

# Laser Cutter Training

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## Safety:

- In case of emergency, to stop whatever the machine is doing press the big red button on the front right face of the machine.
- To shut off cutting laser quickly while cutting is in progress, open lid. Note that carriage will continue to move until sometime after you press stop/reset on the console, so keep hands out of the cutting area.
- Only two materials allowed in cutter. Acrylic and wood. If you don't know what it is and cannot identify, do not cut it and contact [ece-openlab@illinois.edu](mailto:ece-openlab@illinois.edu) for guidance. Acrylic will cut cleanly and easily with correct settings. Polycarbonates will be difficult to cut and have a burnt melted edge. If a piece of polycarbonate was mistaken for Acrylic stop cutting immediately. PVC ( a white or grey opaque plastic often used as pipe) is never to be used in the machine. It emits chlorine gas that is extremely toxic and corrosive to the machine.
- Two CO2 fire extinguishers near the laser cutter are safe to use in the machine to put out a material fire. The ABC chemical fire extinguisher near the main double door of 2024 would ruin the machine if used.

## Cutter Info:

Epilog Fusion M2 40 with a 75W CO2 Laser and 40" x 28" engraving area

- Website: <https://www.epiloglaser.com/products/fusion-laser-series.htm>
- User Manual: <https://www.epiloglaser.com/assets/downloads/manuals/fusion-manual-web.pdf>

## File Preparation:

In terms of software the cutter looks like a printer. It will attempt to cut and/or etch any file sent to its print driver. There are many options and techniques possible with our setup but this training will focus on the most simple and common options.

**Software:** For cutting, students should be using a numeric or vector drawing package.

- Adobe Illustrator
- Autocad
- Solidworks
- Inkscape

**Format:** All output from the software above should be presented to the lab monitors as PDFs.

- File generation guidelines:
  - All paths/lines should be 0.001" to be interpreted as a vector to cut.
  - Use 600 DPI for document resolution.
  - Page size should match the size of the material they bring to cut.
  - Margin of material border to cut should be at least 0.25"
  - All other Text, Pictures, Etc. will be interpreted as an etch.
  - Files should be brought on a USB stick

## Basic Flow:

- **Turn everything on**
  - Unlock laser power cord from red lockout box and re-scramble padlock.
  - Plug in laser cutter.
  - Turn on laser cutters power switch on front, lower, right, side.
  - Turn on air compressor (Shown below on left)
  - Turn on air filtration (Shown below on right) default CFM should be set to 500 cfm. Use arrow keys to adjust if not.



- **Place material in cutter.**
  - Only acrylic or wood
  - Place all the way into upper left hand corner
  - It's helpful to peel top protective film off acrylic but leave bottom film on to assess complete cutting.

- **Focus**

- **Note:** You may need to set origin first if work piece is unusually shaped and focus gauge not above material in home position. See “Set Origin” section below and then return here.
- Hang manual focus gauge (stored in top left cup on machine) on the lens assembly. (Shown below on left)
- Use arrows on control pad to select “FOCUS” menu and use thumb stick to adjust cutting bed up until it barely touches the focus gauge. (Shown below in middle)
- Push thumb stick down to input focus position and display will read -0.000. (Shown below in middle)
- Use arrows on control pad to select “JOB” menu. (Shown below on right)
- Remove the manual focus gauge and replace to storage cup.

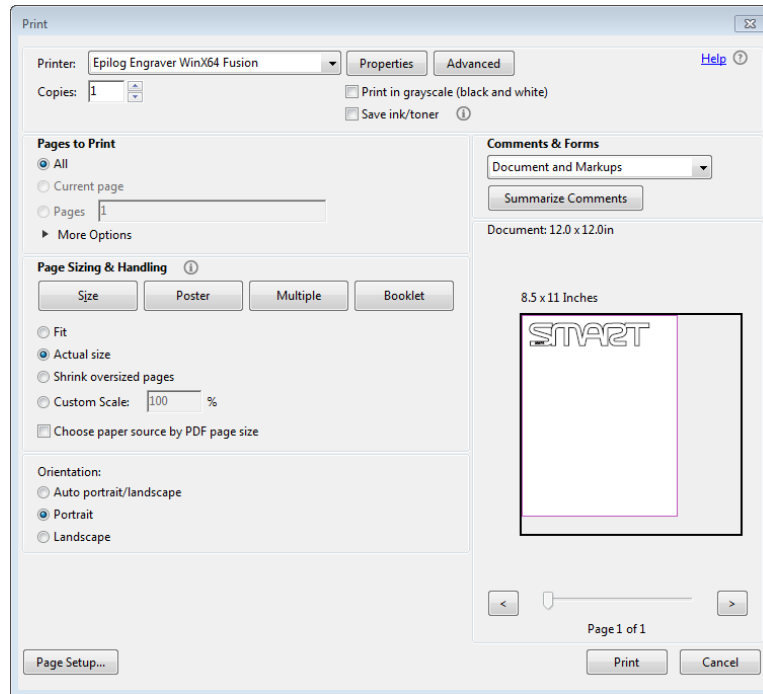


- **Set Origin**

- At power up origin should be set to 0.000, 0.000.
- Pressing “RESET” button will return to home position at ~1.000, 1.000
- To move origin to new position to accommodate material size or move to material that’s not already been cut.
  - Press red star button to turn on laser pointer.
  - Use arrows on control pad to select “JOG” menu and use thumb stick to adjust cutting bed to desired origin.
  - Push thumb stick down to input origin position and display will read 0.000, 0.000.
  - Use arrows on control pad to select “JOB” menu.
  - Press red star button to turn off laser pointer.

- **Send File to Cutter**

- Open the PDF to cut in Adobe Acrobat.
- Print and select “Epilog Engraver WinX64 Fusion” as the printer. Page sizing should be set for “Actual Size” and Orientation set for “Portrait” as shown.



- Select “Properties” to see laser cutter settings. (Shown below on left)
  - **Resolution:** 600DPI
  - **Autofocus:** **NOT SELECTED** we do this manually.
  - **Job Type:**
    - If part is cuts only select Job Type as “Vector”
    - If part is engraving only select “Raster”
    - If it contains both select “Combined”
  - **Page Size:** Update page size with the material dimensions. This helps with visualize the scale of cuts in the Acrobat print preview.
  - **Raster Settings & Power Settings:**
    - **THIS IS IMPORTANT:** Setting these incorrectly is where things could go wrong... as in fires...
    - Follow recommendations in manual on page 188. User notes are written on page 190.
    - If the cut does not go completely through with the settings, you can run the job again with same or adjusted settings if the material was not moved.
- When done select “OK”, and if page setup scale looks as you expect, print!
- Once you have clicked “Print”, the data light on the control panel will flash and then display the job number and estimated run time on the control panel. (Shown below on right)
  - If the estimated time is 00:00:00 then the laser didn’t find anything to cut. Likely the paths in the PDF were > 0.001” and the student needs to update their PDF.





- **Start Job**

- It's always a good idea to do a trial run first, at least for part of the design to make sure everything is where you think it is.
  - Press red star button to turn on laser pointer.
  - Open lid so CO2 cutting laser is disabled.
  - Press "GO" and watch a while....
  - If everything looks good press "STOP" and wait for carriage to stop moving.
  - Press "RESET" to go to the home position
- Close Lid
- Press "GO"
- When the job is done leave the lid closed for a few moments to let all the fumes be extracted.
- If you got it all right it should go more or less like the pictures below...



- **Turn everything off**
  - Close lid after removing part.
  - Turn off laser cutters power switch on front, lower, right, side.
  - Un-plug laser cutter from wall.
  - Lock laser power cord plug end in red lockout box and scramble padlock.
  - Turn off air compressor.
  - Turn off air filtration.

## Cleaning:

- More here later. For now please contact [ece-openlab@illinois.edu](mailto:ece-openlab@illinois.edu) if you think the machine needs cleaned or you notice any problems.
- This is a dirty lens. Don't clean by yourself!

