

Boss Laser LS1420 Standard Operating Procedures

Author: Prof. Florian

Last Updated: 2/26/2025

Machine Specifications:

- Laser: **70W CO2** (10.6 microns)
- Cut Area: 14" (355.6 mm) by 20" (508 mm)
- Platform Travel (Z-axis): 7.5"
- Lenses:
 - 2" for fine detail engraving and cutting up to 1/2" (**default lens installed**).
 - 4" for cutting up to 1" thick material (usually foam) – please request lens change.

Laser Safe Materials for Cutting and Engraving:

- Most woods ($\leq 1/4"$) – avoid oily woods, such as purpleheart and mahogany
- Cardboard and paper
- Acrylic ($\leq 3/8"$)
- Anodized aluminum (laser removes anodized coating but cannot cut metal!)
- Painted/coated metals (laser removes paint)
- Glass (cracks/etches the glass)
- Leather ($< 1/8"$)
- Non-Chlorine-containing rubber (Nitril/Buna-N can be cut, but please ask for help)

Materials that should NOT be cut:

- Polycarbonate
- Polyvinyl Chloride (PVC)
 - This includes vinyl stickers!
- Polyvinyl butyral (PVB)
- Acrylonitrile Butadiene Styrene (ABS)
- Polytetrafluoroethylenes (PTFE/Teflon)
- High-Density Polyethylene (HDPE)
- Polystyrene
- Carbon fiber composites

If you are unsure of what your material is, then do NOT cut it. Reach out for help. Many plastics or coatings can release dusts or gases, which may endanger the user or the functionality of the laser cutter.

Laser Power and Cutting Speeds

Baseline cutting and engraving of approved materials can be found [here](https://bosslaser.com/laser-settings/) (<https://bosslaser.com/laser-settings/>). Please note: The CO2 laser loses power with

use, so you must calibrate the cut settings at the start of each session. It is recommended to make a small test cut to set laser and speed settings.

Supporting Equipment

The laser cutter requires three auxiliary devices to be on and functioning correctly to prevent damage to the laser tube/optics and to properly exhaust fumes (**Fig. 1**):

1. Air Compressor – blows away vaporized material to provide an unobstructed path for the laser and prevents ignition of flammable debris.
2. Chiller – cools the CO2 laser tube.
3. Exhaust/Filter – removes fumes from the cutting envelope and filter it.

It is unacceptable to run the laser cutter without ensuring that all supporting equipment is operating correctly. Of particular concern is the vaporized material generated by the cutting process.



Figure 1. Auxiliary equipment required for the laser cutter.

Operating the Laser Cutter

1. Turn on the power strip for the supporting equipment by hitting the switch on the top of the machine (**Fig. 2**). This will **NOT** turn on the exhaust system – see below.
2. Confirm that the following devices have powered on:
 - a. Air Compressor: should be vibrating on startup. The pressure gauge on the front should increase until ~ 30 PSI. The air compressor will shut off when the tank is full. There is a solenoid (electrically controlled valve) between the air compressor and laser cutter that only opens when the laser cutter is in operation to conserve air.
 - b. The water chiller: green “normal operation” light is illuminated. If not on, then check the power switch on



Figure 2. On/Off sequence for supporting equipment (1), releasing the emergency stop (2), and turning on the laser (3).

the front panel. If an alarm sounds, then more water may be needed (ask for help).

- c. Exhaust/filter– will power on but the exhaust fans will NOT spin up on startup. You must press the “Ok” (ON icon) on the left side of the screen (**Fig. 3**). When turned on the exhaust system will continue to filter the air, slowly plugging the expensive filters. *When finished cutting, promptly turn off the exhaust/filter.*
3. Release the emergency stop button on the laser (if pressed) by twisting it clockwise. Turn the key clockwise to turn the laser on (**Fig. 2**). Often the key is left in the on position and the laser cutter is turned off through the power strip switch, which is permitted.
4. Open the front door and install the honeycomb platform over the knife blades if cutting fine features (**Fig. 4**). You may need to lower the bed to install the honeycomb – see step 7. Be careful not to pump the laser head.
5. If cutting stock material thicker than 1/2" then the 4" lens will need to be installed (ask for help).

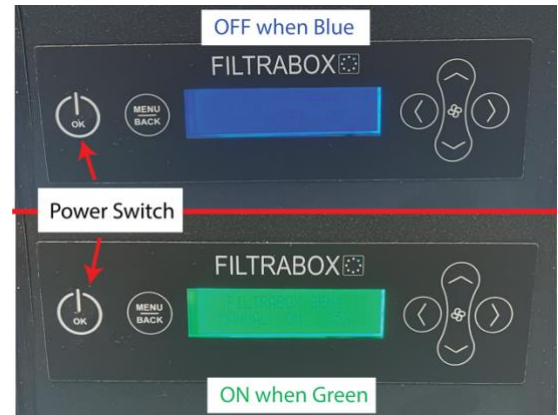


Figure 3. After powering on the exhaust system through the power strip switch, you must press the ok/on button to turn it on. The screen will change from blue (off) to green (on).

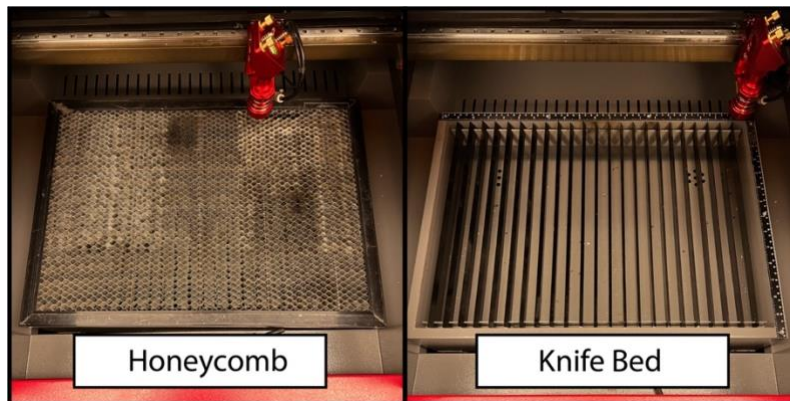


Figure 4. Two different bed styles: Honeycomb and Knife. Use the honeycomb to keep small geometries supported during the cut and to prevent them from falling through.

6. Load your material into the laser cutter (be sure to check the compatible material list above). If the platform is too high, then lower it by selecting “Z/U” on the control panel. “Z move” will automatically be highlighted. Use the **left** arrow to **lower** the bed and the **right** arrow to **raise** it (**Fig. 5**).
7. Next position the cutting head over the stock material by using the left and right arrows for X movements and the up and down arrows for Y movements. If the menu options are still showing from step 7, then you will not be able to move as expected. Press the “Esc” key to return to the main screen, which will reassign the arrow keys.



Figure 5. After pressing Z/U, menu options for moving the Z-axis (1) and autofocusing

8. The distance between the cutting head and the material needs to be precisely set so that the focal distance of the lens is at the surface of the material. Press the “Z/U” button to pull up the menu. Use the down arrow key until the item “Auto focus” is highlighted. Press the “enter” key. The platform will raise until the material contacts the cutting head. The autofocusing procedure needs to be run after turning the laser cutter on, switching to materials with different thicknesses, and or adding/removing the honeycomb platform (**Fig. 5**).
9. Use the red laser pointer to position the cutting head in the top left corner of the stock material. This is the origin for the paths that cutter will follow if set correctly in LightBurn.
10. Close all doors before beginning the cutting process.
11. Review the *LightBurn* document for programming the cutting/engraving paths.
12. When running, the galvanometer (gauge labeled “mA”) should bounce up and down, signifying that the laser is receiving power. If this does not occur, check that the main door is fully closed (press down on it gently), and check settings in LightBurn (make sure power is not set to 0).

The laser cutter should never be left unattended! Always turn the laser cutter off and accessory equipment before leaving.

Shutting Down

1. Turn OFF the fume extraction box. Once off the screen will be blue (**fig. 6**). The filters in the fume extractor are costly to replace and will degrade whenever the extractor is running, regardless of whether the laser cutter is in operation. To preserve the lifespan of the filters, ensure the fume extractor is only activated when necessary, during laser cutting operations.

2. Make sure all debris and cutoffs are collected and disposed of. This may require lifting the individual slats in the knife platform and using the vacuum.
3. Turn off the laser by turning the key counterclockwise.
4. Power down the supporting equipment by switching off the power strip located at the top back of the laser cutter. Make sure the pumps and fans are off as these have a limited lifespan.



Figure 6. Turn off exhaust/filter

Rotary

The rotary instructions are a work in progress. Please ask Prof. Florian for assistance on cutting/engraving round objects.

Laser Engraving Glass Tips:

When a CO2 laser engraves glass, it's thermal energy creates microcracks on the surface that scatter light, making the engraved areas appear frosted or opaque. If the power is too high then the engraved glass will chip off. These glass flakes can embed themselves in your skin (i.e., itchy) and are serious eye hazards. If the glass starts flaking then throw it away and use a lower laser power.

Glasses can slip and fall out of the rotary. If this happens, press "start/pause" then "exc" to cancel the operation before opening the door. If there is broken glass wear gloves to clean up and/or use the vacuum.

- Applying a moist paper towel (single sheet, no overlap, eliminate air bubbles)
- Turn off air assist, which will dry out the paper towels.

