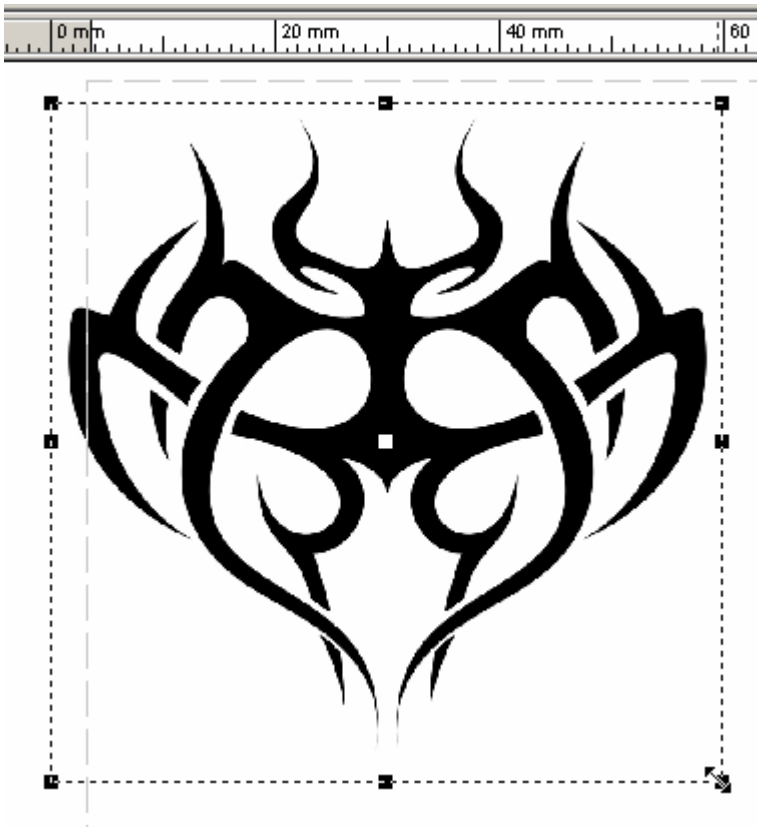
Use the Dropdown button and choose **New Cutting/Drawing Design - d**oing this will give you a new design screen that has the effects already assigned from previous settings, also it will skip the screens that require data for customers and other stuff.

To get an image on the screen, move to the Menu bar and select **Image**, and click on **Insert Image**. Alternatively you can simply click on the **Insert Image Button** on the left hand toolbar



This selection dialog box will be displayed.
Navigate your way to the image that you wish to use as the basis for your design. The better the quality and crispness of the picture the better the result will be.

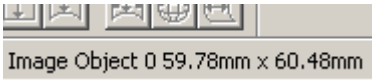
For good results choose your image carefully and view it up close. Diffused or fuzzy edges does not work all that well.



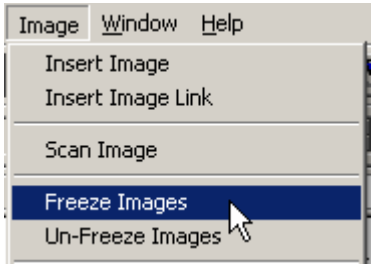
Click and drag the crosshair to mark the area where your image should be pasted.

(If you double-click, the image will be pasted in its original full size.)

Resize the image to the correct size you desire. Make use of the ruler markings as well as the **Image object size** property that will be displayed at the bottom of the screen, as seen here:

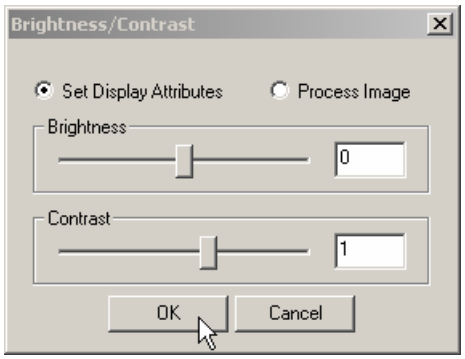


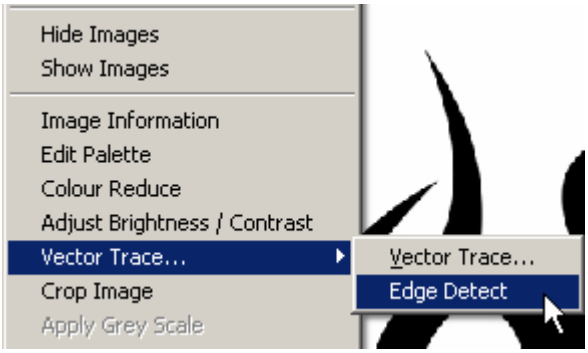
Good practice would be to Zoom Resize the image with the page size. This ensures that we work fits neatly within the constraints of the page area. If the design size is critical, say to fit the cover of a mobile phone, we can always resize the engraving pattern during a later stage.



Another hint that can save a bit of frustration when working with background images, is to **Freeze** the Image. To do this, select **Image** on the Menu bar, and click on **Freeze Image.**

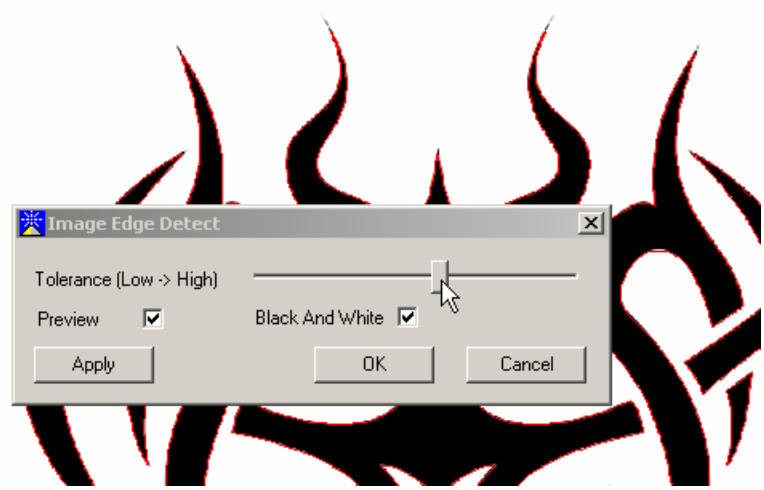
If the background is too dark or if the contrast can be improved, you can adjust the image inside the program by selecting **Image**, and click on **Adjust Brightness / Contrast**.
When you are satisfied with the result, click **OK**





The smart tool to get the outlines of the image is found on the **Image** Menu, **Vector Trace**, **Edge Detect**

A new dialog box with tick boxes and a slider will appear



Tick the boxes for **Preview** and if necessary **Black and White** for crisp results.

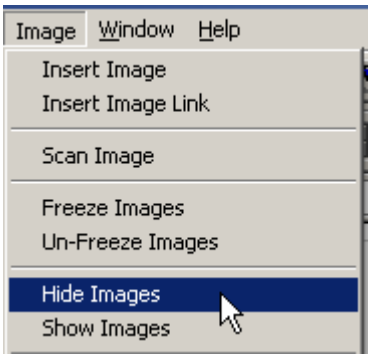
As soon as the **Tolerance Slider** is moved, lines will appear in areas of contrast.

Adjust the slider to get the best outline image and click on **OK**.

Your image should look something like this:

The image now has an outline that can be cut by the laser machine.
This vector outline image can now be further manipulated by adding engraving effects or printing effects.

If you don't need to use the image any more, there is a way to make it disappear:

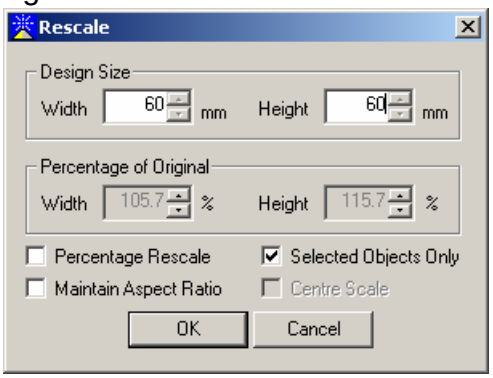


Your image will look something like this now:

All you can see of the design is a vector outline of the image that is hidden from view.
This vector outline now forms the basis of what we are going to be working on.
If your design has a lot of detail, use the Simple vector filter in the **Tools** Menu

A last thing to remember is that the final design size will most times be smaller than the initial picture/image that was imported.
Before you output (cut) the design, recheck the size.

To rescale the object to a specific size, select **Menu,** and click on **Resize.**
The following Dialog box will appear:
Rescale your design to the correct size



From this point onwards, many decisions can be made on what creative things to do with this vector. It will make an excellent engrave on a mobile phone cover, an acrylic object, leather, or even on a pair of denim jeans

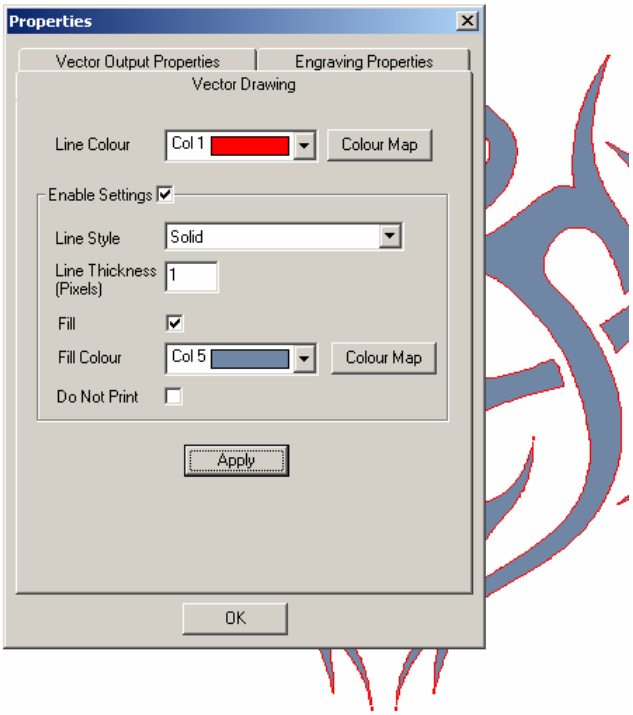
Use the Properties Dialog box to change the way the design is engraved, displayed, or even printed.
To do this, select the vector design by pressing "**Ctrl+A**" on the Keyboard.

Select **Edit**, then **Properties**, or simply click on the button
The following Tabbed Dialog box will appear:

There are three tabs:
Vector output properties:
(leave it as is)

Engraving Properties:
(Enable this according to the preferred effects for your project)

Vector Drawing Properties
(this is for viewing on the screen, as well as printing)



Note:
When it comes to fill engraving (raster), find standard ways of operation. The screen does not give a graphic representation of the raster settings.
I always fill the vector with colour to indicate the presence of raster lines. This is handy when I have to open and old design later.

Before cutting the design onto an object such as this mobile phone, do the following:

- Make a dry run on a piece of card to see what the results are going to be like.
- Define the page size properly to avoid any mistakes.
- Secure small items with blue tack to avoid accidental moving or vibration.
- Adjust the cutting head to focus on top of raised objects
- Slow and low powered etches produce shiny results, whilst fast and high powered runs produce powdery and white finishes

Have fun!

Project 5

The Personalised CD/DVD

This project is an excellent way to make use of APS Ethos to create a design that not only requires some creativity.
It also leaves room for the student to store his coursework.

This project makes use of the program features such as the polar grid, circular text and manipulation of text.
The CD (and the case) can be engraved on the laser cutting machine.
The CD is engraved by using a low powered beam to etch around the outer rim of the disk, leaving lots of space for recording data on the inside.

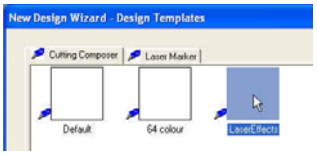
Project 5: How to design a personalised CD/DVD

In this activity we will make a CD that is engraved with a personalised message on the outer rim.

We are going to use **APS-Ethos software** to design and make the entire project.

The idea behind this is to use the empty space at the outer rim of the CD. Because the data is written from the innermost circle outward, we will only lose a few Megabytes of space – a small price to pay for such an innovative end result.

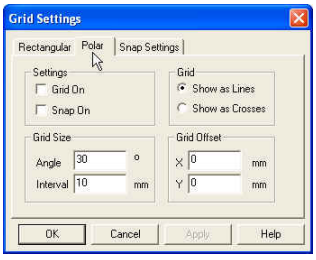
Lets start by opening up a New Design. Click on the New icon.



The **New Design Wizard** will pop up and present you with options. Double click on **Laser Effects.** (Doing this will give us a screen that has the effects already assigned, also it will skip the screens that require data for customers and other stuff.)

A new white page will fill the screen.

Use the mouse to click on the **Grid Settings** button in the bottom left-hand corner of the window.

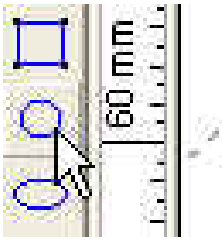


The following **Grid Settings** dialog box will appear. Click on the **Polar** Tab at the top end of this box.

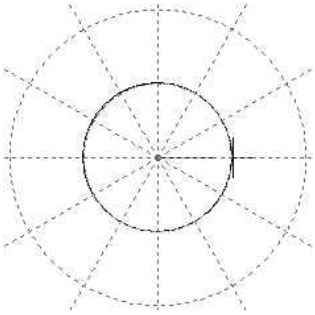
Make sure that in the **Settings** frame the **Grid On** tick box is selected. Click on **OK.**

On your screen you will see a polar grid that looks like a spider's web, every ring is 10 mm apart. This will help us to design the CD a lot easier.

Start drawing:



First, we are gong to draw a small circle in the middle that can be used as a guide when we laser the project.
Click the **Circle Tool** on the Drawing toolbar.
Click and Drag a circle from the centre, outwards to form a ring on the first dotted circle.



For the Guideline to the outer rim of the CD, we are going to draw another circle with a diameter of 120mm.

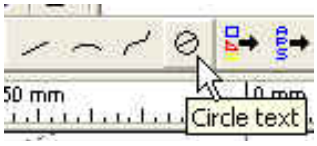
Using the **Circle Tool**, drag a rim from the centre outwards.
If you look at the ruler, you will easily see where 60mm grid runs. Very steadily, click on the dotted line, so that your circle runs on the ∅60mm grid.

Click on the **Zoom to Fit** Button to make both circles fit on the screen. These circles form the parameters of the CD disk.

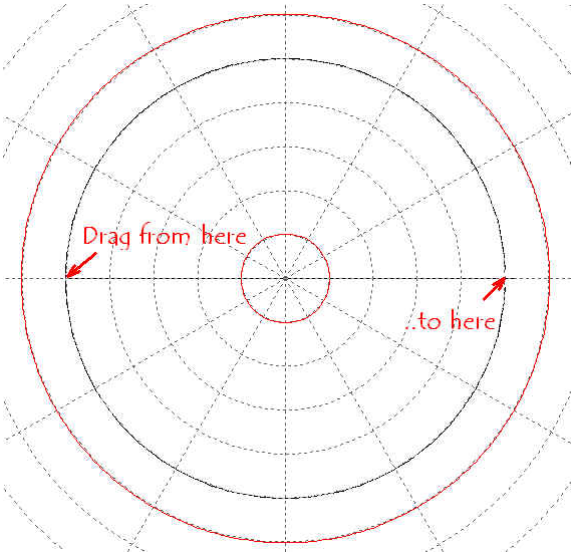
Now it is time to add the text that goes around the CD rim.

Click on the **Create Text** button on the toolbar. This will enable us to place writing on the design.

Click on the **Circle Text** Button.



The circle text button works different from the Circle tool, because it will start on the outer radius, instead of the middle.



This will draw a circular line where the text will be placed. On your APS Ruler, the line will be 45 to 50mm from the centre, depending on the size of the text you want to put in.

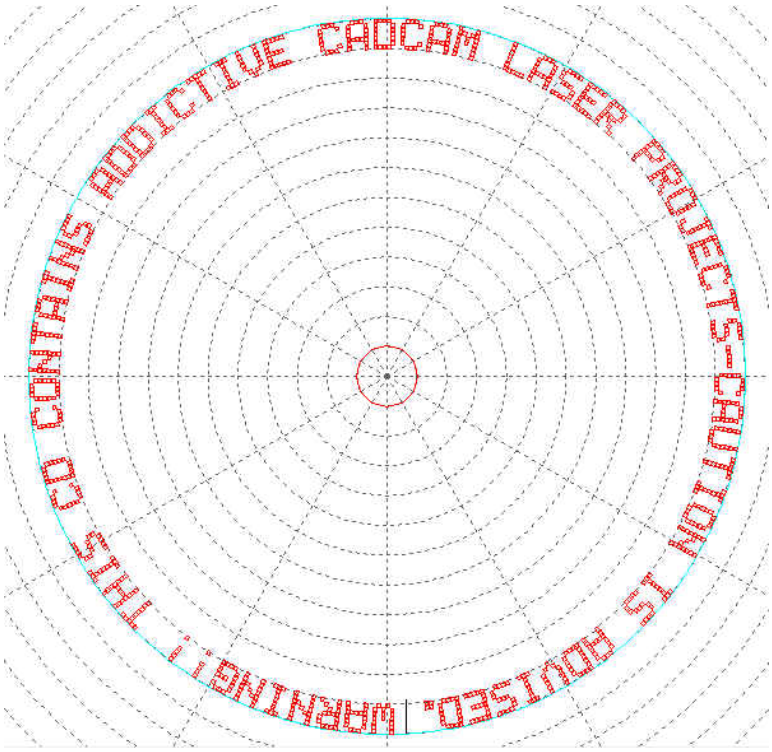
Use the **Undo** Command if you want to, but it is important that the text line must centered around the grid.

Choose the font you want to use.

I have downloaded some free fonts from the Internet to make my CD look special.

Try: www.fontfreak.com

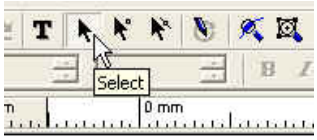
Start typing in the text line for your CD Project…



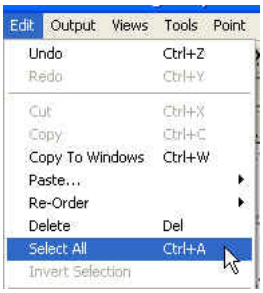
See how it runs all the way round in a circle until it joins up again.

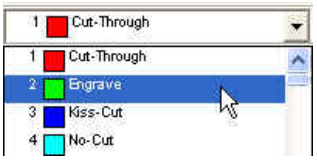
Experiment with various fonts and Sizes until you get the right combination that works for you.

After this there is just one more important thing to do:
We must assign Effects to the design so that the machine will know how to cut this message gently onto the CD without damaging the outer plastic layer.



Make sure you are in **Select Mode** again.
On the Menu Bar, click **Edit,** then **Select All**.





In the **Effects** Dropdown box, select the **Engrave** effect, because the machine will use this setting to burn the CD text.
-Save your project.

Handy Hint: When we laser the image, we are going to use the setting to **Engrave** on **paper**. Run the program on a piece of white paper to see exactly where the image will appear. Lay the CD on top of the paper and align the CD with the inside ring on the burnt image. On the next run your CD will be exactly in the centre.

Have fun!