Laser Cutting and Engraving

Basic Use and Safety

Square One Shop and Safety Policy:

Library General and Behavior Policies apply in Square One.
The most up-to-date policies are always available for review at the front desk.

- Be **Safe**: Pay attention, follow posted procedures and ensure proper materials are being used, wear eye/ear protection in the woodshop.
- Be **Curious**: Experiment, try new things, watch what other people are doing.
- Be **Respectful**: Keep your chaos contained, clean up after yourself, don't touch other people's work without asking, don't interrupt.
- Be **Aware**: Alert staff if equipment isn't functioning properly, follow staff instructions, pay attention to your project.
- Be **Prepared**: Bring your photo ID and library card, wear closed-toe shoes, secure loose or dangly objects (i.e. hair, jewelry, keys), start cleaning up 30 minutes before closing time.

Notes:

Laser Cutter Safety Rules

- NEVER leave the laser cutter unattended while in operation. There is always a danger of fire while the laser is in use. Remain by the machine and watch your work while the laser is in operation regardless of the length of the job.
- If you see flames while cutting, pause the job and:
    - Open the lid and blow out the fire.
    - If the fire is not extinguished by blowing, close the lid, stop the job, and use the fire extinguisher through the intake grille. Inform a Square One staff member immediately.
    - If the fire is still not extinguished, evacuate the building, pull the fire alarm, and call 9-911.
- If your work repeatedly catches fire, stop the job and adjust the speed and intensity settings of the project.
- If you must leave the laser cutter in the middle of a job for **any** reason, pause the job and inform a Square One staff member of the paused job.
- Never cut or engrave any material that has not been approved by Square One staff. Unapproved materials (PVC, vinyl, Lexan, etc.) release noxious gases when cut or engraved by the laser.
- Be gentle with the internal components of the laser. The laser is delicate and finely calibrated. It can be easily knocked out of alignment.
- Ensure the exhaust fan and air supply are on before beginning any job. Check, and double check.

Laser Cutter Overview

- The Universal Laser System at Square One can be used to etch, engrave, and cut a variety of materials.
- The laser is a ULS VLS 3.50 laser system with a 12" x 24" x 4" work area.
- The laser cutter is essentially a fancy computer printer. Jobs are created on a laptop or computer and sent to the cutter using the print function with CorelDRAW or Adobe Illustrator.
- The power supply should always be on – the green light on the back should be on.
- The compressor should be set to "auto" in the horizontal position and not turned off.

Creating Files

- The laser uses two types of paths to 'print' your job: raster and vector.
- ➤ **RASTER**
  - o A raster pattern is used to etch the surface of a material. Raster data is composed of pixels.
  - o The laser will apply dots of heat to the material similar to an ink jet printer on paper. The laser can be adjusted to vary the amount of heat it applies to the material for each pixel.
  - o Pictures or images that come from a camera or a scanner are examples of raster data. JPG, GIF, PNG, and BMP files are common types of raster data files. This results in a gray-scale type image engraved onto the surface of the material.
- ➤ **VECTOR**
  - o Vector patterns are used to score or completely cut through material.
  - o Vector data is always expressed in lines and can be straight lines, curves, circles, rectangles, hand drawn lines, or squiggles.
  - o For the laser cutter to know a line is a vector and should be cut and not etched, the line must be drawn as a 0.001 thickness in Illustrator or 'hairline' in CorelDRAW.

- The laser is set up to identify RGB red as the color of vector lines to be cut. All other colors will be etched.

- For our introduction, we will be using CorelDRAW. Any software capable of creating vector paths can create files for the laser cutter, but there may be a few wrinkles to iron out when the files are imported to Corel or Illustrator.
  - Free software: Fusion 360, InkScape
  - Paid software: CorelDRAW ($50/year), Adobe Illustrator ($20/month)

Your First Cut

When opening CorelDRAW, the document size should be 12"x24", the size of the laser bed.

Draw your desired design, making sure the lines to be cut are "red" and "hairline".
        In Illustrator, the line thickness should be 0.001.

Print your document (remember, it's just a big, fancy, expensive printer).
        File -> Print, Ctrl P, or the printer icon.

Check that the printer is the VLS3.50, the Layout tab has "as in document" checked.

Print.

It looks like nothing happened…
        click on the red square in the lower right corner of the monitor, which will open the
        laser cutter interface page.

Turn on the laser cutter. There are 5 buttons:

        Power - press once to turn on; press and hold for 5 seconds to turn off

        Up/Down Arrows - raise and lower the cutting bed

        Pause - stops a print job if you need to walk away from the cutter

        Start - starts a print job when everything is set up in the software

There are 3 things we need to tell the laser cutter so it can cut the design:

- **What to Cut**
    - We did this in the drawing software.
    - Red/hairline lines will be cut; all others will be etched.

- **What Material is Being Cut**
    - In the software, go to "Settings" (**A**) on the lower right of the screen.
    - Select your material from the database (**B**), paying attention to any notes.
    - Measure the thickness with calipers and enter the thickness of the material (**C**).

- **Where to Cut**
    - Place the material on the bed of the laser cutter.
    - Move the design to the general area to be cut using the cross arrow tool (**D**).
    - Use "Focus View" (**E**) to verify the placement of the design and the material.
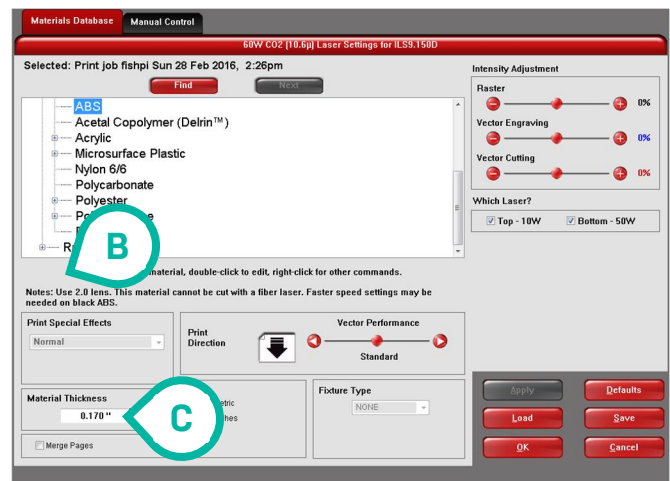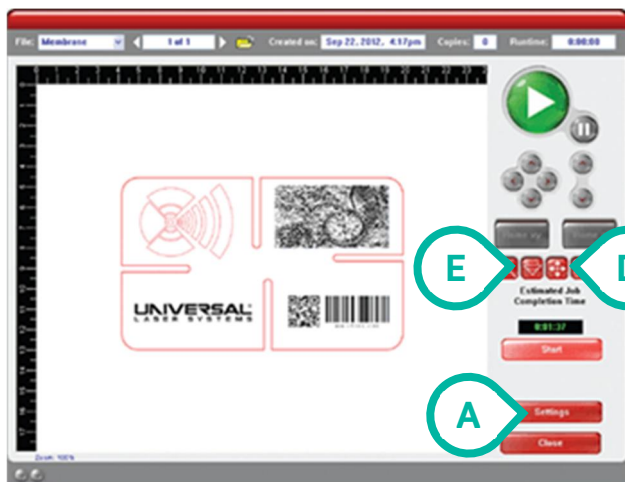
Before you're ready to cut, 3 more things must be done:

- **Close the lid.**
- **Turn on the air by turning the red lever on the back of the laser cutter.** You should hear the hiss.
- **Turn on the vent by flipping the switch on the wall.** You'll know if it's on - **it's loud.**

Press "start" on the laser cutter or the arrow in the green circle on the top right of the computer screen.

Watch the magic!