

# **Universal Systems VLS 6.75 Laser cutter**

Usage Zine

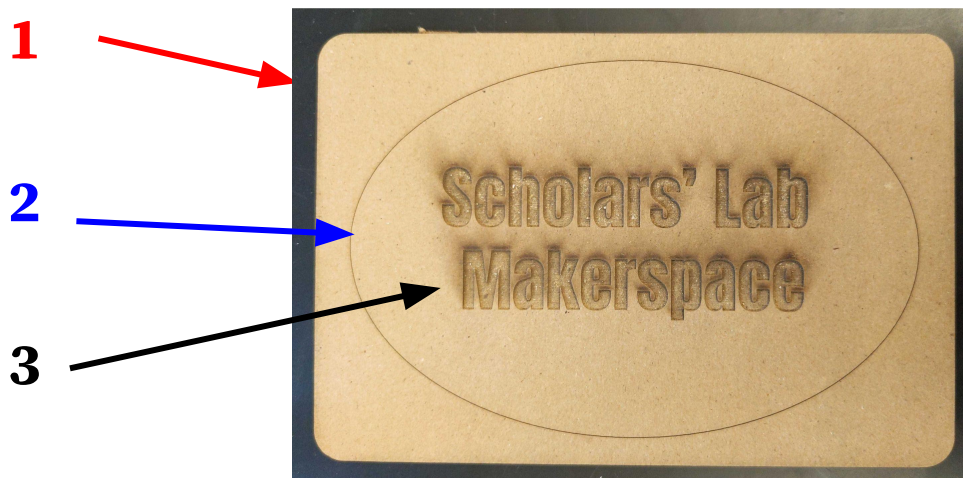


# What can you do with a laser cutter?

The laser cutter is best used with flat materials like acrylic, thin pieces of wood, leather, cardboard and MDF.

There are three (3) modes of “cuts” you can make with a laser cutter:

1. **Cut:** this cuts all the way through the material.
2. **Etch:** this cuts partially through the material, and is only as thick as the laser.
3. **Engrave:** this is like debossing the material, it is useful for burning in text and shapes.



# Dos

- **Do** let a Technologist know that you want to use the laser cutter. A Technologist must supervise the laser cutter whenever it is in use.
- **Do** ask for help. If you are unsure, ask the Technologist for clarification.
- **Do** use only pre-approved materials.
  - Extruded or cast acrylic
  - MDF (premium, not Home Depot stuff)
  - Cardboard
  - Leather
  - Thin wood (birch plywood)
  - Other woods can be engraved
- **Do** wait for the exhaust fan to engage before cutting.

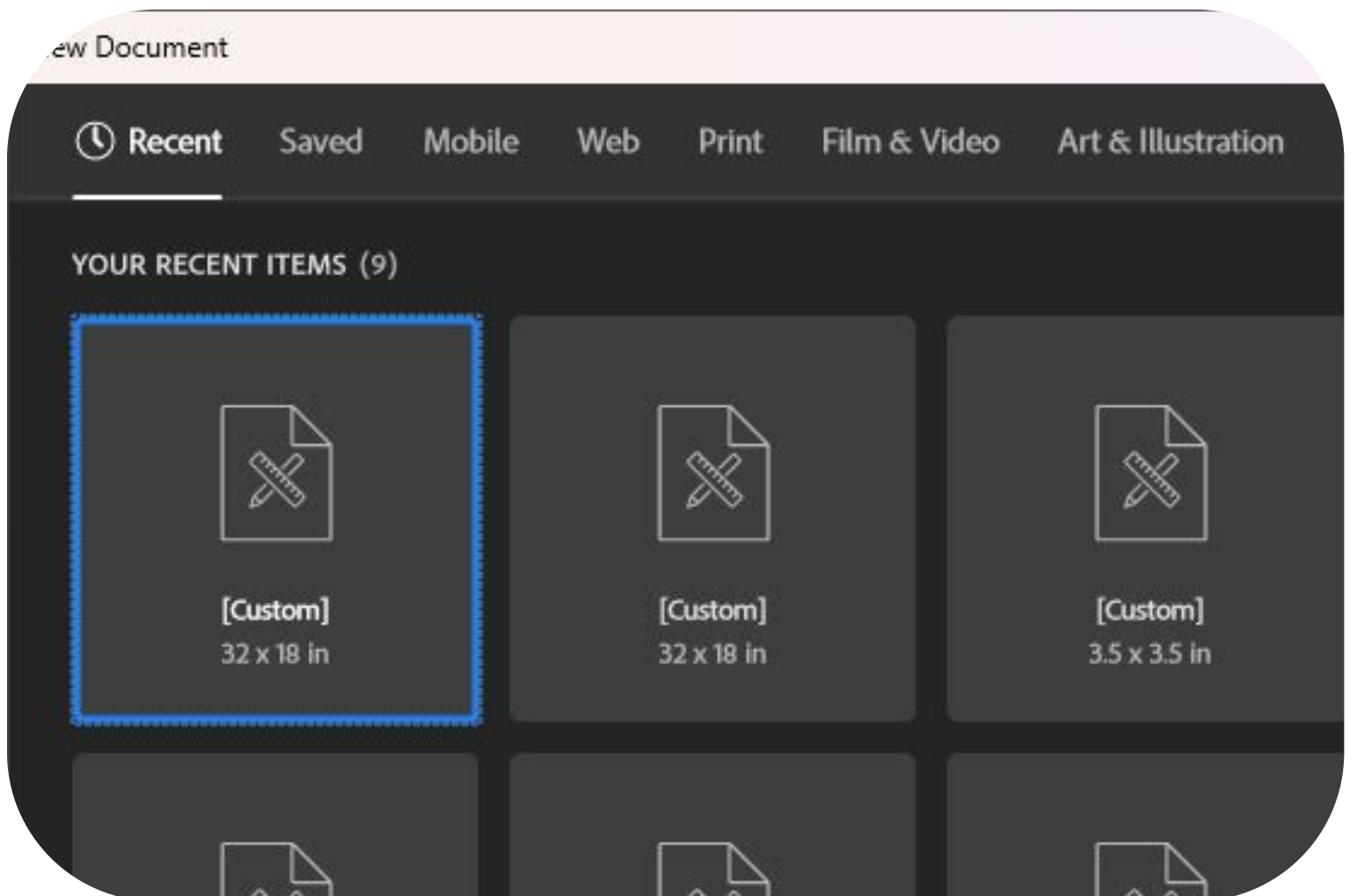
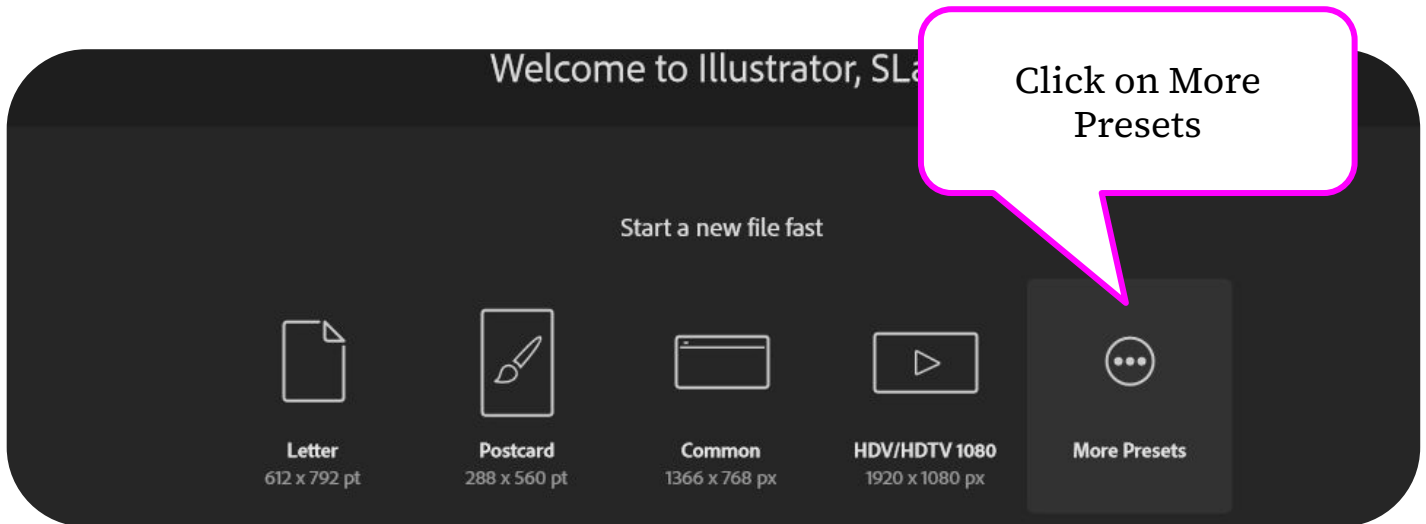


# Don'ts

- **Don't** leave the laser cutter unattended. You must watch your project at all times.
- **Don't** use unapproved materials. They usually create toxic fumes and degrade the lenses.
- **Don't** change any settings in the software or on the laser cutter. Leave that to the Technologists.

# Open Adobe Illustrator

Open Adobe Illustrator, and use the custom profile where the artboard is 32 x 18 inches.



# Import Design and Select Cut Style

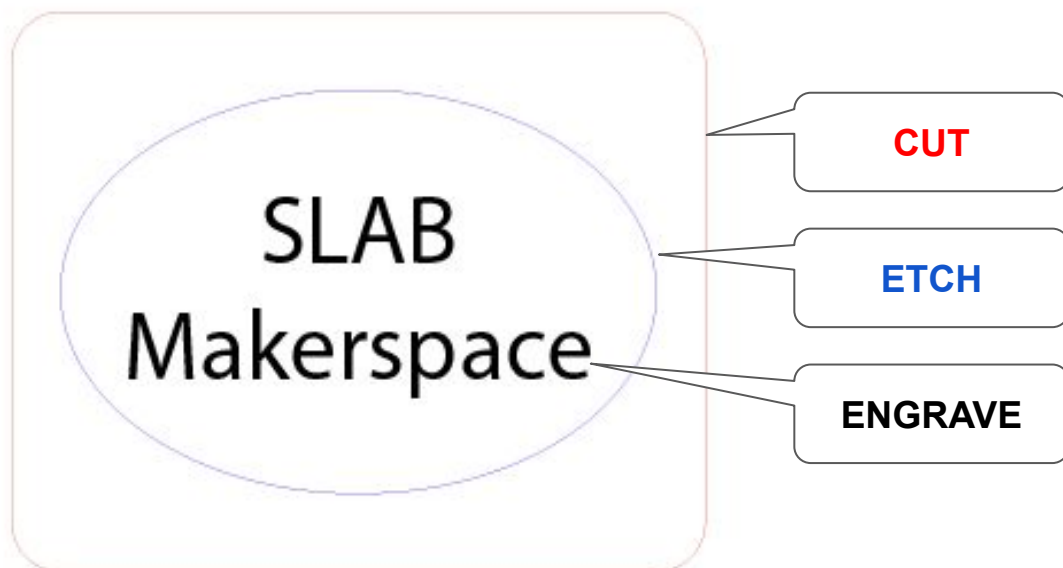
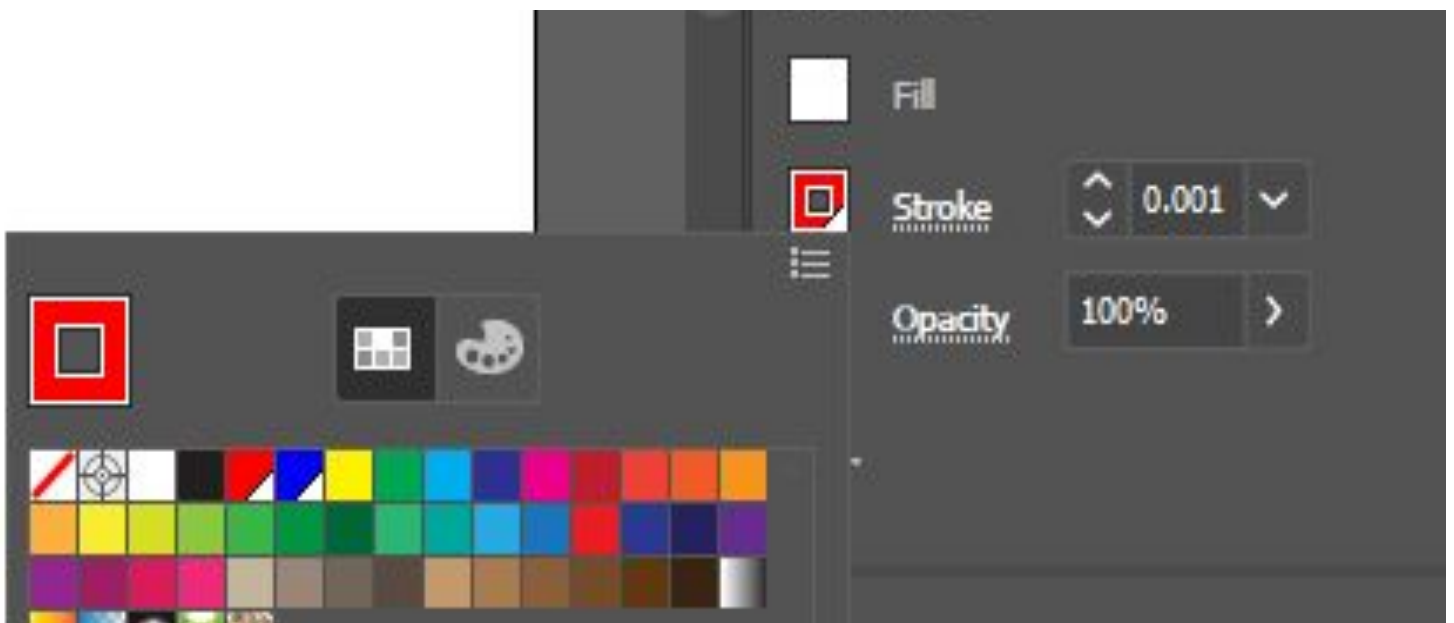
You can import a png, jpg, svg, dxf, or pdf file.

When designing or preparing your design, use the following chart to assign different cut modes.

Mode	Color	HEX Code	Stroke Size
CUT	RED	#ff0000	.001pt
ETCH	BLUE	#0000ff	.001pt
ENGRAVE	BLACK	#000000	any size

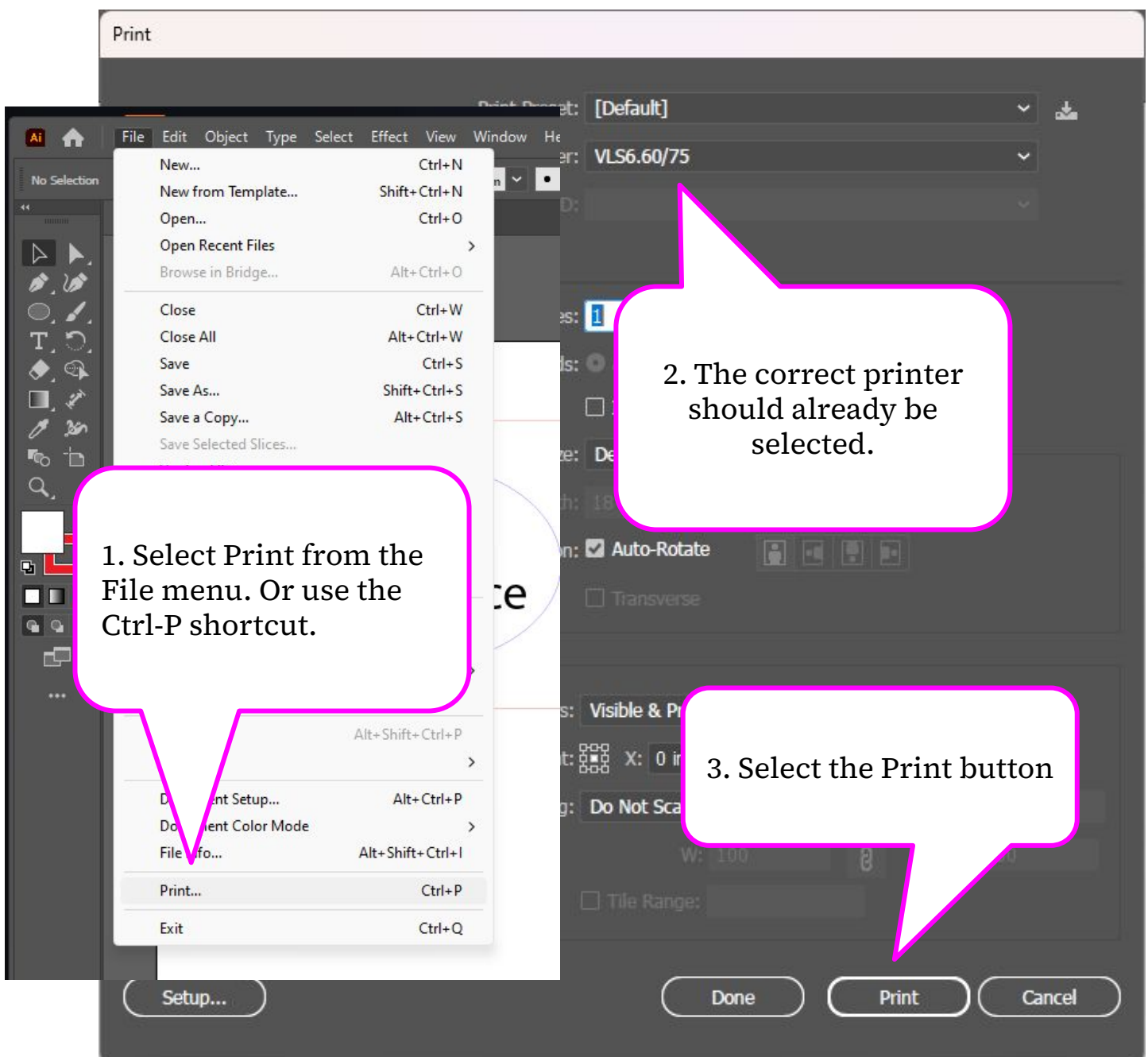
# Change Stroke Color and Size

Change the stroke color and size according to the “cut” you would like to make.



# Send Design to UCP Program

After you have finished preparing your design, then simply print the file. Make sure the VLS laser cutter is selected. Then select the print button again.





# Open UPC Program

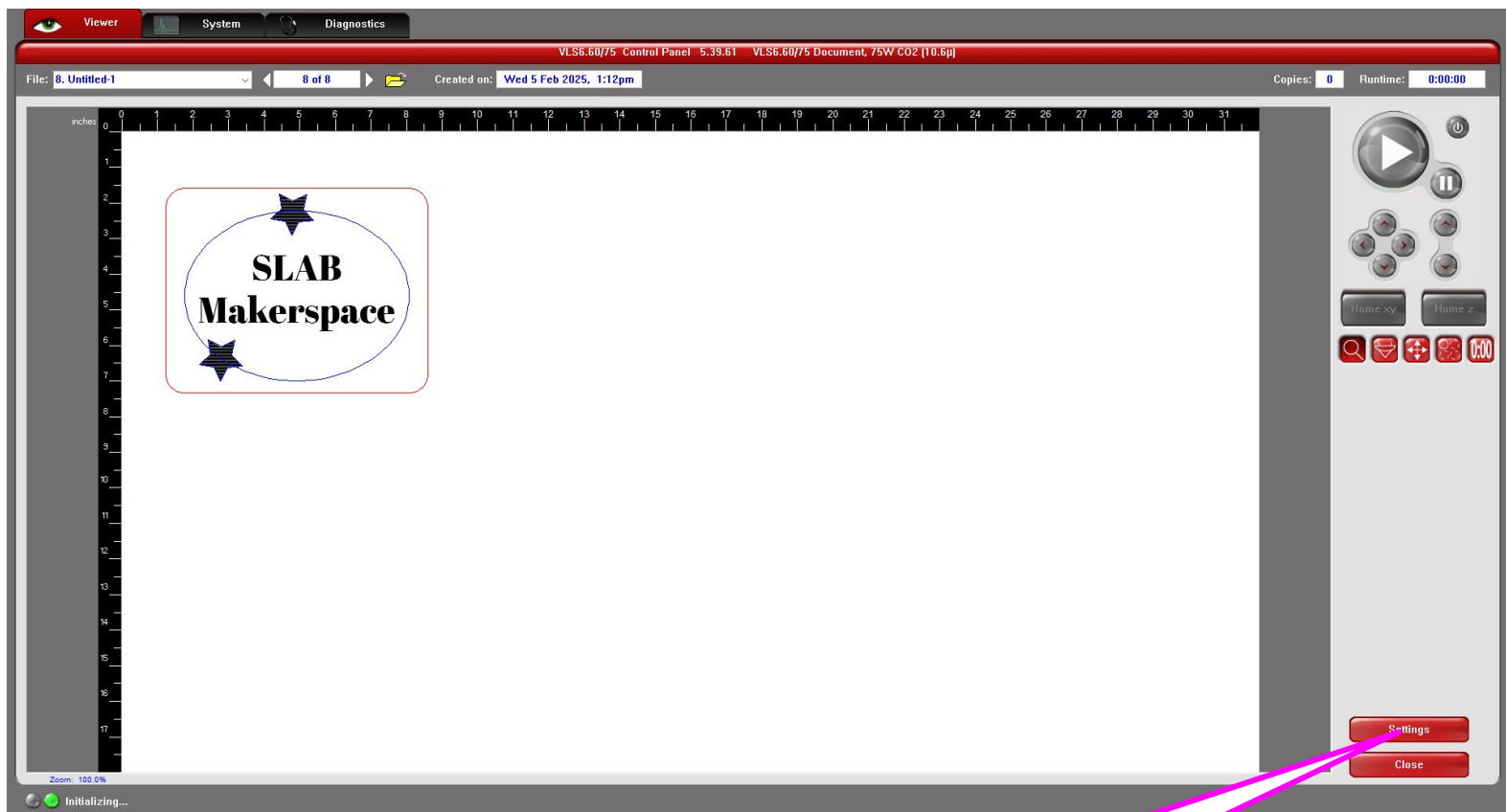
Open the Universal Control Panel by selecting the UCP icon in the taskbar.



# Open Settings Panel

Your design should now be loaded into the UPC interface.

The very first step is to click the settings button.



Settings button

# Select the Settings

1

Select the correct material, or one close enough.

2

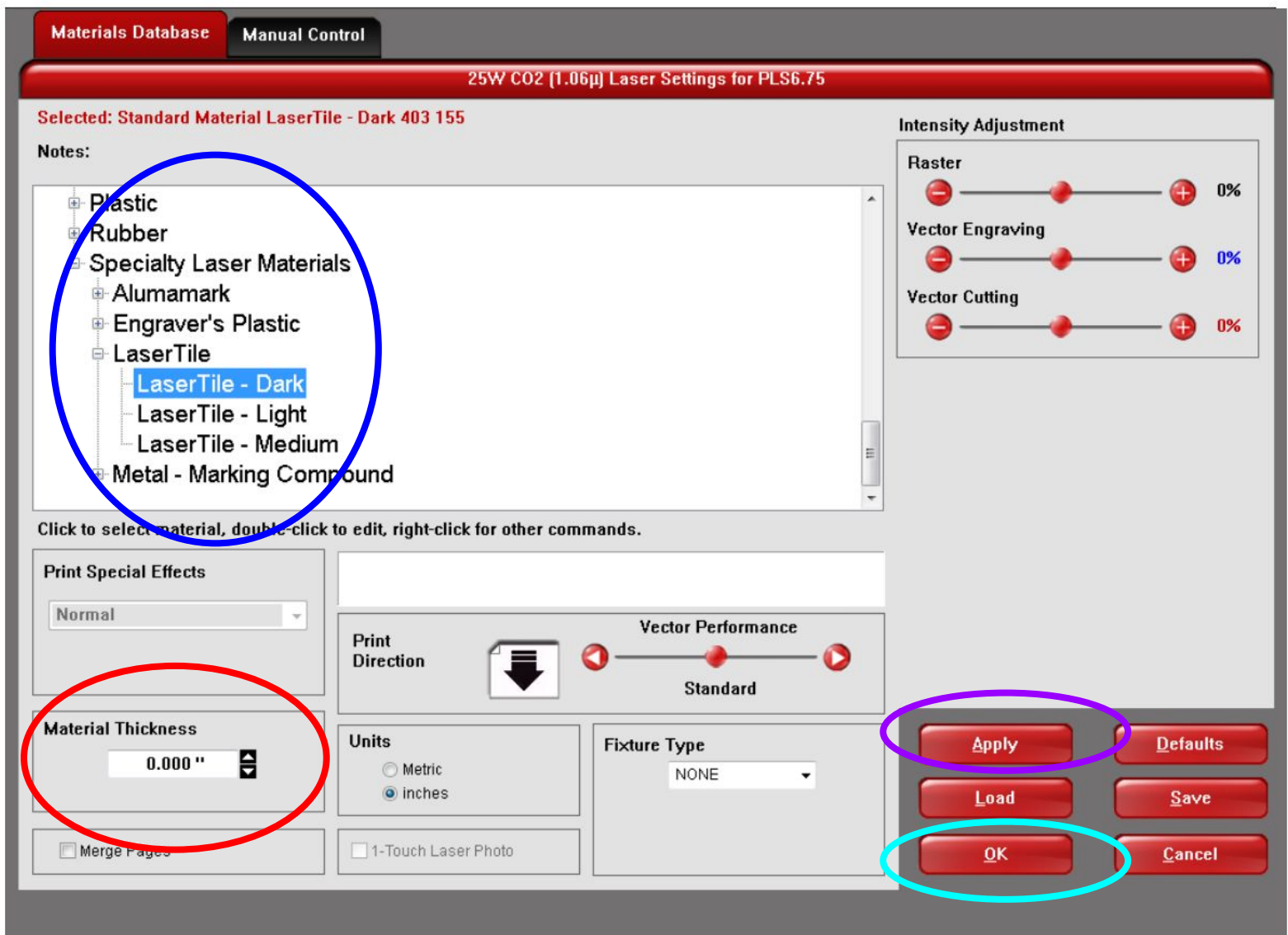
Set the Material Thickness.

3

Click Apply

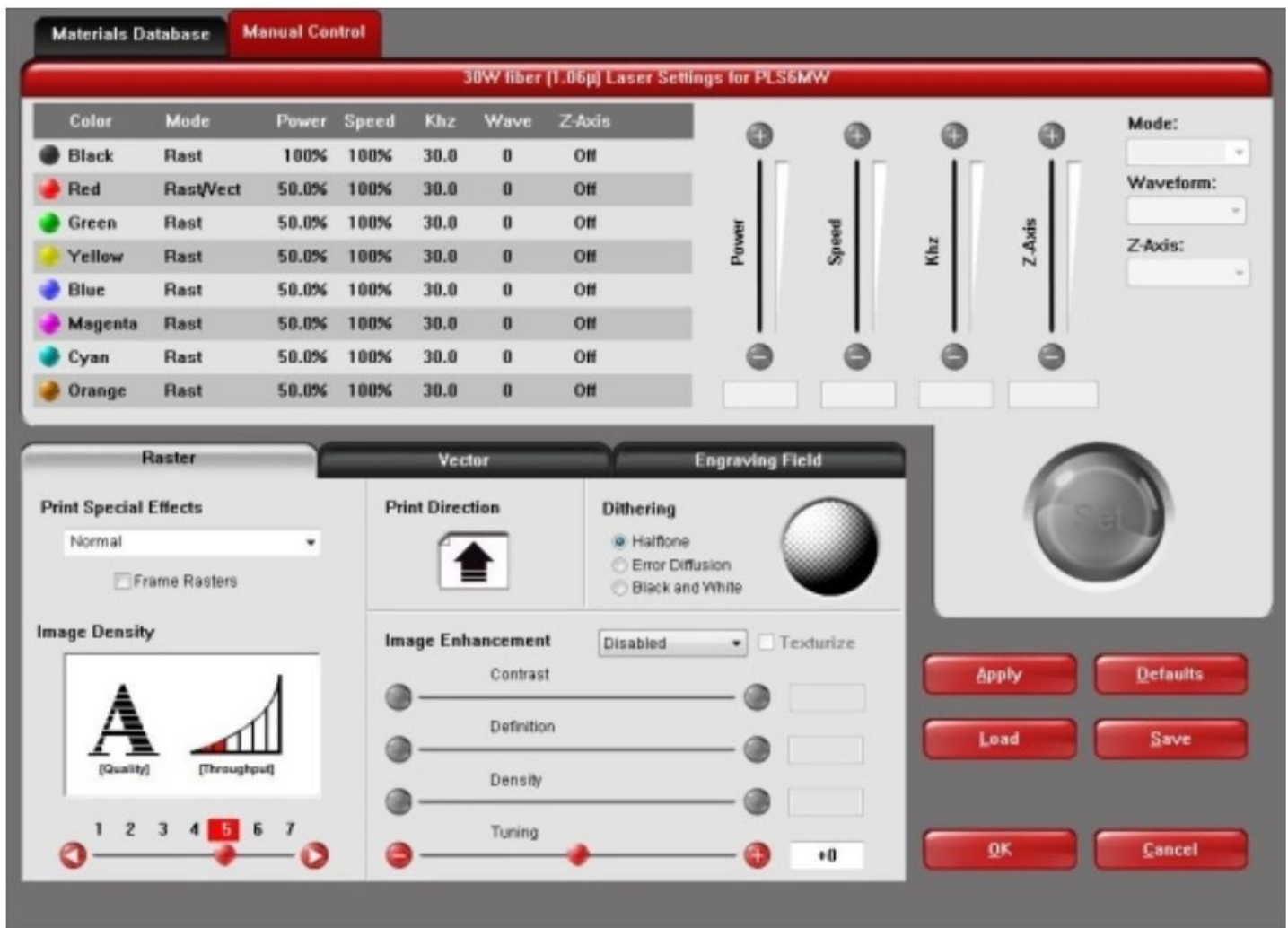
4

Click OK



# Manual Control

You can make fine-tune adjustments to the cut, etch or engrave settings in the Mission Control tab. Speak with a Technologist before making changes on this screen.




# Turn on the laser cutter

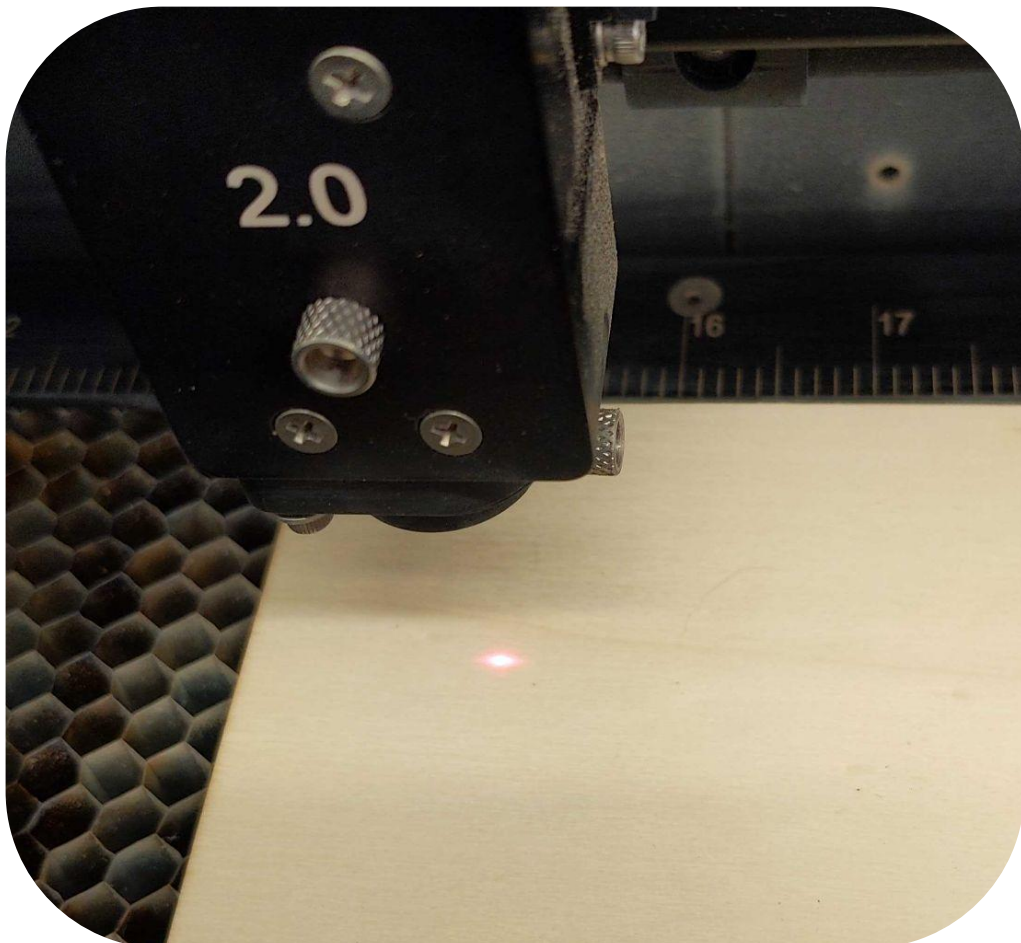
With the correct settings, next click on the red power button to turn on the laser cutter and start the exhaust system.



# Position the material

Place the material in the laser cutter.

With the lid open, you can select the Focus View icon  and click next to your design to make sure it is aligned correctly. The carriage will move to that point and shine a red light onto the material.



# POWER ON!

If the design is in the correct location, the correct material and material thickness are selected, the exhaust system is turned on, then it is time to cut with a laser!!

Once the “play” button turns green, select it to start the job.





# KEEP YOUR EYES ON THE JOB

It is your responsibility to watch the cut job the whole time.

Small flames are OK as long as they self extinguish. If your material catches on fire, turn off the laser cutter and use the fire blanket to cover the material.





# View mode buttons



## **Basic View (default mode)**

The cursor becomes a magnifying glass (Zoom Tool) if you pass it over the preview window. Left- clicking the mouse zooms in and right-clicking zooms out. (Mouse scroll wheel can be used in any mode to zoom in and out.)



## **Focus View (laser pointer mode)**

With the laser cutter lid open, click anywhere in the view field and the carriage will move to that spot. The position is indicated by a red light on the material.



### **Relocate View (Move button)**

Move the image to another location in the engraving field.



### **Duplicate button**

Press this to create more copies of your image. You can select how many rows and columns of the image as well as the spacing between the rows and columns.

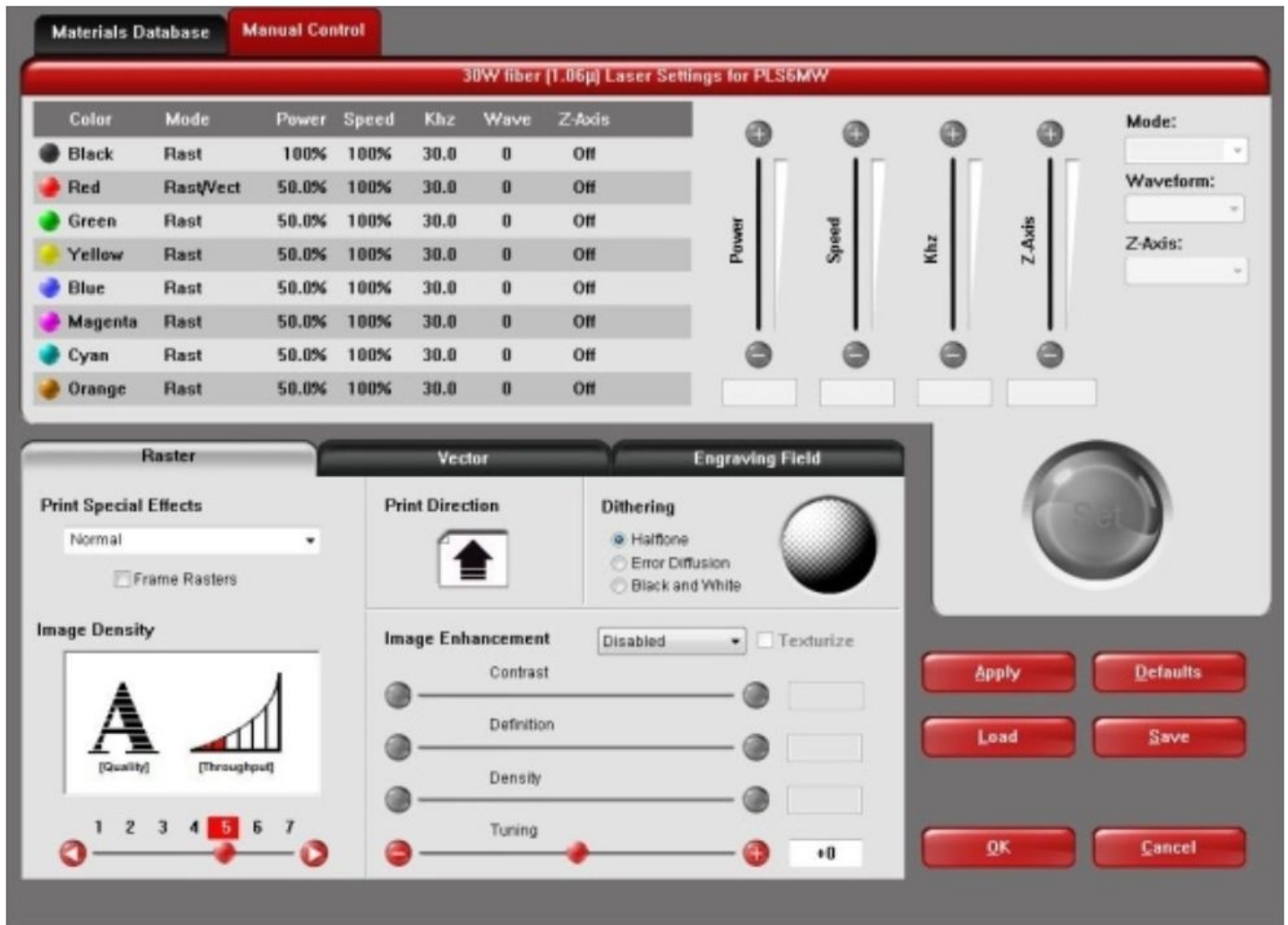


### **Estimate View**

The estimate feature approximately calculates the amount of time it will take the laser system to process the selected job.

# Glossary

## Manual Control Panel



### % Power

The Power setting allows you to select the laser power level to be applied from 0 to 100%.

# **Glossary, cont.**

## **% Speed**

This setting allows you to select processing speed from 0 to 100%. This setting determines the maximum rate of travel of the motion system.

% Power and % Speed work together in determining how deep the engraving or cutting will be. Higher power and slower speeds produce deeper results. Lower power and higher speeds produce shallower results.

## **PPI**

This setting allows you to select the pulsing frequency of the laser pulse stream being applied to the material when vector cutting from 1 to 1000 pulses per inch (PPI).

Note: In engrave mode, PPI is controlled by the image density selected for rasters (image densities 5 and below fix pulses at 500 PPI and image densities 6 and 7 fix pulses at 1000 PPI).

# Glossary, cont.

## **Mode (Drop Down Menu)**

Mode allows you to force graphical elements mapped to that color to be treated in a certain way. The choices are Rast/Vect, Rast, Vect and Skip. Rast/Vect mode is the default setting and will interpret elements in the graphic being printed that are mapped to that color as rasters or vectors depending on line width. Vectors must have a line width of .001" (.0254 mm) or less, everything else will be treated as raster objects. Rast mode will force all elements of the graphic mapped to that color to be converted to raster objects including thin line widths. Vect mode will ignore (not print) raster elements mapped to that color and only print vector objects mapped to that color. Skip will cause all elements of the graphic mapped to that color to be ignored (not printed).

# **Glossary, cont.**

## **Z-Axis**

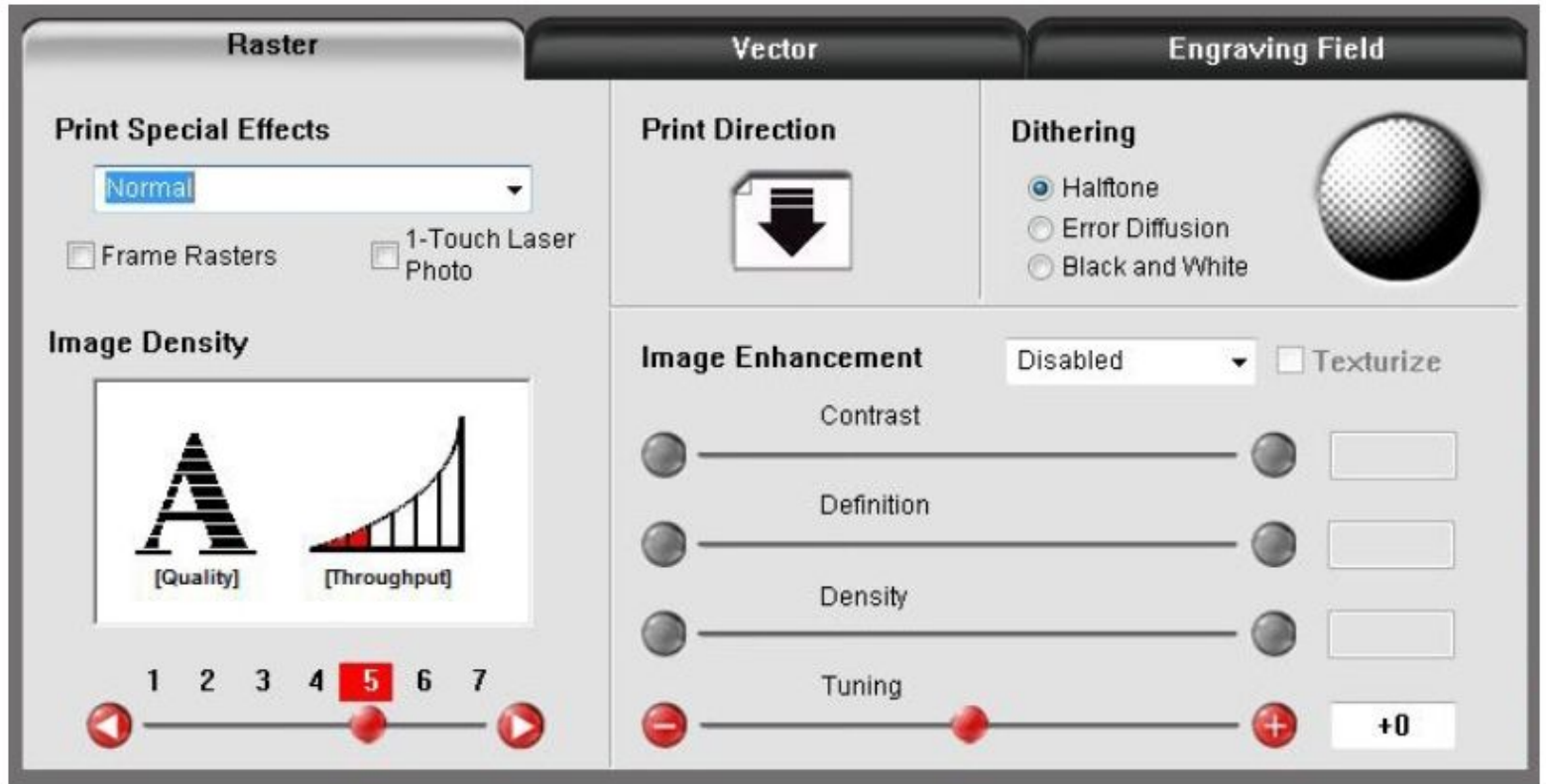
This control lets you set the Z-Axis table to a specific height. When the auto Z feature is turned on in the UCP and a Z height is set for a color in the color table, the table moves to the height indicated before processing the elements in the print job graphic that were mapped to that color.

## **Set Button**

After adjusting all of the color based settings for the colors highlighted you must push the SET button to register the changes to the color table. Also note that the changes will not be permanently saved until the OK or APPLY buttons are pressed.

# Glossary, cont.

## Raster sub-tab



### Print Special Effects

#### Normal mode

In this mode all single color raster data is mapped to the closest color in the color table and processed using the job settings attached to that color. All grayscale or multicolor bitmaps are converted to grayscale and then a dither pattern is applied to them and the black color job settings are used. This is the default recommended mode of operation.

# Glossary, cont.

## 3D mode

This mode affects raster elements of your image. In this mode all raster objects regardless of color will be converted to 256 color grayscale and then during processing the laser power level is varied on the fly in accordance with the grayscale levels in the image. Lighter parts of the image will receive less laser power and darker parts more laser power resulting in a contoured depth and a three dimensional look. Special 3D software is required to produce the type of grayscale images that are compatible with this mode. If you select 3D mode, you can adjust the grayscale to laser power level mapping table using the 3D Setup button. See the description of the 3D Setup button for more details. Keep in mind that it may require several passes to create enough relief in the engraving to get the desired results. By default all other colors are forced to raster mode and are not used since colored raster data is converted to grayscale. The red pen is left in rast/vect mode and it is recommended that all vector cut lines in the graphic being printed be colored red so that they will be interpreted as vectors. Any black vector lines will be converted to raster objects.



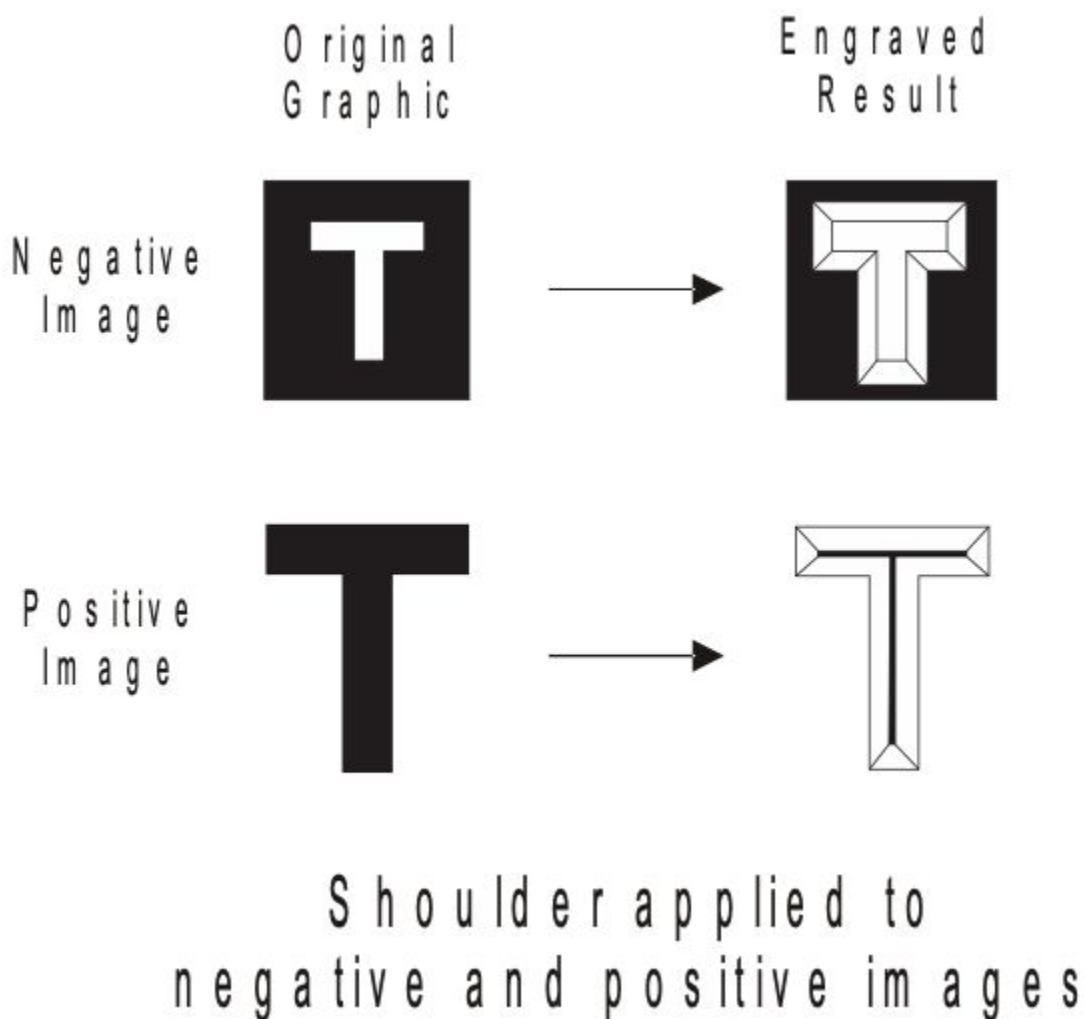
# Glossary, cont.

## Rubber stamp mode

This mode is specifically for rubber stamp creation and is used for creating shoulders on characters and graphics when processing rubber stamps. The shoulder is created by gradually ramping the laser power up or down near the edges of each element in the graphic being printed creating a tapered edge around each graphic element that produces a pyramid-like effect in the material being processed. Most rubber stamp applications will require the graphic to be a negative image with black representing the material to be removed by the laser. The shape of the taper or shoulder can be varied as desired using the controls in the rubber stamp profile setup window by pressing the Rubber stamp setup button. In this mode all non-black raster data is converted to grayscale and a halftone dither pattern is applied to it. By default all other colors are forced to raster mode and are not used since colored raster data is halftoned to black.

# Glossary, cont.

The red pen is left in rast/vect mode and it is recommended that all vector cut lines in the graphic being printed be colored red so that they will be interpreted as vectors. Any black vector lines will be converted to raster objects.



# Glossary, cont.

## Clip Art Mode

This is a special mode that allows you to easily print many images from off-the-shelf clip art libraries. Many of these images are made by combining many overlapping shapes and only print correctly if converted to grayscale bitmaps. Be aware that this mode converts the entire graphic being printed into a grayscale image, including vectors, and the black color job settings are used for processing. Because of this you will notice that the color table is reduced to one color (black) when this mode is selected. The dither pattern applied is the pattern currently selected in the dithering section of the raster sub tab.

# **Glossary, cont.**

## **Reduction Mode**

Raster Block Reduction Mode (also known as Print Growth Management), is specifically for barcode engraving and adjusts the barcode elements for readability by removing pixels from the edges of each element of the barcode being printed to adjust them for readability. This is necessary because most barcodes are generated from barcode fonts so that the widths of the elements in the barcode are not adjustable. This mode allows you to adjust the widths of the elements at time of printing to make the barcodes more readable with barcode scanners. The Reduction Setup button allows you to control the amount of reduction that takes place.

## **Reduction Setup Button**

When you press the Reduction Setup Button the reduction setup window will appear and allow you to adjust the amount of reduction that takes place in .001" (.0254 mm) increments.

# Glossary, cont.

## **Frame Rasters switch**

A Frame Rasters feature is available in normal mode which affects the way rastered object are processed in the laser system. When this switch is off the raster strokes the X axis makes when laying down the pattern of dots on each line of the raster image can vary with the image. For example, if you are engraving a triangular shape the tip of the triangle will be engraved with short raster strokes and the strokes will get longer as the wider parts of the triangle are engraved. If this mode is turned on, the longest raster stroke for the raster object being engraved will be determined and all other raster strokes will be made equal in length to the longest raster stroke. This will increase processing time, but can improve edge quality when engraving or marking at higher processing speeds. Use this mode only if necessary.

# **Glossary, cont.**

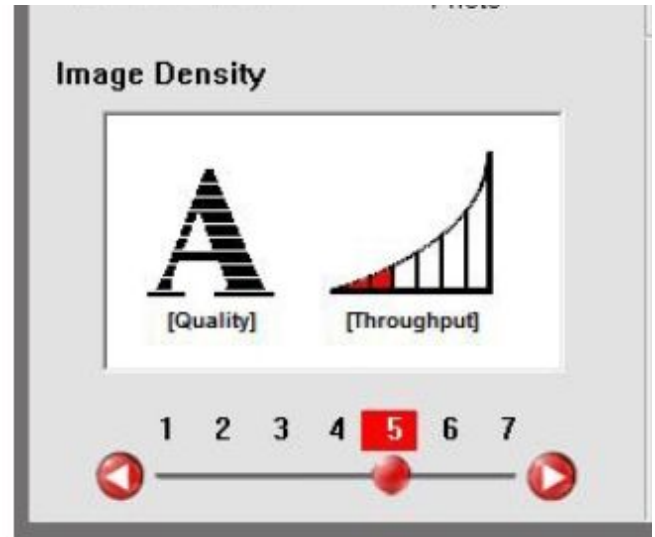
## **1-Touch Laser Photo Switch**

This switch is automatically selected when printing photos from Universal Laser Systems 1-touch Photo laser photo printing software. This switch also be selected when printing a photo processed by 1-Touch Photo and then imported into other software before printing. This switch optimizes settings for best results with 1-Touch Photo images.

# Glossary, cont.

## Image Density

The Image Density setting determines how many lines of pixels (or dots) per vertical inch are used to render a raster image on the material being laser marked or engraved. It can also be referred to as the vertical resolution or dpi of the image. There are seven image density choices available in most models (two extra density levels are available in SuperSpeed models). Higher Image Density (DPI) settings produce better quality raster images with finer detail, but reduce productivity by increasing raster engraving time. Lower Image Density (DPI) settings produce lower quality raster images, but increase productivity by decreasing raster engraving time.



# **Glossary, cont.**

Image Density (DPI) settings will also have an effect on vector quality and processing speeds when vectors objects contain many curves and small segments. Higher image densities will produce finer vector detail, but may reduce productivity and vice versa for lower image densities. By running samples on scrap materials and trying different density settings, you can find a compromise between throughput and image quality that is acceptable to you.



# **Glossary, cont.**

## **Print Direction**

The default direction is Down which begins raster engraving at the top of the field and finishes at the bottom. On some materials you may get better results by starting at the bottom and engraving towards the top of the field (Up) due to the fact that smoke and fumes from the engraving process travel over the surface of the material before being exhausted and can mar the previously engraved areas.

# Glossary, cont.

## Dithering



Dithering settings are used when printing graphics that contain grayscale or color bitmaps such as photographs in all printing modes except 3D mode. A dither pattern is a special screen filter that is used to convert a grayscale or color image to monochrome (black and white). The screen filter reduces the image to black and white while preserving the illusion of shades of gray by varying the spacing of pixels (dots) in the image. Darker areas have more dots spaced closer together and lighter areas have fewer dots spaced farther apart. Since the laser system is not capable of directly reproducing color or shades of gray this is the method used to mimic shades of gray in order to engrave or mark photographs onto material. There are three choices for the dither pattern applied:

# Glossary, cont.

## Halftone

The halftone dither pattern is a line-type filter which applies a 45° line screen to a color or grayscale image to convert it to black and white. The line spacing of the line screen varies with the density chosen so at lower densities the line screen is more coarse.

Image Density	Lines Per Inch
6 and 7	180
5	90
4	60
3	45
2	36

# **Glossary, cont.**

## **Error Diffusion**

The error diffusion dither pattern uses a random scatter filter to place pixels in order to represent shades of gray, introducing a level of noise in the process. The pattern created will vary with density chosen. Higher density settings, such as 5, will produce a more densely packed, finer pattern and lower resolution settings, such as 2, will produce a loosely packed, coarser pattern.

# Glossary, cont.

## **Black and White Mode**

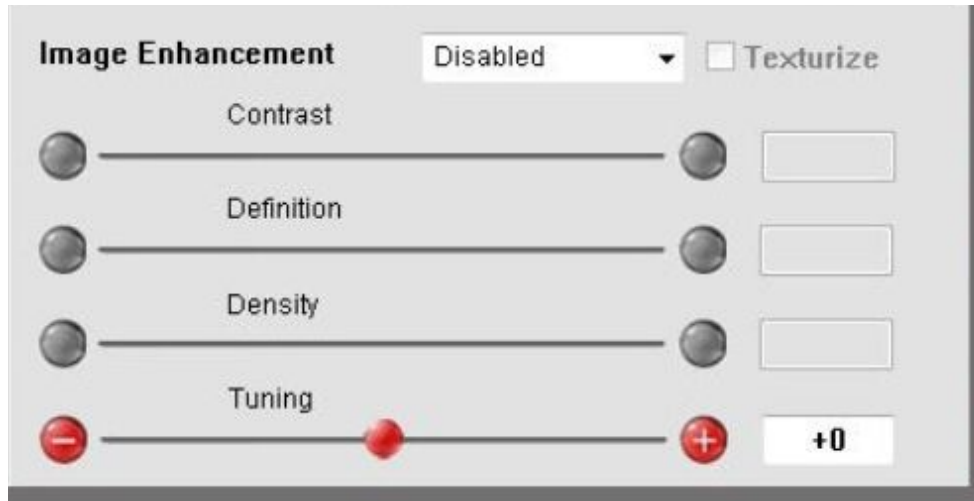
The Black and White dither pattern is a thresholding pattern that thresholds at 50% black. Each pixel in a grayscale image that is greater than 50% black will be converted into black and each pixel that is less than 50% black will be converted into white. This dither pattern will not give good results for reproducing photographs, but is very useful when printing images that should be black and white yet may have some unintended grayscale pixels in them. A good example is a scanned image of a text document that was scanned into a computer using a grayscale scanner setting. Ideally the scanned image of text should be black text on a white background, but if a grayscale scanner setting was used there may be very light gray pixels at the edges of the characters of text. This dither pattern will remove those gray pixels.

# Glossary, cont.

## Helpful Tip

Laser marking or engraving grayscale or color bitmaps onto materials requires a bit of trial and error to achieve good results. Results will vary on different materials. As a rule of thumb, use an Image Density setting of 5 using halftone or diffusion pattern on harder materials where you are marking the surface. Use an Image Density setting of 3 using the halftone or diffusion pattern for softer materials where you are engraving into the material.

# Glossary, cont.



## Texturize

Texturize is a special feature which adds random variation to the laser power level assigned to each color. This is useful for creating a textured effect on engraved surfaces to mask grain lines and motion artifacts. One useful application of this feature is when engraving away large areas of acrylic, but for most applications this feature is not necessary.

# Glossary, cont.

## Tuning

Tuning shifts the left to right and right to left raster strokes the motion system makes when Rastering an image so that they line up vertically with respect to each other. This is necessary to compensate for laser response and mechanical lag when rastering at high speeds. A misadjusted TUNING value will cause the image to appear double- imaged or bolder than normal and edges may not be sharp and defined. The optimum tuning value will vary by material and speed of processing. TUNING will be different if you have Image Enhancements enabled vs. disabled. A typical TUNING value can be from -8 up to 0 depending on speed of processing. If you use the materials database, nominal tuning values are already set for you. You can look up the tuning value for a particular material in the database by selecting that material in the materials database tab and selecting edit.



# **Glossary, cont.**

Keep in mind that the tuning value is optimized for the particular raster speed and power level stored in the database. If you need to change the speed or power significantly for your application, you may need to determine a new value by testing. Also remember that the tuning value is affected by raster enhancement settings so if the material database record has image enhancements turned on, you should use those values along with the tuning value.