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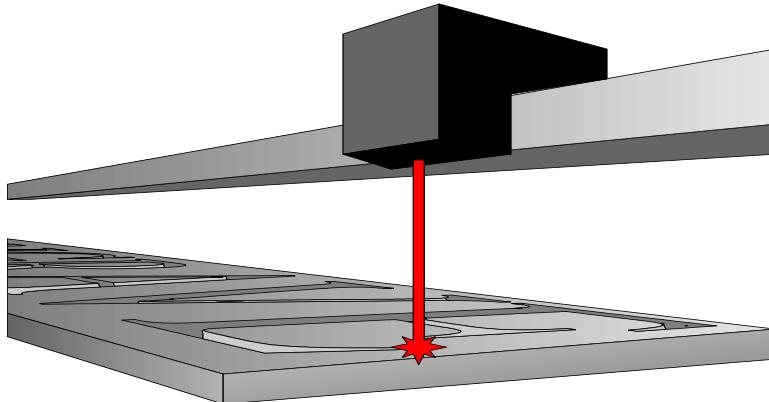
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1. Working with Laser Engravers

Overview

A laser engraving tool uses a laser to engrave a design into an object by scanning across the surface of the object and vaporizing the material in its path.



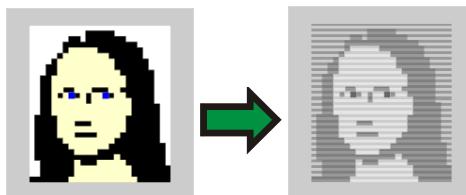
Engraving Raster vs. Vector Graphics

Vector graphics define a picture as a set of mathematical points, lines, curves and shapes. Raster graphics define a picture as an array of dots called *pixels*.

Laser engravers treat vector graphics and raster images differently.

Engraving Raster Images

When cutting out a raster image, the laser engraver will make a series of horizontal cuts that engrave out the entire area covered by the image. Areas with different colors will be engraved to different depths.



Engraving Vector Graphics

Vector graphics are translated into a set of cutting paths that the laser will follow when engraving the design. Filled objects are rendered using the same technique as a raster image: a set of closely spaced horizontal cuts that carve out the entire area.

Laser Engraver Setup

There are three steps to setting up the software to work with a laser engraver:

1. Installing a driver for the laser engraver.
2. Setting the cutting power and speed associated with pen colors.
3. Creating a custom swatch table for the laser engraver.

Installing a Driver for the Laser Engraver

The driver for the laser engraver functions like a local printer driver.

To install the driver:

1. From the Windows Start menu, select **Settings** then **Printers**.
2. In the Printers window, click **Add Printer**.
3. In the Add Printer Wizard, click **Next**.
4. Select **Local Printer** and click **Next**.
5. Select your parallel port (usually **LPT1**) as the printer port and click **Next**.
6. Click **Have Disk** and select the appropriate driver from the **Drivers** directory on your Installation CD.
7. Select your laser engraver in the Printers list and click **Next**.
8. Under **Do you want your Windows-based programs to use this printer as the default printer?** select **No** and click **Next**.
9. Select **Do not share this printer** and click **Next**.
10. Under **Do you want to print a test page?** select **No** and click **Next**.
11. Click **Finish**.

Setting the Cutting Power and Speed for Pen Colors

Most laser engravers support an engraving mode in which the amount of power supplied to the laser and the speed at which the laser moves are determined by the pen color assigned to the path or pixel.

The power and speed settings for each color can be adjusted in the print options for the laser engraver. The colors in your design must exactly match the colors recognized by the driver.

Each type of substrate will require a different combination of speed and power in order to make the most efficient cut. A slower-moving laser will make a deeper cut than a faster-moving laser, because it spends a longer amount of time at each point along the path. Increasing the laser power will also increase the cutting power.

With most substrate materials, there is an upper limit to how much you can cut with a single pass of the laser at a given speed. This is because the excess heat builds up in the area around the cut until it melts or deforms the substrate. The solution is to cut the design using multiple passes of the laser.

Each model of engraver will require unique settings for a given type of substrate because of differences in cutting speed and laser power.

Manufacturer	Color	R	G	B
Epilog	Up to 16 customized RGB colors			
GCC	Black	0	0	0
	Red	255	0	0
	Green	0	255	0
	Yellow	255	255	0
	Blue	0	0	255
	Magenta	255	0	255
	Cyan	0	255	255
	Light Red	255	128	128
	Light Green	128	255	128
	Light Yellow	255	255	128
	Light Blue	128	128	255
	Light Magenta	255	128	255
	Light Cyan	128	255	255
	Gray	128	128	128
Trotec	Teal	0	128	128
	Olive	128	128	0
	Black	0	0	0
	Red	255	0	0
	Blue	0	0	255
	Steel Blue	51	102	153
	Light Blue	0	255	255
	Light Green	0	255	0
	Green	0	153	51
	Dark Green	0	102	51
	Tan	153	153	51
	Light Brown	153	102	51

	Dark Brown	102	51	0
	Dark Purple	102	0	102
	Light Purple	153	0	204
	Magenta	255	0	255
	Orange	255	102	0
	Yellow	255	255	0
Universal Laser	Black	0	0	0
	Red	255	0	0
	Green	0	255	0
	Yellow	255	255	0
	Blue	0	0	255
	Magenta	255	0	255
	Cyan	0	255	255
	Orange	255	128	0

Xenotech	Black	0	0	0
	Red	255	0	0
	Navy	0	0	128
	Magenta	255	0	255
	Maroon	128	48	96
	Lime	0	255	0
	Olive	128	128	0
	Aqua	0	255	255
	Gray	190	190	190
	Blue	0	0	255
	Purple	160	32	240
	Silver	192	192	192
	Green	0	128	0
	Yellow	255	255	0
	Teal	0	128	128
	White	255	255	255

Creating a Custom Swatch Table for the Laser Engraver

In order to make sure that the colors in your design match the pen colors exactly, you should create a custom swatch table that contains the pen colors specified by the manufacturer. You can then use this table and be certain that the colors you assign to objects and bitmaps will map to the pen settings used by the engraver.

 Uncheck **Use Color Management** to prevent using settings from the color management system.

See "Working with Color" in the Flexi User Manual for details.

Designing for Laser Engraving

The following are design tips that save time and effort when creating a design to be engraved with a laser engraver.

Sizing Page to Match Work Area Dimensions

Before you begin creating your design, set your drawing area size to the dimensions of the laser engraver's work area. This ensures that the engraver will be able to cut your design without shrinking it, and eliminates any need to convert between scales when comparing the design and the final engraving.

To set the drawing area size:

1. From the **File** menu, select **Document Setup**.
2. In DesignCentral, enter new height () and width () values for the drawing area (see below).

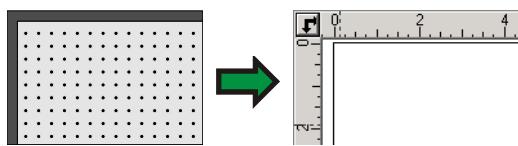
The drawing area is resized automatically to match the values entered in DesignCentral.

Make/Model	Width & Height (mm)	Width & Height (in)
Epilog Mini	457 x 305	18 x 12
Epilog Legend 24TT	610 x 305	24 x 12
Epilog Legend 24EX	610 X 508	24 x 20
Epilog Legend 32EX	813 x 508	32 x 20
GCC Venus	300 x 210	11.81 x 8.27
GCC Neptune	1280 x 930	50.39 x 36.61
GCC Jupiter	300 x 210	11.81 x 8.27
GCC Mercury	635 x 457	25 x 18
Xenetech XLE 1325	330.2 x 635	13 x 25
Xenetech XLT 1325	330.2 x 635	13 x 25
Xenetech Aurora	457.2 x 762	18 x 30
Xenetech XLE 2436	609 x 914	24 x 36
Xenetech XLT 2436	609 x 914	24 x 36
ULS VersaLaser VL-200	406 x 305	16 x 12
ULS VersaLaser VL-300	609 x 305	24 x 12

Set the Origin to Match Your Engraver

You should set the location of the origin in your software to match the location of the origin on the laser engraver. If the origin is in the upper left corner of the work area on your engraver, set the origin in the

software to the upper left corner also.



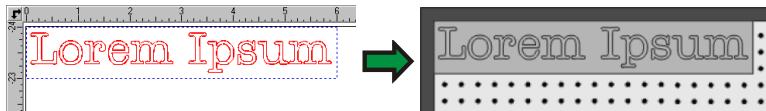
To set the location of the origin:

1. From the **View** menu select **Ruler and Grid**.
2. On the **Ruler** tab, under **Orientation**, press the button to set the origin to be in the top left corner.
3. Click **OK**.

Positioning the Design

The substrate must be positioned exactly as defined in the design. The laser engraver cannot detect the location of the substrate: it can only cut where it is told.

For this reason, it's best to set up your design so that the substrate sits in a corner of the cutting table. This eliminates any need to measure out the position.



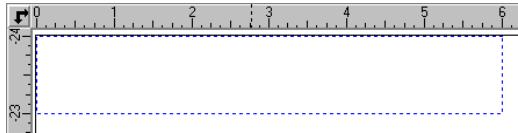
Marking the Boundaries of the Substrate with a Guide

It is often difficult to determine exactly where the boundaries of the substrate are when you are working on your design. It makes it easier if you add an object to your design that has the same size, shape and location as the substrate, then make the object into a guide.

To make an object into a guide:

1. Select the object.
2. From the **Arrange** menu, select **Guides** then **Make Guide**.

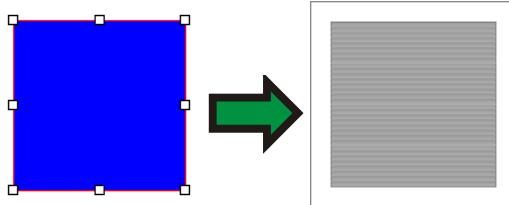
The guide object will appear as a dotted blue outline.



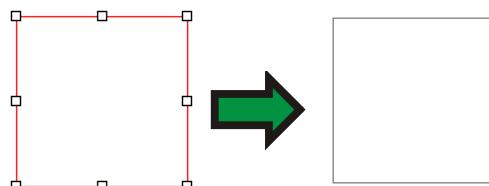
Fill and Stroke Settings

When a vector object is rendered into laser engraving paths, the fill and stroke settings of the object are handled as follows:

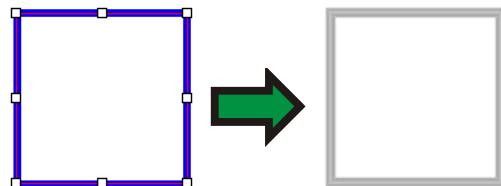
- The fill of the object, if any, is engraved out like a raster fill.



- The stroke of the object, if any, is handled in one of two ways:
 - If the width of the stroke is 0 or 0.001, the stroke will be cut as a vector outline.

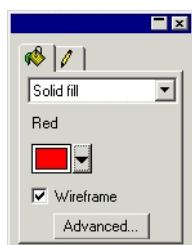


- If the stroke is wider than 0.001, it will be cut as a raster image.

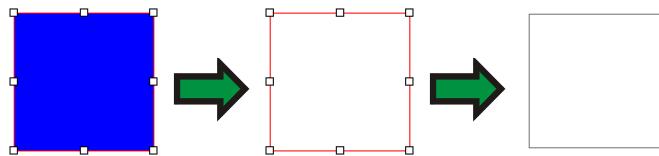


Wireframe

If you want to turn a vector object with a fill into a single engraving path that follows the outline of the object, check the **Wireframe** option in the Fill/Stroke Editor.



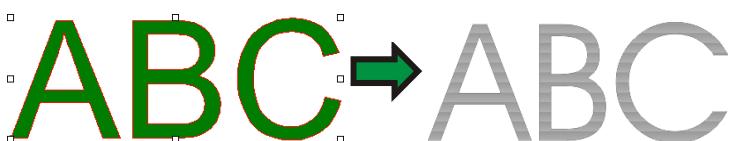
The fill color of the wireframe object will determine the cutting speed and power used to engrave it.



Font Handling

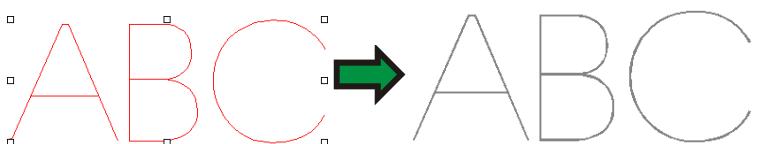
Standard Fonts

When text using TrueType or Adobe Type 1 fonts is engraved, it is treated as an object with a fill and rasterized.



Engraving Fonts

When text using an engraving font is engraved, it is treated like an outline.



The engraving fonts included with the software are:

F F Avanti 1 ABCdef

F F Baha 1 ABCDef

F F Cent 3 ABCdef

F F College 2 ABCdef

F F Engrave 1 ABCDEF

F F Helvetica 1 ABCdef

F F Huckle 1 ABCDEF

F F Script 1 ABCdef

F F Serif 1 ABCdef

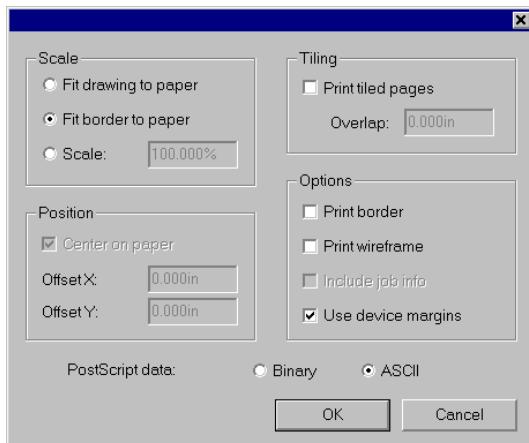
F F Wedding 3 ABCdef

Sending Output to the Laser Engraver

When you output a design to the laser engraver, you will print it like you were printing to a desktop printer, selecting the laser engraver driver.

To output a design to the laser engraver:

1. Position the substrate in the engraver so that it occupies the position specified in your design.
2. Close the engraver cover.
3. Adjust the focus of your laser.
4. From the **File** menu, select **Print**.
5. In the Print dialog, select the laser engraver driver from the list of available print drivers.
6. Click the **Options** button in the Print dialog.



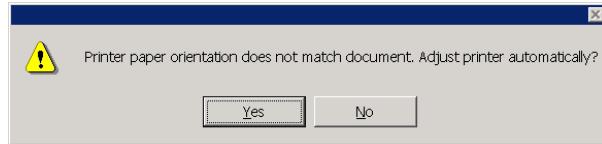
7. Set the following options:
 - Scale** Select **Fit border to paper**.
 - Tiling** Clear the **Print tiled pages** checkbox.
 - Options** Clear the **Print border** checkbox.
Check **Use Device Margins**.
8. Click **OK** to return to the Print dialog.
9. To select laser engraver properties, select the laser engraver driver from the list of drivers in the Print dialog and click **Properties**.

- If you want to use color mapping to determine the power and speed settings used to engrave your design, select the appropriate option for your engraver:

Epilog	Set the Map Colors to Speed/Power print option to Yes .
GCC	Set Mode Setting to Manual Color Fill .
Xenetech	Set Output Mode to Use Color Settings .
Universal	Set Print Mode to Normal .

- The available properties will vary for each make and model of engraver. Please consult your engraver manual for details.

10. Click **OK**.



11. If message about adjusting the paper orientation appears, click **Yes**.

Engraving a Job Using Multiple Passes

To engrave a job using multiple passes of the laser, select colors for the elements of your design that correspond to the cutting speed and power needed for a single pass of the laser. Then print the job multiple times on the same substrate. Do not move the substrate between passes.

Printing Multiple Passes of Selected Parts of a Design

If only certain parts of the design need multiple print passes, you can select only certain parts of a design and then print them as needed.

To print selected parts of a design:

1. Select the parts of the design you want to print multiple passes of.
2. From the **File** menu, select **Print**.
3. In the Print dialog, select **Print Selection**.
4. Click **OK**.

Appendix A: Notes on Laser Engravers

GCC, Inc.

Pen Colors

Each pen color can be assigned the following settings:

- Speed** The speed the cutting laser moves at. A slower-moving laser will make a deeper cut than a faster-moving laser, because it spends a longer amount of time at each point along the path.
- Power** The amount of power supplied to the cutting laser. Increasing the power makes the cut deeper.
- Raster** Check to output pixels or raster fills that have this color.
- Vector** Check to output vector objects that have this color.

Focusing the Laser

To focus the laser of the surface of the substrate, first lower the level of the work area so that the surface of the substrate is below the level of the laser cutting head. Move the cutting head over the surface of the substrate, then press the **Auto Focus** button on the engraver.

Printing and Clearing Jobs

After a new job is sent to the engraver, you need to press the **Next File** button on the engraver to access the new print job.

Press the **Start/Stop** button on the engraver to output the job.

Once a job has been output, press the **Del File** button to delete the job from the engraver's memory.

Xenotech, Inc.

Pen Colors

Each pen color can be assigned the following settings:

- Power** The amount of power supplied to the cutting laser. Increasing the power makes the cut deeper.
- Speed** The speed the cutting laser moves at. A slower-moving laser will make a deeper cut than a faster-moving laser, because it cuts for a longer amount of time at each point along the path.
- PPI** The number of laser pulses per inch.

Universal Laser Systems, Inc.

Pen Colors

Each pen color can be assigned the following settings:

Rast	Determines the types of objects with that color that will be output.
Vect	
Rast/Vect	Rast Only raster fills with this color will be output.
Skip	Vect Only vector outlines with this color will be output.
	Rast/Vect Both raster fills and vector outlines with this color will be output.
	Skip No objects with this color will be output.
% Power	The amount of power supplied to the cutting laser. Increasing the power makes the cut deeper.
% Speed	The speed the cutting laser moves at. A slower-moving laser will make a deeper cut than a faster-moving laser, because it cuts for a longer amount of time at each point along the path.
PPI	The number of laser pulses per inch.

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