<u>Boss Laser LS1420 Standard Operating Procedures</u>

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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 (ask for it to be installed)

Laser Safe Materials for Cutting and Engraving:
- Most woods – avoid oily woods, such as purpleheart and mahogany (≤ 1/4")
- Cardboard and paper
- Acrylic (≤ 3/8")
- Anodized aluminum (laser removes anodized coating)
- 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 Choloride (PVC)
- Polyvinyl butyrale (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 <u>NOT</u> cut it. 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 CO_2 laser tube.
3. Exhaust Blower – removes fumes from the cutting envelope.

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, which is both flammable and a respiratory hazard. Confirm each of the supporting equipment is on through visual or audible inspection.

Air Compressor   **Chiller**   **Exhaust Blower**

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**).
2. Confirm that the following devices have powered on:
   a. Air compressor – vibrating and air flow coming from the cutting head.
   b. The water chiller – green "normal operation" light is illuminated. If not on, then check the power switch on the front panel. If an alarm sounds, then more water may be needed (ask for help).
   c. Exhaust blower – loudest of the three.
3. Trap the light blue exhaust tubing between the sash and the bottom of the fume hood (**Fig. 3**).

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

4. 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**).

5. 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.

6. If cutting stock material thicker than 1/2" then the 4" lens will need to be installed (ask for help).

7. 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 <u>left</u> arrow to lower the bed and the <u>right</u> arrow to raise it (**Fig. 5**).

8. 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.

9. 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**).

Figure 3. The fume hood safely removes laser cutting exhaust from the room.
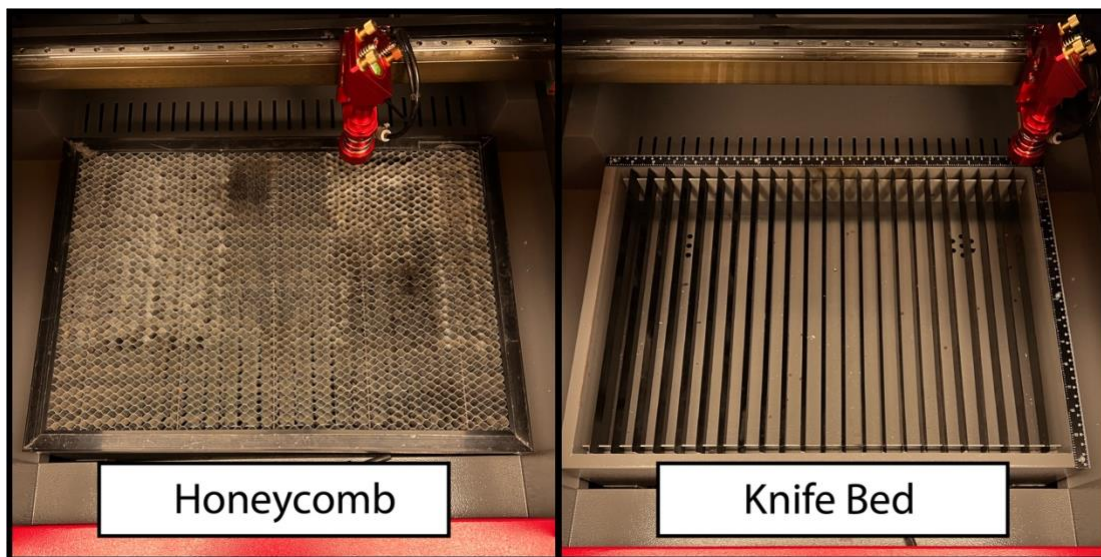

Figure 4. Two different bed styles: Honeycomb and Knife. Use the honeycomb to keep small geometries supported during the cut and to prevent them from falling through.

10. 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.
11. Close all doors before beginning the cutting process.
12. Review the "LightBurn" document for programming the cutting/engraving paths.
13. 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).

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

Shutting Down:
- 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.
- Turn off the laser by turning the key counterclockwise.
- 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.
- Remove the exhaust tubing from the fume hood and close the sash.