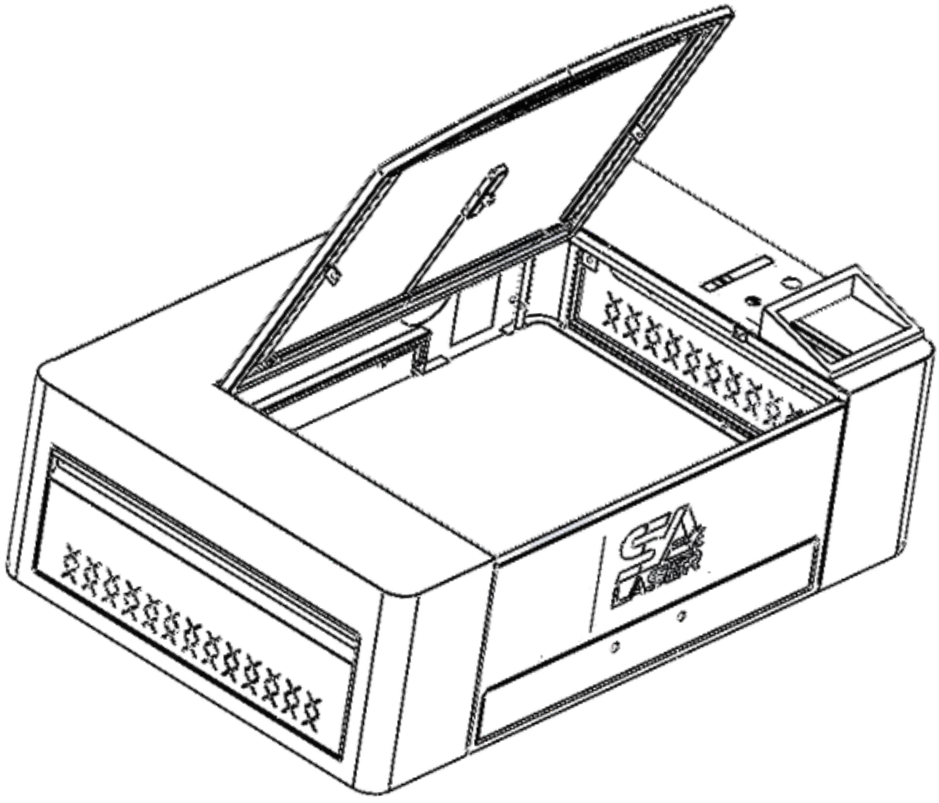
BLADE

CLASS IV CARBON DIOXIDE LASER

USER MANUAL



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INTRODUCTION

The SA Laser Blade is an industrial gantry style carbon dioxide based laser designed for cutting or engraving a range of materials. Whithin the protective housing, the laser beam traverses three mirrors from the source on a two axis moving frame. The laser beam is then reflected into the focsuing lens for irradation of the workpeice.

OPERATION

Operational procedures include programing a unique pattern on the software, opening the protective housing to place material onto the workspace, closing the housing if possible, initiating the cutting / engraving process, opening the protective housing and removing the finished workpiece. Because the machine can cut materials that exceed the dimensions of the workspace, the housing includes removable panels (pass-through).

MAINTENANCE

Maintenance consists of routine cleaning of the scrap tray and mirrors. These procedures are performed with the machine off.

SERVICE

Service includes lifetime support from out team as well as repair when needed. Procedures during service may require the machine to be turned on. SA Laser recommends that only trained personnel complete service or repair.

WARRANTY

The standard 2 year warranty applies to the laser machine itself and all parts purchased from SA Laser

The standard 2 year warranty covers any defects in material or workmanship while the machine is operating under normal use and for its intended purpose during the warranty period.

During this warranty period, SA Laser will repair or replace any part or product that is proven defective while the machine is being used under normal conditions and for its intended purpose.

For any major warranty claims, the buyer is responsible for shipping or transporting the machine to SA Laser. The machine will be shipped back to buyer at no cost after warranty work has been completed. If warranty claim is not substantial, spare parts can be shipped out from SA Laser to buyer at no cost to the buyer.

Any and all modifications that are made to the machine must have written consent from technical support or the warranty can be voided.

SAFETY

The SA Laser Razor series is a Class IV laser product, as defined in International Standard IEC 60825-1

The Razor series complies with 21 RFC 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed. 3., as described in Laser Notice No. 56, dated May 8, 2019.

During normal operation, the output of the embedded laser is contained. The laser cabinet has a main access door with a safety interlock that turns the laser off if it is opened during operation. There are also non-interlocked doors that can be opened during operation. If any non-interlocked doors are opened during operation, proper personal protective equipment (PPE) is required.

The visible output beam of the laser diode pointer (Red Dot) is accessible to the operator. This red dot is potentially hazardous if the beam is directed into the eye. Its beam path is located well inside the protective housingm, and under normal operation, no hazardour levels of laser radiation can escape.

The American National Standards Institute (ANSI) safe use of lasers Z136.1-2000 is the standard reference for laser safety use for operators. The standards are developed by the ANSI Accredited Standards Committee (ASC) Z136, a collaboration of the leading experts in the field, and are the authoritative standard in the United States for safe laser operation and practices. Although the standards are not "law," compliance with the standard is often mandated by federal entities. It is the operators responsibility to ensure the installation and operation of the SA Laser EDGE system is performed in accordance with all applicable laws.

Operators must read and follow the operating requirements and specifications listed in this manual to not cause harm to the machinery, themselves, or others. Highly recommended practices include keeping an ABC fire extinguisher nearby, in the event any fire is started from the cutting / engraving process. Ample forced or natural ventilation will carry away toxic, harmful fumes or particulates from the work area, during normal operation of engraving. Allowing only qualified operators in the area will keep the machine performing.

The SA Laser Razor series family requires almost double digit amperage to run, so a dedicated circuit may not be needed, but be very mindful of the load on the circuit to prevent a possible electric hazard or fire.

FIRE AND MATERIAL HAZARDS

This machine uses high heat to engrave, etch and cut material. The machine should never be left unsupervised while it is in use. Leaving the machine unattended while in use can result in a fire and substantial damage to the machine or building it is in. Any damage caused by fire that is not due to defects in workmanship or the machine itself will NOT be covered by SA Lasers 2 year warranty.

Any materials that are considered hazardous to the health of the machine, operator or individuals surrounding the machine while in use are NOT recommended to engrave or cut. These materials can produce toxic fumes or cause the machine to not function properly from residues and need replacement parts.

Materials that should NOT be cut, etched or engraved:

Polycarbonate - Fumes produced by polycarbonate can cause irritation to eyes, skin and the respiratory tract.

PVC Compounds - Fumes produced by polyvinyl Chlorine can cause irritation to eyes, skin and respiratory tract. This material should not be exposed to elevated temperatures.

Vinyl - Fumes produced by vinyl that has chlorine can cause irritation to eyes, skin, and the respiratory tract. This material should not be exposed to elevated temperatures.

For safety, research a materials safety data sheet (SDS) before using on this machine. Safety data sheets give information on whether materials are safe or not to be exposed to the high heat during engraving / cutting. Any material containing chloring is not safe to you, your laser, or the individuals around you. If you are unsure about the safety of a material, reach out to us and we will help identify the safety of it.

LASER SAFETY AND RECOMMENDED POLICES

Each laser has a stack light on the top, right side of the machine. Ensure the light is only green before opening the protective housing to grab or place material into the work bed. Ensure laser rated safety glasses for 10640nm are worn while operating the machine, especially when reflective materials are being engraved / cut to prevent any indirect exposure to the laser.

Always keep access covers as well as the top lid closed whenever the machine is in operation. Avoid any direct exposure and do not stare at the laser beam while the machine is operating. Notice and understand all of the warning labels located on your machine.

The following safety measures must be strictly enforced and followed by the respective laser safety officer on location to ensure the safety of the machine and operator. SA Laser shall not be held responsible for any damages or injuries resulting from the improper use of the laser machine.

ALWAYS:

- Wear properly rated 10,640nm protective glasses when operating or keep the lid closed.
- Maintain a clean environment for proper unclogged laser cooling.

NEVER:

- Operate the laser machine, unless properly trained.
- Operate the laser near flammable or explosive materials.
- Dismantle the laser machine unless instructed to by an SA Laser Technician.
- Set anything on top of the protective housing while the laser is in use
- Use unsafe materials such as PVC and Vinyl that emit noxious gasses.
- Leave the machine unattended while in use
- Lift the lid of the machine while the laser is running
- Push or pull the laser head or the gantry while the laser is running

In case of a fire:

1. Press the Emergency Stop button located on the top right side of the machine.
2. Lift the Lid .
3. Quickly blow out the flame(s), or an ABC fire extinguisher for serious flames.

LASER SAFE MATERIALS

Plastics:

- ABS (Acrylonitrile butadiene Styrene)
- Acrylic (Plexiglass, Lucite, PMMA)
- Delrin (Acetal)
- Kapton Tape (Polymide)
- Mylar (Polyester)
- Polyethylene Terephthalate Glycol (PETG)
- Nylon (MELTS)
- Polyethylene (MELTS)

Foam:

- Depron
- Gator Foam

Textiles & Others:

- Cloth (Leather, suede, felt, cotton)
- Paper (Cardstock, cardboard)
- Rubber (Only if it does not contain chlorine teflon)
- Woods (MDF, Balsa, Birch, Red Oak, Cherry, etc.

Materials that can not or should not be cut:

- Metals (C02 machines cannot engrave metal, they can just anneal it)
- Polycarbonate
- Any material containing chlorine

SAFETY FEATURES & REGULATORY COMPLIANCE

SA Laser has incorporated specific features into the Razor series in order to meet the requirements of 21 CFR 1040. These safety features include:

- A safety enclosure, which fully encloses the engraving laser and its beam path
- Dual redundant interlock systems that turn off the engraving laser when the main access door is opened.
- A visible emission indicator on the stack light illuminates when the laser is firing.
- An emergency stop is used to immediately cease emission of the machine and laser radiation.
- A viewing optic window in the lid is incorporated to limit levels of laser radiation.
- A remote interlock functions when the terminals of the connector are not electrically joined. All laser radiation from the laser product shall be prevented.

21 CFR 1040 require that certification, identification, and warning labels be placed on laser products. Reproductions of labels on the Razor series follow with the locations specified.

While the warning labels can be found all around the machine, it is important that they are all followed. The warnings are put into place to warn the operator of safety requirements. If these warnings are not followed, serious damage to the machine or injuries to the operator can occur.

Certification / Identification

The “Certification” and “Identification” label can be found on the back right side of the machine

SA Laser	
7210 Eckhert Rd, San Antonio, TX 78238	
Model: Razor X	Serial Number: SGDXXXXXXX
Class IV Laser product	Carbon Dioxide Laser
Maximum Output Power: 130W	Wavelength: 10640 µm
Required Power: AC 110V ± 10% 60 HZ	Pulse Duration: CW
MFG Code: SA-A	Manufactured: Month Year
Complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed. 3., as described in Laser Notice No. 56, dated May 8, 2019	

Warning Logotype

The “DANGER: Visible & Invisible Radiation” warning can be found on the top, right hand side of the machine. Staring at the laser beam can cause damage to the eyes. Touching the laser beam can cause serious injuries.

Laser Aperture

The “Avoid Exposure” warning label can be found inside the working area on the laser head, as well as the back plate in the working area from mirror 1 to 2.

Non-Interlocked Protective Housing

The “Danger” labels for non-interlocked panels are located on each side of the machine, top access panel. This machine produces laser radiation, so all panles must be closed when the laser is operating, unless the pass through panel is needed.

Interlocked Protective Housing

The “Danger” labels for interlocked doors are located on the right side of the front main door, which is accessible if the interlock is defeated.

Electrical Safety

The “Danger! High Voltage” sticker can be found on the left side of the machine, bottom panel where the high voltage laser power supply is located. This label indicates that precautions should be taken when touching or handling any electrical components of the machine. Disconnect the laser from all power sources prior to opening these cabinets.

Key Control

Upon start up of the machine, a password is required to be put into the control panel to operate, acting as . The master switch controls the main contactor that powers on the machine. When this password is logged out and the machine goes into lock mode, the machine is disabled.

Emergency Stop

The emergency stop switch is installed az part of the control panel. The emergency stop switch controls the main contactor that powers on the machine. When the emergency stop is pressed in, the machine is powered down.

Emission Indicator

The emission indicator is installed as part of the control panel. The emission indicator lights up green when the machine is idle and the laser is not emitting The emission indicator lights up as yellow when there is a fault or if interlock is not closed. The emission indicator lights up red when the machine is operating.

Remote Interlock

The machine incorporates a remote interlock connector for the operator of the machine to connect it to a physical barrier or door(s) of a laser protected area. The machine will come with a jumper connected that must be rewired.

GETTING STARTED

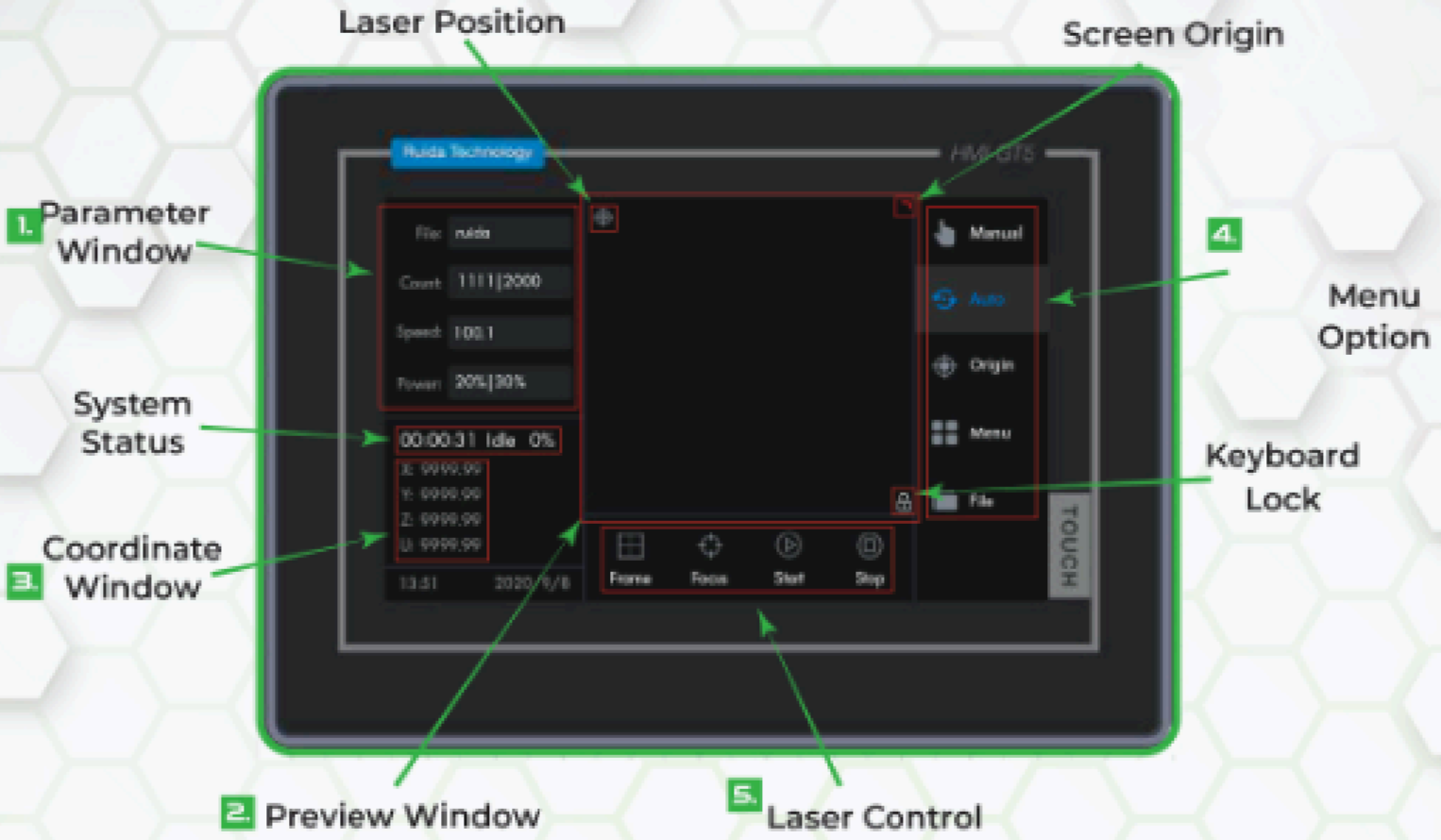
1. THE BLADE
2. RUIDA CONTROLLER
3. PASSTHROUGH SLOT (FRONT)
4. BASE
5. E-STOP (UNSEEN. SEE BELOW)

5. E-STOP
6. LASER HEAD MODULE
7. WORKBED (HONEYCOMB/KNIFE)
8. CAMERA

9. POWER PLUG INSERT
10. ON/OFF SWITCH
11. USB/CAMERA/FEEDER/U-DISK CONNECTIONS
12. EXHAUST PORT
13. MACHINE INDENTIFICATION PLATE
14. MACHINE FANS
15. PASSTHROUGH (REAR)

5. CONTROLLER FUNCTIONS

CONTROLLER HOME SCREEN



1. Preview Window:

- This will show a preview image of the file to be processed by the laser.

2. Parameter Window:

- Displays settings for the current file to be processed.

3. Coordinate Window:

- Displays coordinates of all axis'.

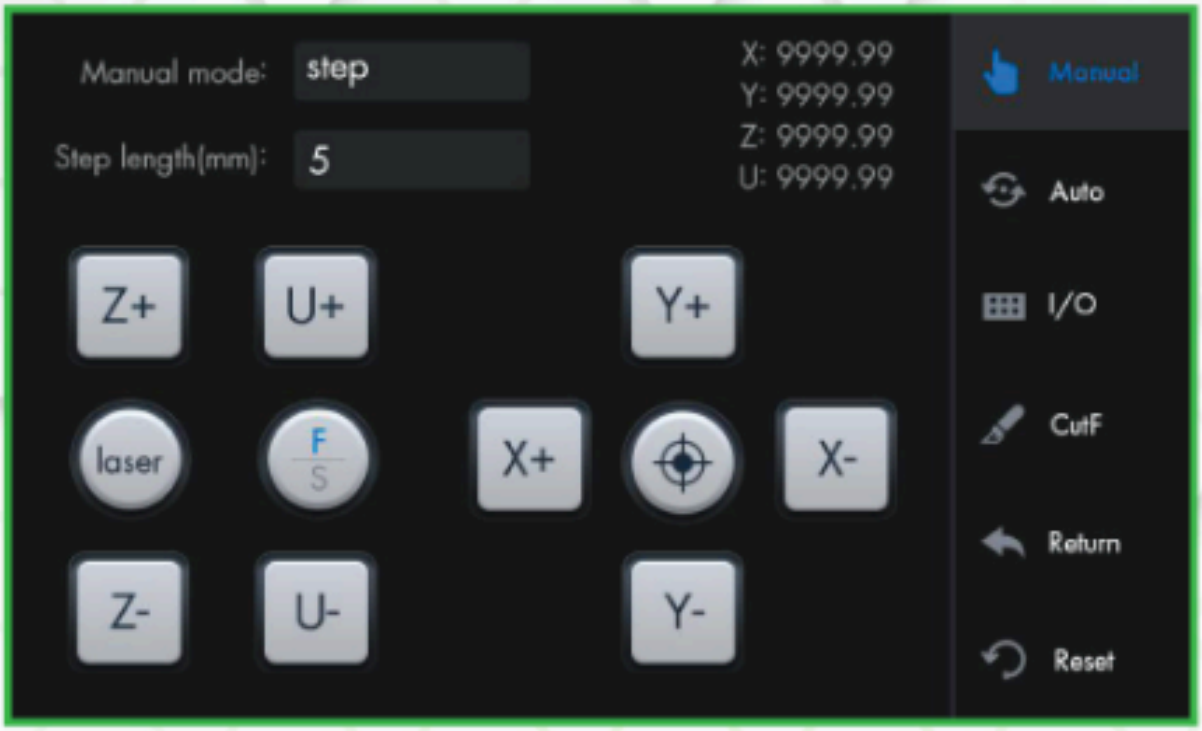
4. Menu Options:

- Allows access to other functions and sub menu's of the controller.

5. Laser Control:

- Access basic function of the laser.

MANUAL FUNCTIONS



X+ X- Y+ Y- Axis' 

- Will move the gantry to the desired position

Z- Z+ Axis' 

- Are used to manually set your focus

Fast / Slow Button 

- Is used to determined the speed of the gantry during positioning.

  Use the "Fast" mode to get an area quickly on the worked. Used the "Slow" Button to dial in an accurate placement of the Laser Head, or Stare Point.

The Bullseye 

- Is used to set an origin point for your laser file on the workbed.

5. MACHINE SETUP... CONT

OVERVIEW... CONT

1. POWER PLUG PORT
2. MAIN POWER SWITCH
3. CAMERA INPUT PORT
4. USB PORT
5. U-DISK INPUT PORT (NOT USED)
6. BLADE ID PLATE
7. FEEDER INPUT PORT (COMING SOON)
8. EXHAUST PORT
9. INTERNAL CHILLER EXHAUST
10. EMERGENCY E-STOP
11. CONTROL INTERFACE

PARTS OVERVIEW

ROTARY

HONEYCOMB TABLE

KNIFE TABLE

RISER

ROTARY MOUNT BED

CRUMB TRAY

EXHAUST ASSEMBLY

TOOL BOX

SCREW DRIVER KIT

BLADE CABLE KIT

FOCUS DISC
SPARE PARTS

SA LASER

If you are missing any parts or components, please contact us immediately for replacement solutions.

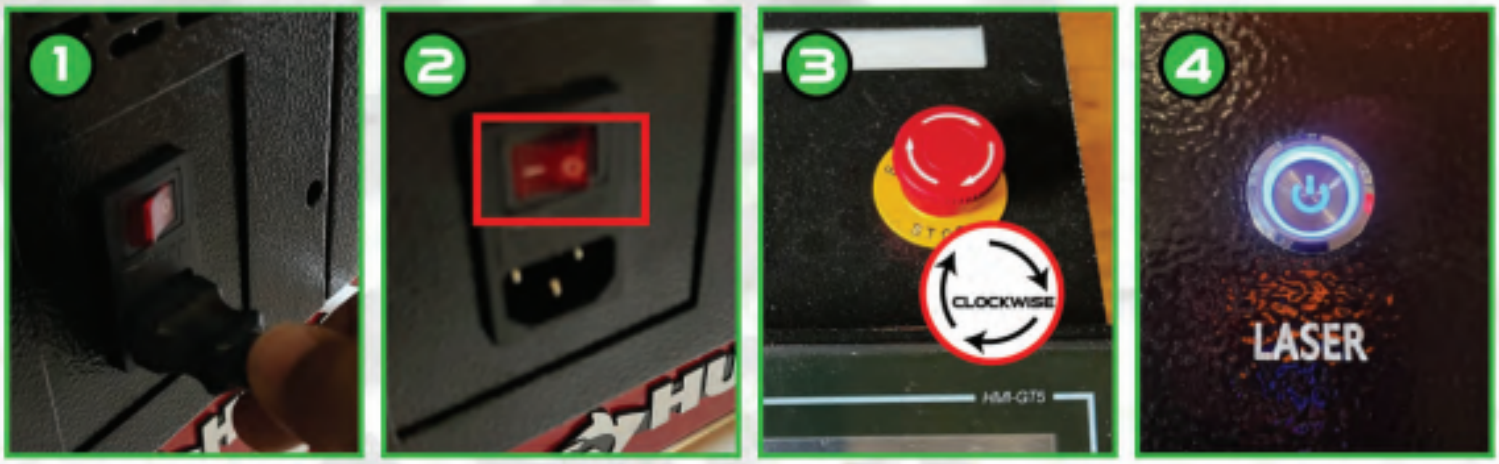
BLADE RISER

The Riser Base comes pre-installed with the BLADE Desktop Laser. To remove it, lock the Riser wheels by firmly pressing down on the latch mechanism, and then firmly lift the BLADE to unseat it from the riser starting in one corner. The base feet on the BLADE seat in the corner openings of the Riser. They constructed of a high density rubber so it may require some firm pressure to release the first corner.

To reinstall it, lock all four wheels of the Riser. Next, with the help of a second person, place the BLADE on top of the Riser by carefully matching up the BLADE base feet with the holes in Riser base corners. Once seated, some firm but gentle pressure may be required to fully seat the BLADE into the Riser. Once secure, unlock the wheels and move accordingly.

This is and should be a 2-person lift. Please gain the assistance of another able bodied person to help with any action requiring the lifting of the BLADE unit. Please use all safe lifting best practices when deinstalling or installing the BLADE Desktop Laser.

FIRST TIME POWER-ON...CONT



On a successful power-up you should hear the exhaust fans turn on, the Laser head move, and the status light illuminate. The status light should turn from an orange/amber color to a green color signifying the laser is ready. Simultaneously, the Laserhead should move into its native origin position. If any of these series of actions do not occur, give us a call at: (877) 745-7660 or email us at support@salasers.com.

Now that you have successfully powered on, lets optimize your laser head.

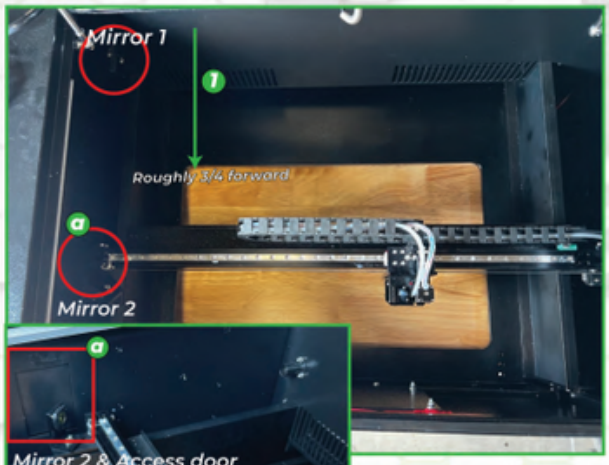
MIRROR ALIGNMENT

STEP 1: POWER DOWN

- Unplug the cord from the machine
- Remove 4 Bolts securing the back panel
- Pull gently on the panel to remove and set aside
- Reattached the power cable.

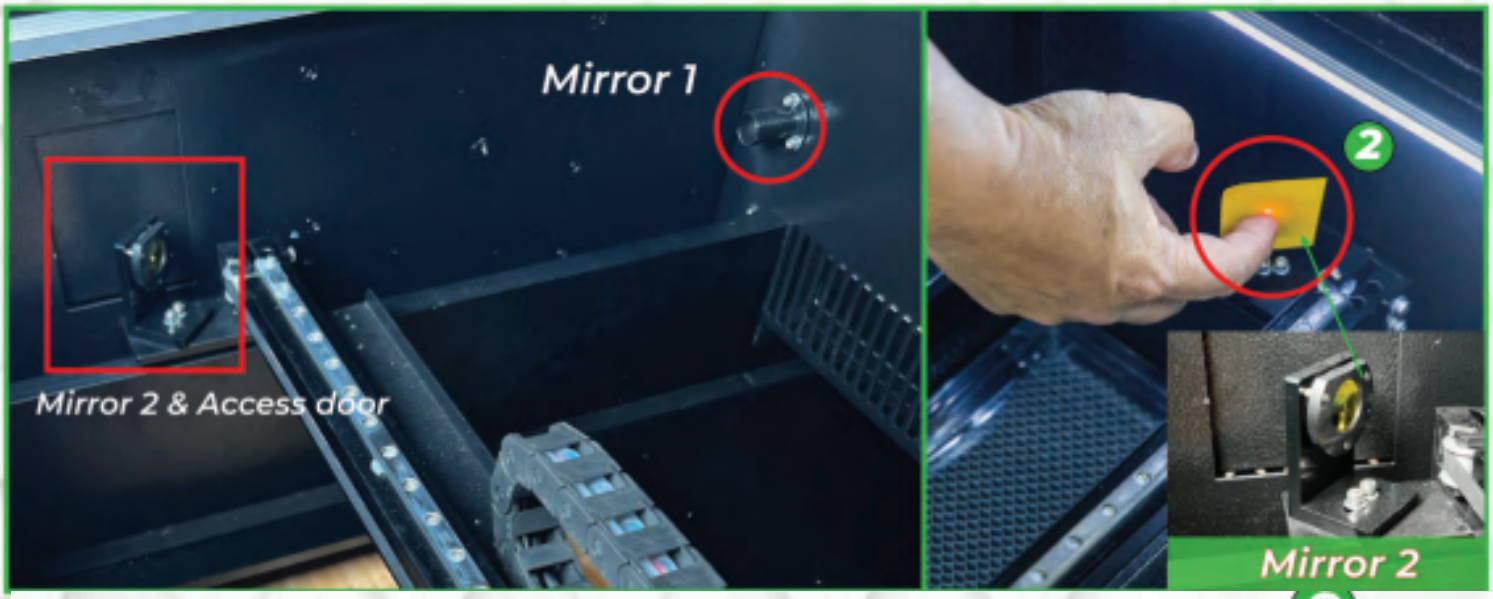
STEP 2: MIRROR 1 – 3

1. Move the gantry about ¾ of the way towards the front of the machine on the Y axis.



a. The goal is to align the mirror and access door

2. Place a piece of the provided Alignment tape over Mirror 2. (Use light even pressure around the rim of the mirror housing to make a slight impression on the tape)



3. On the touch screen press Manual button to access the manual controls.
4. Press the Laser on power button. (Illuminates blue when on)
5. In the manual screen pulse the laser with a quick tap. This will mark the alignment tape.

6. Go to mirror 1 and make adjustments on the 3 adjustment bolts. Continue pulsing and replacing tape until the burn is in the center of the mirror.

7. Once the burn hole is in the center of the mirror, align the red dot to the middle of the burn hole. Use the 3 adustment bolts on the red dot housing. This should give you a halo effect around your burn mark.

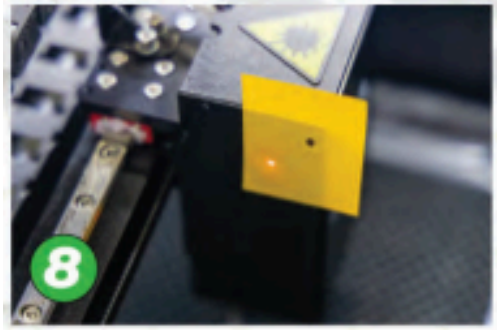
MIRROR ALIGNMENT... CONT

8. Now place a tape on the opening for the laser head where the beam travels through.

9. Repeat steps 3-5 to pulse the laser and get the burn hole to the center of the opening. Use the adjustment bolts on the back of mirror 2 (b) to align red dot.

To gain access to the adjustment bolts, remove the left side panel to access the adjustment bolts on mirror 2. (a) and pivot access door up and out of the way (b).

To achieve the halo effect for mirror 3, use the mirror 1 red dot adjustment for fine tuning. You can also, use a piece of wood under the laser head, pulse the laser from steps 3-7, to verify the laser red dot and pulsed mark are center aligned.



STEP 3: LENS CLEANING & REASSEMBLE

COMPLETE!
The mirrors should be aligned. Clean Mirror 2 using 91% Isopropol Alcohol and a cotton swab. Please use the roll method v. wiping to avoid mirror/lens scratches and damage.

Close the pivot hatch on the side of the machine, replace the panel, remove all tape, unplug the machine, replace the back panel, secure with the 4 bolts provided, and reinsert the power plug.

POWERING ON

1. Plug the main cable into the back of the unit
2. Flip the power switch to the on position
3. Release the E-stop by twisting it in a clockwise motion
4. Press the Laser power button (it will turn blue)

When completed successfully, the status light bar above the E-Stop and Laser Power button with glow and the Laserhead will go to go to the home position.

POWERING OFF

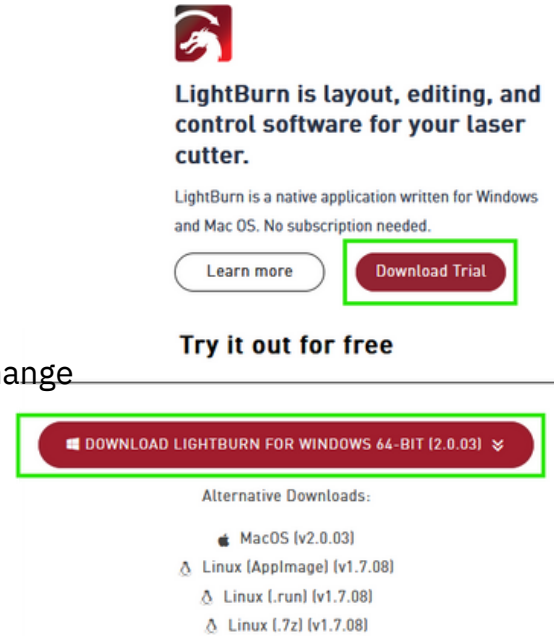
1. Press Laser Power Button or press the E-Stop button
   a. Switch off the main power button
   b. Unplug the main power cord

INSTALLING & STARTING WITH LIGHTBURN

Current versions of LightBurn run on the following operating systems:

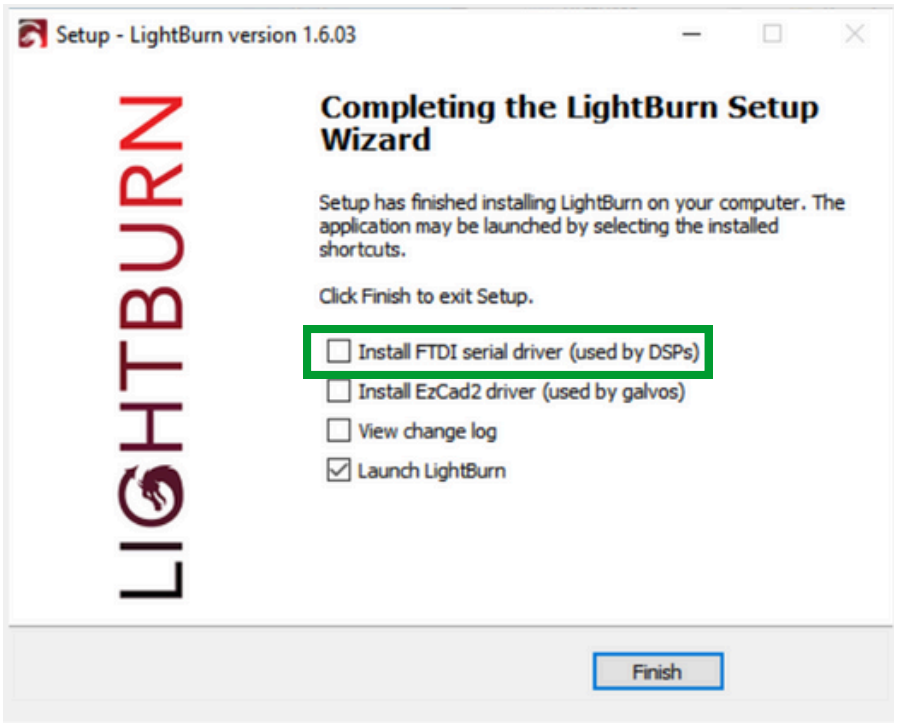
- 64-bit Windows 10 (build 1809) or later
- macOS 12 or later

To install LightBurn, go to their website: **https://lightburnsoftware.com/.** Click the **Download Trial** button.

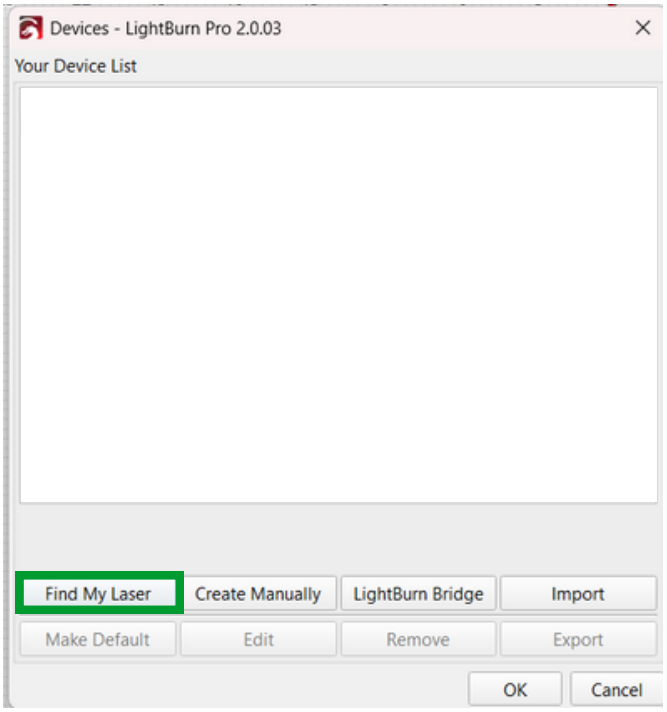


Click on **DOWNLOAD LIGHTBURN FOR WINDOWS 64-BIT.** The numbers will change based on version.

When you've completed the download, you should see the file in your "Downloads" folder or a manually selected folder. Double-click the file to start the installation wizard. Follow the prompts in the wizard. Click **YES** or **ALLOW** to anything asking for permission. Be sure to select the **Install FTDI serial driver (used by DSPs)** driver option. This allows LightBurn to communicate with your laser.



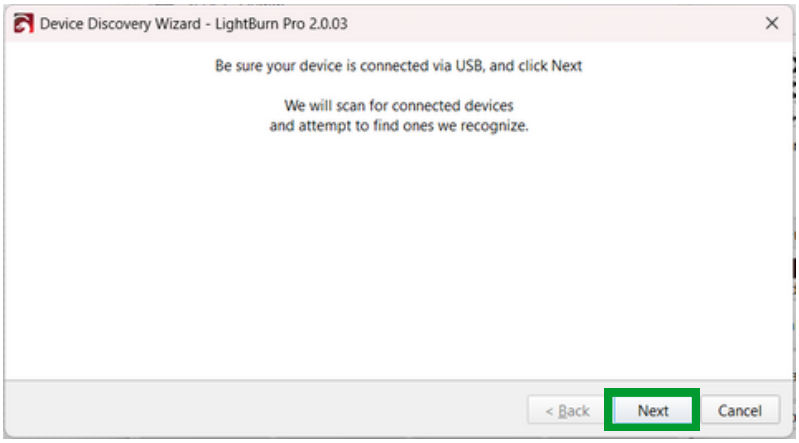
You must have a machine profile to use LightBurn. When you open LightBurn for the first time, it will prompt you to create a profile and bring up the **Devices** window.



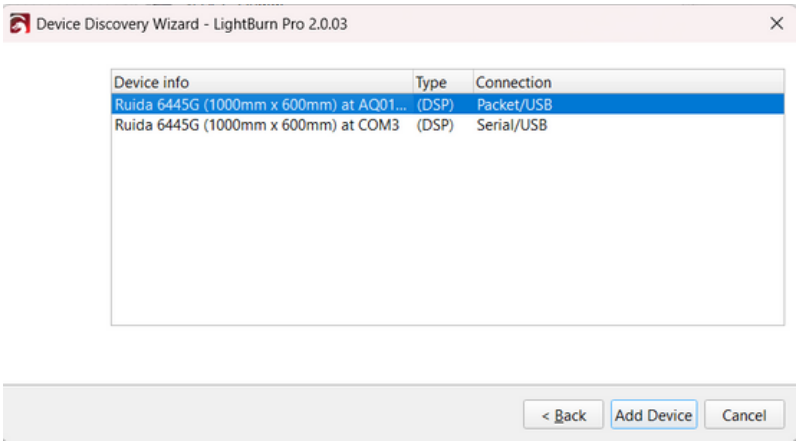
Ensure your computer is connected to your laser via the USB cable and that the laser is turned on.

Click **Find My Laser** to begin.

The next screen reminds you to turn your laser on and connect via USB. Click **Next**.

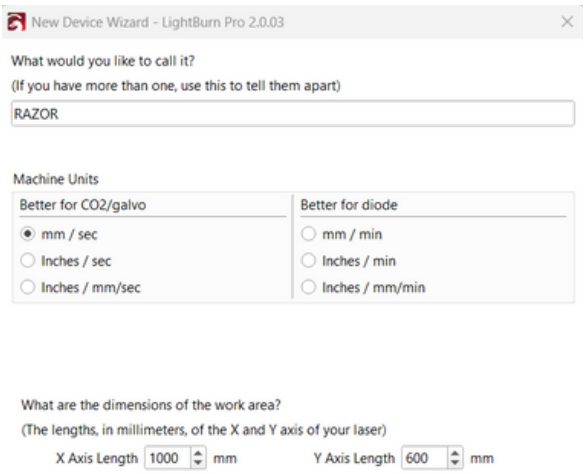


The next screen will show what device(s) is found. If 2 show up, you may select either option, then click **Add Device**.



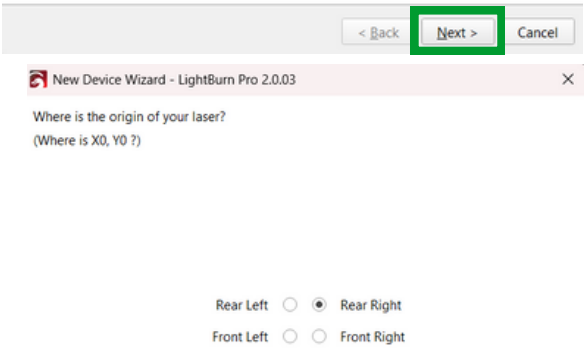
Now, you can assign a name or description to be able to identify this machine's profile in LightBurn.

You can specify the machine units. This can be changed at any time. The work bed dimensions should have already populated as well for the X and Y axis length.

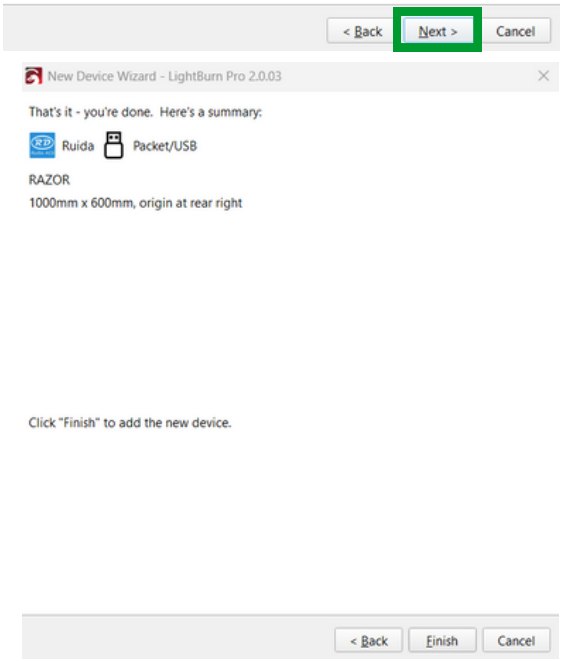


Select the **Rear Right** option for the origin of the laser (home position).

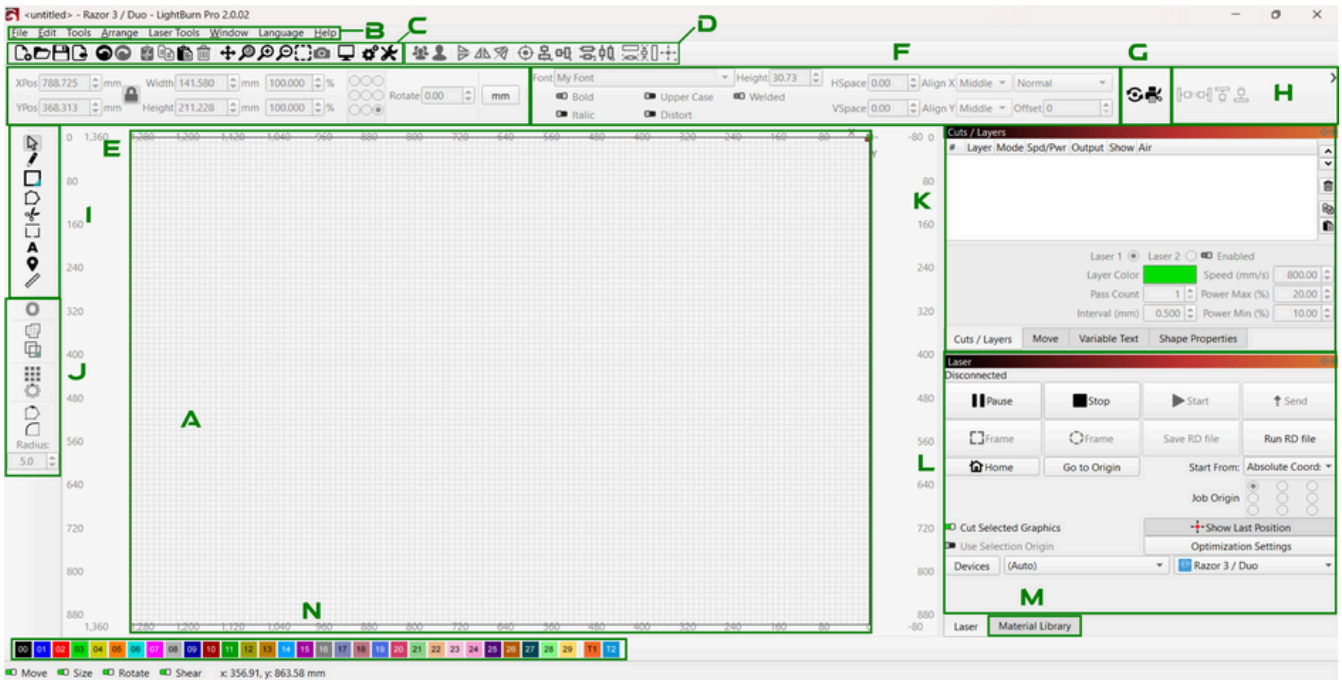
Click **Next**.



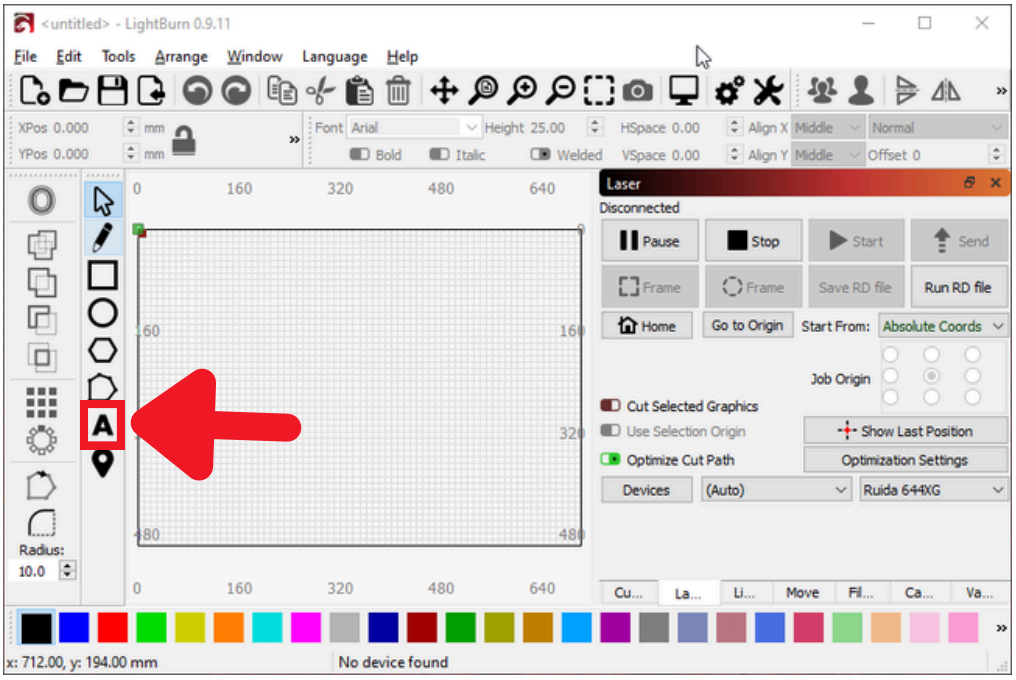
Click **Finish**.



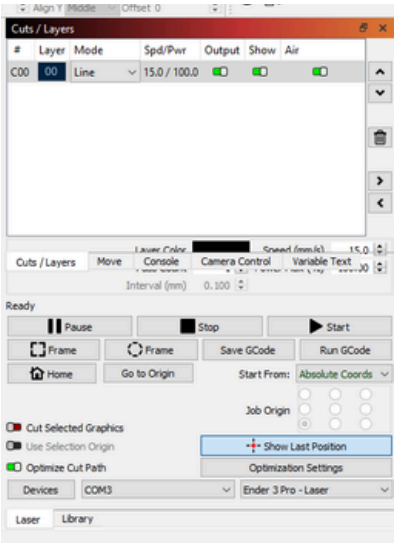
MAIN LIGHTBURN SCREEN



A: WORKSPACE/EDIT WINDOW
B: MENU BAR
C: MAIN TOOLBAR
D: ARRANGE TOOLBAR
E: NUMERIC EDITS TOOLBAR
F: TEXT OPTIONS TOOLBAR
G: ROTARY / CYLINDER CORRECTION
H: DOCKING TOOLBAR
I: CREATION TOOLS
J: MODIFIER TOOLS
K: CUTS / LAYERS WINDOW
L: LASER WINDOW
M: MATERIAL LIBRARY
N: COLOR PALETTE



To begin a project, clock on the Text icon indicated by the red arrow with a red square around it. Once the tool is selected, click anywhere on the grid workspace and a text cursor will appear. For this walk through, type “Test” into the text box.



Next is to set the speed and power for the text. Located on the top right side of the screen, youll find the layer options, shown to the left. Make sure the mode is set to “Fill”, then change the power (Min & Max) to about 20% with a speed of 500 mm/s.

With the desired material loaded into the machine, press the “Focus” button on the Ruida keypad and hit “Enter”. This will automatically auto focus the laser. Press the laser button on the machine to toggle on the laser source and press “Start”. The machine will then begin to engrave the selected text.

This concludes the example that will be able to be used as reference for different applications to help run the machine effectively.

MAINTENANCE

DANGER: CLASS 4 LASER RADIATION. Maintenance of a gantry-style CO2 laser involves working near high-voltage components and invisible infrared radiation (10,600nm). Permanent eye damage, skin burns, and fire can occur instantly upon exposure. Ensure the machine is off before performing any maintenance. Do not bypass or disable the safety interlocks on the door.

Lens Cleaning:

The lens that is used to focus the laser beam is called the focal lens. The lens should be cleaned at least once per week depending on usage of laser, especially when smoke is formed. When cleaning the lens, use denatured alcohol as the cleaning solvent and a microfiber cloth to gently clean. Lens cleanings paper included will also work. Do not scrape the lens. Use a soft swirling motion when applying cleaning, then use a dry swab.
Make sure not to leave any dirt, smudges, or water on your focal lens. The focal lens should be replaced if it is cracked, chipped, or if the coating is scratched.

Belt Tension:

The rubber belts should be checked for appropriate tension every 6months. You should expect the two side Y-Axis belts to be the same tension. These Y-axis belts work together to move the gantry from front to back. If one belts tensioned more often than the other, the gantry can become damaged or the graphics will be warped. Tensioning the belt consists of tightening two screws on the bearing sliders.

TROUBLESHOOTING

Frame Slop Error:

The design is physically larger than the work area, or it’s too close to the edge to allow for "overscan". Try moving the design further from the edge of the workbed in Lightburn.

Machine Protected Error:

The safety interlock on the door is indicating that the lid is not fully shut. Ensure the safety interlock is properly closed.

Weak laser Power:

Optics may be dirty or the lens is out of focus. Clean the mirrors and lenses and double check optimal focus.

NOTICE: If troubleshooting requires the removal of protective panels while the system is energized, the area must be designated as a Temporary Laser Controlled Area. Only certified Laser Safety Officers should perform "Open Housing" troubleshooting.