The Laser Cutter

Here in MCAD's Digital Lab, we have a Universal Laser Systems VLS6.60 with an 18"x 32" cutting bed. The maximum depth of the cutting area is 8". The maximum thickness of material you can cut all the way through is 1/4". However, you are able to etch into the surface of thicker materals.

Before using the laser cutter:

-You must have your finished file saved as a .ai or .pdf on a thumb drive, Google Drive or e-mailed to yourself prior to your appointment.

-Materials must be on hand and pre-cut to fit on the laser cutter bed. This includes extra material for testing.

-You must sign up for an appointment online via the 3D Shop Appointments link which can be found on the MCAD intranet homepage. Go to the **Digital Lab** dropdown menu.

-Failure to show up for your appointment 3 times in a semester will result in suspension of Digital Lab privileges.

Time/Cost/Testing

Time   You are allowed a maximum of 3 hours per week for use of the laser cutter. Please schedule yourself enough time to setup, test and run your entire part. If you are unsure of how long your part will take to run, bring your file to the Lab and we can give you an accurate time estimate.

Cost   50 cents per minute of machine run time

Testing   Two minutes of free run time will be allotted to you for testing your file and material.

Always ask for assistance with material choices. Never start the Laser

The laser cutter operates in two modes.

1. **RASTER** mode results in the etching or engraving of a material from left to right (just like an inkjet printer). To raster, your file must be in pure RGB black or grayscale. The black areas will be etched at full strength while white areas will remain untouched. Any areas of grey will be etched according to their greyscale value in relation to your power and speed settings. The higher the contrast of a greyscale image, the more readable of an image the laser cutter will produce.
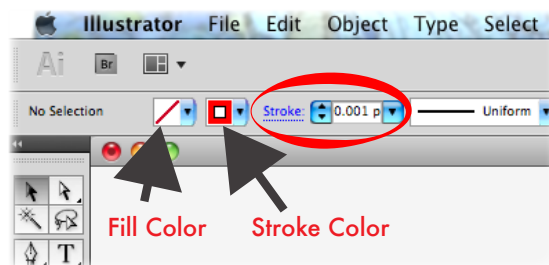
Raster:
Fill = RGB Black
Sroke = None
Weight = N/A

2. **VECTOR** mode follows a two-dimensional path to cut-through or engrave a shape into a material. Only lines and curves with a stroke weight of .001 or less will be interpreted as vector objects (cut-through or scoring lines). A file may carry both vector and **raster** information. Elements of the image that are not a stroke weight of .001 will be interpreted as **raster** objects.

To cut all the way through a material, vector lines must be **RGB Red**.

Vector Cut:
Fill = None
Stroke = RGB Red
R=255, G=0, B=0
Weight = .001 pt

Laser Beams!

Illustrator   File   Edit   Object   Type   Select

Ai   Br

No Selection   Stroke: 0.001 p   Uniform

Fill Color   Stroke Color

To score into a material, **vector** lines must be RGB **Blue**, **Green**, **Yellow**, **Magenta**, **Cyan** or **Orange**. You can use the different colors to set up variations in cut depths within an image. The power and speed settings for each color will be executed in the Universal Laser Systems Control Panel (UCP) program.

*NOTE: These colors are preset swatches in the Laser Cutter Template.

Vector Etch:
Fill = None
Stroke = RGB Blue
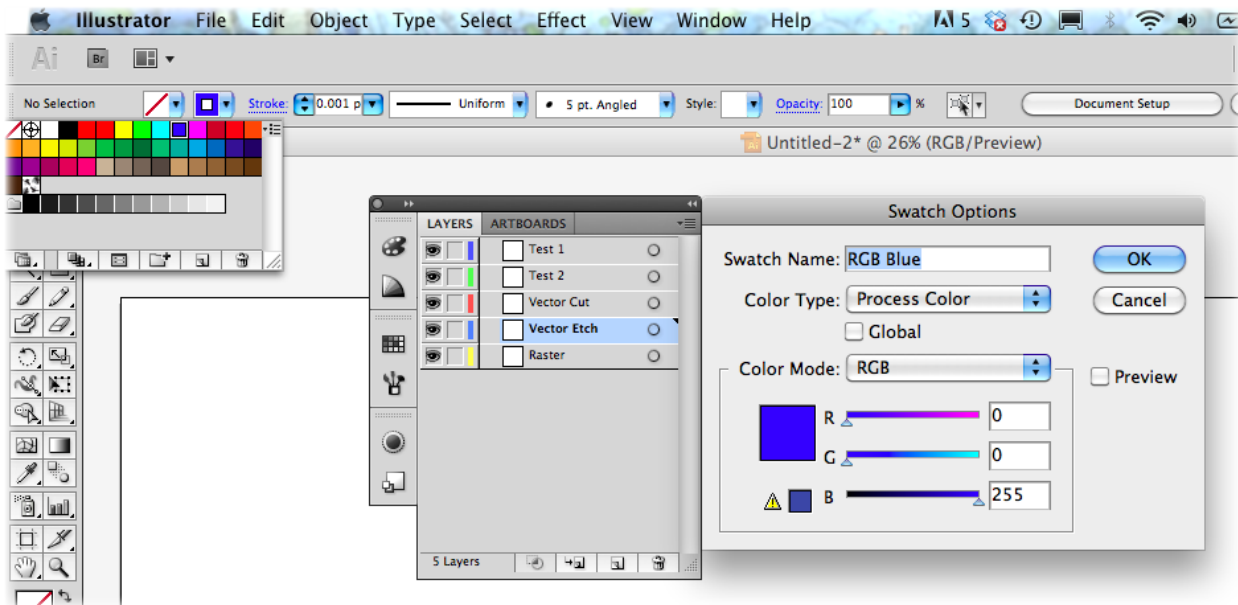R=0, G=0, B=255
Weight = .001 pt

Vector Etch:
Fill = None
Stroke = RGB Green
R=0, G=255, B=0
Weight = .001 pt

Vector Etch:
Fill = None
Stroke = RGB Yellow
R=255, G=255, B=0
Weight = .001 pt

Vector Etch:
Fill = None
Stroke = RGB Magenta
R=255, G=0, B=255
Weight = .001 pt

Vector Etch:
Fill = None
Stroke = RGB Cyan
R=0, G=255, B=255
Weight = .001 pt

Vector Etch:
Fill = None
Stroke = RGB Orange
R=255, G=102, B=0
Weight = .001 pt

Material Choices

There is no limit to the thinness of a material, however the thickest you can cut is ¼" for hard materials such as plywood and acrylic. As with any material brought in, please bring in more than what you need; it is helpful to run a test first and determine settings on a sample piece.

Known materials we can laser cut
- Plastics:
  - ABS (acrylonitrile butadiene styrene)
  - Acrylic (also known as Plexiglas, Lucite, PMMA)
  - Delrin (POM, acetal) —available at www.mcmaster.com
  - Kapton tape (Polyimide)
  - Mylar (polyester)
  - Nylon — melts badly
  - PETG (polyethylene terephthalate glycol)
  - Polyethylene (PE) — melts badly
  - Polypropylene (PP) — melts somewhat
  - Styrene
  - Two-tone acrylic
- Foam:
  - Depron foam — often used for RC planes.
  - EPM
  - Gator foam
- Other:
  - Cloths (leather, suede, felt, hemp, cotton)
  - Magnetic sheets
  - Papers
  - Rubbers (neoprene)
  - Teflon (PTFE, Polytetrafluoroethylene)
  - Woods (MDF, balsa, birch, poplar, red oak, cherry, holly, etc.)

We **DO NOT** cut the following materials
- Metals — steel, aluminum, brass, copper
- Polycarbonate (PC, Lexan)
- Any material containing chlorine
- PVC (Cintra) — contains chlorine
- Vinyl — contains chlorine
- Glass — we can engrave glass, but we cannot cut it.
- Fiberglass
- Printed circuit board (FR4 and other material types)
- Carbon fiber

Making Files

A special Illustrator template designed for this laser cutter is available for you to download from the 3D Shop Intranet site and use for the creation of your files. This template's artboard is the same dimensions as the bed of the lasercutter. It is also in RGB color mode and has preset swatches in true RGB colors, which are what the laser cutter reads.
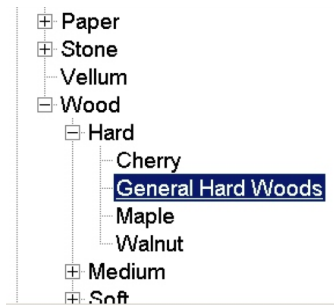
1. Download the Laser Cutter Template (LaserCutter.ait) from the 3D Shop Intranet site.

2. Create your image within the template's artboard using RGB vectors, RGB Black shapes and/or greyscale images. Working in layers is useful for the laser cutter because you can set up an order of operations for projects that involve more than one cut.

3. Make sure to turn all text into outlines! Select your text and in the **Type** dropdown menu select **Create Outlines**.

4. When you are done, go to **File** and **Save As** to save your finished files as a PDF (.pdf) or Illustrator File (.ai). Make sure your file is labeled with your first and last name. Place your file onto a thumb drive, online drive or e-mail it to yourself to open on the Laser Cutter PC desktop.

Sending Files to the Laser Cutter

1. Upload your file onto the PC desktop. Make sure it is labeled with your first and last name.

2. Open your file with Adobe Illustrator.

3. Go to **File** > **Print**. In the Print Options box make sure the selected printer is VLS6.60, the Media Size is *Defined by Driver* and your Print Layers are *Visible & Printable Layers*. Hit "**Print**".

4. Open the **UCP** program from the desktop. Your file should appear correctly on the screen in the program. If something is not showing up as it should, there is an error in your stroke width or color settings.

Adjusting your Settings

1. Click the [Settings] button on the bottom right corner.

2. In the **Materials Database** Tab, choose the material you plan to use by clicking on the plus sign next to its name.

```
⊞ Paper
⊞ Stone
  Vellum
⊟ Wood
  ⊟ Hard
      Cherry
      General Hard Woods
      Maple
      Walnut
  ⊞ Medium
  ⊞ Soft
```

3. Using a calipers, find the thicness of the material in inches. Enter the correct measurement in the Material Thickness box.

Material Thickness

0.24"
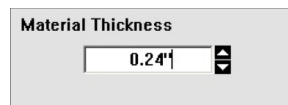
4. Click **Apply** and then **OK**.

NOTE: Under the **Manual Control** tab you can custom adjust your power and speed settings for each color. During your test piece, we can help you change these settings according to your preferred results.

Color	Mode	Power	Speed	PPI	Z-Axis
Black	Rast	85.8%	100%	500	0.240"
Red	Vect	100%	4.4%	300	0.240"
Green	Rast/Vect	50.0%	100%	500	0.240"
Yellow	Rast/Vect	50.0%	100%	500	0.240"
Blue	Vect	9.4%	48%	500	0.240"
Magenta	Rast/Vect	50.0%	100%	500	0.240"
Cyan	Rast/Vect	50.0%	100%	500	0.240"
Orange	Rast/Vect	50.0%	100%	500	0.240"

You are now ready to consult a Shop Tech!