

ACE Laser Cutter 101:

Basic safety and operation

This handout is meant to be a follow-along-guide for the Laser 101 class for the 100w Laser. This helpful documentation is not a substitute for taking the training. You must be trained to use the laser cutter at ACE. For a deep dive and documentation please see the wiki.

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Fees

- ACE members pay \$.50 per min. (firing time) / team laser pays .25¢ while on the team
- ACE members are responsible for all laser fees incurred.
- ACE membership and certification is required to operate the laser cutter. Guest cannot use the laser independantly even if certified. Guests can assist certified members.

Operational safety, usage overview and guidelines

- Lasers can blind you. Don't override or depend too heavily on the safety switch on the hood.
- The hood can hurt you. Be careful.
- Never run the laser without following all the steps in the Start-up section
- Never leave the laser unattended while cutting. You could easily burn the building down. Fire bad.
- Always follow the materials recommendations. No. Really.
- Be careful with the honeycomb. It is sharp. It can be damaged easily.
- Ensure air assist and ventilation are properly running before doing any cutting
- Do not lean on the laser and be careful not to bump into it. It is a precision tool and leaning/bumps can torque the rails and cause damage.
- Do not move the gantry/rails by hand if the laser is on. If moving the rails/gantry by hand when the laser is off: move them slowly
- Keep the laser clean. This is not just aesthetics but helps to insure proper functioning over time.
- The emergency shut off is the master switch on the wall
- Use the CO2 fire extinguisher first but after hitting the master shut off switch.

Start up

- Ensure door to hallway is closed and Honeywell filter is turned on.
- Turn on system via switch on wall.
 - Confirm chiller is on, pumping water, and water level is in the good zone.
 - Confirm air compressor is running and air is coming out of air assist nozzle
- Use your fob to authorize access
- Check that the temperatures are in the right ranges - Approx. 19 - 24 degrees

Materials

Storing and disposal

- Expect to pack out your waste material.
- If it doesn't fit on the scrap rack take it with you.
- Pack out your waste material... there is no trash service in the building and it will cost Ace money if you leave your trash.
- If it is smaller than a half a piece of LTR size paper it is okay for the trash bins
- Only leave the usable bit in scrap - cut off the waste and pack the waste out!
- Be practical about your waste materials... go with common sense of leave it better than you found it.
- Materials can be stored here for up to two weeks by members using the tagging system

Things you can put in the laser cutter

- Paper/matte board/cardboard/pressboard/cork (cardstock could have additives that should not go in the cutter, test a sample)
- Acrylic and several other plastics (Delrin, Melamine, Mylar, Corian, Rubber polyimer)
- Wood (careful of fire, treated wood could have additives)
- Cotton / other NATURAL fibers/cloth
- Many other fabrics (moleskin books can have high chlorine content and are bad!)
- Cell phones (check for chlorine in the plastic)
- Laptops (check for chlorine in the plastic)
- Leather (be careful about how it is tanned)
- Glass, Ceramin, Tile, Marble (etch only, cannot cut)
- Anodized/coated/painted metal (etch only, cannot cut)
- Tortillas (the drier the better)

Things you cannot put in the laser cutter

- Anything containing halogens (fluorine, chlorine, bromine, iodine, astatine, and ununseptium). This includes vinyl and many plastics (including teflon), as well as Moleskine. notebooks or anything 'pleather.' If you're not sure whether what you've got contains chlorine, you can check on the MSDS (if you can't find it there, ask the vendor or manufacturer directly) or do a burn test to check.
- PVC (contains chlorine --> hydrogen chloride gas --> hurts you and the laser)
- PVC Foams (chlorine)
- Lexan / Polycarbonate / PETG (Does not cut)
- ABS (Gives off hydrogen cyanide)
- Vinyl (chlorine)
- Polymer clay (contains PVC)
- Foam Core (Usually made of PVC)
- Styrofoam (Catches on fire)
- Metals* (exception is that you can etch anodized metal)
- Animals
- People or your body parts
- Butane lighters
- Gasoline or other liquids
- ANY OTHER ITEM NOT ON THE APPROVED LIST

Set up and test cutting

- Zero the Z (see binder for additional information)
- Prepare your material for a test cut on the laser bed
- Jog laser head over to the material using arrow buttons to move a little bit, and hold down to move a lot.
- Use the focus tool to get a good start point for the focus process
 - Adjust the Z axis by raising/lowering table On laser (Z+/Z-) BUT NEVER WITH SOMETHING UNDER HEAD.
- Fire test dot On laser*: Press "Laser", while looking at your material. You should see it burn a dot
- Focus by raising/lowering table On laser (Z+/Z-). You are aiming to land the focal point of the laser in the middle (Z) of your material. For thick material you may need to refocus on multiple passes. NEVER ADJUST THE Z WITH SOMETHING UNDER HEAD.
- Open LaserSoft (always start with a new file)
 - Set the parameters for your workspace (i.e. Set relative origin point) - click "Parameters", then "Workspace":
 - Set Platform -> Relative Position setting for how you want laser to cut relative to your material.
 - Draw a shape to test with; set the power and speed (see the binder or poster for settings for your specific material).
- Download your test art to the laser
- Position the laser head over the material (mindful of relative origin)
- Press "origin" - ANY time you move the laser head PRESS ORIGIN
- Click the 'Run Box' command to confirm you will be on the material (Rectangle icon with arrows on control panel)-- this will move the laser in a rectangle around the area it will operate, without turning on the laser.
- Confirm the temperature readout on the laser cutter is below 25. Also check the chiller, it should be 20-22ish.
- Start the cut-- click Start! DO NOT LEAVE THE LASER WHILE IT'S CUTTING. You need to watch it at all times to make sure nothing bad happens (eg burning down the building).
- Adjust the focus, power and speed settings as needed until you are getting the cut you desire.

Importing art

- Set the parameters for your workspace (i.e. Set relative origin point) - click "Parameters", then "Workspace":
 - Set Platform -> Relative Position setting for how you want laser to cut relative to your material.
- Import shapes/graphics (Or draw them manually with the tools in the software)
- Assign items as relevant to layers and apply your power and speed settings
- You can run simulation to see how it will cut
- Download the program to the laser: Click 'Download', then 'Download' again.
- Position gantry over your material where you want to start cutting.
- Press "origin" on laser.
- Confirm material/cut position- Click the 'Run Box' command -- this will move the laser in a rectangle around the area it will operate, without turning on the laser.
- Start the cut-- click Start! DO NOT LEAVE THE LASER WHILE IT'S CUTTING. You need to watch it at all times to make sure nothing bad happens (eg burning down the building).

About file preparation/file types

- Preparing files is an art form of it's own. Lots of information is on the wiki.
- Both vector and bitmap information can be used by the software. See the binder.
- Grouped objects often fail on import

Filter Care / Logging

- We have two types of filters. One for natural products and one for sticky synthetic things
- Use the right filter for the job
- Use the Access point to change your filter. (see wiki for more details)
- Never assume access point time, visually look at the filter at the start and throughout long runs

How to Calculate Venting Time

- Venting is not a flat amount of time.
- Minimum venting time for the smallest test cut is 1 min.
- Your material and the duration of cutting or etching effects needed venting time.
- Example: Etching acrylic for 6 min. will require 8 min. minimum ventilation time.
- Example: a 1.5 min. cut of plywood will require a 2 min. venting time.
- Not all fumes are visible smoke.
- If you do see any smoke you have not waited long enough.

Shut down

- Move the laser head to the very back, center
- Log off
- When done, turn off main switch to power down system.
- Remove any bits and scraps from the laser bed, use brushes and pipe cleaners when needed
- Clean up any waste material you may have generated.
- Use shopvac next to laser and vacuum underneath honeycomb.
- Carefully wipe down the interior of the laser after each use using a dry cloth. NEVER USE SPRAY CLEANERS or solvents or scratchy things. (Okay to use a damp cloth as long as it is water only.)
- DO NOT TURN OFF THE COMPUTER
- If the room is stinky it is okay to leave the honeywell on.

Troubleshooting

- Is it you or is it the laser?
 - Back to basics: Try cutting a circle or ellipse and make sure its circular or elliptical and the start and end point match. Use digital calipers to make sure its within around ~.01mm of the dimensions specified in LaserCut.
- Try cutting a kraken. You can find one on the file server. This is a good example to detect if there is backlash, over/under tightening of belts or misalignment of the rails.
- It is smoky or fummy? Confirm exhaust fans are running

Getting Help

- Slack: Join the slack team: <https://www.acemakerspace.org/contact-us/#Slack>. Ask questions in the #laser channel

Certification

- Certification for the laser is a two part process. If you have just taken this class you completed part 1. The second part is completing a knowledge check at on line at: <https://www.acemakerspace.org/laser-101-knowledge-check/>