

Laser cutter (HL40-5g-110) – Standard operating procedure

Updated 2018-06-05 (Roger Shih)

PURPOSE

The laser cutter is used to carve out or engrave designs from sheets of material, such as acrylic. This document provides instructions for safe usage of the instrument.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

- Nitrile gloves
- Safety glasses/goggles

MATERIALS AND EQUIPMENT

- Fume hood
- Sheet of material to be cut
 - Never cut material containing PVC or vinyl. Corrosive chlorine vapors are hazardous and will damage machine.
 - Never cut unknown material. Check material's MSDS for its response to extreme heat.

PROCEDURE

Reserve fume hood in lab's Google calendar. (In CCBR, the hood is also used for the spin coater and roll coater. Do not use the laser cutter at the same time, since debris from the laser cutter will vent into the hood and fall on objects to be coated.)

Set up drawing

1. Create or convert design in Inkscape.
2. Select independent colors for cutting (vector) and raster (engraving).
3. When design is ready, open RetinaEngrave software.
4. In Inkscape, print file to "Full Spectrum Engineering Driver". (If design does not transfer properly, the canvas may be fitting too closely. Adjust canvas size to leave a few mm of margin.)
5. Design will appear in RetinaEngrave with tabs for Raster Engrave and Vector Cut.
6. Set # of passes to 0 (on right side of screen) for the vector cutting of the engraving color.
7. Set appropriate speed for cutting color, e.g. 20% for 3mm acrylic.

Set up laser cutter

1. Turn on power bar (on floor) and make sure blower is running.
2. Home the machine by pressing house-icon button on right panel.
3. Place material to be cut inside laser cutter, on grille. Use tape to affix, if desired. Close lid.

4. Press FS/Z button until display reads "Fast XY" mode. Use arrow buttons to move laser head to desired origin (starting position). "Slow XY" mode can also be used for finer adjustments.

Send job

1. In RetinaEngrave, check if machine is connected (in lower-left corner).
2. Press triangular Play button while on cutting tab.
3. Press Play button while on engraving tab.
4. Check machine to confirm cutting has commenced. Remain nearby in case of fire.

Collection and shutdown

1. Wait 10 minutes after job completion before opening lid to collect results. Fumes are noxious.
2. After collecting results, clean up debris and floor grille.
3. Turn off power bar (on floor).

For maintenance and troubleshooting (to be handled by designated lab member in charge of instrument), see full manual linked below in Resources section.

HAZARDS

Laser: Do not look into the red alignment laser. (The actual cutting laser is invisible.) From the manual: "The output of the CO2 engraving laser is fully contained in a Class 1 enclosure during normal operation. The laser cabinet has a safety interlock switch that deactivates the laser if the door is opened during operation, and no special precautions are necessary to operate the high power laser safely. However, the output beam of the Alignment Laser (visible red diode laser) is accessible to the operator during normal operation, giving the total system an overall rating of Class 3R. Class 3R lasers have minimal safety concerns when used properly and handled with care."

Fire Risk: Materials can be ignited by laser.

- Check material's MSDS for its response to extreme heat.
- Be aware that stacking materials can increase ignition risk.
- Do not let debris/residue accumulate in grille. Clean up after each session.
- Do not let machine operate unattended.
- Stock a 5lb fire extinguisher (dry chemical, or preferably halogen for easier cleanup).

Fumes: Heated materials generate noxious fumes.

- Check material MSDS for specific hazards.
- Never cut PVC or vinyl materials. Corrosive chlorine vapors will damage the machine.
- After a cutting job, allow 10 minutes for fumes to clear out before opening lid.

RESOURCES

Wheeler Lab Wiki page for laser cutter:

<http://microfluidics.utoronto.ca/wiki/tiki-index.php?page=Laser+cutter>

Full Spectrum Laser support page:

<https://fslaser.com/Support>

HL40-5g laser cutter manual:

https://fsl-public.s3.amazonaws.com/website/production/pdfs/H_Series_20x12_Manual.pdf

RetinaEngrave software download:

<https://fslaser.com/RetinaEngrave>

RetinaEngrave software manual:

https://fsl-public.s3.amazonaws.com/website/production/pdfs/RetinaEngrave3D_Manual.pdf