V20241120

omtech

SH-G1060 | 100W | CO_2 Cabinet Laser Engraver

User Manual

Read Carefully Before Use
Keep for Future Reference

BEAMING WITH POSSIBILITIES!

Thank you for choosing omtech!

Your new CO_2 laser engraving machine is intended for personal and professional use. When used following these instructions, it comprises a **CLASS 1** laser system but some components remain extremely dangerous. Never disable the preinstalled safety engravers and always use your laser safely and responsibly.

Read this manual carefully before operation. It covers the details of correct installation, adjustment, maintenance, and—most importantly—safe operation of your new laser. It is intended to be used in conjunction with your engraving software manual, as the software typically does not only provide image design but also serves as an alternative interface for the laser settings and machine controls. You and any other users of this engraver should thoroughly understand **BOTH** manuals before attempting to operate the laser.

Keep both manuals for future reference and provide them to **ANYONE** who will install, operate, maintain, or repair this machine. Both manuals should be included if this engraver is given or sold to a third party.

If you have any questions after reading these manuals, please contact us and our support department will address your concerns as soon as possible.

Welcome to the OMTech Community!

For helpful hints and instructional videos, visit our **Help Center** or join our official laser group! If you encounter any issues with your engraver, please feel free to contact us. Our support team will respond **ASAP** to resolve your concerns.

Help Center

help.omtechlaser.com/hc/en-us

First Time Setup | Safety | Maintenance | Troubleshooting | FAQ | Hot Tips

Explore on your smart device

@omtechlaser

Official Website: omtechlaser.com

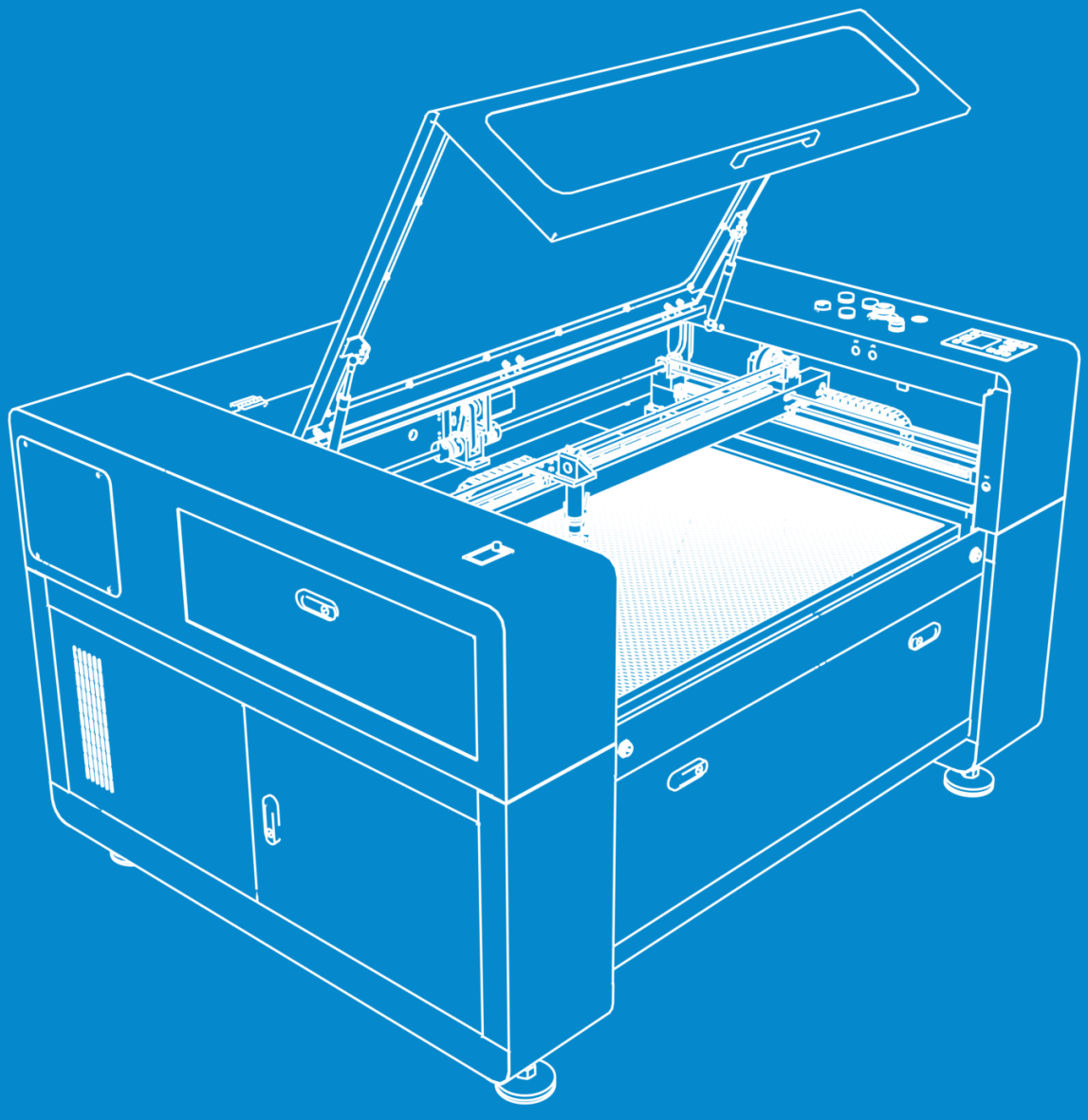
Technical Support: support@omtechlaser.com

Support Tel: +1 (949) 438-4949, Monday – Friday from 9:00 am – 5:00 pm (PT)

Address: Rygel Advanced Machines, 1150 N Red Gum St Ste F, Anaheim, California 92806, USA.

Content

Content



1 Safety Information

1.1 Disclaimer

Read this disclaimer completely and carefully before proceeding with the rest of the manual content.

1. **As-Is**

   This OMTech product is sold 'as is' and without any express or implied warranties, including but not limited to the implied warranties of merchantability and fitness for a particular purpose.

2. **Product Modifications**

   Any modifications or alterations to OMTech products void any warranties and may result in damage or injury. OMTech shall not be liable for any damages resulting from such modifications or alterations.

3. **Compliance with Laws**

   Customers shall be liable for ensuring that the use of OMTech products complies with all applicable laws and regulations in their respective jurisdictions. OMTech assumes no responsibility for any violations of laws or regulations resulting from the use of OMTech products.

4. **Correct Use**

   Always use OMTech products only as directed in the accompanying manuals. Failure to follow instructions may result in injury or damage.

   Always ensure the assembly, installation, operation, maintenance, or repair of OMTech products is carried out by a competent person.

   Always make maintenance regularly throughout OMTech products' lifecycles; you have the liability to keep the products operating as intended.

   Always wear appropriate protective gear.

5. **Third-Party Products**

   OMTech shall not be liable for any damages or losses resulting from the use of third-party products in conjunction with OMTech products. Customers shall refer to the third-party's guidelines or/and warranties (if any) for any third-party products used.

6. **Limitation of Liability**

   OMTech shall not be liable for any direct, indirect, punitive, incidental, special, or consequential damages to property or life, whatsoever arising out of or connected with the use or misuse of OMTech products. In no event shall OMTech's liability exceed the value of the products sold.

This disclaimer states the entire obligation of OMTech with respect to OMTech products. If any part of this disclaimer is determined to be void, invalid, unenforceable, or illegal, including but not limited to the warranty disclaimers, liability disclaimers, and liability limitations set forth above, the invalid or unenforceable provision will be deemed superseded by a valid and enforceable provision that most closely matches the intent of the original provision and the remainder of the agreement shall remain in full force and effect.

1.2 Symbol Guide

The following symbols are used on this machine's labeling or in this manual:

These items present a risk of serious property damage or personal injury.

These items address similarly serious concerns about the laser beam.

These items address similarly serious concerns about electrical components.

These items address similarly serious concerns about fire hazards.

These items address pinching and crushing hazards.

Protective eyewear should be worn by anyone around this machine during operation.

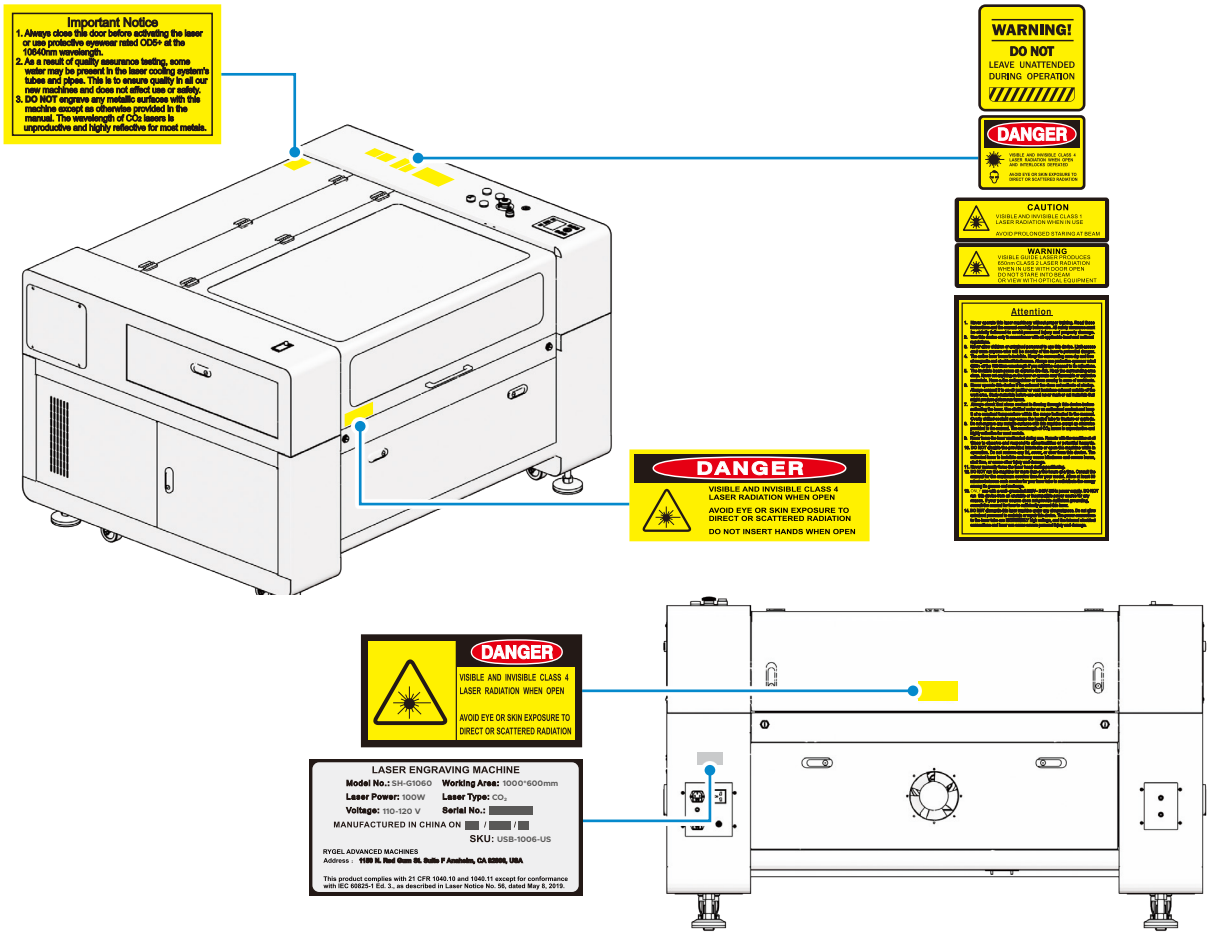
This product is sold in conformity with applicable EU regulations.

This product contains electrical components that should not be disposed of with regular garbage.

1 Safety Information

1.3 General Safety Instructions

- Your device should come with instruction labels in the following locations:



If any of these labels is missing, illegible, or becomes damaged, it must be replaced.

- Use this laser engraving device only in accordance with all applicable local and national laws and regulations.
- Use this device only in accordance with this instruction manual and the manual for the engraving software included with it. Only allow this device to be installed, operated, maintained, repaired, etc. by others who have also read and understood both manuals. Ensure that this manual and the software manual are both included with this device if it is ever given or sold to a third party.
- **DO NOT** operate continuously for more than 5½ hours. Stop for at least 30 minutes between uses.
- **DO NOT** leave this device unattended during operation. Observe the device throughout operation and, if anything seems to be operating strangely, immediately cut off **ALL** power to the machine and contact either our customer service or your dedicated repair service. Similarly, ensure the device is **FULLY** turned off (including by means of the emergency stop switch) after each use.

- **DO NOT** allow minors, untrained personnel, or personnel suffering from physical or mental impairment that would affect their ability to follow this manual and the software manual to install, operate, maintain, or repair this device.
- Any untrained personnel who might be near the device while it is in operation **MUST** be informed that it is dangerous and fully instructed on how to avoid injury during its use.
- Always keep a fire extinguisher, water hose, or other flame retardant system nearby in case of accidents. Ensure that the local fire department's phone number is clearly displayed nearby. In the case of a fire, cut electrical power before dousing the flame. Familiarize yourself with the correct range for your extinguisher before use. Take care not to use the extinguisher too close to the flame, as its high pressure can produce blowback.

1.4 Laser Safety Instructions

This machine 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.

When used in accordance with these instructions, it is a **CLASS 1** laser product. However the invisible engraving laser, the laser tube, and its electrical connections remain **EXTREMELY** dangerous. Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure. Used without care, it can also cause serious property damage and personal injury including but not limited to the following:

- The laser will easily burn nearby combustible materials
- Some working materials may produce radiation or harmful gases during processing
- Direct exposure to the laser will cause bodily harm including serious burns and irreparable eye damage

As such,

- **DO NOT** modify or disable this device's provided safety features. Do not modify or disassemble the laser and do not use the laser if it has been modified or disassembled by anyone except trained and skilled professionals. Dangerous radiation exposure and other injury may result from the use of adjusted, modified, or otherwise incompatible equipment.
- **NEVER** leave any part of the cabinet open during operation except (when needed) the pass-through doors. Never interfere with the laser beam, do not place any part of your body in any part of the laser path during operation, and never attempt to view the laser directly. When using the pass-through doors or otherwise risking exposure to the laser beam, take measures to protect yourself from potentially reflected laser beams including the use of personal protective equipment such as protective eyewear specially designed to filter the specific wavelength of your engraver's laser with an optical density (OD) of 5+.
- **DO NOT** stare or allow others to stare continuously at the laser beam during operation even when the cover is closed and/or wearing protective eyewear.

1 Safety Information

- **ONLY** use this engraver if its automatic shutoffs are working properly. When you first get this engraver and if you subsequently notice any problems, test them (see below) before undertaking any other work. Do not continue use if the shutoffs do not occur. Turn off the device and contact customer service or your repair service. Never disable these shutoffs.
- **DO NOT** ever under **ANY** circumstances use this laser engraver if the water cooling system is not working properly. Always activate the water cooling system and visually confirm that water is flowing through the entire system before turning on the laser tube. Do not use ice water or water that has become hotter than 100°F (38°C). For best results, keep it between 60–70°F (15–21°C). Replace heated water or add sealed bottles of frozen water to cool it, while never allowing the system to run without water or allowing the water to become colder than 50°F (10°C). Immediately stop use if the water cooling system malfunctions.
- **DO NOT** use generic coolant or antifreeze in your cooling water, as they may leave corrosive residues and solidify inside your hoses and piping, causing malfunctions and even explosions. Use custom laser-safe formulations or use and store your engraver in a climate-controlled area.
- **DO NOT** leave potentially combustible, flammable, explosive, or corrosive materials nearby where they could be exposed to the direct or reflected laser beam.
- **DO NOT** use or leave sensitive EMI equipment nearby. Ensure the area around the laser is free of strong electromagnetic interference during any use.
- **ONLY** use this machine for working the materials described in the Material Safety section of this manual. The laser settings and engraving process must be properly adjusted for specific materials.
- Ensure the area is kept free of other airborne pollutants, as these might pose a similar risk of reflection, combustion, etc.

1.5 Electrical Safety Instructions

- **ONLY** use this device with a compatible and stable power supply with less than 5% fluctuation in its voltage.
- **DO NOT** connect other devices to the same fuse, as the laser system will require its full amperage. Do not use with standard extension cords or power strips. Use only surge protectors rated over 2000 J.
- **ONLY** turn on the power to this device when it is well grounded, either via a firm connection to a 3-prong outlet or via a dedicated grounding cable firmly connected to the proper slot on the cabinet. Do not use with an ungrounded 3 to 2 prong adapter. The device's grounding should be checked regularly for any damage to the line or loose connections.
- The area around this laser engraving device should be kept dry, well ventilated, and environmentally controlled to keep the ambient temperature between 40–95°F (5–35°C). For best results, keep the temperature at 75°F (25°C) or below. The ambient humidity should not exceed 70%.

- Do not handle your water pump or the water in which it is submerged while the pump is attached to its power supply. Place it in water before connecting it to power and disconnect it from power before removing it.
- Adjustment, maintenance, and repair of the electrical components of this device must be done **ONLY** by trained and skilled professionals to avoid fires and other malfunctions, including potential radiation exposure from damage to the laser components. Because specialized techniques are required for testing the electrical components of this marking system, it is recommended such testing only be done by the manufacturer, seller, or repair service.
- Unless otherwise specified, **ONLY** undertake adjustment, maintenance, and repair of the device when it is turned off, disconnected from its power supply, and fully cooled.

1.6 Material Safety Instructions

- Users of this laser engraving machine are responsible for confirming that materials to be processed can withstand the heat of the laser and will not produce any emissions or byproducts either harmful to people nearby or in violation of local or national laws or regulations. In particular, do not use this device to process polyvinyl chloride (PVC), teflon, or other halogen containing materials under any circumstances.
- Users of this laser engraver are responsible for ensuring that every person present during operation has sufficient PPE to avoid the injury from the emissions and byproducts of the materials being processed. In addition to the protective laser eyewear described above, this may require goggles, masks or respirators, gloves, and other protective outer clothing.
- **DO NOT** ever under any circumstances use this laser engraver if the exhaust system is not working properly. Always ensure that the exhaust fans can remove the dust and gas produced by the engraving process in accordance with all applicable local and national laws and regulations. Immediately stop use if the exhaust fans or vent pipes malfunction. Periodically check the air assist intake filter to ensure it stays free of any dust or debris.
- Users must exercise special caution when working with conductive materials as buildup of their dust and ambient particles may damage electrical components, cause short circuits, or produce other effects including reflected laser radiation.

1.7 Disposal Safety Instructions

Electrical products should not be disposed of with household products. In the EU and UK, according to the European Directive 2012/19/EU for the disposal of electrical and electronic equipment and its implementation in national laws, used electrical products must be collected separately and disposed of at the collection points provided for this purpose. Locations in Australia, Canada, and the United States may have similar regulations. Contact your local authorities or dealer for advice.

2 Introduction

2.1 General Information

This manual is the designated user guide for the installation, setup, safe operation, and maintenance of your cabinet laser engraver. It is divided into six chapters covering general information, safety instructions, installation steps, operation instructions, maintenance procedures, and contact information.

ALL personnel involved in the installation, setup, operation, maintenance, and repair of this machine should read and understand this manual, particularly its safety instructions. Some components are extremely high voltage and/or produce powerful laser radiation. Substandard performance and longevity, property damage, and personal injury may result from not knowing and following these instructions.

Your laser engraver works by emitting a powerful laser beam from a glass tube filled with excited carbon dioxide (CO_2), reflecting that beam off three mirrors and through a focus lens, and using this focused light to etch designs into certain substrates. The first mirror is fixed near the end of the laser tube, the second mirror travels along the machine's Y axis, and the third mirror is attached to the laser head that travels along the X axis. Because some dust from the engraving process settles on the mirrors, they require frequent cleaning. Because they move during operation, they also require periodic readjustment using their attached positioning screws to maintain the proper laser path. A water cooling system—typically a pump or chiller—must be used with this engraver to dissipate the heat produced by the laser tube. Similarly, an exhaust system—typically either an external vent or a dedicated air purifier—must be used to remove the dust and gases produced by the engraving process.

With low intensity use, the provided laser tube has an average lifespan around 12000 hours before requiring replacement. However, constantly running your laser above 70% of its maximum rated power can significantly shorten its service life. It is recommended to use settings from 10–70% of the maximum rated power to enjoy optimal performance and longevity.

Note that this is a high-voltage device and, as a safety precaution, it is recommended to only touch its components with one hand at a time during use.

Note that the active laser is invisible to the human eye. This device should never be used while any cover is open to avoid potentially permanent injury.

Note also that the water cooling system and exhaust system are both absolutely essential to the safe use of this device. Never operate the engraver without both of these systems operating properly. Water should always be kept clean and around room temperature, and the exhaust system should always comply with all applicable laws and regulations for workplace and environmental air quality.

2.2 Designated Use

This machine is intended for engraving signs and logos on consumer products or applicable substrates. This laser can process a wide variety of materials including wood, paper, cardboard, many plastics, glass, cloth, leather, and stone (see §1.6 Material Safety Instructions on Page 6 and §4.6 Instructions for Specific Materials on Page 50 for further details). The use of this system for non-designated purposes or materials is not permitted.

2.3 Specifications

Name		SH-G1060, 100W, CO_2 Cabinet Laser Engraver	
Model		SH-G1060	
Input Power		AC 110–120 (V), 60 Hz	
Power Consumption		1400 W	
Laser Output Power		100 W	
Expected Service Life at <40% / 40–70% / >70% Power		12,000 / 10,000 / 8,000 hr.	
Laser Wavelength		10,640 nm	
Laser Tube	Diameter	2.36 in.	60 mm
	Length	57.08 in.	1450 mm
Focus Lens	Diameter	0.79 in.	20 mm
	Thickness	0.08 in.	2 mm
	Focal Length	2.5 in.	63.5 mm
Mirror	Diameter	0.98 in.	25 mm
	Thickness	0.12 in.	3 mm
Processing Area	Standard (L×W)	39.4×23.6 (in.)	1000×600 (mm)
	Front/Back Pass-Through Size	42.9×1.9 (in.)	1090×50 (mm)
	Side Pass-Through Size	38.2×0.8 (in.)	970×20 (mm)
Workbed Blades		27	
Max. Processing Speed		23.6 ips	600 mm/s
Rec. Processing Acceleration	X Axis	315 ips^2	8000 mm/s^2
	Y Axis	118 ips^2	3000 mm/s^2
Mainboard		RDC6442G	
Req. Operating Environment	Humidity Range	70%	
	Temp. Range	40–95 (°F)	5–35 (°C)
Provided Operating Software		RDWorks	
Compatible Operating Software		CorelLaser, LightBurn	
Supported Image Formats		.ai, .bmp, .dxf, .gif, .hpgl, .jpeg, .pdf, .plt, .png, .rd, .svg, .tiff, .tga	
Graphic Operating Modes		Raster, Vector, Combined	
Certification		CE, FDA	
Net Weight		573 lb.	260 kg

2 Introduction

2.4 Components

2.4.1 Package List

A

B

C

D

E

F

G

H

I

J

K

L

M

N

O

P

Q

R

S

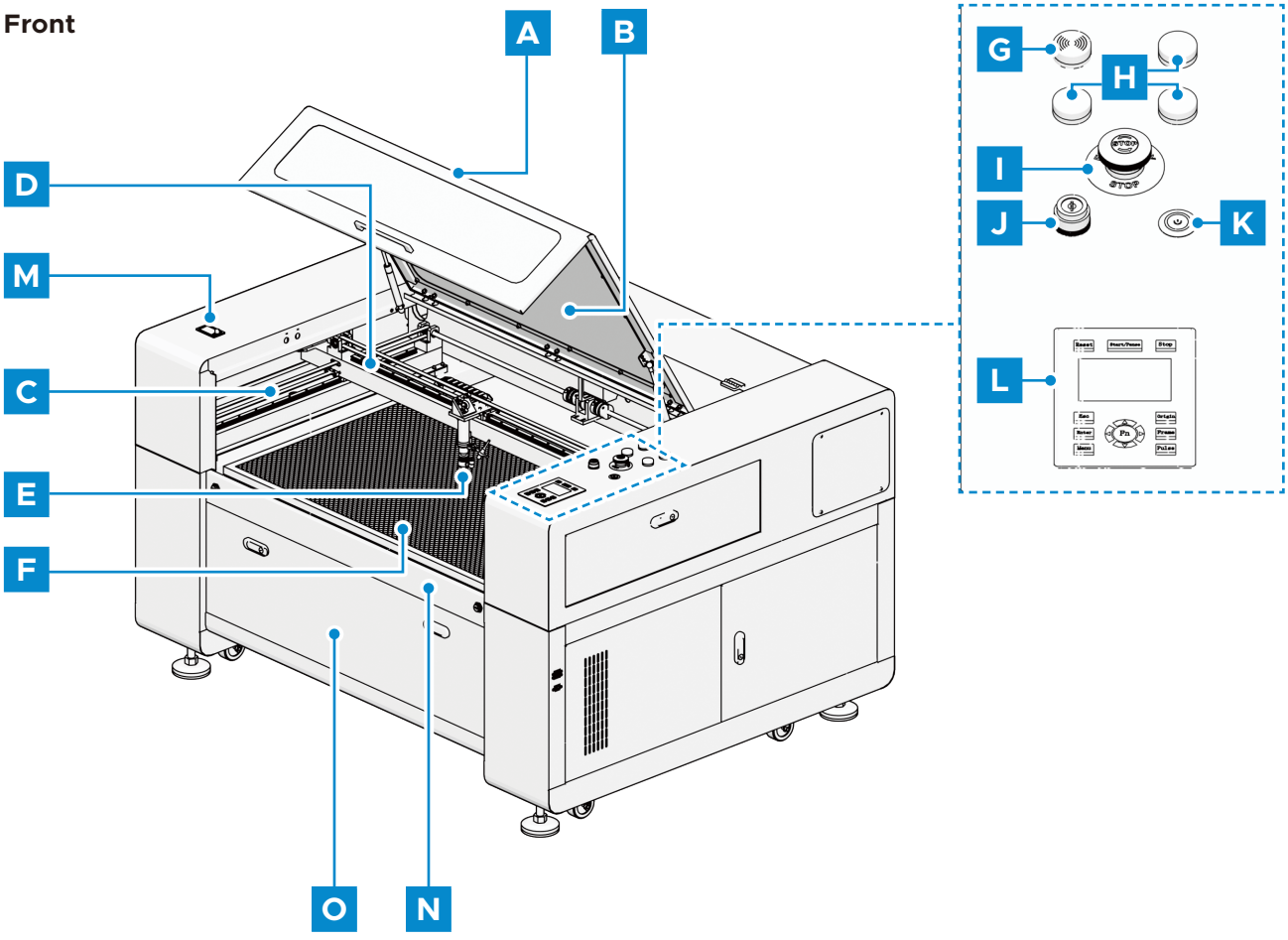
T

No.	Item	Qty.
A	Power Cord	2
B	Ground Wire	1
C	USB Cable	1
D	Ethernet Cable	1
E	Laser Keys	2
F	Door Keys	2
G	USB Flash Drive with Engraving Software Included	1
H	Ø 150 mm Exhaust Pipes	1
I	Ø 150 mm Pipe Clamps	1
J	A Set of Hex Wrenches	1
K	Silicone Sealant	1
L	Acrylic Focusing Tool	2
M	Ceramic Testing Resistor	1
N	Water Hoses	2
O	Water Hose Clamps	2
P	Lens Removal Tools	2
Q	Double-Sided Tape	1
R	Water Pump	1
S	Water Bucket	1
T	Storage Bag	1

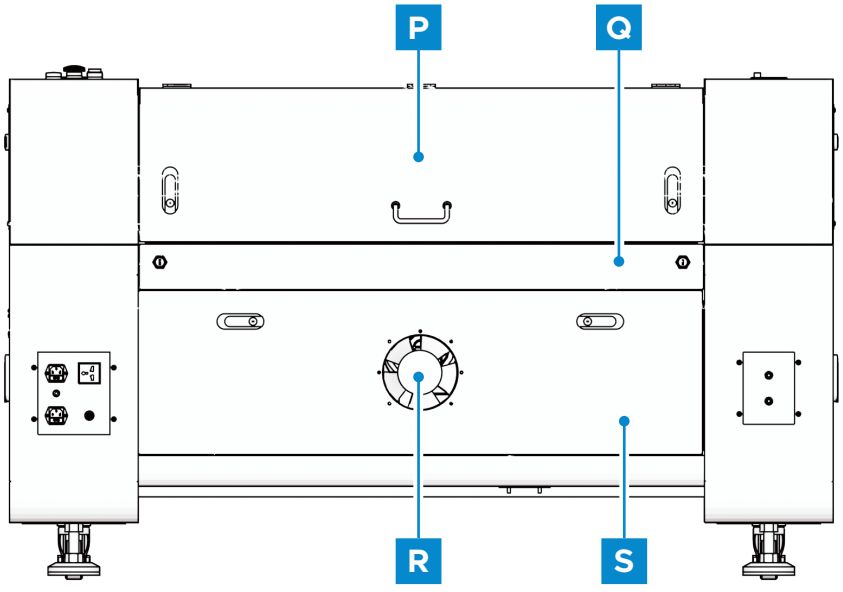
2 Introduction

2.4.2 Main Parts

Front



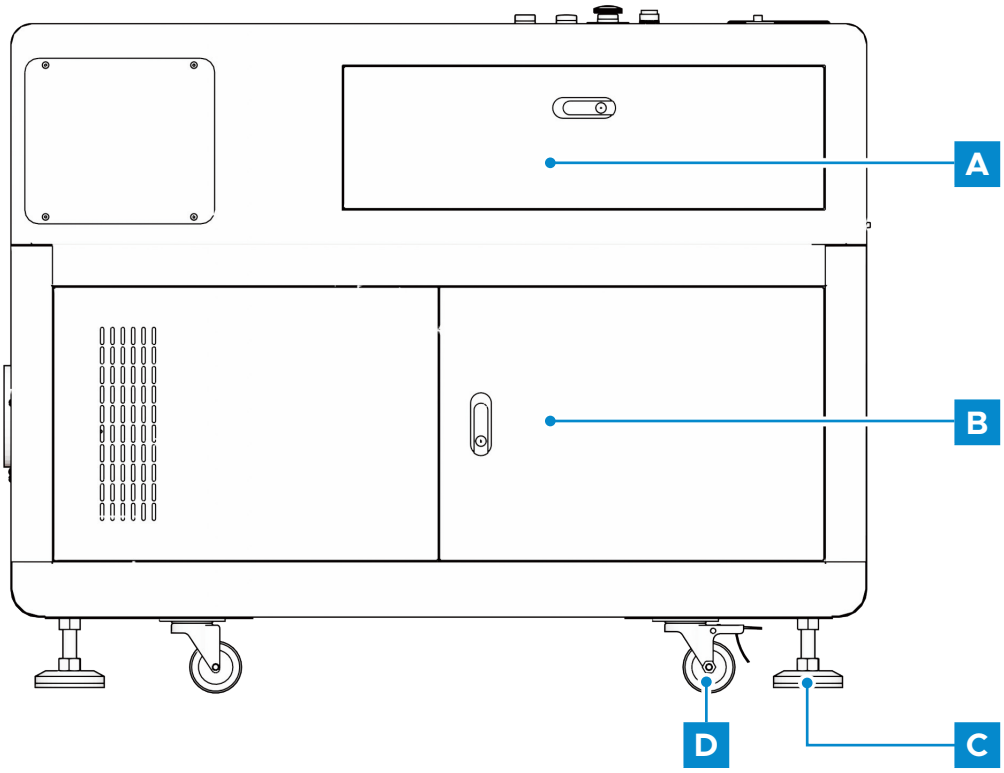
Back



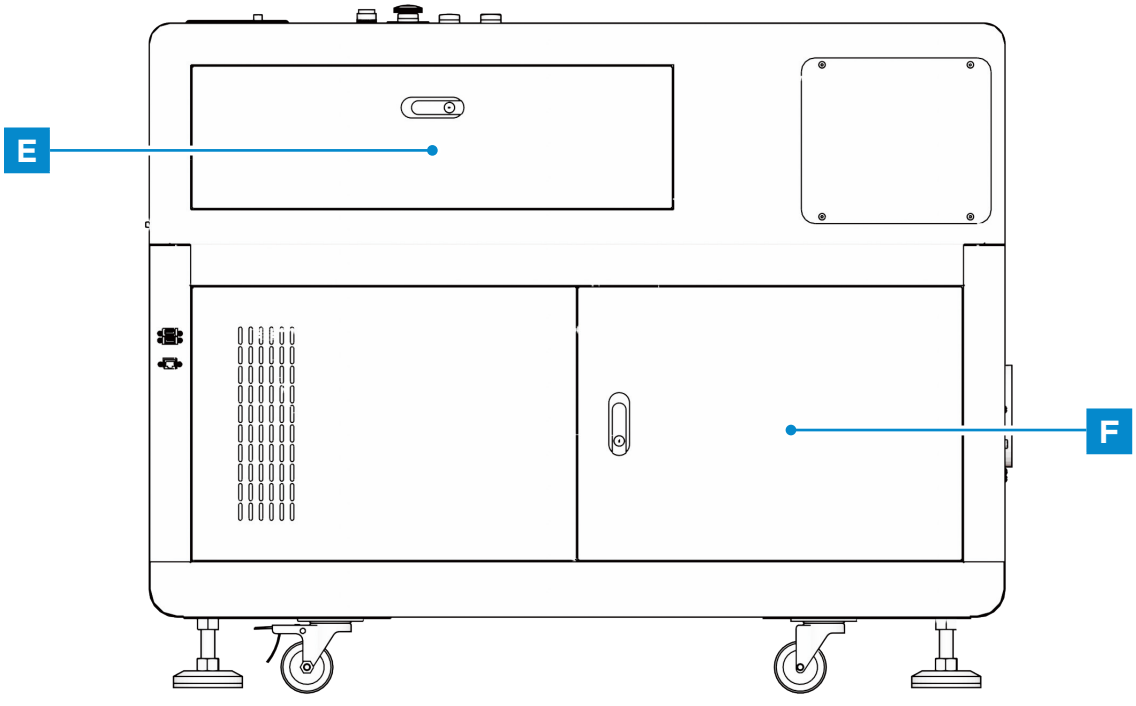
A	**Cover**	The cover provides access to the main bay for placing and retrieving materials, as well as fixing the laser path alignment and other maintenance. Power to the laser is automatically cut when the cover is opened.
B	**Viewing Window**	The polycarbonate window is shielded to protect you and others from the laser and its reflection, allowing monitoring of the engraving process. However, you should never stare continuously at the laser during operation, even through the window.
C	**Y-Axis Rail**	The Y-axis rail supports the movement of the X-axis rail up and down the workbed.
D	**X-Axis Rail**	The X-axis rail holds the 2nd mirror and LED lighting. It also supports the movement of the laser head left and right across the workbed.
E	**Laser Head**	The laser head holds the 3rd mirror, the focus lens, the red dot guidance, and the air assist outlet.
F	**Workbed**	The workbed can be adjusted in height to fit thinner and thicker materials, as well as adjusted between the aluminum and honeycomb platforms. This is also where the accessories pack is located when the engraver first arrives.
G	**Buzzer**	This device sounds when the cover opens.
H	**Indicator Lights**	The red light comes on when the laser key turns on. The green light comes on when the control system power turns on. The orange light comes on when the cover opens.
I	**Emergency Stop**	This button immediately cuts all power to the laser tube in the event of an emergency.
J	**Laser Key**	This key controls the power supply to your laser tube and air assist, helping ensure that only approved operators can use your engraver.
K	**Main Power**	This button turns on your engraver's control system, exhaust fan, LED light, and cabinet sockets.
L	**Control Panel**	The control panel offers hands-on control of the engraving process, including manual movement of the laser head and fi ring of the laser.
M	**Ammeter**	This ammeter controls and displays the current used by the laser tube in mA. The knob to its right is its master control for the laser's power settings. This ammeter can also fire the laser in bursts by pressing the **TEST** button. Make sure the knob is always turned completely clockwise to **MAX** to enable the software to use the engraver's full power range. When it is turned completely clockwise to **MAX**, it is recommended to use settings from 10%–70% in the **SOFTWARE** of the maximum rated power to enjoy optimal performance and longevity. Partly turning the knob reduces the **SOFTWARE's** power settings proportionately. 
N	**Front Pass-Through Door**	This door opens to allow larger pieces of material to be fed through the workbed. Additional care must be taken to avoid direct viewing, direct or reflected laser beam exposure.
O	**Front Access Door**	This door provides access to the waste hopper for easy cleanup after each project.
P	**Rear Top Access Door**	This door opens to the laser bay, holding the laser tube and its connections.
Q	**Rear Pass-Through Door**	This door opens to allow larger pieces of material to be fed through the workbed. Additional care must be taken to avoid direct viewing, direct or reflected laser beam exposure.
R	**Exhaust Vent**	The gases and airborne debris from the worktable can be sent out to an dedicated air purifier through this vent and an exhaust pipe.
S	**Rear Bottom Access Door**	This door provides access to the air pump for easier maintenance.

2 Introduction

Left



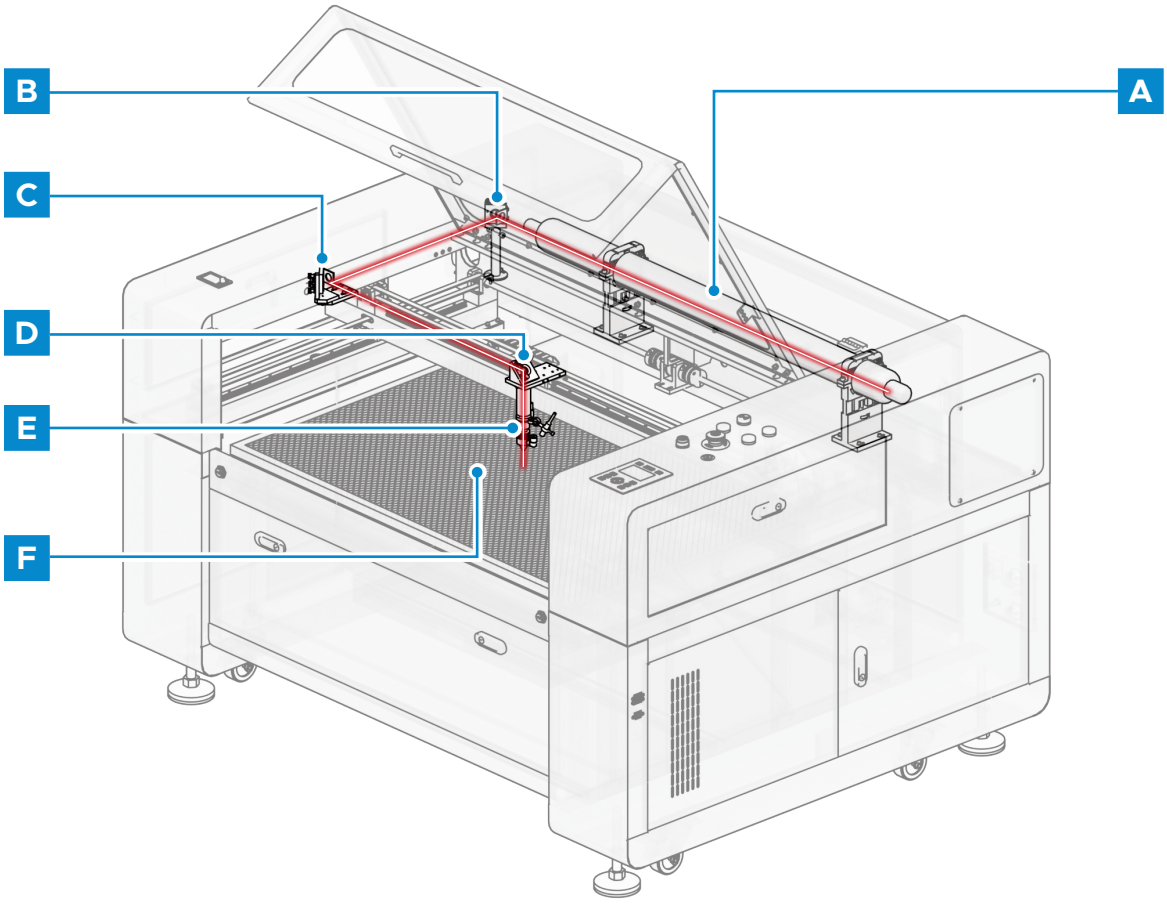
Right



A	**Left Top Access Door**	This door provides access to the main bay for work on the mirrors and Y-axis rail.
B	**Left Bottom Access Door**	This door provides access to the laser power supply.
C	**Feet**	These feet can be rotated down to help anchor the machine in place.
D	**Caster Wheels**	The front wheels include locks to hold the engraver in place.
E	**Right Top Access Door**	This door provides access to the control panel, buttons, and sensors for maintenance at the front rear, and sides and repair.
F	**Right Bottom Access Door**	This door provides access to the mainboard, motor drivers, and power supplies.

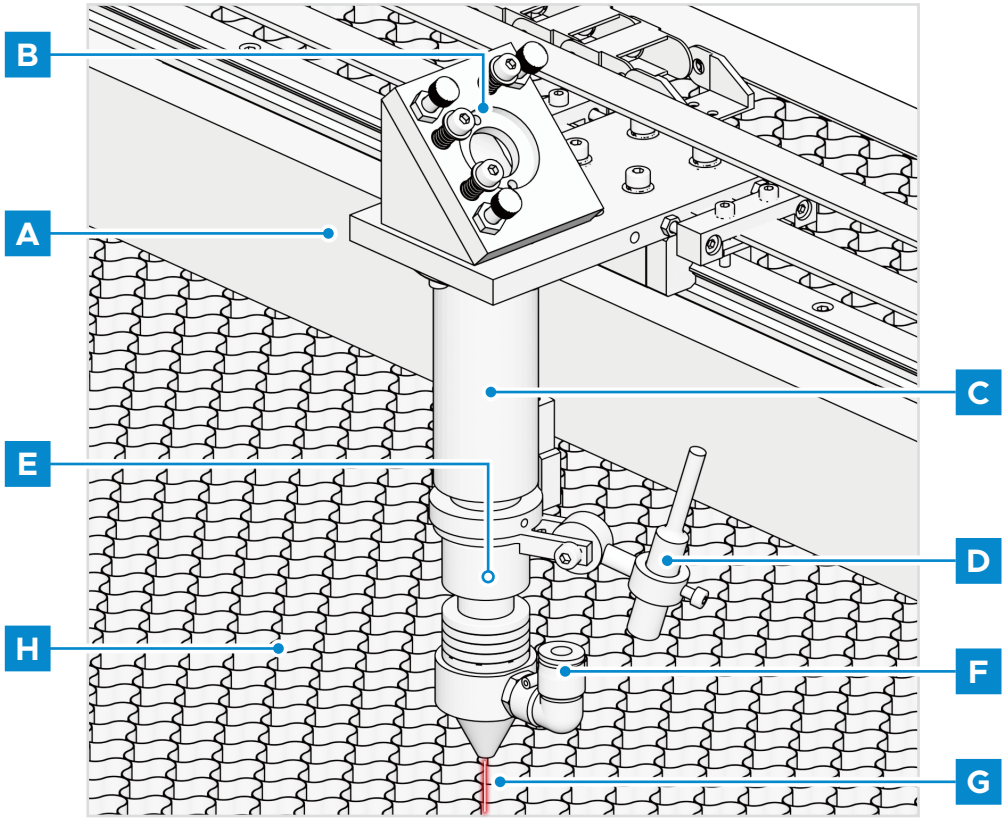
2 Introduction

2.4.3 Laser Path



A	**Laser Tube**	This CO_2-filled glass tube is mounted on brackets and immobile. Its connection to the laser power supply is extremely high voltage and extremely dangerous.
B	**1st Mirror**	This adjustable-angle mirror is fixed in place to transfer the engraving laser from the tube to the 2nd mirror.
C	**2nd Mirror**	This adjustable-angle mirror moves with the X-axis rail to allow the laser beam to travel along the Y axis.
D	**3rd Mirror**	This adjustable-angle mirror moves with the laser head to allow the laser beam to travel along the X axis.
E	**Focus Lens**	This lens directs and focuses the laser to the material.
F	**Workbed**	The bare workbed can be adjusted in height or fitted with aluminum or honeycomb tables for different projects.

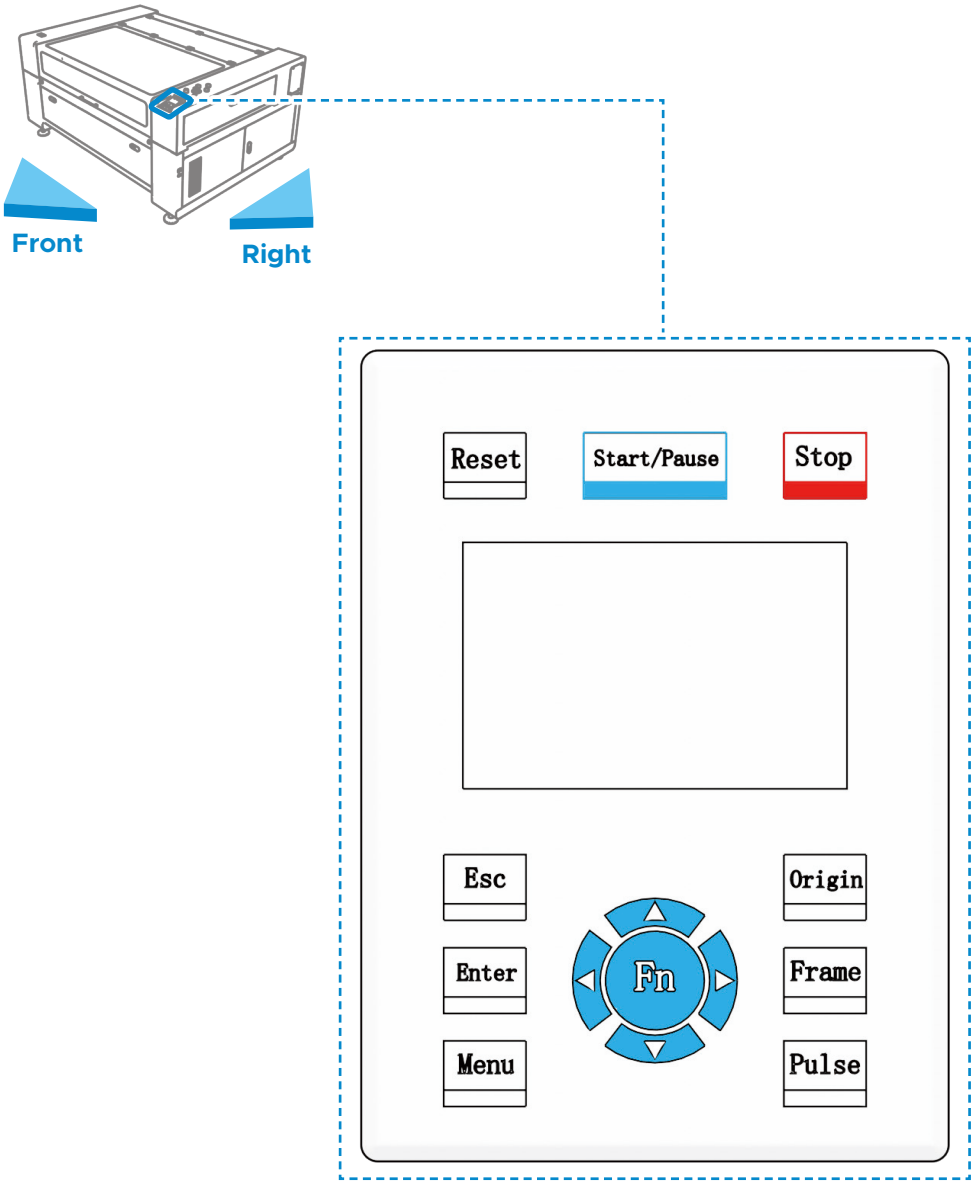
2.4.4 Laser Head



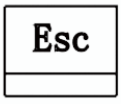
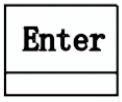
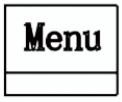
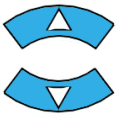
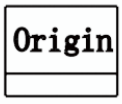
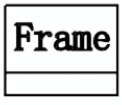
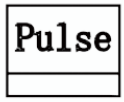
A	**X-Axis Rail**	This rail moves along the Y axis, with its movement controlled by limit switches.
B	**3rd Mirror**	This adjustable-angle mirror transfers the laser from the 2nd mirror to the focus lens.
C	**Autofocus Sensor**	This sensor is to properly focus the laser by maintaining the appropriate distance between the material surface and the laser head.
D	**Red Dot Pointer**	This device helps you see the exact position of the invisible engraving laser.
E	**Focus Lens**	This 20 mm lens directs and focuses the laser beam to its point of contact with the engraving material.
F	**Air Assist**	This device blows pressurized air to kill sparks and blow away gas and debris as you engrave.
G	**Laser**	The engraving laser itself is invisible but highly dangerous. Avoid any direct exposure to your skin or eyes.
H	**Workbed**	The workbed can be moved up or down to get the perfect focus for the material.

2 Introduction

2.4.5 Control Panel

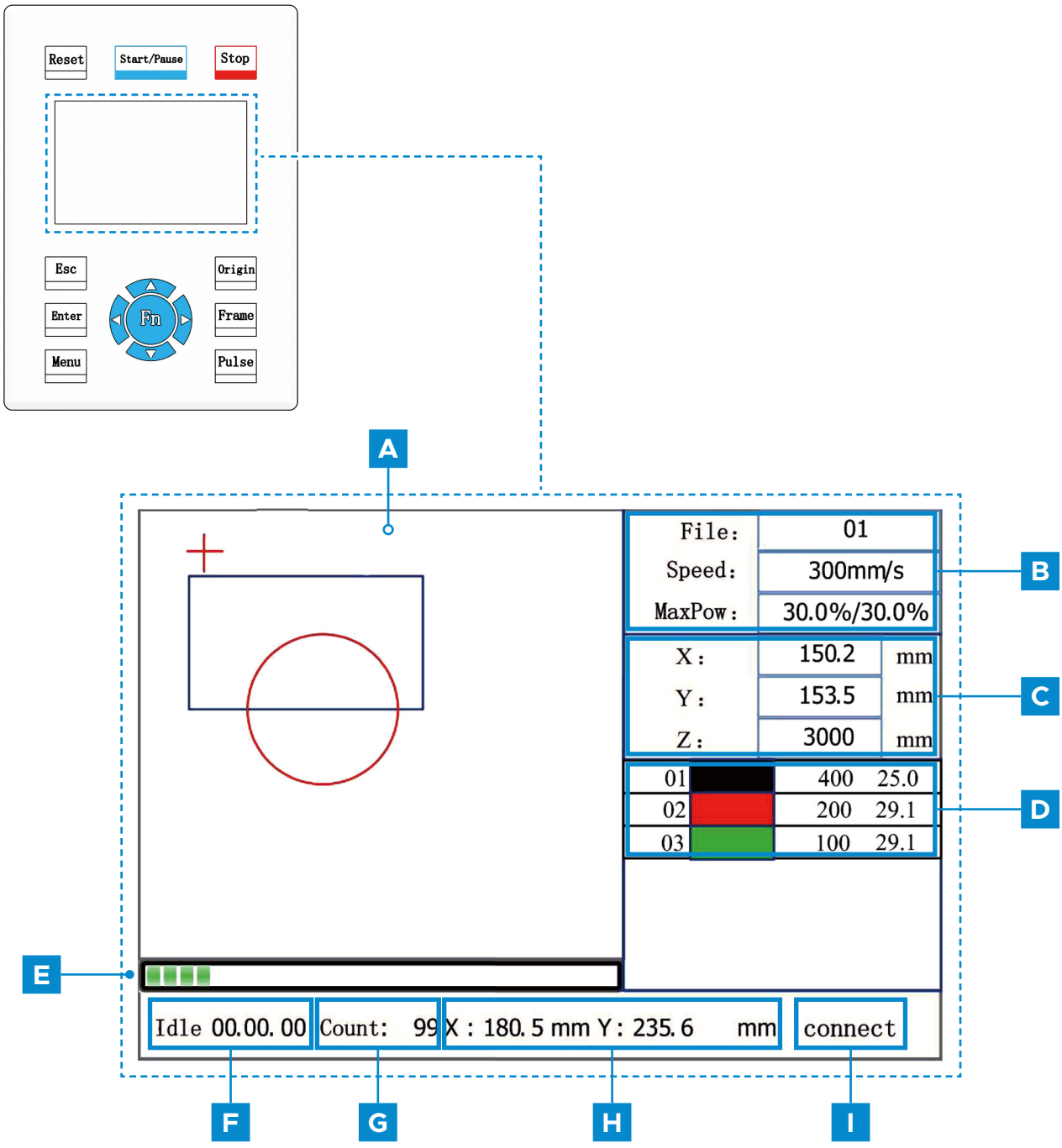


When the system is idle or the work is finished, all the buttons can be used. Users can process the file, set the parameters, preview their file, etc. When the work is running or paused, some buttons will not work, e.g., Origin and Frame.

	Returns the machine to the saved default parameters (see §4.7.14 Saving Current Parameters and Virtual Keyboard Use on Page 63).
	Starts/pauses the current job.
	Stops the current job.
	Stops work or returns to a previous menu.
	Enters a command or confirms your selection.
	Opens the main menu (see §4.7.2 Menu Button on Page 55).
	Opens the Function menu (see §4.7.8 Function Menu on Page 59).
	Controls X-axis movement or moves left and right in parameters.
	Controls Y-axis movement or moves up and down in parameters.
	Sets the starting point for the laser head (see §4.7.13 Setting Origin Points on Page 62).
	Traces the outline of the current design for sizing.
	Fires the laser manually (see §4.7.12 Manual Firing of the Laser on Page 61).

2 Introduction

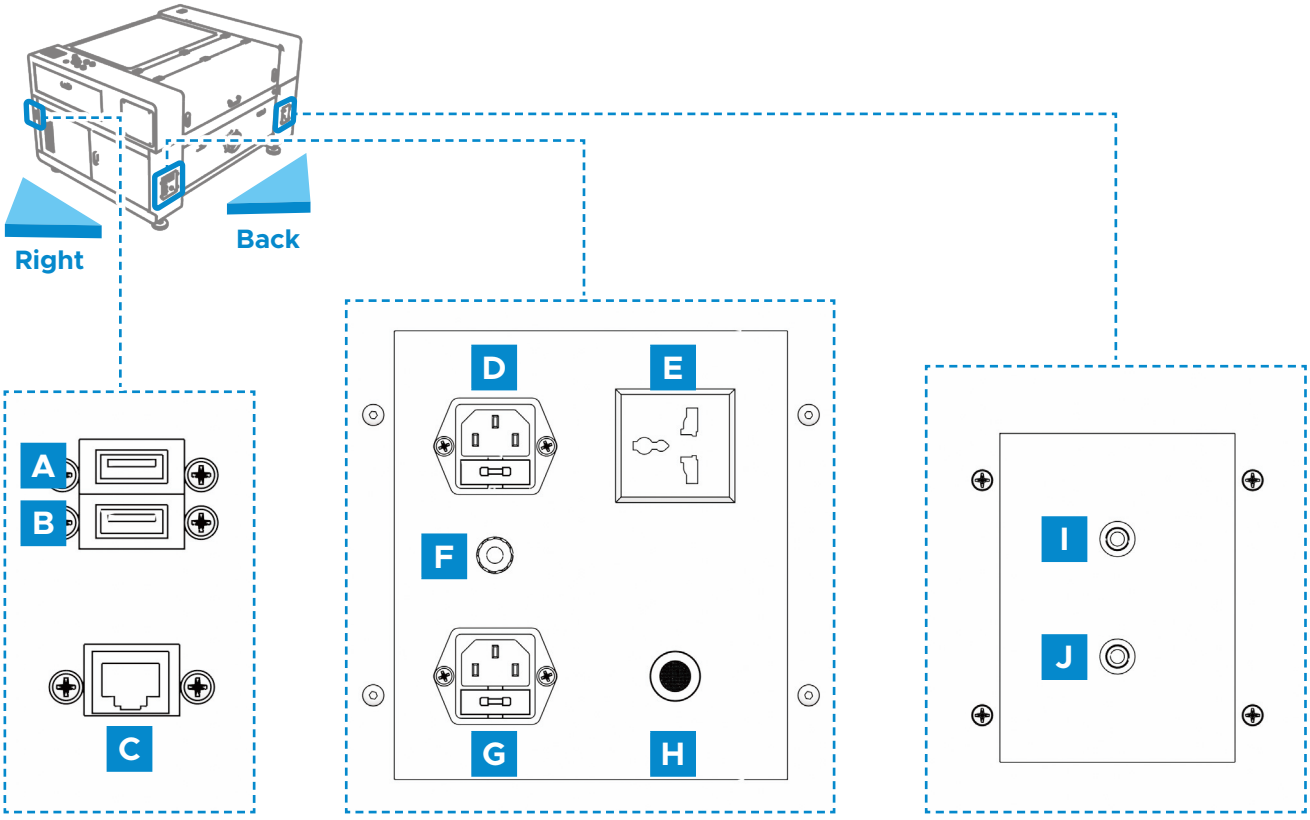
2.4.6 Screen Display



A	**Design Display**	Shows the whole file's track and the running track.
B	**Parameters**	Displays the running file's fi le number, speed, max power, etc.
C	**Coordinates**	Displays the current coordinates of the laser head.
D	**Layers**	Displays the layer parameters of current or previewed fi les. Parameters from left to right are layer number, color, speed, and maximum power.
E	**Laser Status**	Displays the current status of the machine: Idle, Running, Paused, or Finished. The processing time is shown on the right side.
F	**Progress Bar**	Displays the progress of the current file.
G	**Job Number**	Shows the count of completed runs of the current fi le.
H	**Design Dimensions**	Displays the dimension of the current file.
I	**Internet Status**	Displays the status of the machine's internet connection.

2 Introduction

2.4.7 Connection Inputs

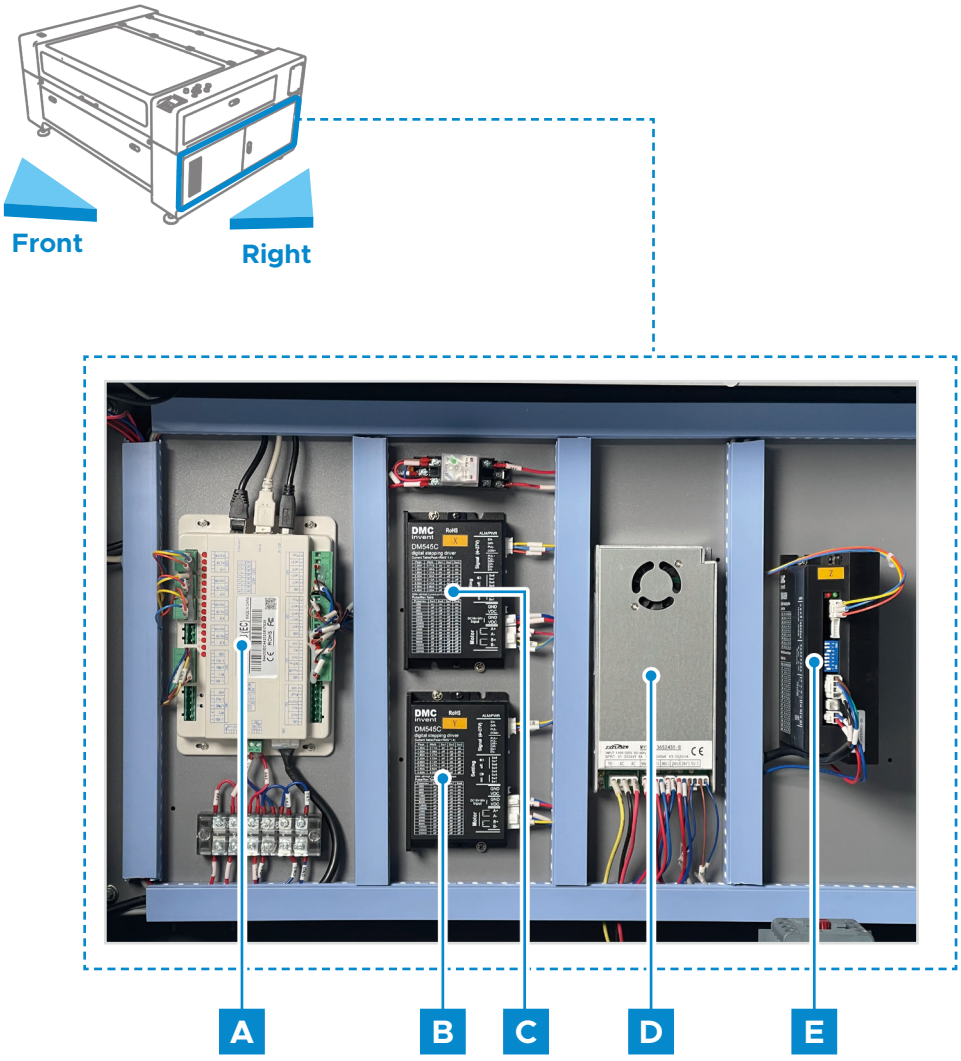


A	**USB Port**	This port allows you to load and save designs and parameters directly onto the engraver.
B	**USB Line Port**	This port connects to your control computer and its engraving software using any of its USB ports.
C	**Ethernet Port**	This port connects to your control computer and its software either directly or via the internet.
D	**1st Main Power Port**	This port connects to the 3-prong main power cable.
E	**Water Pump**	This port connects to the water pump power cable. **ONLY** use this port for your water pump. **DO NOT** plug your water chiller into it. It is highly recommended, however, to use an industrial water chiller considering the high power of the laser.
F	**Ground**	This port connects to the dedicated grounding cable for safety if applicable.

G	**2nd Main Power Port**	This port connects to the 3-prong main power cable. **ONLY** the **TWO** power cables are plugged, can the machine work normally. The two power cords should be plugged into a compatible and stable power source via grounded 3-prong outlets on **SEPARATE** circuits rated for at least 10 A.
H	**Air Assist Intake**	This intake provides the pressurized air for the machine's air assist. Periodically check its filter to keep it clear of any obstruction.
I	**Water Inlet**	This port connects to the outlet of a water cooling system.
J	**Water Outlet**	This port connects to the inlet of a water cooling system.

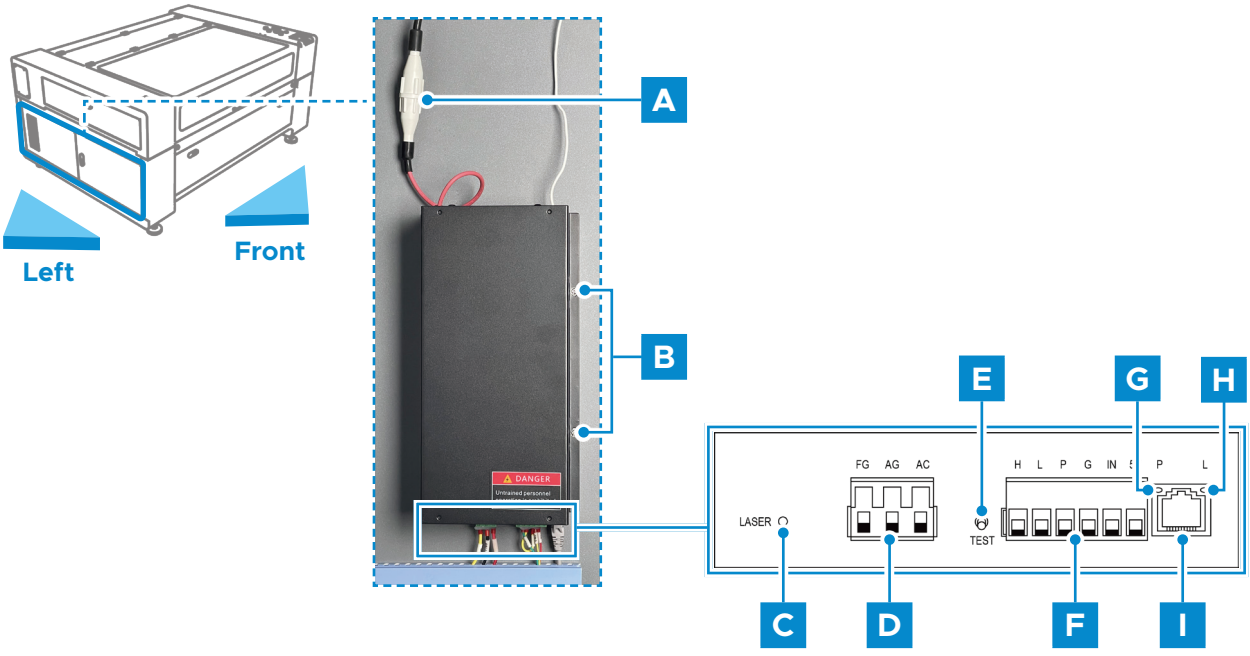
2 Introduction

2.4.8 Electronics Bay



A	**Mainboard**	This circuit board controls the engraving process, responding to commands from your engraving software or the machine's control panel.
B	**Y-Axis Driver**	This device moves the X rail along the Y rail.
C	**X-Axis Driver**	This device moves the laser head along the X rail.
D	**Control Power Supply**	This device powers the machine's control panel.
E	**Z-Axis Driver**	This device moves the workbed up and down.

2.4.9 Laser Power Supply



A	**High-Voltage Wire**	This line is connected to the laser tube's anode or positive end, providing high-voltage current to power the laser.
B	**Mounting Holes**	These standard slots allow simple installation and removal.
C	**Water Indicator Light**	When connected, this light shows the water cooling system is operating.
D	**Laser Signal Indicator Light**	This light shows the laser tube is operating.
E	**Laser Indicator Light**	This light shows when current is being sent to the laser tube.
F	**Main Power Terminal**	This terminal block holds the power supply's connection to the engraver's grounding (FG) and to the main power supply (AC).
G	**Test Button**	This button is used to attempt to test fire the laser when troubleshooting problems. If the laser fi res successfully, the problem will usually be with the control panel or its connections.
H	**Connection Terminal**	This terminal block holds the connections to the high (H) and low level output (L), the water protection switch (P), another ground (G), and two laser signal controls (IN & 5V).
I	**Ethernet Port**	This port allows you to connect the laser power supply to an external ammeter.

3 Installation

3.1 Installation Overview

A complete working system consists of the following parts:

- A laser engraving cabinet

  The cabinet can use designs provided by the enclosed engraving software by direct or internet connection with your computer; it can also engrave designs loaded directly from a flash drive.

- A water cooling system
- A ventilation system adequate for the materials you're working with (fan and ducts included)
- All applicable connection cables
- Laser and door keys

Use only the hardware, wiring, and power sources that came with or are compatible with this engraver. Installing equipment that your engraver is not designed to work with can lead to poor performance, shortened service time, increased maintenance costs, property damage, and personal injury.

Users can configure other accessories (such as a fume extractor or rotary axis) to suit their needs.

Note the specific requirements of your system's installation. Every customer must understand these notes before installation to execute a proper setup and achieve safe laser performance. If you have any installation questions or problems, contact our technicians and customer support team.

Any auxiliary equipment must be adjusted to the base machine. Queries may be directed to the dealer or manufacturer of such equipment.

3.2 Selecting a Location

The location should meet all of the following requirements:

- The location meets all of the requirements mentioned in §1 Safety Information on Page 1.
- The location should be stable, level, dry, and climate-controlled to ensure an ambient temperature of 40°F–95°F and an ambient humidity under 70%. In particular, the temperature and humidity together should not be close to the dew point.
- The location should be free of dust and other airborne pollutants and well-ventilated enough to process any fumes produced by the engraving process in accordance with all applicable laws and regulations.

- Depending on the materials to be processed, this may require the construction of a dedicated ventilation system.
- The location should be away from children; combustible, flammable, explosive, or corrosive materials; and sensitive EMI machines.
- The two power cords should be plugged into a compatible and stable power source via grounded 3-prong outlets on **SEPARATE** circuits rated for at least 10 A.
- The location has fire-fighting equipment nearby and the local fire department's phone number clearly displayed.
- It is recommended to use a windowless room or to use blinds and/or curtains to avoid exposure to the potential additional heat of direct sunlight.
- It is highly recommended to have an extra work table nearby to avoid placing objects on or directly adjacent to the machine, which could become a fire or laser hazard.

3.3 Unpacking Your Engraver

Your engraver should have arrived in a wooden crate with its accessories (including this manual) packaged inside. You should place the crate in a spacious flat area for unpacking, ideally near where you plan to operate the machine permanently. Use at least two people to move and adjust the engraver's position to help keep it level and avoid any sharp or sudden movement.

1. Open the top of the crate.
2. Carefully remove the packaging and foam insulation from the sides and set them aside. With at least one other person, use the two straps around the engraver to lift it out of the crate and move it to a sturdy table or countertop.
3. Carefully remove the straps and plastic packaging from around the engraver.
4. Open the cover and take out all the parts.

   Make sure that you have received all listed accessories in the package list (see §2.4.1 Package List on Page 9.
5. Carefully remove any remaining interior packaging and stays—including the strap around the laser head—and set them aside.

   The laser tube is a highly fragile object and should be handled delicately and as little as possible.

You may keep the packaging in case of future return but, if you dispose of it or any accessories, be sure to do so in compliance with applicable waste disposal regulations.

3 Installation

3.4 Installing the Water Cooling System

- The provided water pump is essential to your engraver's performance and longevity. When this laser works without a properly maintained cooling system, its glass tube **WILL** crack from excess heat.
- Always fill the tank with deionized or distilled water or a custom-purpose laser-safe antifreeze. Using tap water will gradually degrade the quality of your engraver and may even cause dangerous mineral buildup within the cooling system. Never use generic antifreeze for the same reason.

NEVER touch or adjust your engraver's water supply while the pump is connected to power.

As an alternative to manually adjusting the water in your tank, you can also use an industrial water chiller to provide your engraver with temperature-controlled water. We recommend the CW-5200 chiller (not included). If using it with this engraver, follow its separate manual and plug it into an outlet on a separate fuse from the engraver itself.

To connect the water pump to the engraver:

1. Fill a dedicated water tank with distilled water at 15°C–21°C. The tank should always hold at least 2 gallons (7.5 L) of water.

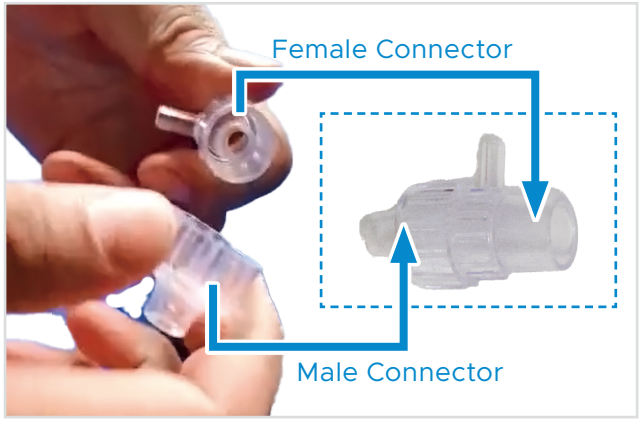
   If the temperature drops below 0°C, it is recommended to use laser-safe antifreeze.

2. Turn the protective cover counterclockwise.

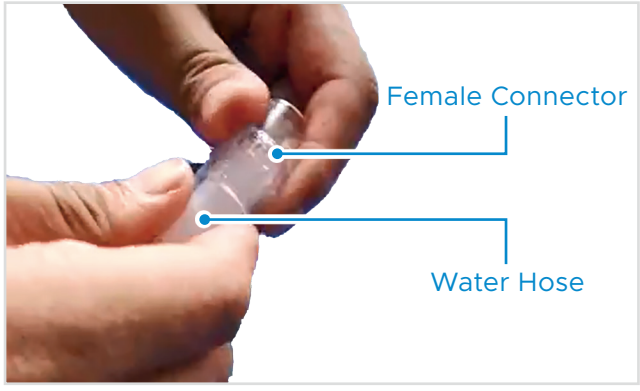
3. Use a flathead screwdriver to pry open the protective cover and remove it.

4. Attach the mesh cover to the water pump and turn it clockwise to secure it.

5. Turn and disconnect the female connector and male connector.



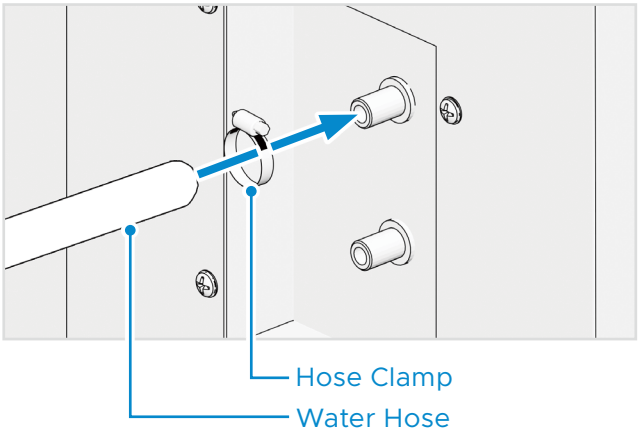
6. Connect the female connector to one end of a water hose.



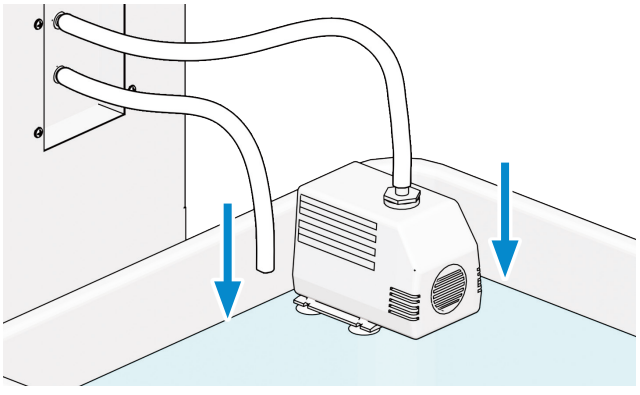
3 Installation

7. Connect the female connector to the water outlet of water pump.

8. Connect the other end of water hose to the water inlet at the back of your engraver and secure it with one hose clamp.



9. Completely submerge the pump in the water tank.
10. Connect one end of the other white hose to the water outlet at the back of your engraver and secure it with the other hose clamp.
11. Put the other end into the tank in such a way that the returning water flows into the tank without splashing or other problems.



12. Connect the water pump to its power supply.

    For best results, use a power outlet on a separate fuse from the engraver itself. If no such outlet is available, the pump can also be plugged into the dedicated socket located on the back of the engraver.

    Once the plug is plugged in, water should begin to run through your machine and back into your tank. When the water cooling system is in operation, pay attention to the following:

    - **ALWAYS** obtain visual confirmation that the water flows through the laser tube before starting your laser.
    - Larger bubbles will pose a risk of overheating the laser tube. **ENSURE** there are no air bubbles larger than 1 cm. If there are larger bubbles, check the water level in the water tank to fully cover the water pump. You can tilt the engraver on the left side until the bubbles **dissipate**.
    - **NEVER** allow the water in the tank to become too hot to cool the laser. Heat damage can occur quickly and severely shorten the life of the laser tube.

      Periodically check the water's temperature on the built-in digital display on the laser power supply. For best results, keep it between 60°F–70°F (15°C–21°C). If the water begins to come near 100°F (38°C), replace it with cooler water. Either replace it in stages or turn off the laser during this process: never allow the laser to operate without a constant flow of cooling water. It is also possible to add sealed bottles of frozen water to your tank to keep the water cool but never allow the water to become ice cold, as this could shatter the heated glass CO_2 **tube as well.**

13. Unplug the water pump after confirmation.

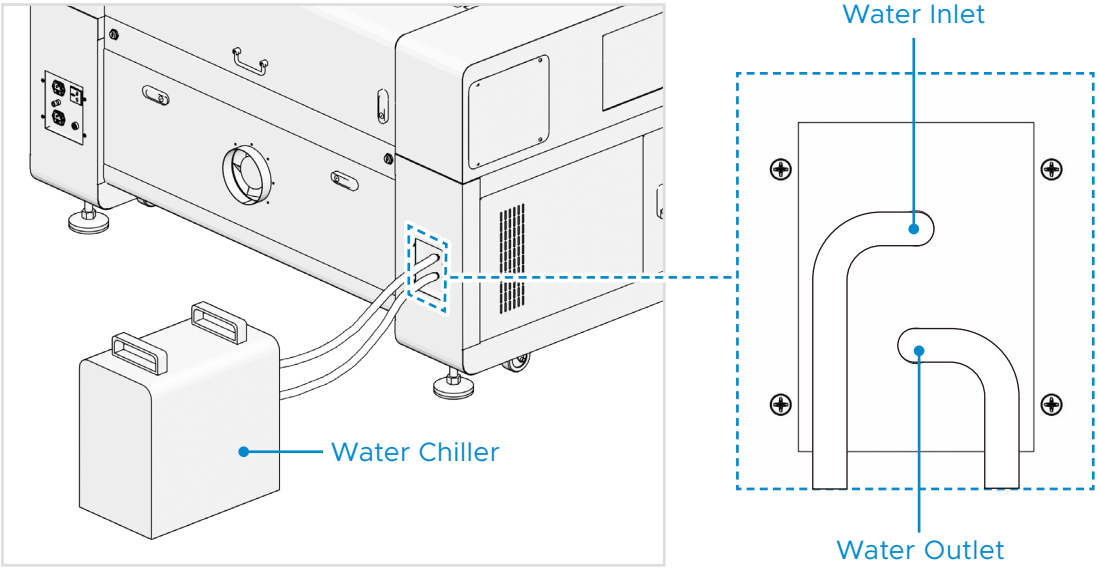
3 Installation

For an engraver with such high power, it is recommended to use an industrial water chiller for better cooling performance, especially when you are using the machine for a long time.

For instructions on installing the water chiller, see the manual of your water chiller. But keep in mind:

- Connect the water **OUTLET** of your water chiller to the water **INLET** of the engraver.
- Connect the water **INLET** of your water chiller to the water **OUTLET** of the engraver.

You can use the provided water hose clamps to seal the ports.

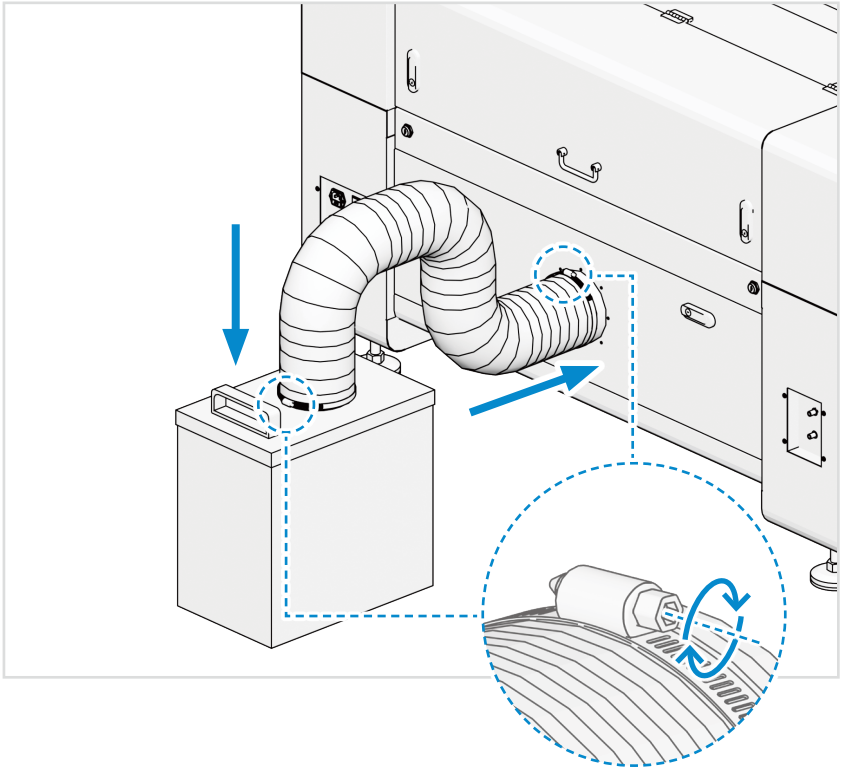


3.5 Installing the Exhaust System

An exhaust system—typically an exhaust fan and a dedicated air purifier (not included)—**MUST** be used to remove the dust and gases produced by the engraving process. This machine is equipped with one duct fan inside, you need to install the rest as follows.

To install the exhaust system:

1. Firmly connect the engraver's exhaust vent to the provided exhaust pipe by using one pipe clamp.
2. Connect the other end of the pipe to a dedicated air purifier by using the other pipe clamp. The pipe can be expanded to a full length of about 5 feet (1.5 m).
3. Plug in the dedicated air purifier.



3 Installation

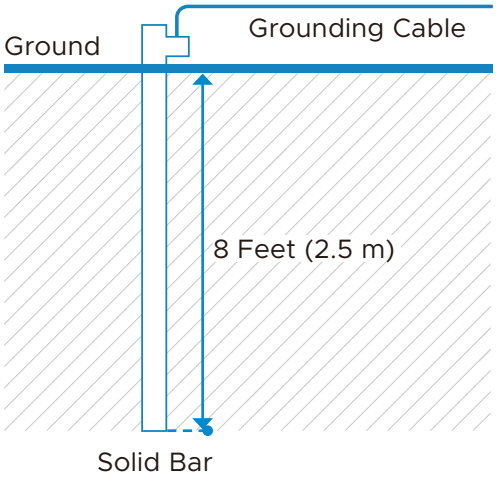
3.6 Connecting to Power Supply

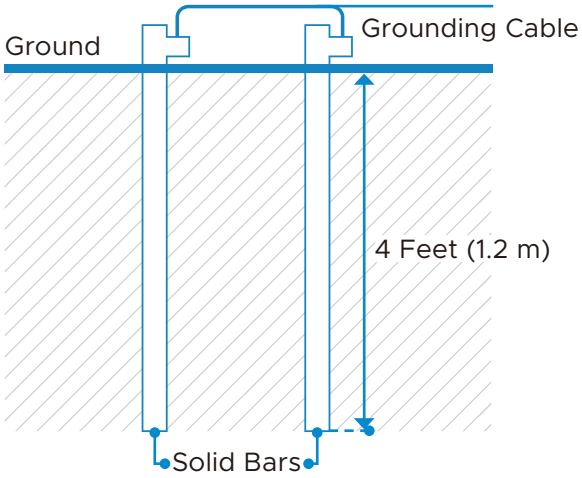
1. Confirm that the labeling beside the power socket at the back of the engraver matches your local power supply.
2. Connect one end of the power cable to the power socket.
3. Plug the other end of the power cable into a grounded 3-prong outlet or into a surge protector rated over 2000 J that is itself connected to a grounded outlet. Use a dedicated circuit with no other devices on it.

   If the outlet is not grounded, use the grounding cable and connect it as follows:

   a. Fasten the near end of the grounding cable to the ground port at the back of the engraver.

   b. Connect the far end of the cable to a single metal rod driven at least 8 feet (2.5 m) deep or to two separate metal rods driven at least 4 feet (1.2 m) deep into soil located at least 5 feet (1.5 m) from the machine.
4. Repeat the same process for the other power cable.





- Fluctuation along the circuit line should be less than 5%. If this is exceeded, the fuse will blow, which is located in the power socket and accessible from the exterior.
- Do not connect this device to standard extension cords or power strips.
- The powerful laser is extremely high voltage and potentially dangerous, so users must securely ground the engraver to avoid the buildup of static electricity.
- Poor grounding **WILL** cause equipment failure and create a serious electrical shock hazard. The manufacturer and/or seller bear(s) no responsibility and assume(s) no liability for any damage, accidents, or injuries caused by bad grounding connections.

3.7 Setting Up Your Control Computer

See the software manual for details on the requirements for the control computer. The control computer can be connected directly using the provided USB. The control computer should not be placed more than 15 feet (4.5 m) away to avoid possible interference with the signal on its line.

A Windows-compatible copy of RDworks V8 is provided on the USB flash drive that came with your engraver. Since Lightburn is also commonly used, this chapter provides instructions to configure these two softwares for the machine. Familiarize yourself with the software's image design features and laser control settings before using it to operate the laser.

When you first configure your software to work with the laser, the device name to search for will be the mainboard model: **RDC6442G**. The default origin position will be at the workbed's top right corner. If you change this in your software, be sure to also change the control panel settings to match. See §5.7.13 Setting Origin Points on Page 42 for details.

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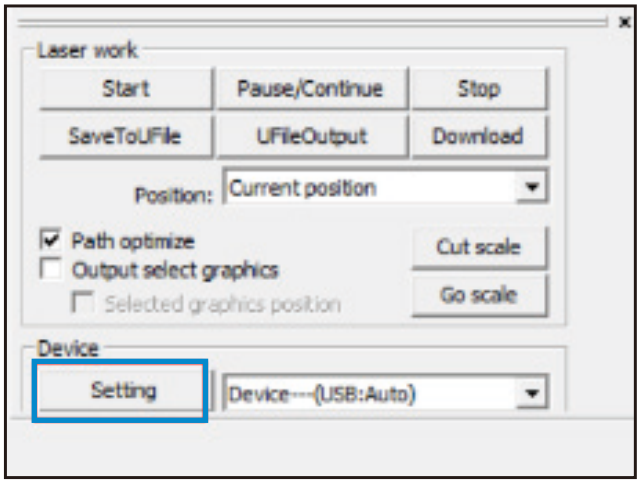
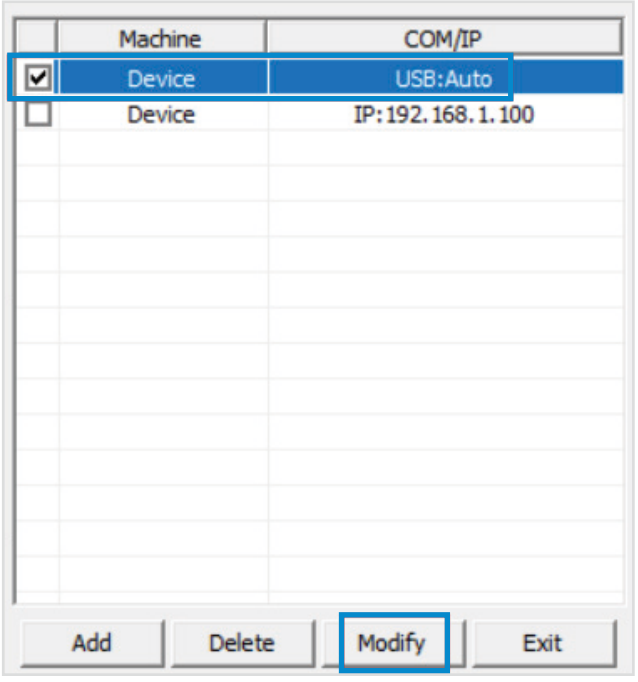
3.7.1 RDWorks V8

1. Initiate RDWorks V8 on your control computer and connect it to the engraver using the provided USB cable.
2. Click “Setting”.

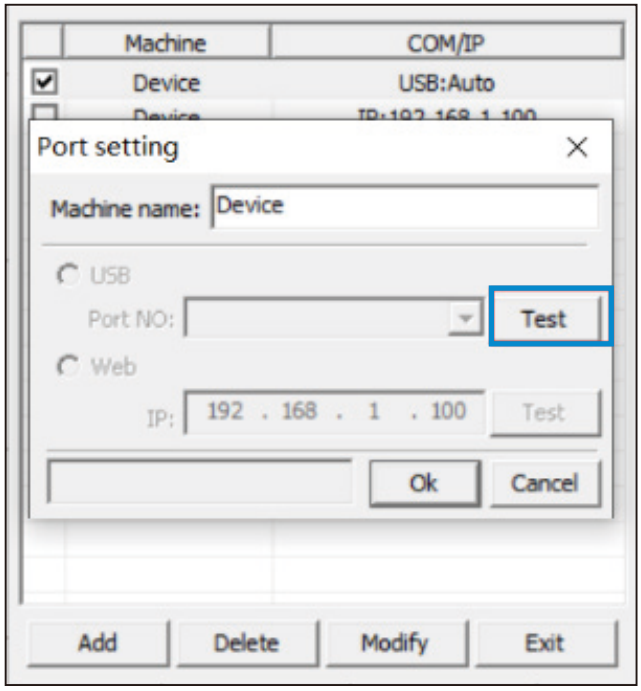


3. Click to tick the box as shown. Click “Modify”.

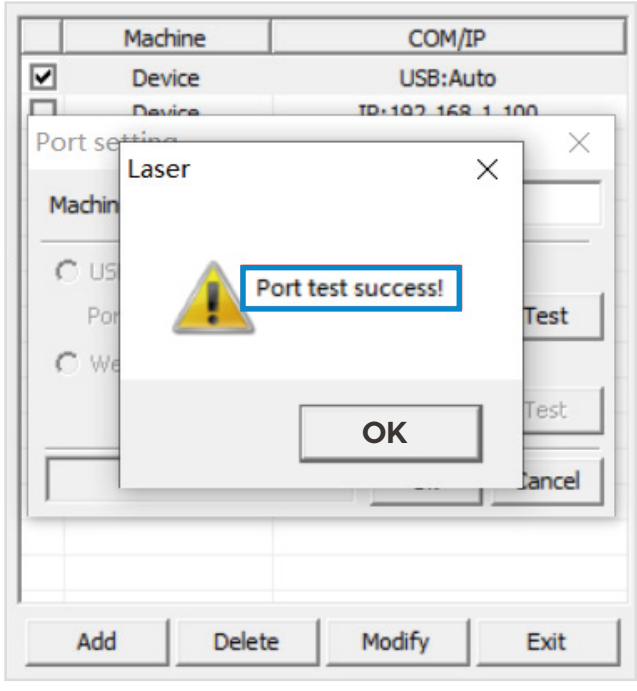


4. Click “Test” in the dialogue box that shows up as shown.

   The connection is successful when the pop-up as shown shows up.



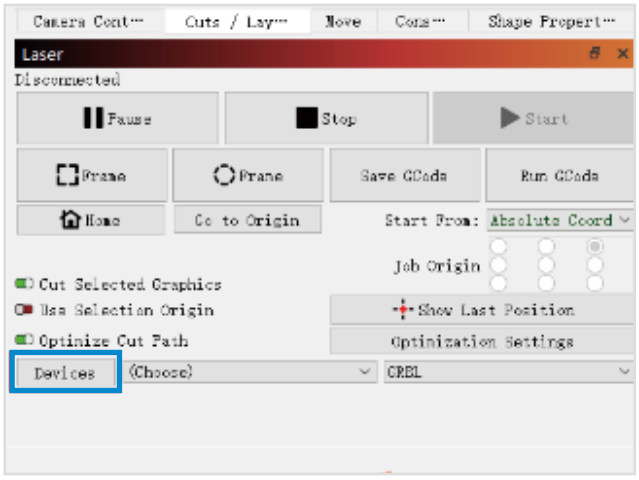
5. Click OK to confirm the connection and close the dialogue box.
6. Click “Exit” to return to the home interface.



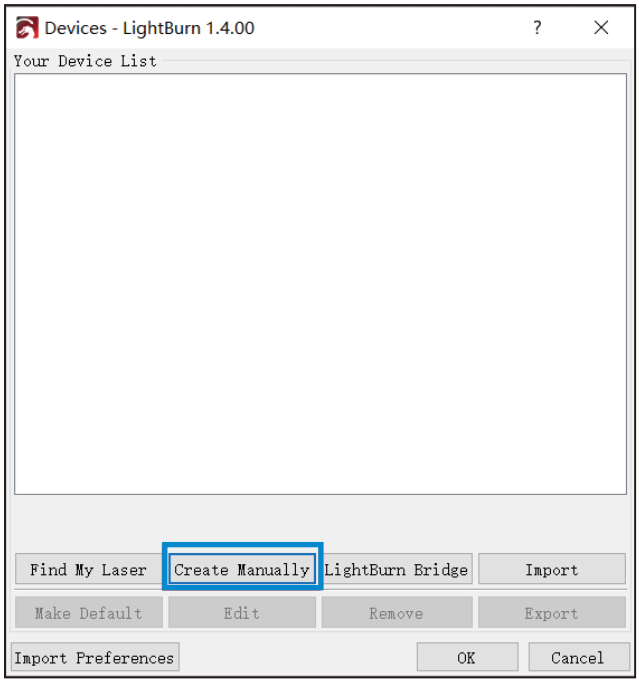
3 Installation

3.7.2 Lightburn

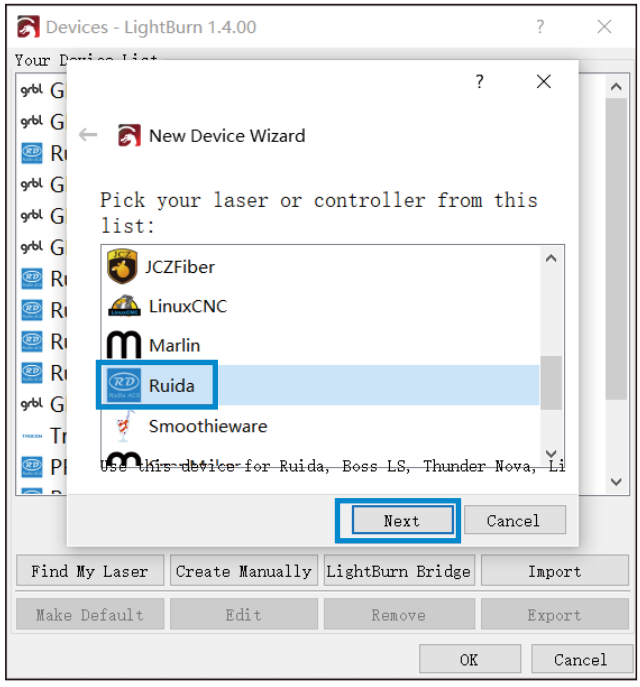
1. Initiate Lightburn on your control computer and connect it to your engraver using the provided USB cable.
2. Click “Device” as shown.



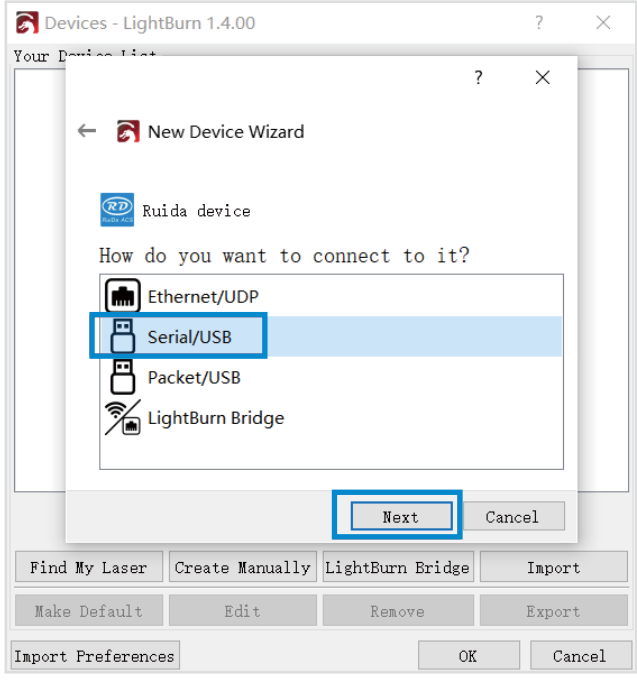
3. Click “Create Manually” in the pop-up that shows up.



4. Choose “Ruida” and click “Next”.

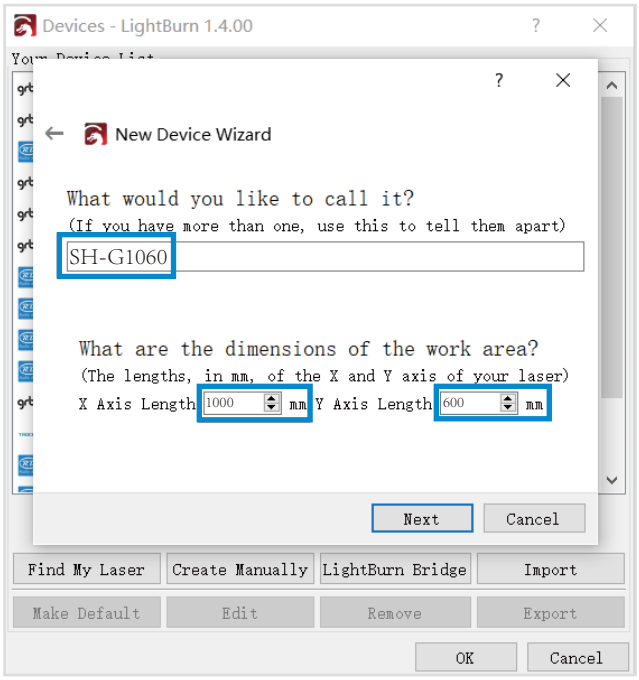


5. Choose Serial/USB and then “Next”.

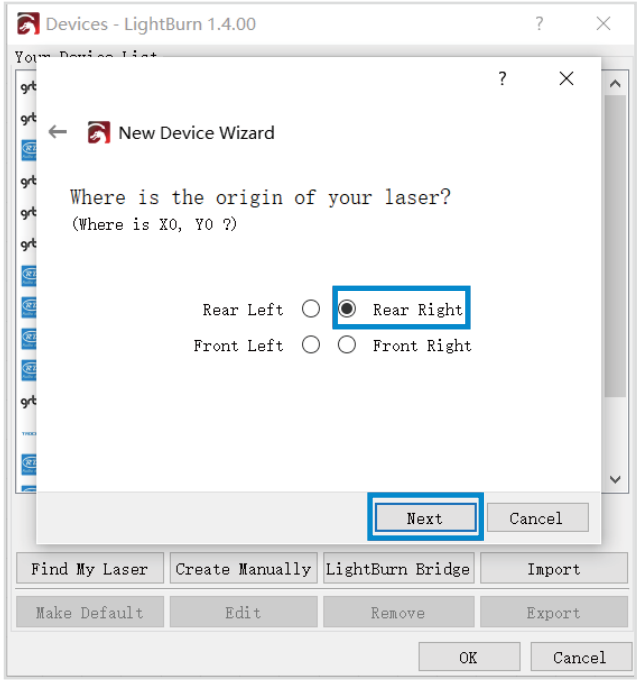


3 Installation

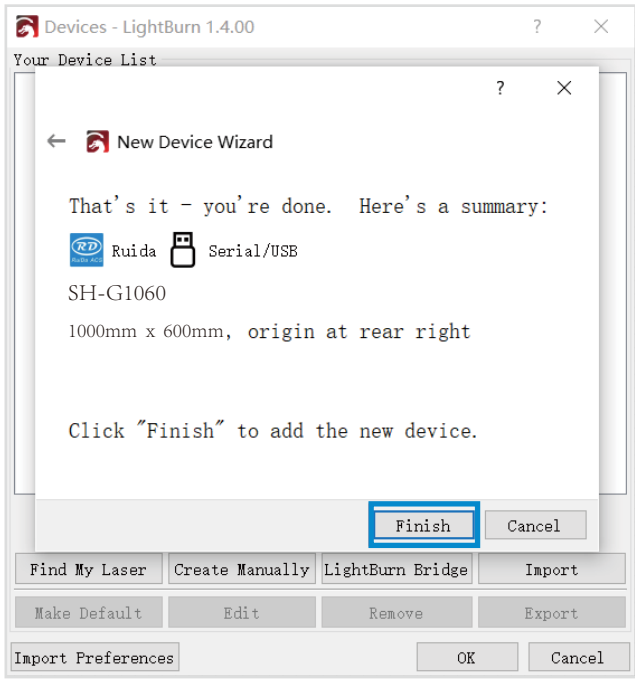
6. Enter the circled engraver name and X and Y axis length. Click “Next”.



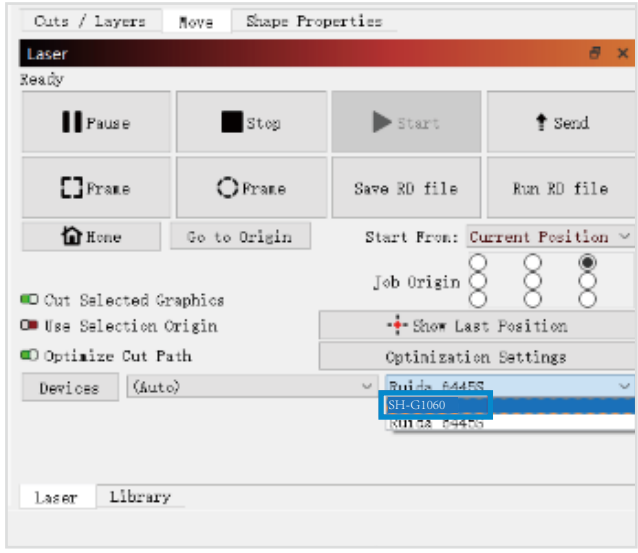
7. Set the origin to “Rear Right” as shown and click “Next”.



8. Confirm your configuration and click “Finish” to close the pop-up.



9. Click the device drop list in the lower right corner and choose “SH-G1060”. The engraver is connected when the system shows “Ready”.



3 Installation

3.8 Initial Testing

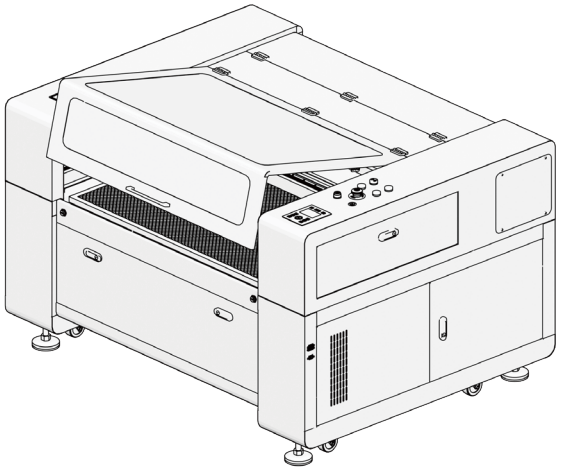
3.8.1 Emergency Shutoff

Because of the risk of fire and other hazards during engraving, this engraver includes a large and easy-to-reach emergency stop button near the control panel. Press it down to stop the laser tube instantly.

When your engraver arrives, its e-stop is already pressed and must be pulled up to allow the laser to function. You should test that it works properly before conducting **ANY** other work with your machine. Start the water cooling system, place a piece of laserable scrap material on the workbed, close the cover, and press **Pulse** to fire the laser. Hit the emergency stop button and observe whether the laser stops instantly. If the laser continues to fire, the emergency stop is not working and must be replaced before the engraver can be used. Turn off the machine and contact customer service.

3.8.2 Cover Shutoff (Interlock)

Because of the risk of blindness, burns, and other injury from direct exposure to the invisible engraving beam, this device also shuts off the laser automatically when the protective cover is raised during operation.



After ensuring that the emergency stop button works, you should also test that the cover shutoff works properly before conducting any other work on your machine. Start the water cooling system, place a piece of laserable scrap material on the workbed, close the cover, and press **Pulse** to fire the laser. Release the button. Taking care not to expose yourself to seeing or being hit by any possible reflected laser light, open the cover as little as possible and attempt to fire the laser again. If the laser fires, the automatic shutoff is not working and must be repaired before the engraver can be used. Turn off the machine and contact customer service.

3.8.3 Water Shutoff

Because of the danger posed by an uncooled laser tube, this engraver also shuts off the laser automatically when the water cooling system malfunctions.

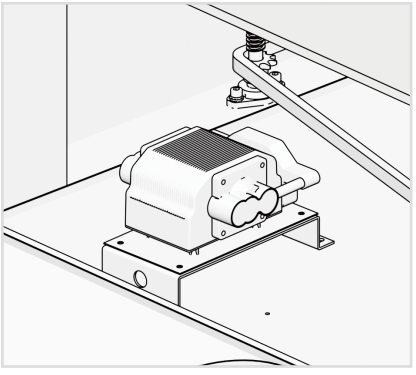
After ensuring that the emergency stop button and cover protection both work, you should also test that the water shutoff works properly before conducting any other work on your machine. Start the water cooling system, place a piece of laserable scrap material on the workbed, close the cover, and press **Pulse** to fire the laser. Release the button. Cut off the flow of water by crimping or tying the two hoses. (Take care not to damage the hoses themselves in this procedure.) Attempt to fire the laser again. If the laser fires, the automatic shutoff is not working and must be repaired before the engraver can be used. Turn off the machine and contact customer service. If the laser does not fire, the automatic shutoff is working fine; simply release the two hoses to begin circulating water again and continue setting up your engraver.

3.8.4 Laser Path Calibration

Although our factory calibrates your entire system during assembly, it is possible for the laser tube, the focus lens, and/or one or more of the mirrors to be jostled out of alignment during shipment. As such, it is recommended that you perform an optical alignment test as part of setting up your machine. See the Maintenance section below for step-by-step guidance.

3.8.5 Air Assist

Your air assist should arrive preinstalled and correctly wired. Simply check that it is correctly configured and connected as shown. If any tubing or wiring needs to be reconnected, shut off all power to the machine (including by pressing the emergency stop) before adjusting anything. Check that its air intake filter is in place, clean, and not obstructed by any nearby objects.



4 Operation

4.1 Operation Overview

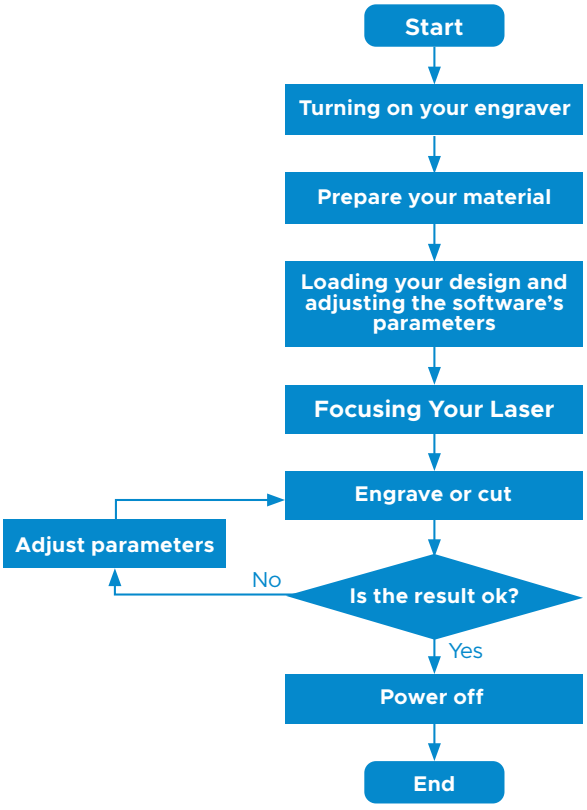
Operate this laser engraver only in accordance with all the instructions provided in this manual.

Failure to follow these instructions can result in property damage and personal injury.

Wear safety glasses during the entire test process!

This section will address only some of the options and features provided by the operation software. Before beginning to use the machine, make sure that you have read this entire manual (particularly §Safety Information on Page 1), the separate software manual, and any warnings provided on the machine itself.

Here are the main operation steps:

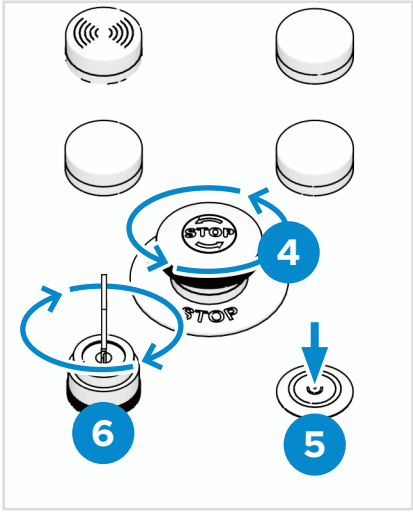


4.2 Pre-Operation Preparation

4.2.1 Turning on the Machine

1. Make sure the power supply is ok.
2. Turn on your water cooling system.
3. (Optional) Turn on your additional ventilation system (such as a dedicated purifier).

4. On the control panel, slightly rotate the emergency stop button counterclockwise until it pops up.
5. Turn on the main power by pressing the main power button.
6. Use the laser key to activate the laser source.



7. Open the engraver's cover to check that the air assist is working properly. Close the cover.
8. Wait until the engraver is in standby mode and ready to use.

4 Operation

4.2.2 Preparing Material

1. Open the engraver's cover.
2. Place a sample piece of your material on the workbed.

   The default location of the laser head's zero position is at the top right corner of the workbed. This can be changed by moving either your design or the engraver's origin position using the control panel or your engraving software. For instructions on material safety, see §1.6 Material Safety Instructions on Page 6.

   The honeycomb bed is recommended for most applications. But if needed, the workbed can be raised or lowered using the control panel to accommodate different thicknesses of various materials. Alternatively, the honeycomb bed can be removed to expose the aluminum knife bed and provide a little more space for thicker projects.

- **DO NOT** insert anything through the pass-through doors other than the material once the laser is active. Pay special attention to the fumes and dust that may be released through these doors. Be sure that your ventilation system is strong enough to pull in all of the byproducts or wear the necessary PPE to ensure the health of users and passersby.
- For heavier pieces of material, be careful to distribute its weight as evenly as possible across reinforced supports. For larger pieces of material, you may open the front and back pass-through doors, and/or the side access doors.

3. Close the engraver's cover.

Exercise caution with your hands when closing the cover.

4.2.3 Preparing the Engraving Pattern

1. Create the design.

   You can do this directly in your engraving software or use any other graphics program, saving or converting the file to a format compatible with the engraver. See the full list of acceptable file types in §2.3 Specifications on Page 8.

2. Customize your design's contrast and engraving depth by adjusting the parameters in your engraving software or directly through the control panel.

   - To increase engraving depth, increase the amount of energy per unit area by increasing the laser's power or the number of loops or by slowing down the speed parameter. Engraving too deep, however, reduces image quality, especially for coated materials.
   - When working with new materials, remember that you should always start on the low end of likely settings. If the effect is not yet strong enough, you can always rerun the design loop several times or rerun it with more powerful settings until you create the effect that you want.
   - Resolution should usually be set to 500 dots per inch. Reducing your image resolution can be helpful in some cases, reducing flaming and increasing the energy of the pulse in a way that improves the quality of the resultant image in some materials such as some plastics.

3. Customize the power setting.

   With the ammeter knob being turned completely clockwise to **MAX**, it is recommended to use settings from 10%–70% in the **SOFTWARE** of the maximum rated power to enjoy optimal performance and longevity. It is **NOT** recommended to use the laser tube at full capacity, especially for extended periods.

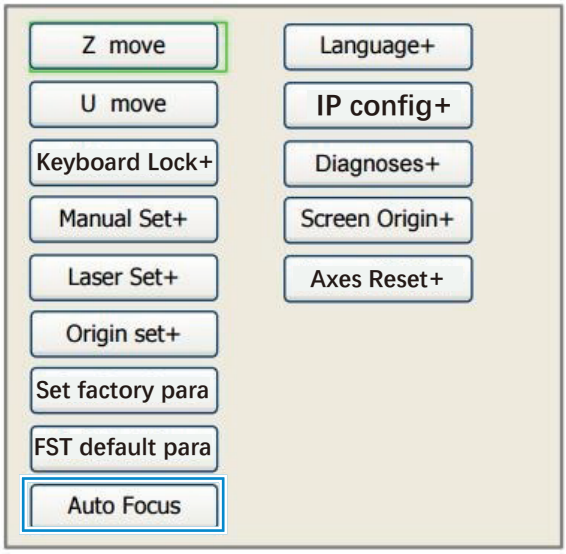
4 Operation

4.2.4 Focusing

1. Open the cover to check that your sample material is under the laser head.

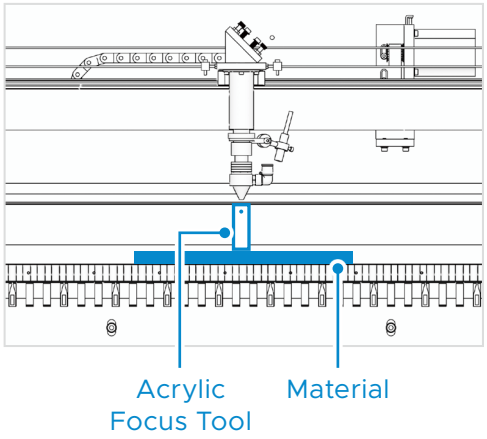
> Never attempt to focus the laser without some material on the workbed.

2. Press Fn on the control panel to enter the following menu.
3. Click **Auto focus** on the screen.
4. Press Enter on the control panel to confirm.
5. Close the cover.



Optionally, you can also focus manually as below:

1. Open the cover to check that your sample material is under the laser head.
2. Place the acrylic focus tool on top of the material and carefully raise the workbed. The laser head should barely touch the top of the acrylic tool without applying any pressure, ensuring the engraving distance is correct.
3. Close the cover.



4.3 Engraving

1. Press Start/Pause to engrave your design.

   Again, do not stare continuously at the laser even through the protective polycarbonate window. Watch for possible issues like sparks or fires, however, and be prepared to quickly extinguish a fire if necessary.

2. Once the laser has stopped, open the cover and check that the engraved pattern is desired. If not, adjust the parameters as needed. For parameter reference, see §4.6 Instructions for Specific Materials on Page 50.

3. Remove the sample material and place the actual material for engraving.

4. Press Start/Pause to engrave your design.

> For your own safety and that of passersby, this engraver can be locked shut using the provided laser key. It is recommended that you use it to lock the machine between sessions, preventing any unauthorized operation of the machine.

4.4 Wrapping-up

1. Once you have finished engraving, close your software and then turn off your machine in the following order:

   a. Close your engraving software, and unplug the USB cable or ethernet cable.

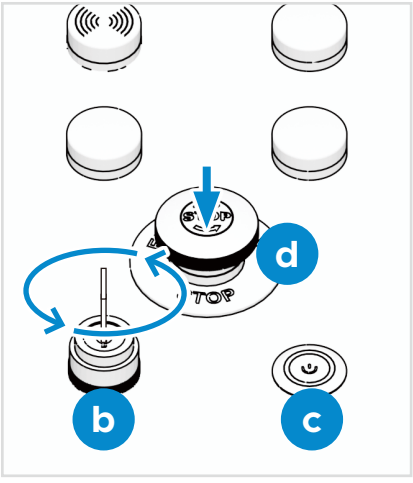
   b. Turn and remove your laser key.

   c. Turn off the main power by pressing the main power button.

   d. Press the emergency stop button.

   e. Allow time for the ventilation and cooling systems to continue running, cooling the laser and removing any remaining fumes or dust.

   f. Turn off the water cooling system and your additional ventilation system if any (such as a dedicated purifier).



2. Fully clean the workbed and check if the lens or any mirrors require cleaning. Use the bottom access door to remove, empty, clean, and replace the debris tray. Store everything neatly away.

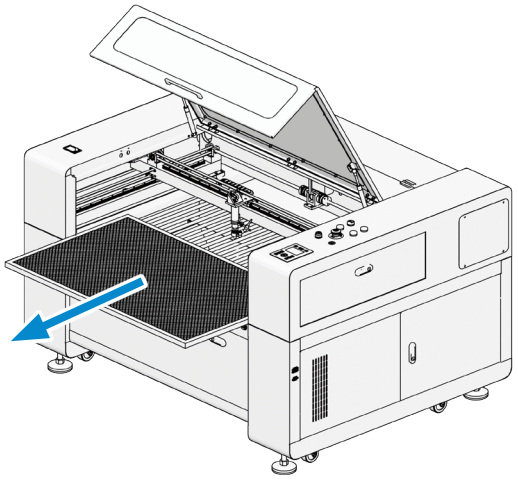
3. For best results, lock the bottom access door and disconnect your laser engraver from its power supply between uses.

4 Operation

4.5 Rotary Operation (Optional)

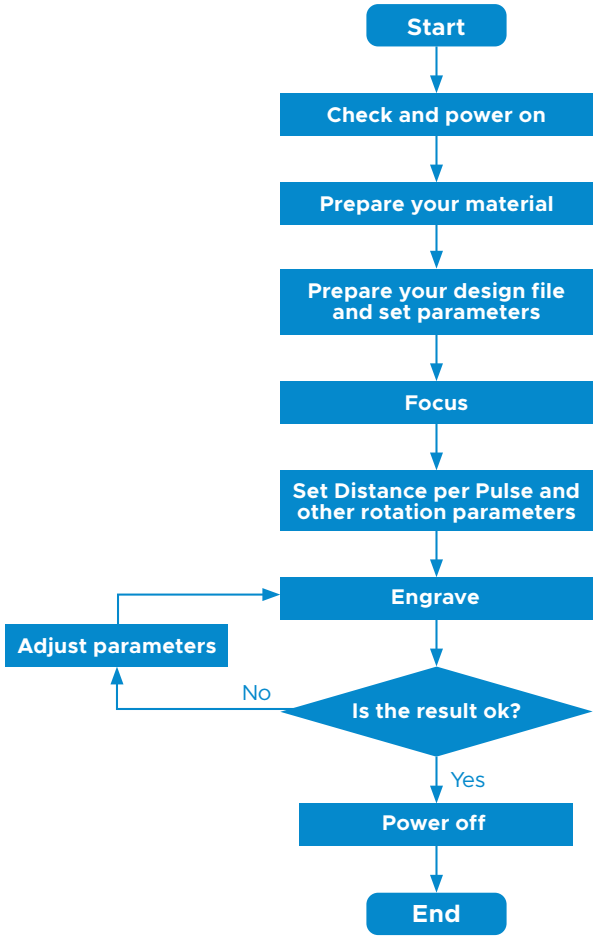
4.5.1 Installing a Rotary Attachment

1. (Optional) If the engraved object is too big, remove the honeycomb or remove the honeycomb and the aluminum knife bed for space.
2. Place your rotary axis in an open area.
3. Put the object and adjust the position using the rotary axis' knobs.
4. Check the height of the workbed is appropriate. If necessary, lower the workbed to provide room for the laser head to pass over your axis and object.
5. Connect the rotary axis cord to the rotary port at the back of the main bay.



4.5.2 Engraving Procedures with a Rotary Attachment

In typical workflows, designs are created by using graphic files on a control computer, and then transferred to the engraver for execution. Here are the main operation steps:



4.5.3 Engraving

1. Do the pre-operation steps per §4.2 Pre-Operation Preparation on Page 44.
2. Turn on the switch of your rotary attachment. The rotation of the rotary attachment will be controlled by the engraver's Y axis settings.
3. Follow §4.3 Engraving on Page 48 and §4.4 Wrapping-up on Page 48 for the rest of the engraving process.

4.6 Instructions for Specific Materials

The following instructions are suggestions to help speed safe work with a range of materials. The user should research the specific safety and engraving requirements of their specific material to avoid the risk of fire, hazardous dust, corrosive and poisonous fumes, and other potential problems. Once the product is known to be safe or appropriate protective equipment has been set up, it can be helpful to engrave a test matrix of small boxes produced at various speed and power settings to discover the ideal settings for your design. Alternatively, start with low power and fast speed settings and rerun your design as many times as needed, using progressively greater laser intensity.

4.6.1 Ceramics

When engraving on ceramics, generally use moderate to high power. Using more loops rather than higher power and lower speed can help avoid cracking the material during work. Be mindful of the health risk posed by dust generated from ceramic engraving, especially for repetitive industrial applications. Depending on the material and the amount of work, a fan or even full ventilation system may be required to address the problem. Similarly, operators and others in the work area may need to use breathing PPE such as masks and respirators.

4.6.2 Glass

When engraving glass, generally use high power and low speed. As with ceramics, it can be helpful to run more loops at lower settings to avoid cracks. Care must be taken when engraving fiberglass and carbon fiber to avoid combinations of settings that produce a laser intensity great enough to damage the structural integrity of its component fibers, producing blurry marking. PPE should be worn to avoid exposure of the eyes, nose, mouth, and skin to the dust produced by working with either material, especially for repetitive industrial applications. Clothing worn while working with fiberglass should be washed separately afterwards.

4 Operation

4.6.3 Leather

When engraving leather products, generally use low to moderate power at high speed. Be especially attentive to the possibility of fire, as well as the dust produced in repetitive applications.

4.6.4 Metal

CO_2 laser engravers should not be used for marking, engraving, or cutting metal. They are best suited for working coatings applied to a metal base, and care must be taken not to attempt work on the underlying metal itself. A variety of coatings specialized for CO_2 engraving are available, and the user should follow the instructions provided as the parameters vary from product to product and metal to metal. Generally, work on aluminum coatings should be done more quickly at lower power and work on steel coatings can be done more slowly at higher power.

4.6.5 Paper and Cardboard

When engraving various paper products, generally use low to moderate power and fast speed. Test samples from each batch, as only small parameter differences can separate effects that are too light from those that burn through the substrate. As with leather, be especially attentive of the possibility of fire, as well as the dust produced in repetitive applications.

4.6.6 Plastics

Plastics for engraving are available in many different colors and thicknesses and with many different coatings and surfaces. The majority of available plastics can be well engraved and cut with the laser. Plastics with a microporous surface seem to give the best result, because less surface material needs to be removed. When engraving plastics, generally use low power and high speed settings. Marking and engraving with too much power or at too low a speed can concentrate too much energy at the point of contact, causing the plastic to melt. Among other problems, this may produce poor engraving quality, noxious fumes, and even fires. High resolution engraving can cause the same problem, so medium to low resolution designs should be preferred for most plastics.

4.6.7 Rubber

The various compositions and densities of rubber cause slightly varying engraving depth. Testing various settings on sample pieces of your specific rubber is highly recommended for best results. When engraving rubber, generally use a consistent high power setting and create your effects by varying the laser's speed. Microporous rubber materials require a significantly higher speed than standard rubber. Engraving any kind of rubber produces a considerable amount of dust and gas. Depending on the amount of work, breathing PPE and/or a full ventilation system may be required to address the problem.

4.6.8 Stone

When engraving various kinds of stone, generally use moderate power and moderate to fast speed. As with ceramics and glass, be mindful of the dust created (especially for repetitive industrial applications) and take similar measures to ensure the safety of users and others in the work area.

4.6.9 Textiles

When engraving textiles like cloth and fleece, generally use low power and fast speed. As with leather, be especially attentive to the possibility of fire and dust.

4.6.10 Wood

As with rubber, there is a huge variety of woods and testing your specific material is essential to get the best results. In general, wood with consistent grain and coloring engraves more evenly. Knotted wood produces uneven effects, while resinous wood produces greater edge contrast. Some soft woods like balsa, cork, and pine engrave well (albeit with low contrast) at low or moderate power settings and high speed. Others like fir suffer from uneven fibers that usually produce a poor effect no matter what you do. Hard woods like cherry and oak engrave well at high power settings and low speed. Manufactured wood products can vary from brand to brand, mostly based on its glue composition and abundance. MDF works well but creates dark edges when cut.

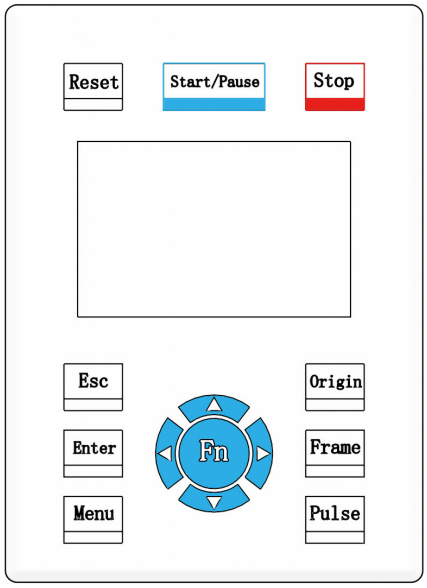
In addition to the risk of fire with any wood product, extra care must be taken with the fumes from the glue used in plywood and other manufactured woods. Some are too dangerous to work with at all, while others require careful ventilation and the use of breathing PPE for repetitive industrial applications. Wood toxicity should also be examined, as the dust from some natural woods including oleander and yew can also cause nausea and cardiac problems in high enough amounts.

4 Operation

4.7 Control Panel Instructions

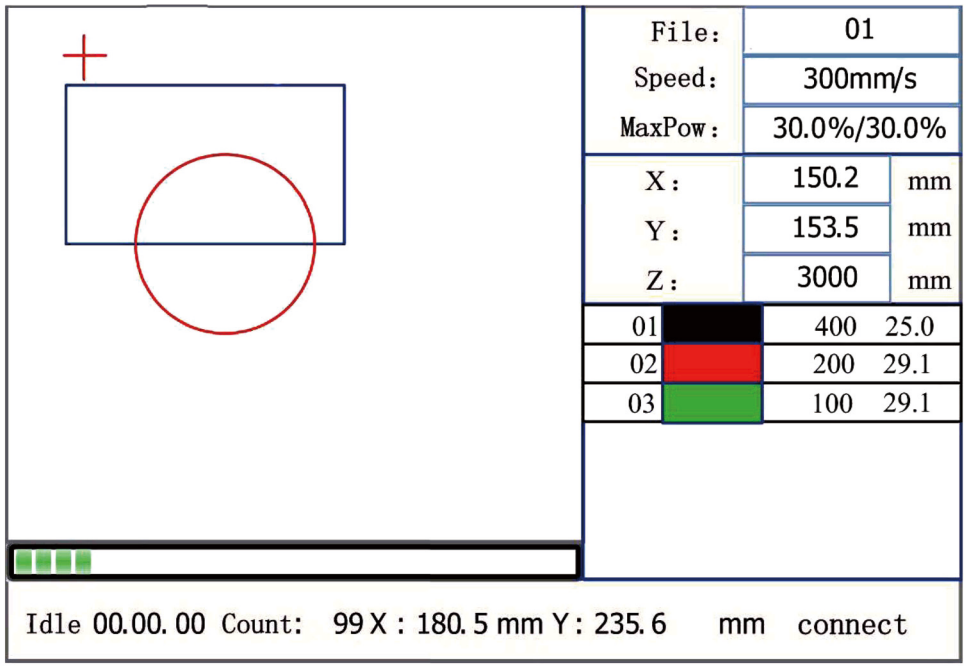
4.7.1 Overview

You can control your engraver directly from the built-in control panel, through a direct connection with your computer, or over the internet. For details on operating your engraving software, see its separate manual. The built-in control panel can operate the laser manually or engrave designs loaded onto flash drives and external hard drives connected to the USB port on the right side of the cabinet.



For manual operation, the arrow keys can be used to move the laser head along the X and Y-axis guide rails and the **Pulse** button can be used to fire the laser. The laser head can be set to tab over a set distance each time the arrow buttons are pressed by hitting **FN** and adjusting the parameters under “Manual Set+”. The laser can be set to fire for a fixed period by pressing **FN** and adjusting the parameters under “Laser Set+”. All of the buttons and menus should be labelled in English. If they are not, press **FN** and go to the top button in the right column to change the console's language settings.

To load a design from a FAT16 or FAT32 formatted flash disk or external hard drive, press **MENU**, select “File”, then “Udisk+” and then “Copy to Memory”. Select the design in the File menu and then select “Run”. Various parameters can be adjusted using the console's menus and submenus, including setting multiple origin points to engrave the design on your material four times in a single session.



When running a design from the control console, this will be the main display. The design should appear in the top left corner and its name and the current speed and power settings on the top right. The position of the laser head relative to the workbed appears as the X (horizontal) and Y (vertical) coordinates. The Z coordinate shows the elevation of the workbed itself. The U coordinate can be configured to control rotary axes or an automatic feed if either is installed. Below them are the layers with notes about their separate speeds in mm/s and their maximum power as a % of your machine's rated power. The batch count on the lower left keeps track of the number of times the current design has been engraved in a single session. Like the button says, press **START/PAUSE** to start engraving your loaded pattern and to pause engraving when needed.

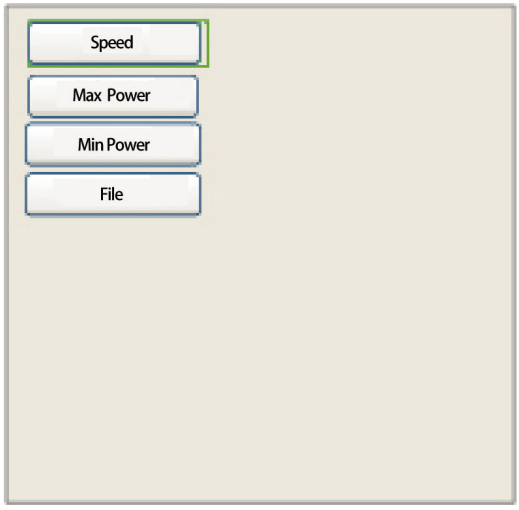
If there is ever an emergency situation such as a fire, do not use the control panel to pause or stop the engraving. Hit the emergency stop button immediately.

4 Operation

4.7.2 Menu Button

Press **MENU** on the main interface to enter the Menu interface:

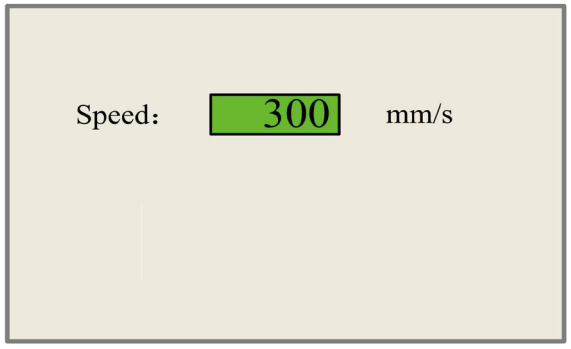
Push the ▲ and ▼ keys to select items, and then press **ENTER** to enter the corresponding submenu.



4.7.3 Setting the Laser Speed

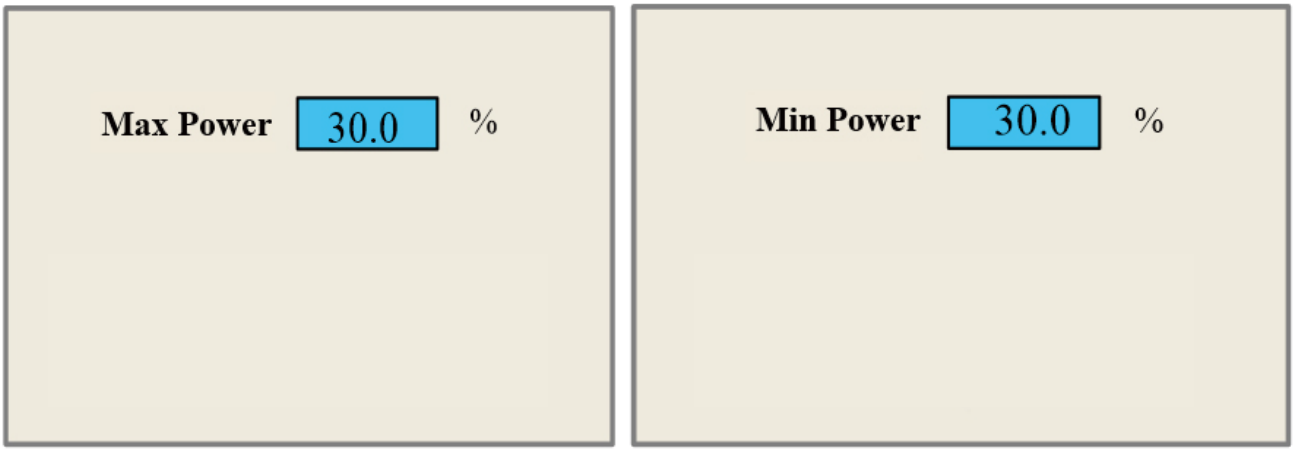
Select “Speed” on the Menu interface, and the following dialogue box will appear:

The cursor will appear when pushing the ◄ and ► keys. Move the cursor to the numeral area and push the ▲ and ▼ keys to change the value. Press **ENTER** to save the change. Press **ESC** to invalidate the change and return to the Menu interface.



4.7.4 Setting the Laser Power

Select “Max Power” or “Min Power” on the Menu interface, and the following dialogue boxes will appear:

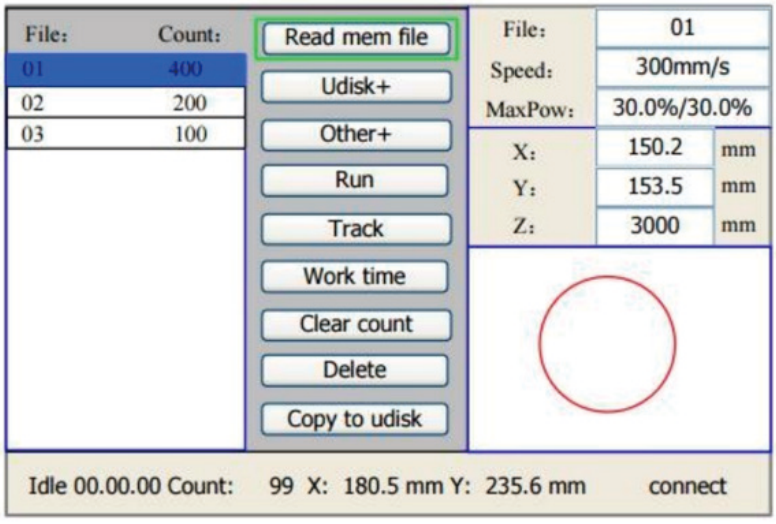


Push the ◄ and ► and ▲ and ▼ keys to change the parameters. See the “Speed” setting for reference.

4 Operation

4.7.5 File Commands

Select “File” on the Menu interface, and the following dialogue box will appear:



When entering the above interface, the system automatically reads the memory files. The file name and the work times will be listed, and the selected file will be previewed in the upper right corner. When there are several files, use the ▲ and ▼ keys to select one file, and its preview will be shown in the upper right corner of the interface. Press **ENTER** to preview the selected file on the main interface. Press **ESC** to close the preview.

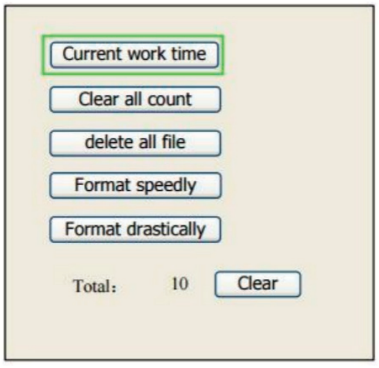
Push the ◄ and ► keys, and the light blue cursor can be moved left and right to switch between the file column in the left and the item column in the middle. If the file is being previewed, the preview will be closed when switching to the item column. When the light blue cursor is on the item column, push the ▲ and ▼ keys to select the item and press **ENTER** to activate the item.

Press **ESC** to return to the main interface.

The item column includes:

- Read Mem File reads the memory file list
- U-Disk reads the file list of an inserted USB flash drive·
- Other Displays other memory files operations
- Run runs the selected file equivalent to pressing Start/Pause.
- Track tracks the selected file
- Work Time forecasts the total running time of the selected file, accurate to 1 ms
- Clear Count clears the count of the selected file
- Delete deletes the selected file from the memory
- Copy to U-Disk copies the selected file to an inserted USB flash drive

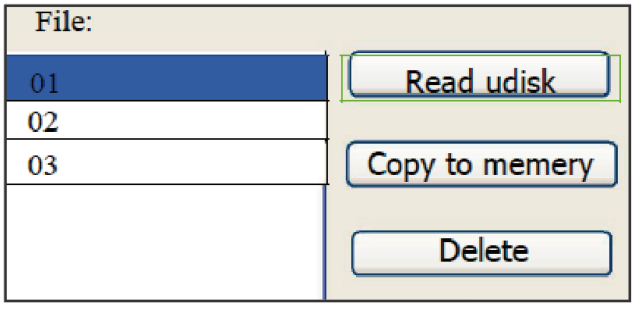
Select "Other" and press **ENTER**, and the following dialogue box will pop up:



- Current Work Time forecasts the running time of the current file
- Clear All Count clears the count of every file in the memory
- Delete All Files deletes all files from memory
- Format Speedily deleted all files from memory and returns to default settings.
- Format Drastically formats memory, after which all files will be deleted
- Total displays the total count of all the files

4.7.6 Flash Drive Commands

Select “U-disk” on the File interface and press **ENTER**, and the following dialogue box will appear:



The operation method is the same as that of files in memory. Press **ESC** to return to the File interface.

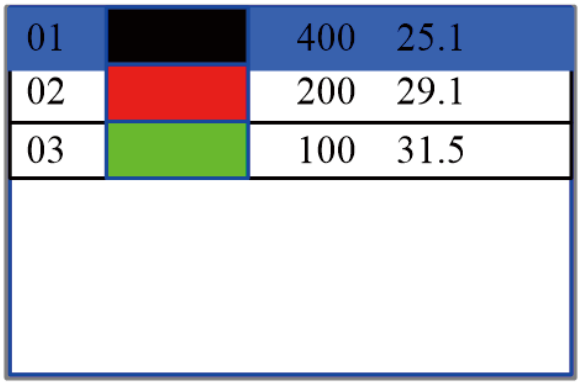
- Read U-disk reads the file list of an inserted USB flash drive
- Copy to memory copies the target file to memory.
- Delete deletes the selected file from the USB flash drive

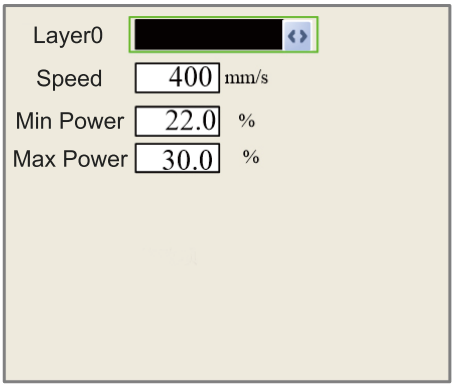
The system supports file formats such as FAT16 and FAT32, but files can only be identified when placed under the root directory. File names with more than 8 characters will be automatically cut short. File names containing things other than English characters and numbers cannot be shown when copied to the mainboard. Files copied from the mainboard to the flash drive will be placed in its root directory.

4 Operation

4.7.7 Adjusting Engraving Layers

When the system is idle or the work is finished, press **ENTER** to enter the layer parameter section. Push the ▲ and ▼ keys to select the intended layer. Press **ENTER** to check the selected layer's parameters as shown below:

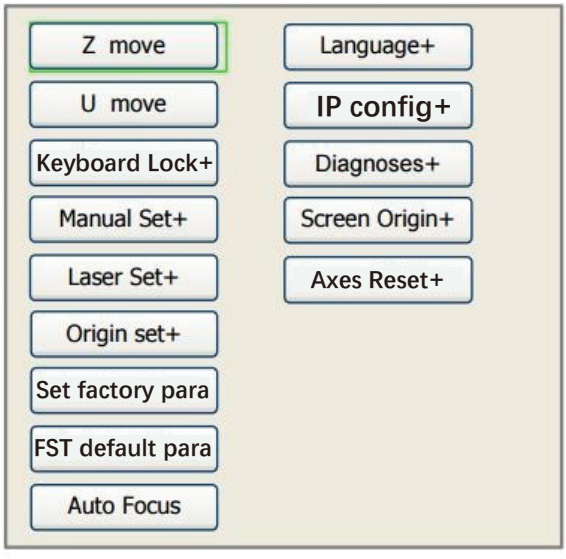




The light blue cursor will be on "Layer" by default. Push the ◄ and ► keys to select the intended layer. Press **FN** to move the light blue block to the intended parameter. Press **ENTER** to save the parameter changes. Otherwise, changes will not be saved. The operation method is the same as that of the max/min power setting.

4.7.8 Function Menu

Press **FN** on the main interface to enter the following menu:



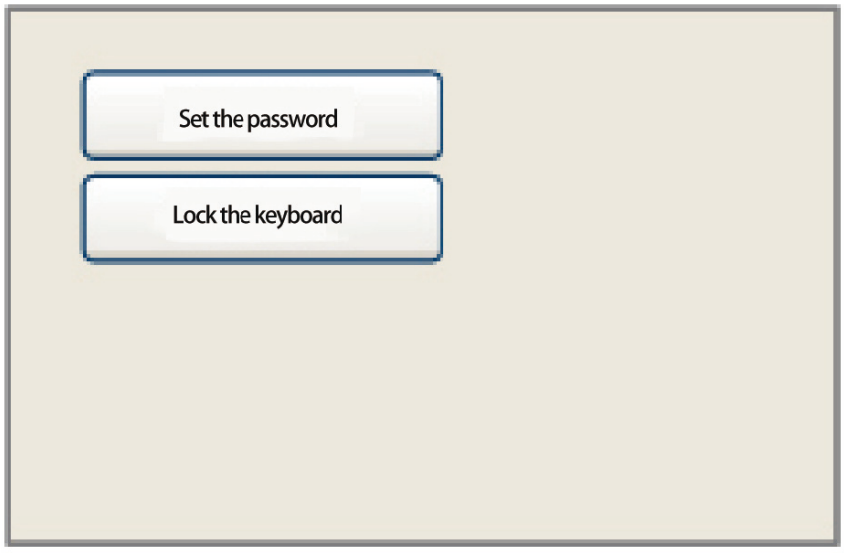
Push the ▲ and ▼ keys to move the light blue cursor to the intended entry, and press **ENTER** to enter the corresponding submenu.

4.7.9 Adjusting the Z Axis

When the light blue cursor is on “Z move”, push the ◄ and ► keys to control the movement of the Z-axis.

4.7.10 Setting an Interface Password

When the light blue cursor is on this item, press **ENTER**, and the following dialogue box will pop up:

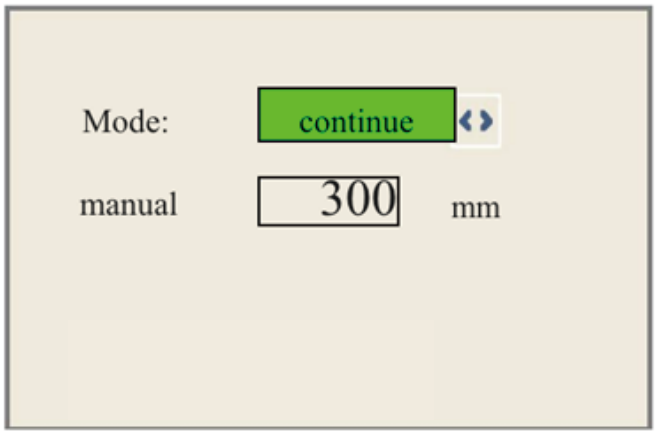


Push the ▲ and ▼ keys to select items. When the light blue cursor is on the intended item, press **ENTER** to enter the corresponding interface. See §4.7.14 Saving Current Parameters and Virtual Keyboard Use on Page 63 for details on the keyboard interface.

4 Operation

4.7.11 Manual Movement of the Laser Head

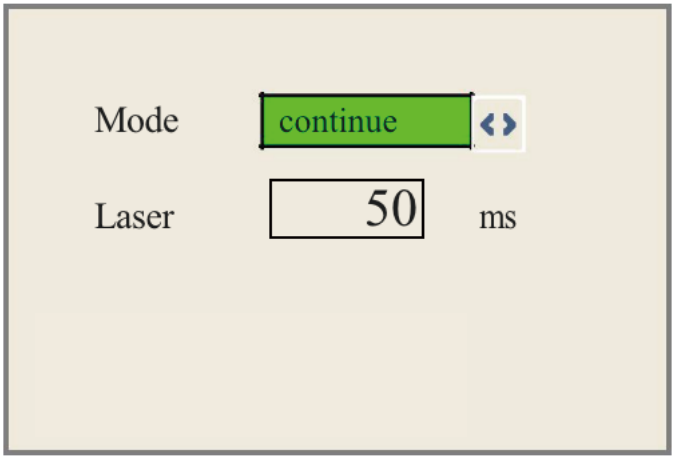
When the light blue cursor is on “Manual Set+”, press **ENTER**, and the following dialogue box will pop up:



When the light blue cursor is on “Mode”, push the ◄ and ► keys to choose between the two modes “Continue” and “Manual”. Push **FN** to move the cursor. When the cursor is on the “Manual” item, push the ▲ and ▼ and ◄ and ► keys to change the parameters. When the “Continue” mode is selected, the “Manual” item will not be valid. In this case, press down the direction keys to move the corresponding axes, and release the keys to stop the moving. When it is in “Manual” mode, push the direction key and the corresponding axes will move a fixed length as set by the users with each push (unless the scope is overstepped).

4.7.12 Manual Firing of the Laser

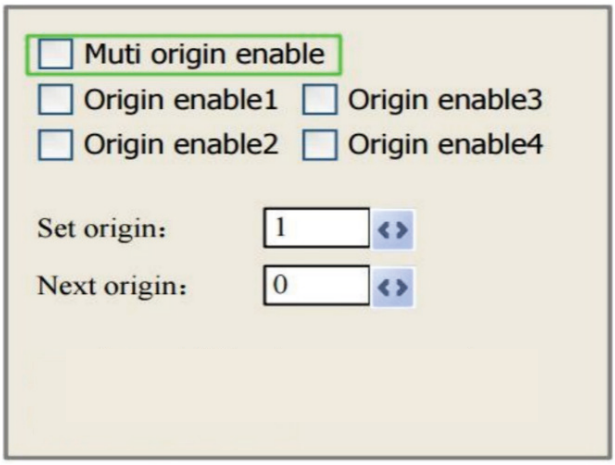
When the light blue cursor is on “Laser Set+”, press **ENTER**, and the following dialogue box will pop up:



The operation method is the same as that of the manual set. When “Continue” mode is selected, press down **Pulse** to fire the enabled lasers, and release **Pulse** to finish firing. When “Manual” mode is selected, push **Pulse**, and the laser will fire for a fixed period of time as set by the users with each push.

4.7.13 Setting Origin Points

When the light blue cursor is on “Origin Set+”, press **ENTER**, and the following dialogue box will pop up:



Press **FN** to move the light blue cursor to an item and press **ENTER** to enable or disable the item. When enabled, the small box will be red and, when disabled, the small box will be gray. When the light blue cursor is on the “Set origin” item or the “Next origin” item, push the ◄ and ► keys to change the value. When changing the parameters of “Set origin”, remember to press **ENTER** to validate the change. Parameters will be saved automatically when the interface is closed.

Multiple Origins Enable: “Yes” or “No” can be selected. If you select “No”, the system will use single-origin logic. If you press Origin and set the origin, only this origin will be used. If you select “Yes”, the system will use multiple-origin logic and Origin is disabled. In this case, the parameter of each origin must be set in the menu.

Set Origin 1/2/3/4: After multiple-origin logic is enabled, put the cursor on “Set as Origin 1/2/3/4”. Press **ENTER** on the keyboard and the system will take the coordinates as the corresponding origin.

Next Origin: Users can choose from 0–4, which represent the origin to be used for the next figure. Origin 0 refers to the origin set by Origin under single-origin logic. 1–4 represent the origins under multiple-origin logic.

The next origin can be chosen from origin 1–4 so as to control the starting point of the next job provided that the origin is enabled. However, it cannot be changed to origin 0. The next origin will always be Origin 0 under single-origin logic.

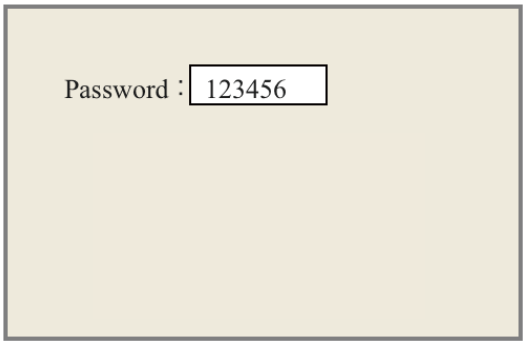
Origin Enable 1/2/3/4: After multiple-origin logic is enabled, the four origins can also be individually disabled and enabled.

Once multiple-origin logic is selected, if the number of the next origin is 1 and four origins are enabled, when the memory file function is started (via the keyboard or PC) or the processing file is uploaded into the PC and this file selects “Take the Original Origin as the Origin”, the work will use different origins each time it starts. The rotation order of origins is 1→2→3→4→1→2…If the processing file is uploaded to the PC and this file selects “Take the Current Origin as the Origin”, the system will always use the current origin.

4 Operation

4.7.14 Saving Current Parameters and Virtual Keyboard Use

When the light blue cursor is on the “Set factory para” item, press **ENTER**, and the following dialogue box will pop up:



The password consists of six characters. Push the ▲ and ▼ and ◄ and ► keys to select each character, and press **ENTER** to confirm each selection. If the password is wrong, “password error” will pop up and you need to reenter the password. If the password is correct, the system will set all current parameters as factory parameters, and “factory parameters have been successfully set” will appear on the screen.

Before a machine leaves the factory, this function is used to store the preset parameters, which later can be restored by users at any time.

4.7.15 Loading Saved Parameter

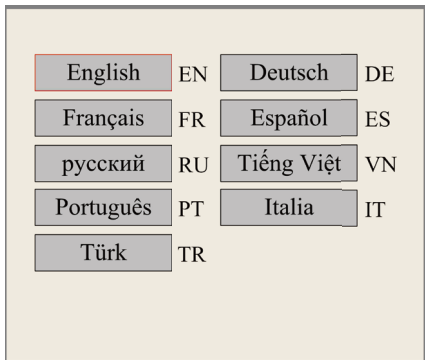
When “FST default para” is selected, the system will replace all current parameters with the default factory parameters. The operation method is the same as setting the factory parameters.

4.7.16 Autofocus

When the light blue cursor stops on “Auto Focus”, press **ENTER** to automatically focus the laser lens.

4.7.17 Setting the Interface Language

When the light blue cursor is on this item, press **ENTER**, and the following dialogue box will pop up:

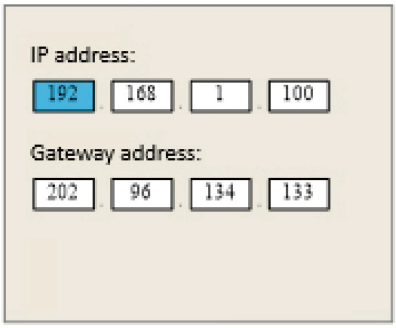


The operation method is the same as described above.

Press **ENTER** when one language is selected, and then return to the main interface.

4.7.18 Setting the Machine's IP Address

When the light blue cursor is on this item, press **ENTER**, and the following dialogue box will pop up:

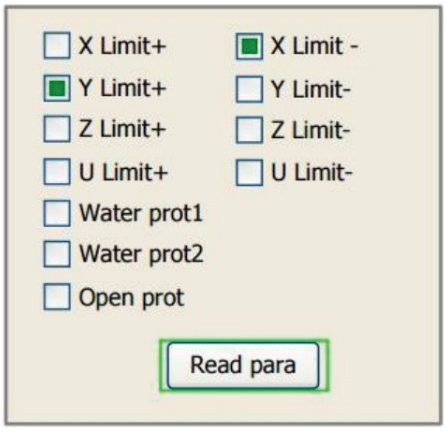


Press **FN** to move the light blue cursor to the intended item, and push the ▲ and ▼ and ◄ and ► keys to change the parameters. Press **ENTER** to save the changes or **ESC** to discard changes and return to the previous menu.

4 Operation

4.7.19 Diagnostic Tools

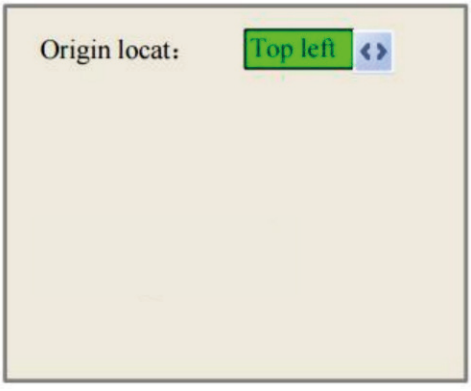
When the light blue cursor is on this item, press **ENTER**, and the following dialogue box will pop up:



This interface contains input/output information of the system's hardware. Press the "Read Para" button to access hardware information. When the hardware signal is triggered, the small box to the left of the corresponding item will be displayed in green. Otherwise, it will be gray. Press **ESC** to return to the previous menu.

4.7.20 Reflecting Images across an Axis

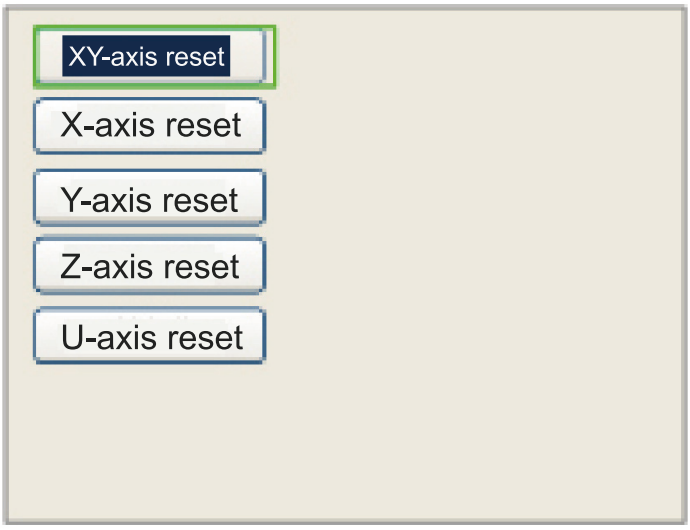
When the light blue cursor is on this item, press **ENTER**, and the following dialogue box will pop up:



This interface shows the position of the origin. Different origin positions can generate different reflections of the graph over the X/Y axis. The operation method is the same as described above.

4.7.21 Resetting Axes

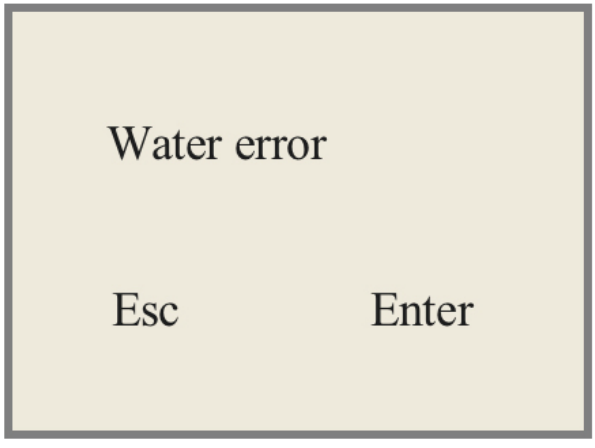
When the green block is on this item, press **ENTER**, and the following dialogue box will pop up:



Push the ▲ and ▼ keys to move the light blue block to the intended item. Press **ENTER** to start the resetting of the selected axis. The message “resetting is underway” will show on the screen. Upon resetting, the message will automatically disappear and the system will return to the main interface.

4.7.22 Alarm Displays

During the operation of the system or the running of the machine, some alarm information may pop up if there is a water protection error etc. For example, the water protection alarm may pop up as shown below:



Correct the problem displayed and then select either “Enter” or “Esc” to exit.

5 Maintenance

5.1 Maintenance Overview

- The use of procedures other than those specified herein may result in hazardous laser radiation exposure.
- Before any cleaning or maintenance work, always switch off the device and disconnect it from its power supply.
- Always keep the system clean, as flammable debris in the working and exhaust areas constitutes a fire hazard.
- **ONLY** allow trained and skilled professionals to modify or disassemble this device.

- Clean and cool water must be provided to the system at all times.
- The working table must be cleaned on a daily basis.
- the 3rd mirror and the focus lens must be checked every day and cleaned if required.
- The other mirrors, exhaust system, and air assist intake filter must be checked every week and cleaned if required.
- The beam alignment should be checked weekly.
- The wiring should be checked every week for loose connections, especially the wiring for the laser tube power supply.
- The guide rails should be cleaned and lubricated at least twice a month.
- The air assist must be checked every month and cleaned if required.
- The whole laser machine including the other components such as the water cooling system must be checked every month and cleaned where required.

5.2 Cleaning

5.2.1 Cleaning the Water Cooling System

NEVER touch or adjust your engraver's water supply while the pump is still connected to power.

Because distilled water can leach chemicals from your tank and/or hoses and spread these possibly corrosive particles to the laser tube, change your water each week regardless of its level or clarity to maximize your laser's service life.

While changing the water, clean the tank and pump completely to minimize any buildup of residue or chemicals.

1. Turn off the laser engraver and unplug the pump.
2. Open the water tank, remove the pump, and clean both.
3. Disconnect the pump's hose, allowing it to drain, and clean it if needed.
4. Reconnect the hose and replace the pump inside the tank.
5. Add your new water to the tank.
6. Plug the pump in again and allow it to run for 2–3 minutes to restore the water throughout the engraver's cooling system.

Before starting the laser, visually confirm water is running through the laser tube without bubbles and check the water temperature.

5 Maintenance

5.2.2 Cleaning the Main Bay and Engraver

Cleaning Frequency: Daily, after each use

- Disconnect the engraver from power before cleaning.
- Completely wipe dry the surfaces after cleaning.
- **NEVER** allow water to come into contact with the electronic elements.

Depending on what you've been engraving, you might need to clean the engraver more or less often. However, we suggest cleaning it after each use for the best results.

Tools Needed:

- Paper towel
- Mild detergent

Viewing Window

Clean with mild cleansers and a lens or cotton cloth. **DO NOT** use paper towels as they can scratch the acrylic and reduce the cover's ability to protect you from laser radiation.

Main Bay Interior

Clean thoroughly with paper towels, removing any debris or deposits.

Debris Tray

1. Open the front access door (using the key if you have locked it).
2. Take out the debris tray.
3. Empty loose waste, rinse dust and fine debris off and dry it.
4. Replace the debris tray.

Other Surfaces

Dust the other surfaces with a soft cloth or clean them using a mild detergent and then wipe clean before further use.

5.2.3 Cleaning the Focus Lens

The lens has a durable coating and won't be damaged by correct and careful cleaning. If not clean, your laser will be less efficient and heat buildup on the oil or dust itself can damage the lens.

Cleaning Frequency: Daily, after each use

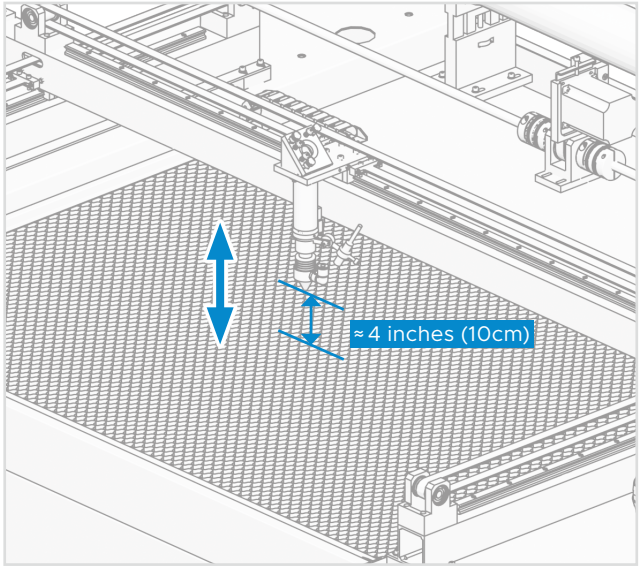
Tools Needed:

- Lens-cleaning liquid
- Lens tissue or cloth
- The focus lens repair tool (J)

- Disconnect the engraver from power before cleaning.
- Completely wipe dry the surfaces after cleaning.
- **NEVER** allow water to come into contact with the electronic elements.
- Be careful in all of the following steps not to directly touch the lens surface with your hands or any dirty, oily, or abrasive surface. Use lens-safe gloves or cloths only.

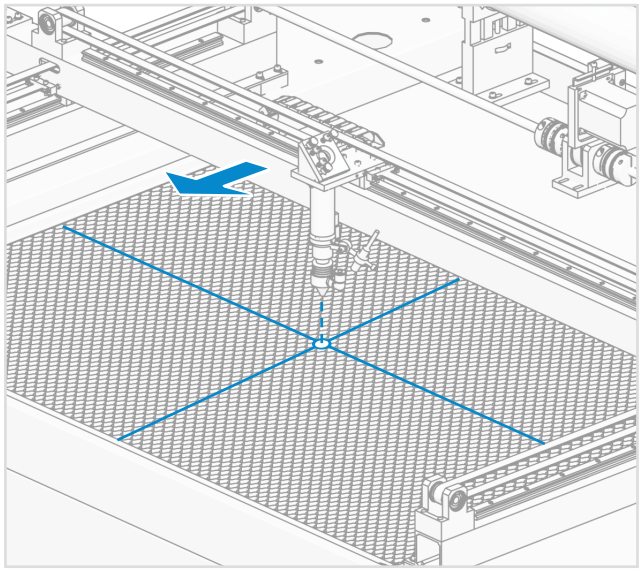
Detaching the Focus Lens

1. Move the engraving table to a distance of approximately 4 inches (10 cm) under the lens holder.

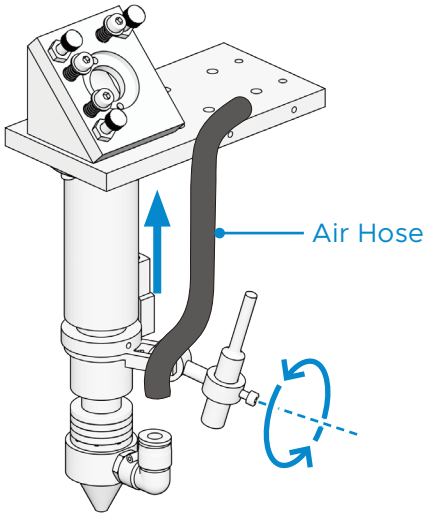


5 Maintenance

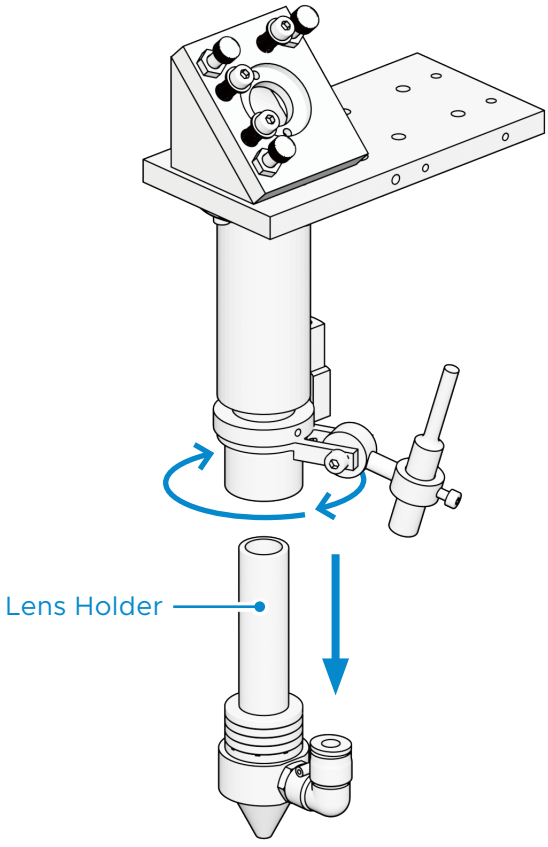
2. Move the laser head into the center of the workbed and put a cloth under the lens holder so that the lens will not be damaged if it accidentally falls from its holder.



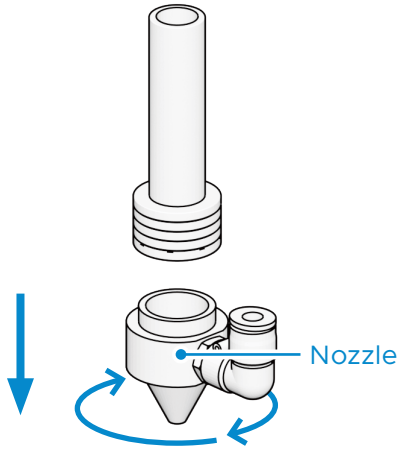
3. Remove the pressurized air hose by pulling it out.
4. Remove the red laser by detaching its bolt.



5. Take out the lens holder by rotation.

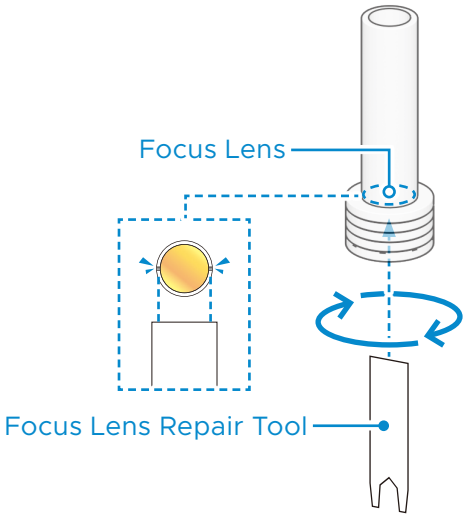


6. Remove the nozzle by rotating it toward you.



5 Maintenance

7. Remove the lens from the lens holder by using the lens removal tool (16) and letting the lens and its O-ring drop onto the cleaning cloth.



Cleaning the Focus Lens and Its O-Ring

1. Examine the lens surface, remove coarse dust as well as possible by blowing air onto the lens surface and, if necessary, clean it with the lens cleaning liquid and lens tissue or cloth as below.
   a. Put the lens on a clean lens-cleaning tissue.
   b. Put some lens-cleaning liquid on one side of the lens.
   c. Leave the liquid to take effect for approximately one minute.
   d. Gently wipe the liquid away with lens-cleaning tissues soaked with lens-cleaning liquid.
   e. Dry this side of the lens with dry lens-cleaning tissues/cloth.
2. Repeat the same cleaning process on the other side of the lens.

> **NEVER** use a cleaning tissue twice. Dust accumulated in the cleaning tissue could scratch the lens surface.

3. Examine the O-ring and, if necessary, clean it with a cotton bud and a lens-cleaning tissue or cloth.
4. Examine the O-ring and lens to ensure they are clean. If any dirt remains, repeat the cleaning process until both are thoroughly clean.

> Do not touch the surface of the lens after cleaning.

Reattaching the Focus Lens

1. Carefully insert the lens into the lens holder, ensuring that its rounded convex side is facing upwards.
2. Put the O-ring on top of the lens.
3. Carefully reassemble nozzle, the lens holder, the red dot pointer and the air hose in reverse order.

5 Maintenance

5.2.4 Cleaning the Mirrors

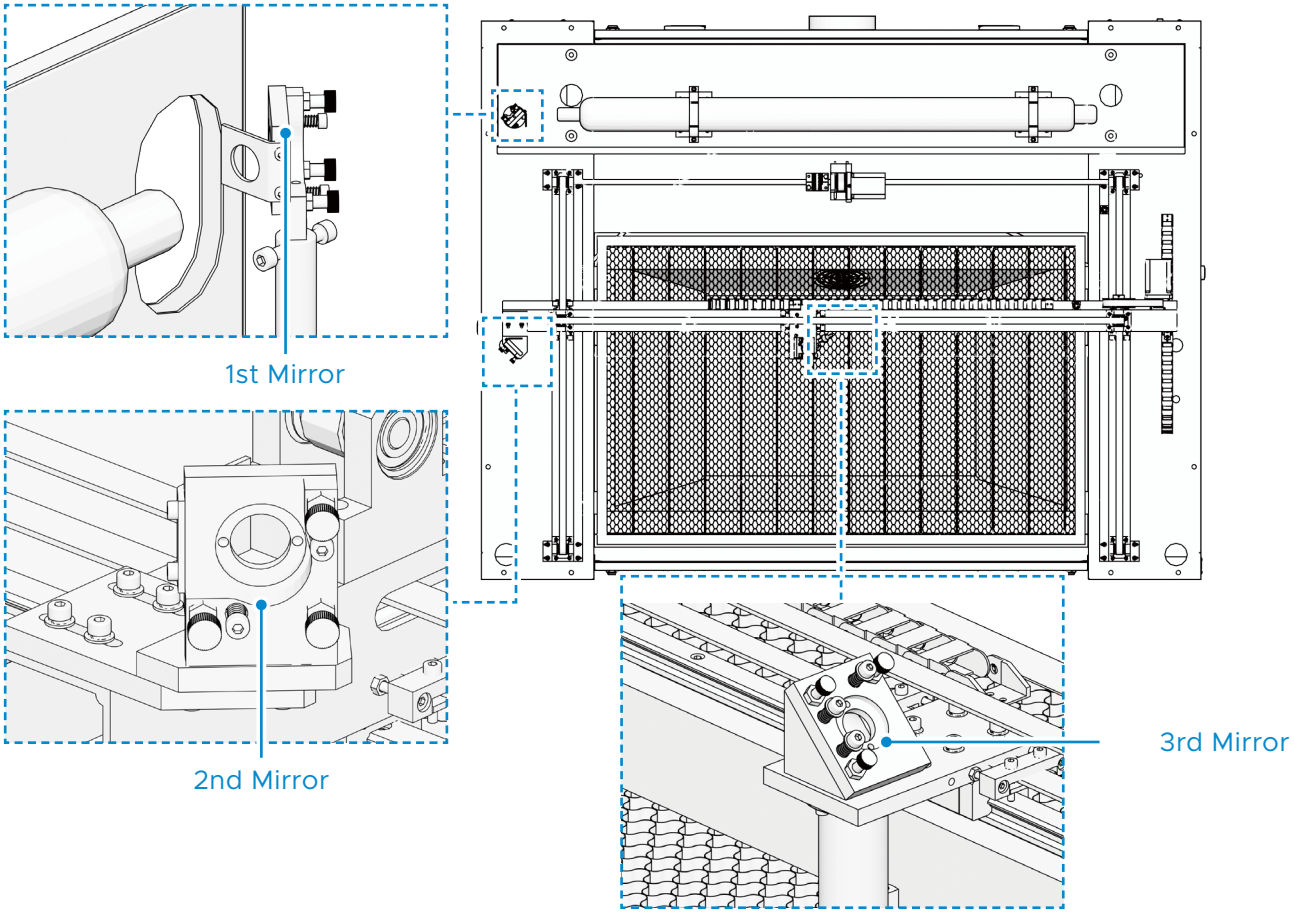
The mirrors should be similarly cleaned if there is any debris or haze on their surface. Otherwise, your laser will be less efficient and could have permanent damage on the mirrors.

Cleaning Frequency: Once a week, after each use

Tools Needed:

- Lens-cleaning liquid
- Lens tissue or cloth

This machine has 3 mirrors used during working, for their locations and cleaning methods, see below:



<table>
<tr><th>Mirror Name</th><th>Mirror Location</th><th>Cleaning Method</th></tr>
<tr><td>1st Mirror</td><td>In the back left of the machine beyond the far end of the Y axis</td><td rowspan="4">• Avoid press hard enough to grind any debris or cause scratching.
• The semitransparent mirror at the end of the laser tube should only be cleaned when the engraver is fully disconnected from power and the tube is fully cooled.
• Take care not to touch the surface of any mirror directly.

Clean with lens-cleaning tissue or with cotton wetted with lens-cleaning liquid or isopropyl alcohol in gentle circular motions.

The 3 positioning mirrors can be cleaned in place or removed for cleaning by turning them counterclockwise.

If any mirrors are removed for cleaning, reinstall them by turning them into place clockwise carefully.</td></tr>
<tr><td>Beam Combiner Lens</td><td>The end of the laser tube closest to 1st Mirror</td></tr>
<tr><td>2nd Mirror</td><td>On the Y axis at the left end of the X axis</td></tr>
<tr><td>3rd mirror</td><td>On top of the laser head on the X axis</td></tr>
</table>

5.2.5 Cleaning the Exhaust System

Check and clean the exhaust pipes and fans. The rate of dust accumulation on the exhaust fan and pipe will vary depending on the materials processed and the working environment's air quality.

Cleaning Frequency: Weekly

Tools Needed:

- Dust brush
- Mild cleanser
- Vacuum
- Soft cloth
- Water
- Caulk

- Disconnect the engraver from power before cleaning.
- Allow the fluid used for cleaning to dry completely before reusing.

1. Check the exhaust fan and surrounding pipes for excessive accumulation of dust and debris.
   a. Use a brush, vacuum, or compressed air to remove large accumulation of dust and debris.
   b. Use mild cleansers and soft rags or paper towels to fully clean the fan and its blades.
2. Check the seams and joints of the pipes for any damage or leaks. If any found, immediately repair them. Caulk or special-purpose aluminum foil tape generally works best if available; standard duct tape can deteriorate over time, especially near heated components.

5 Maintenance

5.3 Water Cooling System

NEVER touch or adjust your engraver's water supply while the pump is still connected to power.

Always fill the water tank with deionized or distilled water or a custom-purpose laser-safe antifreeze. Using tap water for any purpose but rinsing out cleansers (see §5.2.2 Cleaning the Cooling System above) will gradually degrade the quality of your engraver and may even cause dangerous mineral buildup within the cooling system. Never use generic antifreeze for the same reason.

Always make sure the water cooling system is in good conditions by doing the following checks:

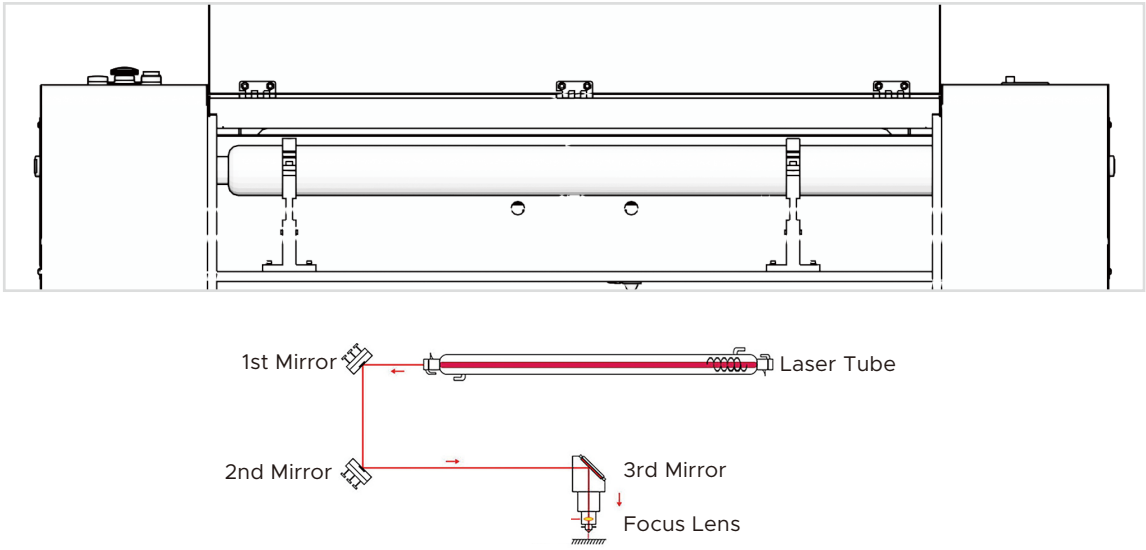
- The laser tube requires cool and clean distilled water to avoid overheating. Tepid water at room temperature or a little below is ideal.
- The laser tube requires at least 2 gallons (7.5 L) of cool and clean distilled water or other lasersafe coolant to avoid overheating. Check that the tank is at least 2 gallons (7.5 L) of water before and after each use.
- If the temperature of the water ever approaches 100°F (38°C), discontinue work until it has cooled or find a way to reduce its temperature without interrupting the supply of water to the laser tube. The water should never be allowed to become too cold either, which could also cause the glass laser tube to shatter during use. During winter or if ice is used to cool hot water, ensure the temperature never falls below 50°F (10°C).
- More water should be added every few days to ensure evaporation does not cause the pump to become exposed during use
- Ensure that the temperature of the cooling water does not fall below the dew point of the surrounding air to prevent condensation. Here are some tips to prevent condensation:
  - ✧ Use a hygrometer to monitor the temperature and humidity levels in the environment.
  - ✧ If possible, increase the ambient temperature to be lower than the temperature of the cooling water.
  - ✧ Lower the relative humidity of the room, for instance, by using a dehumidifier.
  - ✧ Insulate the cooling water pipes to reduce the likelihood of their surfaces falling below the dew point.
  - ✧ Regularly check the cooling system to ensure it is operating at optimal conditions.

Adjust the above measures appropriately according to your specific environment and equipment requirements.

5.4 Laser Path Alignment

Having a perfectly aligned laser path is paramount to your engraver's overall performance. Each of the pro-line series went through a complete beam alignment before shipping. Upon first arrival and about once a week during normal operation, however, it is recommended that the alignment be checked. Refer to the diagram below for the basics of the alignment.

This machine went through a complete beam alignment before shipping. However, when the engraver first arrives and about once a week during normal operation, it is recommended that users confirm that alignment is still at acceptable levels and that the mirrors and focus lens have not shifted due to the movement of the machine. Refer to the diagram below for the basics of the alignment



The normal alignment procedures are as below:

Performing a beam alignment can expose the operator to small amounts of radiation if performed carelessly. Follow these procedures correctly and always take caution when performing a beam alignment.

5 Maintenance

1. Place a piece of tape at each stage of the laser path. **DO NOT** place the tape directly onto the mirror.
2. Turn on the machine.
3. Set the Max. Power (not Min.) parameter to 15% or lower. Any higher percentage will cause the laser to ignite the testing tape instead of marking it.
4. Press **Pulse** to manually fire the laser and confirm that the stages remain correctly aligned.

   When it is not, use the laser tube's brackets or the setscrews on the back of the misaligned mirror to correct the problem.

Once the provided tape runs out, we recommend masking tape as it is easy to manage and use.

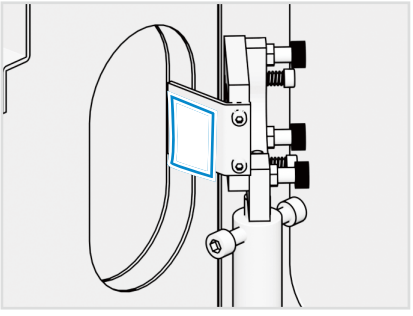
5.4.1 Laser Tube Alignment

The laser tube is where the laser beam is generated. Once emitted from the tube, the laser hits the 1st mirror first. Follow the steps below to check the laser hits the 1st mirror right in the center.

- Wear safety goggles during the entire aligning process.
- Avoid attaching the tape directly to any of the mirrors.
- Less than 15% of the maximum power (not Min.) should be sufficient to leave a clear mark without setting the testing tape on fire.
- Always make sure the path is clear between the laser and its target. Never allow foreign objects between the laser and its target. Always close the cover before firing the laser. Do not look directly at the active laser through the cover during this procedure.

To test the alignment of the laser tube with the 1st Mirror:

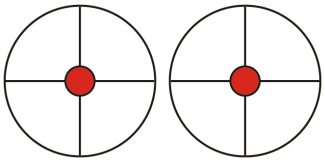
1. Cut out a piece of masking tape and place it on the mirror's frame. **DO NOT** place the tape directly onto the mirror.
2. Turn on the machine.
3. Set the Max. Power (not Min.) parameter to 15% or lower.



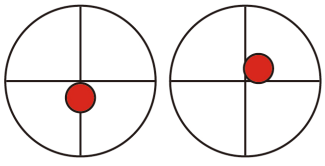
4. Press **Pulse** to manually fire the laser and observe if the laser mark is centered on the tape as below. If so, then the laser tube is aligned with the 1st Mirror; if not, continue to step 5.

You should be able to see a small mark on the tape. If it is not noticeable, press **Pulse** again.

Pressing **Pulse** activates the laser. Always make sure the path is clear between the laser and its target. Never allow foreign objects between the laser and its target. Take care not to leave any part of your body in the laser path while pressing the **Pulse** button.

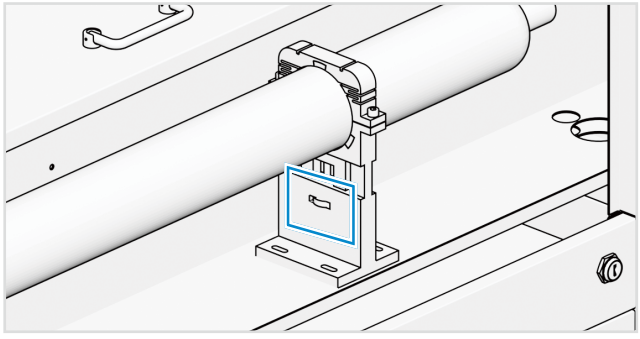


These marks are OK.



These marks require adjustment.

5. Cut the power to your laser.
6. Loosen the setscrews on its stand to adjust the laser tube in its brackets. Be careful not to over-loosen the setscrews and not to overtighten them. Only adjust one stand at a time.



7. Repeat steps 1, 2, 4, 5, and 6 until the burnt hole is at the perfect center of the masking tape.
8. Retighten the setscrews.

5 Maintenance

5.4.2 1st Mirror Alignment

- Wear safety goggles during the entire aligning process.
- Avoid attaching the tape directly to any of the mirrors.
- Less than 15% of the maximum power (not Min.) should be sufficient to leave a clear mark without setting the testing tape on fire.
- Always make sure the path is clear between the laser and its target. Never allow foreign objects between the laser and its target. Always close the cover before firing the laser. Do not look directly at the active laser through the cover during this procedure.

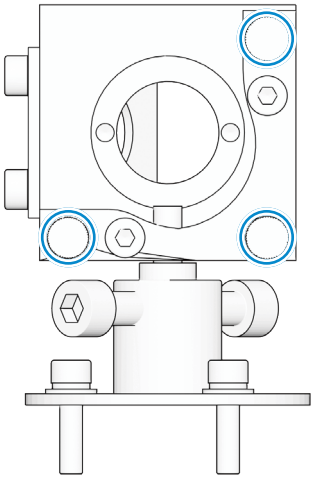
After ensuring the laser is well aligned between the laser tube and the 1st Mirror, check the alignment between the 1st mirror and the 2nd mirror.

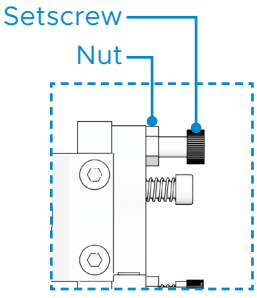
1. Use the direction arrows on the control panel to send the 2nd mirror to the back of the bed along the Y axis.
2. Place a piece of masking tape on the 2nd mirror's frame.

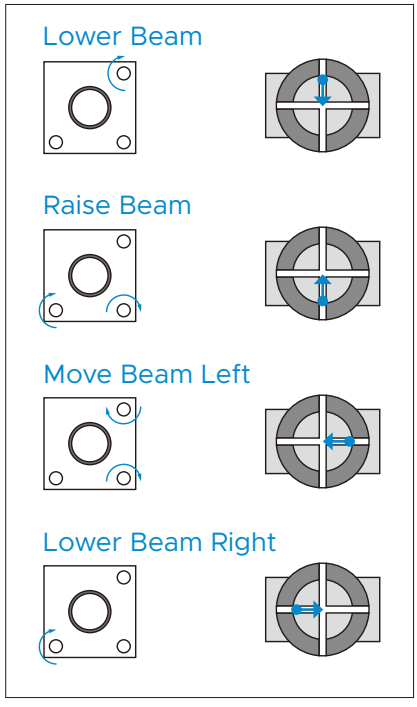
DO NOT place the tape directly onto the mirror.

3. Press **Pulse** to manually fire the laser and observe if the burnt hole is at the center of the masking tape on the 2nd mirror. If so, the 1st mirror and the 2nd mirror are aligned; if not, continue to step 4.

4. Adjust the 1st mirror's set setscrews accordingly.
    a. Loosen the nut on the setscrew.
    b. Slightly turn the setscrew either clockwise or counterclockwise.







- Each screw adjusts a different position or angle.
- Keep track of which screw you are adjusting and the direction of adjustment.
- Do not turn the screw more than ¼ turn at a time and, especially at first, test the position of the laser after each adjustment so that you learn the effect of each change.

5. Use the direction arrows on the control panel to send the 2nd mirror to the front of the bed along the Y axis.
6. Repeat steps 2, 3 and 4 until the beam is well aligned.
7. Retighten the nuts on the setscrews.

5 Maintenance

5.4.3 2nd Mirror Alignment

After ensuring the laser is well aligned between the 1st mirror and the 2nd mirror, check the alignment between the 2nd mirror and the 3rd mirror.

1. Use the direction arrows on the control panel to send the 3rd mirror to the left of the bed along the X axis.
2. Place a piece of tape on the 3rd mirror's frame.

DO NOT place the tape directly onto the mirror.

3. Press **Pulse** to manually fire the laser and observe if the laser is at the center of the masking tape on the 3rd mirror. If so, the 2nd mirror and the 3rd mirror are aligned; if not, continue to step 4.
4. Adjust the 2nd mirror's set setscrews accordingly as in §5.4.2 1st Mirror Alignment on Page 81.
5. Use the direction arrows on the control panel to send the 3rd mirror to the right of the bed along the X axis.
6. Repeat steps 2, 3 and 4 until the beam is well aligned.
7. Retighten the nuts on the setscrews.

5.4.4 3rd Mirror Alignment

- Wear safety goggles during the entire aligning process.
- Avoid attaching the tape directly to the mirror.
- Less than 15% of the maximum power (not Min.) should be sufficient to leave a clear mark without setting the testing tape on fire.
- Always make sure the path is clear between the laser and its target. Never allow foreign objects between the laser and its target. Always close the cover before firing the laser. Do not look directly at the active laser through the cover during this procedure.

After ensuring the laser is well aligned between the 2nd mirror and the 3rd mirror, check the alignment between the 3rd mirror and the workbed.

1. Unplug the air assist hose from the laser head.
2. Place a piece of masking tape across the bottom of the laser head and press it onto the nozzle with some force. This will leave a ring mark that can help you check the accuracy.
3. Lay the tape right under the laser aperture and on top of the laserable scrap.
4. Press **Pulse** to manually fire the laser. You should be able to see a small mark on the tape. If it is not noticeable, press **Pulse** again.

   If the burnt hole is at the center of the masking tape, the 3rd mirror and the workbed are aligned; if not, continue to step 4.
5. Adjust the 3rd mirror's setscrews accordingly as in §5.4.2 1st Mirror Alignment on Page 81.
6. Repeat steps 2, 3, and 4 until the hole is at the center of the masking tape.
7. Retighten the nuts on the setscrews.

5 Maintenance

5.5 Lubrication

5.5.1 Rails

Lubrication Frequency: Every two weeks

Tools Needed:

- Cotton cloth
- White lithium grease

1. Disconnect the engraver from power.
2. Gently move the laser head out of the way.
3. Wipe away all dust and debris along the X and Y axis rails with a dry cotton cloth until they are shiny and clean. Do the same to the Z axis screws.
4. Lubricate both the rails and screws with white lithium grease.
5. Gently move the laser head and X axis to coat the lubricant evenly along both rails.
6. Raise and lower the workbed to distribute the lubricant evenly along the screws.

5.5.2 Workbed Elevation Bolts

Lubrication Frequency: Every two weeks

Tools Needed:

- Cotton cloth
- White lithium grease

KEEP YOUR HAND CLEAR OF THE MOVING WORKBED WHILE APPLYING GREASE.

1. Disconnect the engraver from power.
2. Open the bottom access door in the front and back to access the ball screws.
3. Clean any contaminated grease off the ball screws using a piece of cloth.
4. Apply some new lithium grease at the middle of the ball screws.
5. Move the workbed along its full stroke of motion along the ball screws to distribute the lubricant evenly along the ball screws.

5.6 Parts Replacement

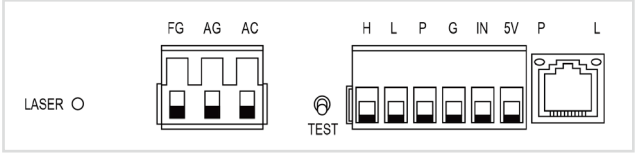
- **ALWAYS** completely disconnect the engraver from its power supply before replacing any parts.
- Take special care when replacing the laser tube or its power supply, as both have extremely high voltage connections.

The engraver should not be modified or disassembled by anyone except trained and skilled professionals, but some consumable parts may require replacement after prolonged use. Be sure only to use identical or compatible replacement parts with this engraver. Contact your vendor or our technicians if you have any questions about fitment. Using incompatible components is highly dangerous and waives all the manufacturer's liability for any damage or injury caused.

Laser Power Supply

If you need to replace the laser power supply, contact our customer service for instructions.

The detailed introductions of the laser power supply are as follows:



FG: Ground Wire for the Mains and Case

AC_1: Neutral Wire to the Main Power

AC_2: Live Input from the Main Power

H: Connection for Active-High Devices

L: Connection for Active-Low Devices (like this machine)

P: Line to the Trigger, Water, & Other Systems (like the door switch)

G: Ground Wire for the Control System, PWM Level Shifters, Potentiometers, &c.

IN: Input Power for PWM Level Shifters or Potentiometers

5V: 5V Connection for Digital Signals

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SH-G1060 | 100W | CO_2 Cabinet Laser Engraver

User Manual

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