FIBER LASER QUICK START

PREREQUISITES

This document is not a substitution for the certification process. Reading a quick start guide is not a substitute for reading the manual and warnings from the manufacturer. Unboxing, setup, installing ventilation, installing drivers, advanced lens calibration, and installing LightBurn are steps that all had to be completed before this tutorial. As part of your training, you will be asked to mark a few small work pieces.

SAFETY WARNINGS

- Do not take lightly the fact that this machine can do irreparable harm.
- Use of this laser is the responsibility of the member, and the member should take note of whether the material being marked is suitable. First, it is strongly discouraged to mark wood, paper or any other materials commonly thought of as flammable. Some of these items CAN be marked and cut with the fiber laser, but they may also catch fire and pose a great risk and liability. At the time of this writing, it is the author's opinion that we just shouldn't mark things generally considered flammable.
- Members using the fiber lasers are responsible for ensuring that they and the other people in the space have the proper PPE (gloves, goggles, glasses, masks or respirators, etc.) for the laser being used to vaporize the material being marked.
- Items that have been ablated with a laser may be VERY HOT. There should be an infrared thermometer at the laser station, please take the proper precautions against burning yourself or others. Infrared thermometers may not give entirely accurate readings for especially reflective materials; please use caution.
- Please keep all doors on the laser surround shut properly while the machine is in use, and ensure that all items to be marked can fit comfortably within the enclosure for the safety of yourself and others.

- Do not touch this device with two hands simultaneously. Placing both hands on the machine during operation can potentially create a closed circuit, resulting in an electrical shock.
- Members must exercise special caution when working with conductive materials, as the buildup of their dust and ambient particles may damage electrical components, cause short circuits, or produce other effects, including reflected laser radiation.
- Some items have coatings on them that produce dangerous fumes. One example is galvanized steel: this is most of the steel you find at hardware stores, especially for construction or outdoor purposes. While the fiber laser is capable of marking these items, the coating on them contains zinc and lead and can cause serious health issues to the people in the area.
- Do not place anything in the path of the laser that should not be marked. The laser is not necessarily safe just because it is currently off. Use common sense and precautions, and treat the laser as if it could spontaneously turn on at any moment. Do not place reflective items in the path of the laser. Do not place flammable items in the path of the laser.
- More items known to be dangerous to laser:
  - Artificial Leather containing Hexavalent Chromium (Cr[VI])
  - Astatine
  - Beryllium Oxide
  - Bromine
  - Chlorine, including Polyvinyl Butyral (PVB) and Polyvinyl Chloride (PVC, Vinyl, Sintra, etc.)
  - Fluorine, including Polytetrafluoroethylenes (Teflon, PTFE, HDPE etc.) There are plenty of halogen containing polymers, so if your item is plastic and you aren't sure it's on the safe plastics list, just avoid it as it can be lethal to you and other members.
  - Iodine
  - Phenolic Resins, including various forms of Epoxy
  - Galvanized metals, and metals containing large or unknown amounts of zinc, lead, or other toxins should be avoided. Pot-metal, for example, may contain any number of hazardous chemicals and should be avoided. This also includes tin-coated steel.

OPERATION

POWER IT ON

1. Please read all precautions and follow safety rules before you begin.

2. Power on the mini PC beside the fiber laser (password hackrv@@) and open LightBurn.

3. Turn on the yellow power strip to the right of the laser. Listen to be sure that this engages the ventilation.

4. Once the ventilation is running, turn the red emergency stop button clockwise and pull out. This will turn on the laser.

5. Each user should only run one laser at a time and not leave the room during operation. We ask that individuals do not use both lasers concurrently as a courtesy to other members.

FIND YOUR FOCUS

1. Take your object to be marked and put it down underneath the head.

2. Open the enclosure door on the side closest to the computer and make sure your focal stick (410mm long) lines up from the line marked on the laser head to the top of your material to be marked.

3. If you have trouble with this, or if you cannot find the focal stick, please see the detailed section on how to find the focal length manually.

START A PROJECT

1. With your material in place underneath the laser head, open LightBurn and open your prepared file or start a new project.

2. If you aren't experienced with advanced laser settings, search in the Materials Library for presets that best match the desired outcome to your project. To do this, find the tab labeled Material Library at the bottom of the Laser window in LightBurn. Select your material.

3. Hit Frame in LightBurn and align your material with the red dot, which should be showing you an outline of your design.

4. Shut the enclosure door.

5. Before you hit Start, make absolutely certain everything is the way you want it. The laser will immediately start and will mark your material or anything else in its path.
Note: If LightBurn gives you a door safety switch error, the laser will not start. Check that the door is securely closed and make sure that the sensor at the top is making contact.

SHUT DOWN

1. When you are done, turn off the laser by pushing in the Emergency Stop button (far right, red button).

2. If no one is using the CO2 laser, turn off the ventilation at the yellow power strip. If someone is using or is about to use the CO2 laser, please leave the yellow power strip on.
3. If you are done with the computer, please sign out, because the automatic sleep settings can interfere with laser operation so they have been disabled.
4. If you used a lens other than the 290, please put the 290 back on.
5. Refer to the housekeeping section below and leave the space ready for the next Hack member.

HOUSEKEEPING

1. If your work on the laser produced any dust (such as in the case of reliefs or heavy etching on slate material), please vacuum it out of the enclosure with a shop vac and carefully use compressed air to remove dust from the lens.
2. Be sure that no work piece is left inside the laser enclosure.
3. Check and be sure that the tools for the laser are in reasonable and visible places on the bench (metric ruler, infrared thermometer, etc.)
4. Check the trash in the area. If it is full, please take the trash out. Thank you in advance.

EXPLANATION OF LASER CONTROL SETTINGS

SPEED

Speed controls how much time the laser spends on a given line, so the slower the speed the more energy and heat is put into any given square mm of space. So in many cases a lower speed could be more aggressive, but this may change based on material properties. This may go up to 7,000 mm/s. The setting goes as low as 1mm/s, but this isn't a practical speed (50mm/s is reasonable).

POWER

Power is the percentage of total power used, so in the case of this equipment, 100% power = 60w maximum power. The higher the number, the more energy will go into the material. The range is 0 to 100.

FREQUENCY

Kind of like sandpaper: the lower the frequency, the more aggressive. The higher the frequency, the more smooth and polished the results will be. The frequency range for the JPT MOPA is 1khz-600khz where 1 would be the most aggressive. To transition from removing material to cleaning up, you should make several passes, increasing the frequency each time.

Q-PULSE WIDTH

This is the time between the start of one pulse and the start of the next pulse. For basic black marking, 200ns works fine. Change these values to get different color outcomes for the same power/speed settings. If you choose a setting outside the range, the machine will not let you start a job. The effects of this setting are subject to many variables including material, ambient temperature and humidity, material temperature and thickness, etc. Try to do a test burn if you change this setting to dial in your results.

MANUALLY FIND THE FOCAL LENGTH

This only needs to be done occasionally, as the touch stick should be set to approximately the right height after this has been done the first time. However, if you are experiencing problems, this is an easy thing to do to ensure you are getting the best results from the laser.

1. Launch the LightBurn software and start a new project. Make a small square near the center. You can center work by selecting the pointer tool, selecting your shape, and typing P on the keyboard.
2. In the Cuts/Layers window, double click your work layer and use these settings:
   - Speed 1000mm/s
   - Frequency 25khz
   - Max power should be set to 80
   - Line interval set to 0.025
   - Q pulse width shouldn't be adjusted (200ns)
   - Global passes should be set to 1
   - Check that bidirectional fill and cross hatch are both ON
   - Auto-rotate OFF
   - Flood fill OFF
   - Wobble OFF
   - Fill all shapes at once ON
   - Fill groups together OFF
   - Fill shapes individually OFF
   - Enable dot width adjust OFF
   - Ramp outer edge OFF
3. Once you have your settings adjusted, hit OK.
4. In the Laser>Frame menu, check the box that says Run Continuously.

5. Check that your material is under the laser (the red dot should be framing the area it will mark) and then press Start.
6. The laser will start to mark the material. Using the up and down buttons, adjust the height of the laser head until the light from the laser is at its brightest and the noise from the laser is loudest.
7. Once you have found the brightest and loudest position, hit Stop.
8. Wait for the work to cool sufficiently and then measure the height from the work to the red line on the laser head sticker. This is your optimised focal length. You can make a touch stick that length so that you can quickly set the height of the laser head housing to this position over your work each time.

CUTTING

While the laser is capable of cutting, it takes significantly longer than marking, and may cause damage to materials due to excessive heat. You should check the material being used. At the time of this writing, cutting material thicker than 2mm requires stopping after the laser has cut 2mm and lowering the Z axis by 2mm to continue cutting in focus. We do think it's a simple software fix but we don't know if or when the software will be updated.

At the time of this writing, we have only cut steel and brass, for which the following settings were used.
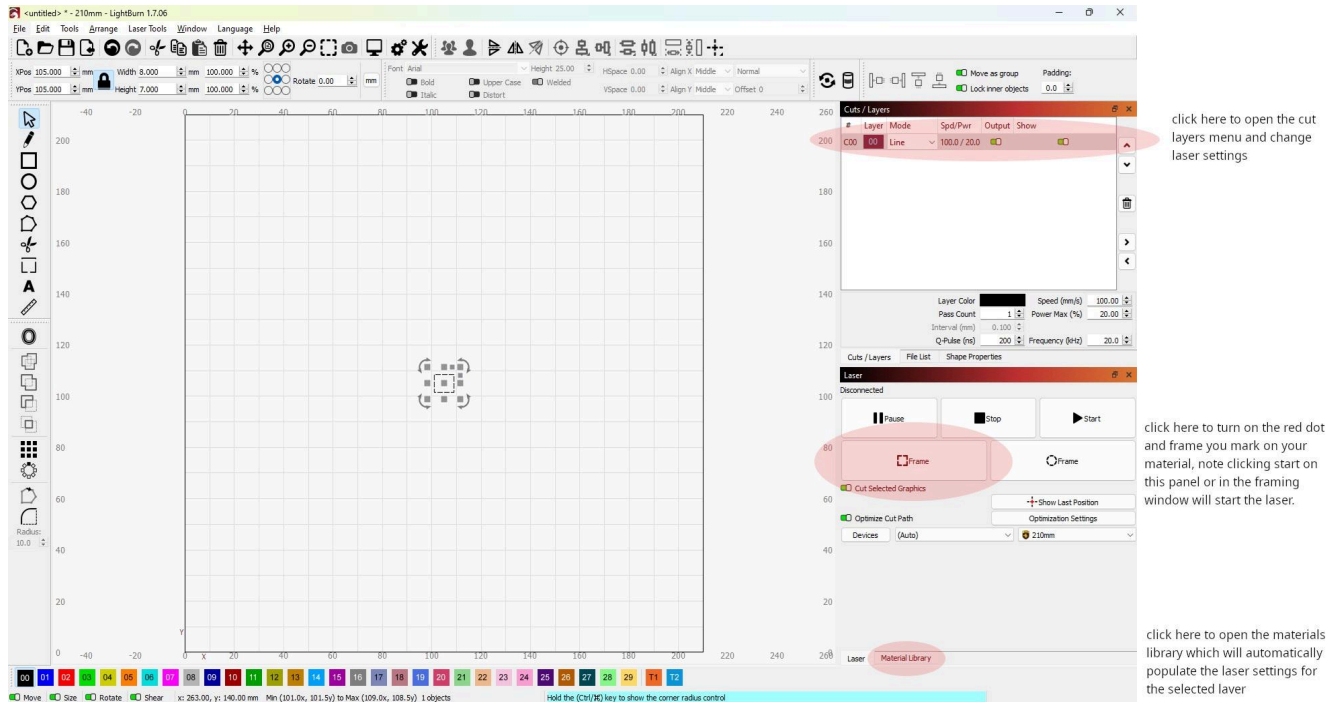
To cut lines/outlined shapes:

- Power 100%
- Frequency 20khz
- Q pulse width 200ns
- Speed 50mm/s
- Wobble ON

Steel took 100 passes per mm, and brass took 30 passes per mm. Be prepared for trial and error. When cutting please place the item to be cut on a riser. The riser will get VERY hot and may be etched somewhat. There are 12"x12" floor tiles available to put under your work piece in order to protect the bed. If you remove a significant amount of material from the protective tile, please bring in a replacement. Big box hardware stores offer inexpensive individual tiles for sale.

LIGHTBURN USER INTERFACE

Menus may change based on laser selection. If you need assistance with the design tools, please refer to [LightBurn Documentation online](#) or the Help menu for tool functions.

click here to open the cut layers menu and change laser settings

click here to turn on the red dot and frame you mark on your material, note clicking start on this panel or in the framing window will start the laser.

click here to open the materials library which will automatically populate the laser settings for the selected layer

GRATITUDE

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