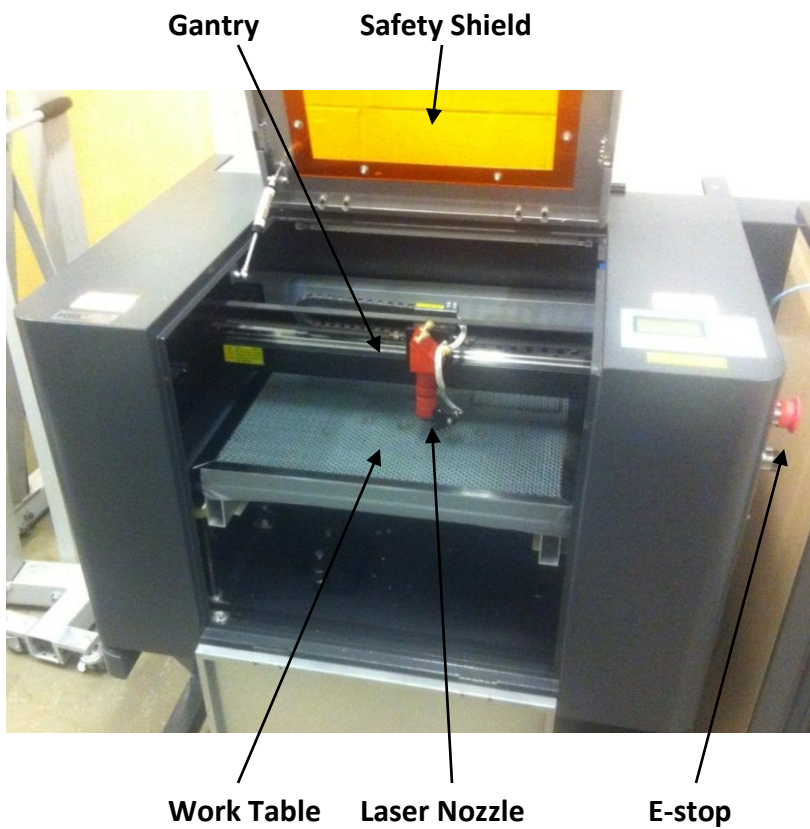


Armstrong Hall of Engineering
Artisan and Fabrication Laboratories (AFL)
Safety and Operational Procedure

LASER CUTTER



PPE Required: **Safety Glasses**

Prohibited Clothing: None

Machine Access Level: **Supervised Only**

Materials: See Appendix 1 in this document for a complete list of allowed and prohibited materials.

Operating Procedure

1. Machine Safety Inspection and Work Area Check-Out

- A. **PPE:** Make sure you are wearing the proper PPE.
- B. **Machine Warning Signs:** Make sure you read and follow the machine warning signs that are attached to the machine. If you have any questions, please ask.
- C. **Work Area:** Make sure the area around the machine is free and clear of debris.

2. Work Supervision

- A. This machine requires supervision by an AFL employee. A Supervisor or TA will assist you in the set-up and operation of the machine. **You may not operate this machine without supervision.**

3. Machine Adjustment

- A. **Identify E-stop:** This button is used to stop the laser in an emergency.
- B. **Check condition of laser nozzle:** Confirm the nozzle is clean of soot and debris.
- C. **Confirm work table is clear:** The laser gantry should be free to move through its full range of X, Y-motion without crashing into anything on the work table.

4. Machine Setup

- A. **Turn on master power:** Flip the switch on the power strip on the rear left lower corner of the machine to turn on the air and water pumps.
- B. **Turn on Fume Hood:** Ensure unobstructed airflow from laser to fume hood.
- C. **Turn on machine:** Twist and pull out the E-stop button, turn the safety key to ON, and flip the machine power switch to ON. Turn the work light switch ON if required.
- D. **Wait for gantry to home:** Machine will automatically go through start up procedures. Gantry will move to its home position in the rear right corner of the work space when startup is complete.

Control panel will look like this:



Machine Setup (cont.)

- E. **Lower work table:** Press “ESC” to enable jog mode. Press the Z button and hold the DOWN arrow to lower the table so the laser gantry is at least $\frac{1}{4}$ ” above the level of your work piece. Press Z again to fix the table in position.
- F. **Install work piece:** Place work piece on laser table. While not essential, it is highly recommended that the piece be positioned in a captured/repeatable position, such as against the rear-left corner of the work table.
- G. **Position laser gantry:** Position the laser over the work piece with the arrow keys. Be careful not to crash the gantry into the work piece!
- H. **Focus Gantry:** Place the Focus Plate on the top of the work piece and raise the table with the Z and UP button until the top of focus plate is level with the first groove in the laser nozzle, as shown in the figure.



5. Cutting

- A. **Close the lid:** Job may be run with lid open to confirm the laser path, but the laser will not fire with the lid open. A low power alignment laser is always on, even when the shield is open. Do not stare directly into this beam.
- B. **CAUTION: DO NOT BYPASS THE SAFETY INTERLOCK ON THE LID.** The laser beam travels from the laser tube to the nozzle through the open air, via mirrors on the gantry, and possess a burn hazard if the laser is forced to operate with the lid open.
- C. **Watch for fire:** Flammable materials will catch fire during cutting. If running a program for the first time with a flammable material, monitor the machine to ensure flame does not spread beyond cutting area. If flame does spread, or persists after cutting has completed, press the E-stop button and get a TA. Keep lid closed.

6. Clean Up

- A. **Remove work piece:** Clean/vacuum up any debris which may have fallen through the work table during cutting.
- B. **Clean up the area:** Remove scrap material from the table. The TA will check that the area is clean before you can sign-out of the AFL.
- C. **Clean focal lens:** The TA will show you how to safely remove the focal lens and clear it of soot and dust. Wear latex gloves during cleaning. Handle the lens only from the edges, and do not touch the lens face.

Appendix 1: Material List

Materials Allowed (Maximum thickness permitted $1/4$ "):

- ABS
- Acrylic (Plexiglas, Lucite, PMMA)
- Acetyl (Derlin)
- HDPE
- Kapton tape
- Mylar (Polyester)
- Nylon (susceptible to melting)
- PETG
- High density polyethylene (susceptible to melting)
- Polypropylene
- Styrene
- All foams
- Cloth (Leather, suede, felt, hemp, cotton)
- Rubber
- Wood
- Anodized metals (Engraving Only)

Materials Prohibited:

- Polycarbonate
- Vinyl
- Non-anodized metals
- PVC
- Any material containing chlorine

Appendix 2: Laser Specification

Optical Power	60 W (Class 4)
Lasing Medium	CO ₂ (gas)
Peak Wavelength	1000 nm (NIR)
Beam Width (Collimated)	4 mm
Beam Width (Focused)	500 μ m
Intensity (Collimated)	$5 \cdot 10^6$ W/m ²
Intensity (Focused)	$3 \cdot 10^8$ W/m ²

