Protohaven

Class Notes

Laser 101: Basic Operation

Clearances

Rabbit Large Format Lasers

Contents

Welcome

Welcome to the Introduction to Lathe class at Protohaven!

Shop Rules

Be Safe

- Get safety clearances
- Wear protective equipment
- Watch and reset equipment after use
- Never use equipment that is red-tagged

Take Care of Each Other

- Be aware of your surroundings
- Don't use a tool if it poses a danger to someone else

Take Care of the Tools

- Get tool clearances
- Do not alter of use equipment beyond limits
- Notify staff when maintenance is needed

Keep the Shop Clean

- Clean up after yourself
- Return tools to their original locations

Tool Status Tags

Every tool at Protohaven has a status to let you know if the tool is safe to use.

If the tool status is *green*, the tool is safe to use. All features should be expected to work, and no extra care should need to be taken while using the tool.

If the tool status is *yellow*, the tool may still be used, but with extra caution. The information on the physical tag or in the online maintenance history will indicate what special care needs to be taken while using the tool. If the physical tag and the maintenance log disagree, alert a tech.

If the tool status is *red*: **DO NOT USE THE TOOL**. The tool is not safe to use. The information on the physical tag or in the online maintenance history will indicate what fixes are pending, and when a repair is expected.

Some tools in the shop are explicitly green tagged to let you know they are working. Other tools in the shop are not explicitly green tagged when they are working to reduce sign fatigue. If you are in doubt about the status of a tool with no visible tag, check the Protohaven website for the tool status page:

`https://www.protohaven.org/equipment/`

Filing a Tool Report

If you are using a tool, and the tool becomes unsafe, damaged, or is not working properly, you must notify a tech. The tech may instruct you to submit a tool report:

`https://airtable.com/appbIlORlmbIxNU1L/shrluff2WSzy8c3xd`

Notifying the tech will help us keep signage up to date, and make sure the users who come in after you have all the information they need to use the tool safely, even if they don't use discord.

Safety

If you feel unsure of something, feel free to ask!

Introduction

Learning Objectives

Terminology

Tools

Large Format Laser

(Overview paragraph(s))

Notes

Safety

Common Hazards

(Putting out small fires with the spray bottle, large files with a fire extinguisher)

(Toxic outgassing)

Care

Use care when opening and closing the cover; do not let the cover slam closed. (Can hurt the laser tube)

Materials

Prohibited Materials

Some materials are dangerous to etch or cut in the laser cutter: the process may cause a fire hazard, or introduce dangerous gasses into the studio space.

The following materials are prohibited for use in the laser cutter:

Prohibited Material	Hazard
Any material containing a halogen	Fluorine, Chlorine, Bromine, etc...
Artificial Leather	
AVS	
Butadiene-acrylonitrile Rubber	
Chlorinated Plastics	
Coated Carbon Fiber	
Dry Moly Lube	
Easyweed Electric Heat Transfer Film	polyurethanes
Epoxy Resin	Formaldehyde, Hydrogen Cyanide
Fiberglass	
Foam Core	
Foamular Extruded Polystyrene Insulation	
Galvanized Metal	
HDPE	
Laser Rubber	Hydrogen Cyanide
Lexan	
Mirrored Surfaces	
Moleskine Notebooks	
Neoprene	

Prohibited Material	Hazard
Nylon	
Oracal 651	Contains PVC, Lead, Chromium
Polycarbonate	
Polymer Clay	
Polypropylene	
Polyurethane	
Pressure Treated Wood	
PTFE	
PVC	
Rock Salt/Table Salt	Chlorine
Sculpey	
Silicone conformal coating spray from MG Chemicals	contains halogens
Siser P.S. Film	polyurethanes
Siser StripFlock P.S. Film	PVC
Spandex & Stretch	contains polyurethane
Speedball Art Speedy Cut, Speedy Cut Easy and Speedy Carve	PVC at minimum
Styrofoam	
Teflon	
Uncured Powder Coating	
Vinyl	

Approved Materials

Approved Material	Cut	Etch	Warning
3M 200MP Adhesive Transfer Tapes	✓	✓	
Abalone Shell	✓	✓	
Acrylic	✓	✓	Mirrored Acrylic reflective side down
Cardboard	✓	✓	
Cardstock	✓	✓	
Cellulose Acetate Butyrate	✓	✓	
Ceramic		✓	
Ceremark Metal Marking Compound		✓	
Chipboard	✓	✓	
CobalTex RF	✓	✓	wash hands after handling the cut edges of this fabric to help prevent ingesting the metal dust
Corian	✓	✓	
Coroplast Brand Corregated Polypropylene	✓	✓	watch for melting; bulk polypropylene is not approved
Cotton	✓	✓	Watch for fire.
Cotton Denim	✓	✓	Stretch denim has Spandex and is prohibited.
Delrin	✓	✓	

Approved Material	Cut	Etch	Warning
Depron Foam	✓	✓	
Easyweed Glow in the Dark Heat Transfer Film	✓	✓	
Eco-fi™ Specialty Craft Felts	✓	✓	
EVA copolymer	✓	✓	
Felt	✓	✓	Watch for fire.
Foamboard/Foam Core	✓	✓	HIGH FIRE RISK: The entire job must be monitored closely.
Freezer Paper	✓	✓	Raw polyethylene is not approved
GE Silicone Caulk	✓	✓	
Glass		✓	
Hemp	✓	✓	Watch for fire.
Kaolin Clay (claybord)	✓	✓	
Kapton Film	✓	✓	FPC and HN variants only
LDF	✓	✓	
Magnetic Sheets	✓	✓	
Marmoleum	✓	✓	
MDF	✓	✓	
Metal (painted/anodized)		✓	The laser must not be used over 50% power in this scenario. Reflections can damage the optics.
ModPodge Gloss	✓	✓	
Mylar	✓	✓	
Natural Cork	✓	✓	Only cork without adhesive backing. All artificial cork must be approved separately.
Natural Leather	✓	✓	
Non-Chlorinated Rubber	✓	✓	
Painter's Tape	✓	✓	
Paints and Thin Spray Coatings (thinner than powder coating)		✓	
Paper	✓	✓	
Peelable Solder Mask (latex)	✓	✓	
PET Plastic	✓	✓	
PETG Plastic	✓	✓	
PLA Plastic	✓	✓	
Plaster of Paris		✓	
Plasti-dip		✓	
Plexiglass	✓	✓	
Plywood	✓	✓	
Polybutylene Terephthalate	✓	✓	Must not contain brominated fire retardant
Polypropylene Tape	✓	✓	
Polystyrene	✓	✓	Watch for fire.

Approved Material	Cut	Etch	Warning
Rowmark LaserMAX	✓	✓	
Siser Glitter Heat Transfer Film	✓	✓	
Speedball Art Linoleum	✓	✓	
Stone		✓	
Suede	✓	✓	
Wood	✓	✓	
Wool	✓	✓	Watch for fire.
Worbla BlackArt	✓	✓	
Worbla FinestArt	✓	✓	
Worbla TranspArt	✓	✓	

Parts of the Laser Cutter

Basic Operation

Setting Up the Laser

turn on

make sure cooling is working

make sure the exhaust fan is running

secure workpiece to grid

check focus

Workholding

Use magnets to secure the workpiece to the grid.

Make sure that the laser's path won't cause the laser to cut the magnets, or for the laser head to crash into the magnets.

Focusing the Lens

1. Press Z(Control Panel 2) to change to bed height control.
2. Use ↔ Control Panel 1 to align the lens carriage to the focus gauge (Right raises bed, left lowers)
3. Select Esc(Control Panel 3) to return to the main menu.

Setting the Origin

1. Use the directional arrows(Control Panel 2) to jog the lens carriage to the desired location.

• Optional: Press Pulse(Control Panel 8)to verify the exact location.

1. Select Origin(Control Panel 5) to set the Origin
2. Select Frame(Control Panel 6) to check the footprint of job. (framing can also be managed from Lightburn control)

Setting up the Job in Lightburn

Load art into light burn

Running the Job on the Laser

1. Check the footprint of your job
2. Start your file
3. Monitor the machine until the job is complete and cleanup

While the job is running, remain nearby the laser to make sure nothing goes wrong.

Cleaning Up

1. Power off the Laser
2. Reset any modified computer settings to default
3. Vacuum the interior so material does not build up beneath the honeycomb
4. Note any maintenance needs or concerns on the tag and at protohaven.org/maintenance
5. Recycle waste in the single-stream scrap bins
6. Empty the bin when full

Software

Concepts

Resources

LightBurn

LightBurn software has a YouTube page (`https://www.youtube.com/@lightburnsoftware7189/`) with lots of content to help with projects. For those new to laser cutting and etching, these videos are a good place to start:

- Getting Started With LightBurn: Set up & First Project
  `https://www.youtube.com/watch?v=v3RDzOrlCTM`
- LightBurn UI Walkthrough
  `https://www.youtube.com/watch?v=uzFsrUwONbw`
- LightBurn Cut Settings
  `https://www.youtube.com/watch?v=nybhYtjElQU`

Inkscape

- Inkscape Tutorial: Complete Starter Guide for New Users (with chapters)
  `https://www.youtube.com/watch?v=fzk-suGcqrc`

A comprehensive tutorial series for Inkscape is available from TJ Free: `https://www.youtube.com/playlist?list=PLqazFFzUAPc5lOQwDoZ4Dw2YSXtO7lWNv`

Some videos from the series that are good places to start:

- Inkscape Lesson 1 - Interface and Basic Drawing
  `https://www.youtube.com/watch?v=8f011wdiW7g`
- Inkscape Lesson 10 - Trace Images with Bezier Tool
  `https://www.youtube.com/watch?v=sagrkdmC_BI`
- Inkscape Lesson 11 - Trace Bitmap Tool (Convert Raster to SVG)
  `https://www.youtube.com/watch?v=E7HwLTQu2FI`