V20240531

PRO 3655
Cabinet Laser Engraver
User Manual

Read Carefully Before Use
Keep for Future Reference

omtech

Preface

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.

Contact Us

Thank you for choosing our laser equipment for your home or shop! For a .pdf copy of the latest version of this manual, use the appropriate app on your smartphone or other engraver to scan the QR code to the right.

Come join the omtech community at our official laser group on Facebook or visit the company forums at **omtechlaser.com**. Check our YouTube channel for helpful hints and instructional videos. If you encounter any problem regarding your engraver, do not hesitate to contact customer service with your order number at **support@omtechlaser.com**. Our teams will respond within 24 hours to make things right. You can also reach us at (949) 438-4949.

Thank you and we hope you will choose us again for all your laser needs!

Content

Content

1. Safety Information

1.1 Disclaimer

This manual is the designated user guide for the installation, setup, safe operation, and maintenance of your cabinet laser engraver.

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 engraver may differ somewhat from those shown in this manual due to options, updates, etc. Contact us if your engraving machine came with an outdated manual or if you have any other questions.

1.2 Designated Use

This machine is intended for engraving signs and other consumer products on applicable substrates. This laser can process a wide variety of materials including wood and cork, paper and cardboard, many plastics, glass, cloth and leather, and stone. Use of this system for non-designated purposes or materials is not permitted.

The system must be operated, maintained, and repaired by personnel familiar with the field of use and the dangers of the machine and the material being engraved including its reflectivity, conductivity, potential for creating harmful or combustible fumes, etc.

Laser beams are dangerous. The manufacturer and/or seller bear(s) no responsibility and assume(s) no liability for any improper use of this device or for any damage or injury arising from such use. The operator is obliged to use this cabinet laser engraver only in accordance with its designated use, the other instructions in its manuals, and all applicable local and national laws and regulations.

1.3 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.

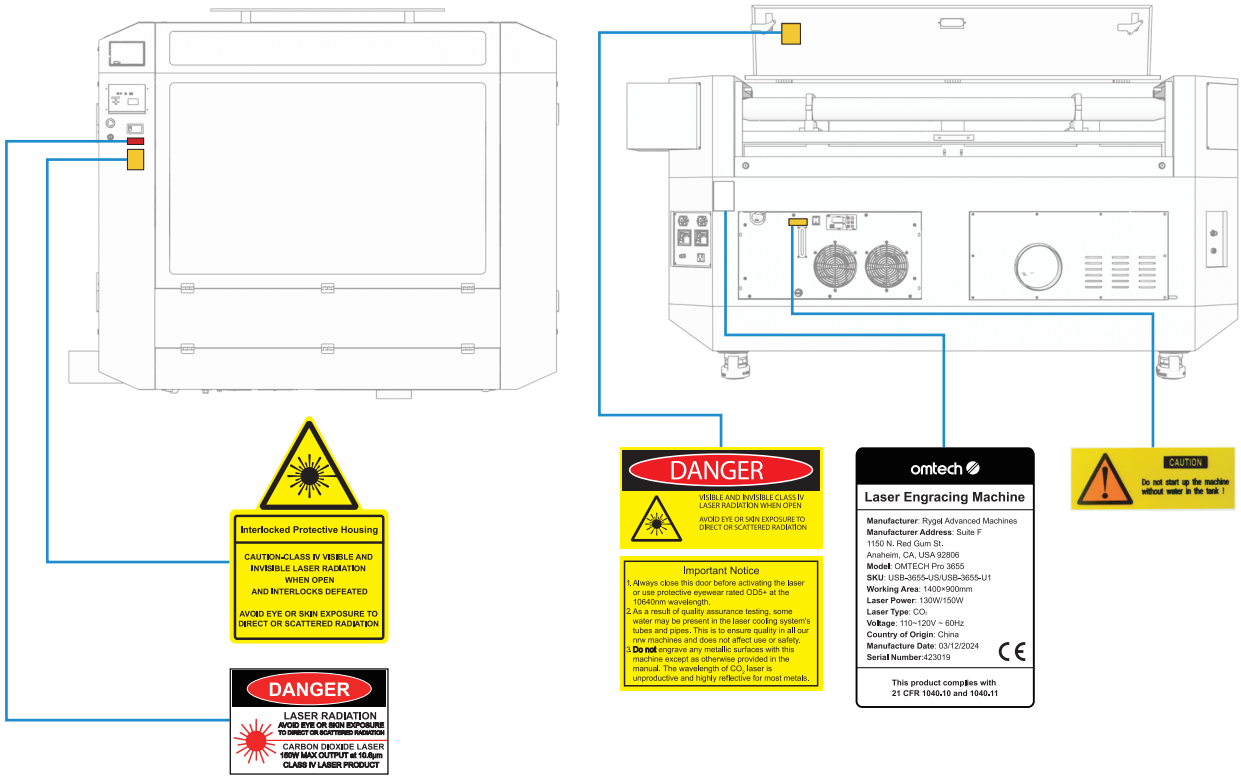
This product is sold in conformity with applicable EU regulations.

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

1. Safety Information

1.4 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 this engraver with its cooling liquid hotter than 104°F (40°C). If this temperature is ever approached, stop using the laser but allow the exhaust and water cooling systems to continue running to clear and cool the machine.
- **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 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.

1.5 Laser Safety Instructions

When used as instructed, this machine comprises a Class 1 laser system safe for users and bystanders. However, the invisible engraving laser, the laser tube, and its electrical connections remain **extremely** dangerous. Used or modified without care, they can 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 gasses 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 or higher.
- **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. Exercise caution with the red dot positioning light as well, as its direct beam is a Class 2 laser in its own right.
- **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 §4) 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.

1. Safety Information

- **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. Immediately stop use if the water cooling system malfunctions.
- **DO NOT** use generic 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.

1.6 Electrical Safety Instructions

- **ONLY** use this device with a compatible and stable power supply with less than 5% fluctuation in its voltage.
- **DO NOT** plug the engraver and chiller into the same circuit or connect other devices to the same circuits that they will use, as this laser system is extremely powerful and will require its full amperage. If no other devices are on the same circuits, the laser and chiller can work on standard 20A 110V circuits, and the external fan can be plugged into the engraver or use the same circuit as the water chiller. If it is necessary to run the laser, the water chiller, and the external fan all on the same circuit, its wiring will need to be specially prepared to handle at least 35A of current at 110V.

- **DO NOT** use with standard surge protectors, extension cords, or power strips. Only use additional wiring thick enough to safely handle the full load of the machine.
- **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 remain between 5–90%.

- **DO NOT** drain or fill the integrated water tank while it is connected to its power supply. Disconnect the chiller and the laser from power before adjusting the cooling liquid level. Do not allow any electronic component to become wet and, if any accidentally does become wet, leave the entire system disconnected from power until all components are fully dry.
- 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. For maximum safety, wait about 3 minutes after turning the machine off before adjusting the integrated chiller or other electronic parts. This will allow time for the ground connection to clear any residual charge.

1. Safety Information

1.7 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 fan 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 fan or vent pipe malfunctions. Periodically check the air assist intake filter to ensure it stays free of any dust or debris.

Materials that can be safely used with this machine are:

Plastics	Other
Acrylonitrile Butadiene Styrene (ABS)	Cardboard
Nylon (Polyamide, PA, etc.)	Ceramics, including Dishes, Tile, etc.
Polyethylene (PE)	Glass
High-Density Polyethylene (HDPE, PEHD, etc.)	Leather
Biaxially-oriented Polyethylene Terephthalate (BoPET, Mylar, Polyester, etc.)	Some metals, including carbon steel and stainless steel, when properly configured
Polyethylene Terephthalate Glycol (PETG, PET-G, etc.)	Paper & Paperboard
Polyimide (PI, Kapton, etc.)	Rubber
Polymethyl Methacrylate (PMMA, Acrylic, Plexiglass, Lucite, etc.)	Stone, including Marble, Granite, etc.
Polyoxymethylene (POM, Acetal, Delrin, etc.)	Textiles, including Cotton, Suede, Felt, Hemp, etc.
Polypropylene (PP, etc.)	Wood, including Cork, MDF, Plywood, Balsa, Birch, Cherry, Oak, Poplar, etc.
Styrene	

See §5.6 for the power recommendations of mostly engravable materials.

This machine **CANNOT** be used with the following materials or with any materials that include them due to the toxic fumes they will release when being engraved:

- Artificial Leather containing Hexavalent Chromium (Cr [VI])
- Astatine
- Beryllium Oxide
- Bromine
- Chlorine, including Polyvinyl Butyral (PVB) and Polyvinyl Chloride (PVC, Vinyl, Sintra, etc.)
- Fluorine, including Polytetrafluoroethylenes (teflon, PTFE, etc.)
- Iodine
- Phenolic Resins, including various forms of Epoxy
- Polycarbonate (PC, Lexan, etc.)

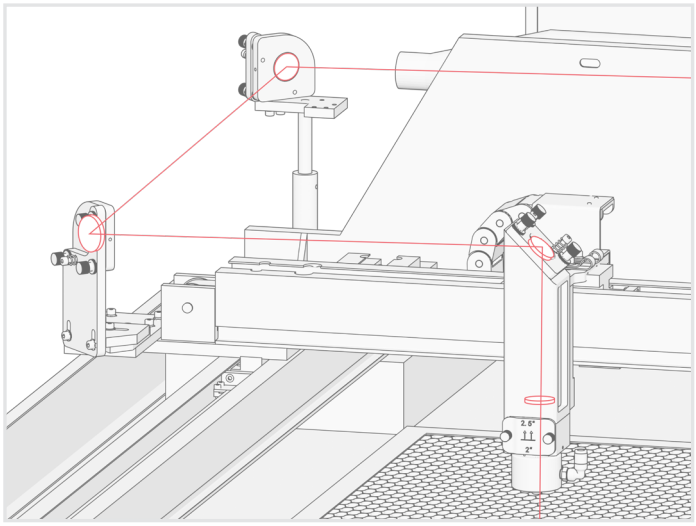
Besides **TOXIC FUMES**, fire hazard that could be cuased by highly reflective material is another major issue. Thus, do not use on highly reflective metals, including aluminum, titanium, and copper.

For all other materials, if you are unsure about its safety or laserability with this device, seek out its material safety data sheet (MSDS). Pay especial attention to information about safety, toxicity, corrosiveness, reflectivity, and reaction(s) to high heat. Alternatively, contact our support department for further guidance.

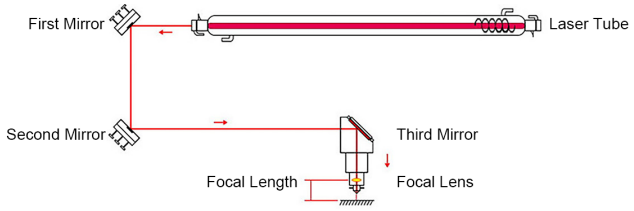
2. Introduction

2.1 General Information

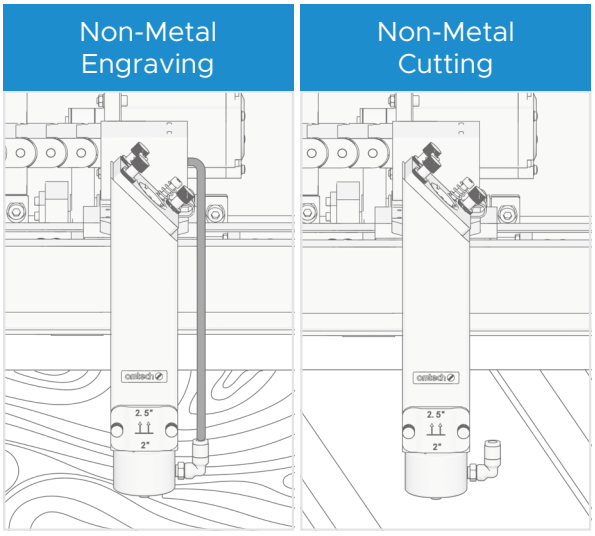
Your laser engraver works by emitting a powerful laser beam from a glass tube filled with excited carbon dioxide (CO_2), catalyzing nitrogen (N_2), and insulating helium (He), reflecting that beam off three mirrors and through a focus lens, and using this focused light to cut and etch designs into certain 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.



Laser Path



With low-intensity use, the provided laser tube has an average lifespan around 11,000 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. Further note at its rated voltage this device and its components can draw over 30 amps at their maximum settings. Use separate 20A circuits for the machine's two power cords, prepare a robust dedicated circuit ahead of time, or carefully use lower settings to avoid drawing too much power at one time.



The water-cooling system or its equivalent 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 with the provided fan to remove the dust and gases produced by the engraving process. Never operate the engraver without both of these systems operating properly. The cooling liquid should always be kept clean and below 104°F (40°C), and the exhaust system should always comply with all applicable laws and regulations for workplace and environmental air quality. The small amount of refrigerant in the integrated chiller should not be dangerous under normal use, but only use this machine in well-ventilated areas and be careful to avoid any sharp impacts, especially during transport and movement.

Finally, 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 injuries.

2. Introduction

2.2 Technical Specifications

Model		PRO 3655	
Laser Tube	Diameter	3.15 in.	80 mm
	Length	57.1 in.	1450 mm
Max. Input Power (Laser and Motors)		1300 W	
Rated Power		130 W	150 W
Wavelength		10640 nm	
Focus Lens	Diameter	0.79 in.	20 mm
	Thickness	0.08 in.	2 mm
	Focal Length	2.5 in.	63.5 mm
	Material	Znse	
Molybdenum Mirror	Diameter	0.98 in.	25 mm
	Thickness	0.12 in.	3 mm
Rated Voltage/Frequency		AC 110 V–120 V 60 Hz	
Expected Service Life at <40% / 40–70% / >70% Power		11000 / 9000 / 7000 hr	
Processing Area		55.1×35.4 in	1400×900 mm
Front/Back Pass-Through Size		40.5×1.5 in.	1030×40 mm
Left/Right Side Pass-Through Size		25.5×1.5 in.	650×40 mm
Max. Height Adjustment		6.30 in.	160 mm
Max. Material Height		5.91 in.	150 mm

Max. Engraving Depth		0.04 in.	1 mm
Min. Engraving Depth		0.0004 in.	0.01 mm
Min. Letter Size		0.04×0.04 in.	1×1 mm
Positioning Accuracy		±0.0008 in.	±0.02 mm
Aluminum Bed Blades	Number	47	
	Load Capacity (ea.)	8.4 oz.	240 g
Honeycomb Bed	Dimensions	41.3×25.5 in.	1050×650 mm
Max. Processing Speed		47.2 ips	1000 mm/s
Max. Acceleration	X-Axis	394 ips^2	8000 mm/s^2
	Y-Axis	315 ips^2	5000 mm/s^2
Provided Operating Software		RDWorkds V8	
Supported Image Formats		.ai, .bmp, .dxf, .gif, .hpgl, .jpeg, .pdf, .plt, .png, .rd, .svg, .tiff, .tga	
Internal Air Assist	Max. Airflow (±10%)	3.2 cfm	5.4 m^3/h
	Port Diameter	0.3 in.	8 mm
	Max. Input Power	120 W	
External Fan	Max. Input Power	550 W	
	Max. Airflow (±10%)	306 cfm	520 m^3/h
	Port Diameter	5.9 in.	150 mm
Integrated Chiller	Max. Input Power	770 W	
	Tank Capacity	1.6 gal.	6 L
	Max. Flow Rate	3.4 gpm	13 L/min
	R-410A Charge	7.1 oz.	200 g
Required Operating Environment	Max. Humidity	5–90%	
	Temp. Range	40–95°F	5–35°C
Certification		CE, FDA	
Dimensions		87.8×70.5×48.9 in.	223×179×124 cm
Net Weight		1190 lb.	540 kg

2. Introduction

2.3 Components

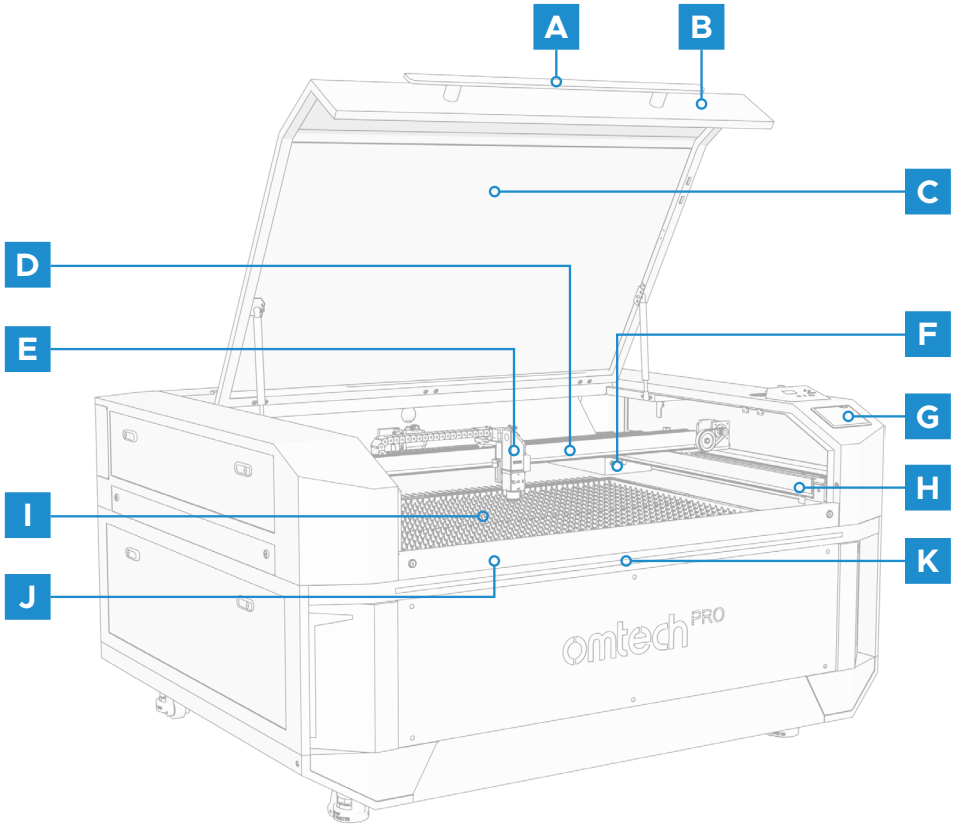
2.3.1 Package List

Items	Qty.
Toolkit	1
External Fan (with power cord)	1
Exhaust Pipes	2
Hose Clamps (150 mm)	5
Hex Wrench Set	1
Flathead Screwdriver	1
Phillips Screwdriver	1
Focal Length Rulers	2
USB Cable	1

Items	Qty.
Ethernet Cable	1
USB Flash Drive (preloaded with RDWorks V8)	1
Limit Switch	1
Laser Glasses (OD5+)	1
Power Cords (15 A)	2
Focal Lens Tools	2
Laser Keys	2
Access Keys	4
Manual	1

2.3.2 Main Components

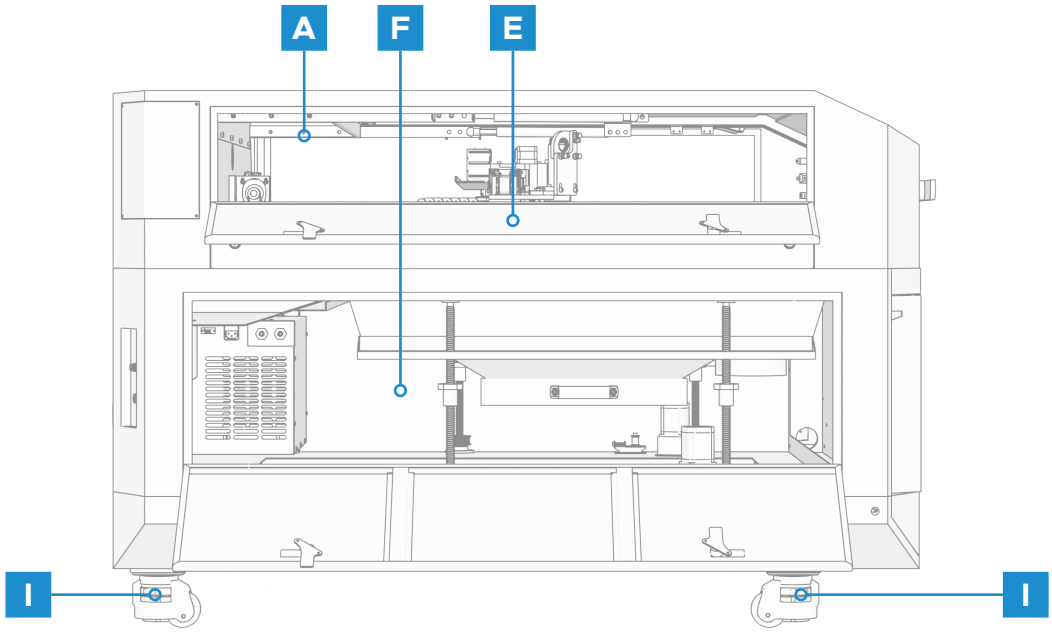
Front



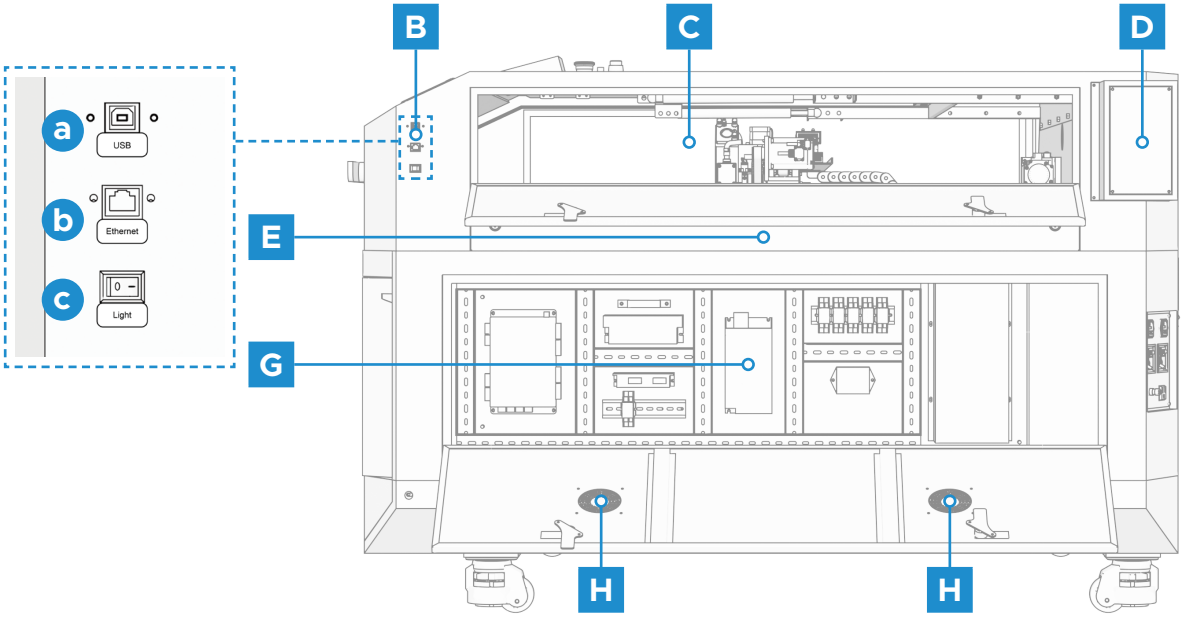
A	**Handle**	Use this to raise and lower the cover. The laser is automatically disabled when the cover is opened.
B	**Cover**	The cover provides access to the main bay for placing and retrieving materials, as well as fixing the laser path alignment and other maintenance.
C	**Viewing Window**	This polycarbonate window protects 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.
D	**X-Axis Rail**	The X-axis rail supports the movement of the laser head left and right across the workbed. It also holds the 2nd mirror and the LED light that illuminates the workbed.
E	**Laser Head**	The laser head holds the 3rd mirror, the focus lens, the air assist outlet, and the nozzle. There are two separate nozzles: one for engraving metal and the other for other materials. The laser head is also motorized and controlled as the engraver's Z axis.
F	**Rotary Axis Switch & Port**	Four-pin rotary axes can be connected to this port to engrave curved surfaces. The rotary axis replaces the Y axis during use.
G	**Control Panel**	This panel offers parameter adjustment and immediate control of the engraving process, including manual movement of the laser head and firing of the laser. It is also the location of the engraver's emergency stop, motorized workbed controls, and ammeter.
H	**Y-Axis Rails**	These rails support the movement of the X-axis rail up and down the workbed.
I	**Workbed**	The workbed can be adjusted in height to fit thinner and thicker materials, as well as adjusted between the aluminum knife blade and steel saw blade platforms. The open design allows better airflow beneath the material for stronger, faster, and cleaner engraving.
J	**Front Pass-Through Door**	This door opens to allow larger pieces of material to be fed through the workbed. When open, care must be taken to avoid exposure to the laser beam or its reflection.
K	**Status Light**	This LED light strip displays the engraver's current status: blue in standby, green during active lasing, and red for errors.

2. Introduction

Left Side



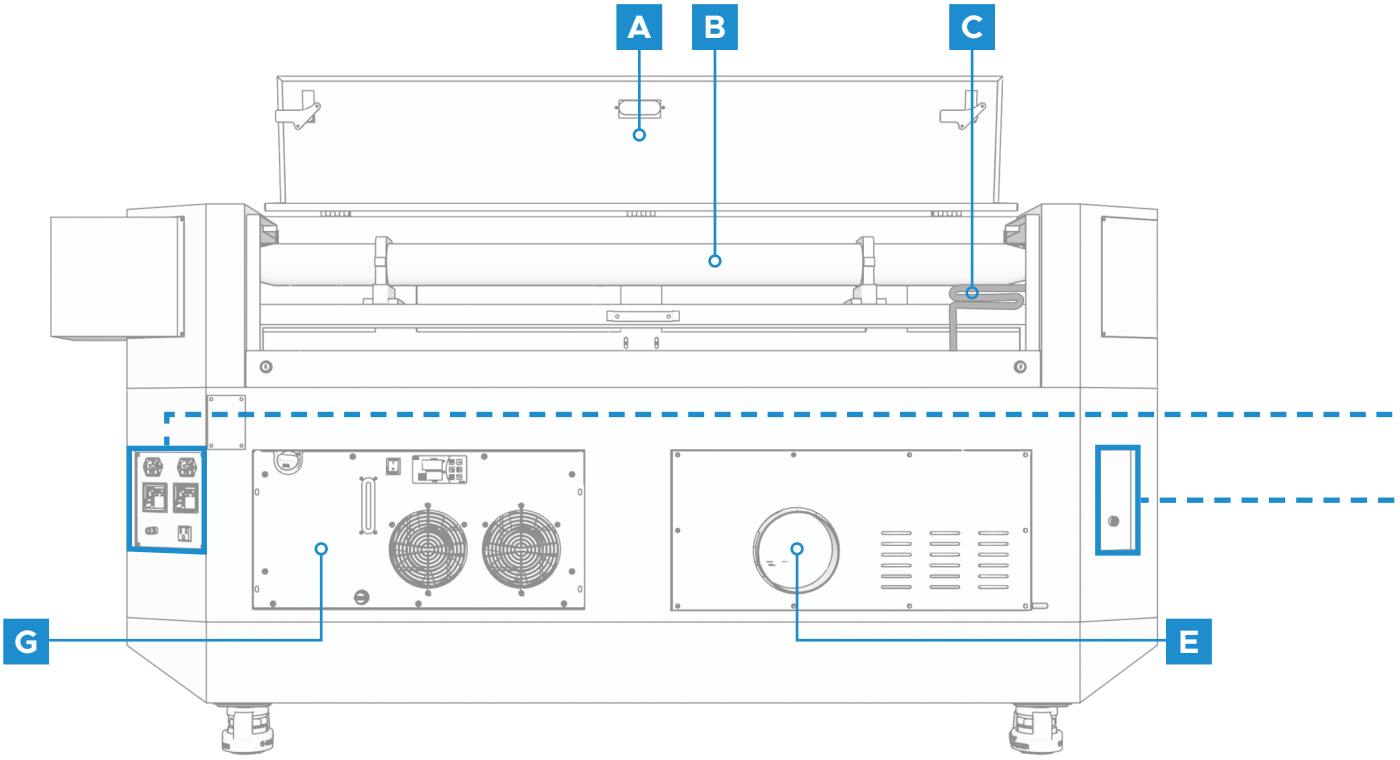
Right Side



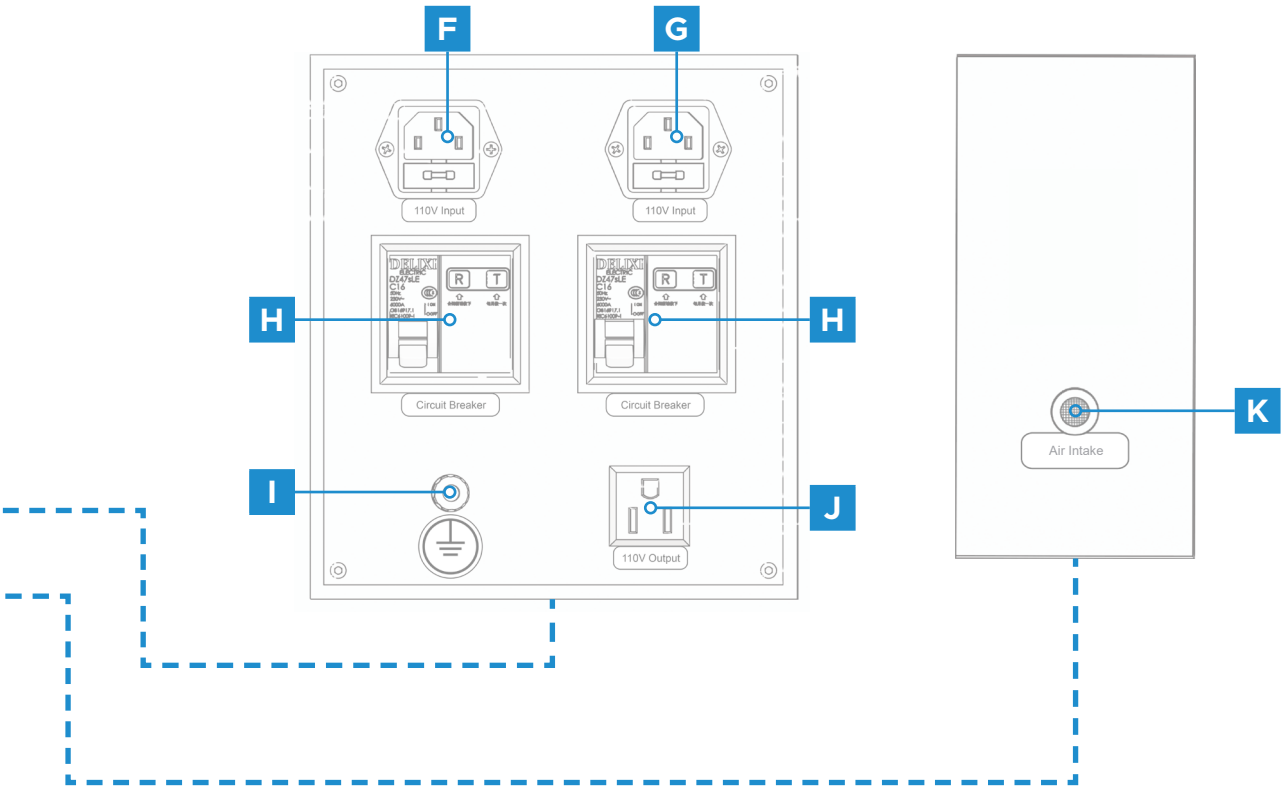
A	**Top Left Access Door**		This door provides access to the left Y-axis rail, its motor, and the 2nd mirror. For all of the engraver's access doors, unlock, open, and rotate the handles found on each end together. When the latches are freed, carefully support the door as it opens to avoid damage.
B	**Connection Ports**	a	This port connects to your USB flashdrive, whose files can be accessed through the touchscreen.
		b	This port connects to your control computer through an ethernet cable.
		c	This switch controls the light strip.
C	**Top Right Access Door**		This door provides access to the right Y-axis rail and its motor.
D	**Extension Box**		The power of a CO_2 laser is directly related to the length of its tube. This extension box allows you to use a longer and stronger tube without needless wasted space in the rest of the engraver. However, take care to protect it. Do not place it in a location where anyone might run into it, place any items upon it, or otherwise risk damage to the fragile glass tube inside.
E	**Side Pass-Through Doors**		These doors open to allow larger pieces of material to be fed through the workbed. When open, care must be taken to avoid exposure to the laser beam or its reflection.
F	**Bottom Left Access Door**		This door provides access to the waste bin under the workbed and the air assist pump, regulator, and digital control. It also provides access to the U-axis motor and the large screws that the workbed moves up and down. These should be lubricated as needed, typically once a month or every few months.
G	**Bottom Right Access Door**		This door provides access to the electronics bay with the mainboard, laser power supply, and other electrical connections. Always remember to make any adjustments to these components when the engraver is turned off and **FULLY** disconnected from its power supply. The connection between the laser power supply and the laser tube is extremely high voltage and extremely dangerous.
H	**Cooling Fans**		These two fans help keep the engraver's electronic components from overheating. Be sure that they are well-ventilated and completely unobstructed during use.
I	**Caster Wheels & Foot Pads**		These wheels help move the engraver into place, after which the pads hold the engraver steady while protecting your flooring.

2. Introduction

Rear



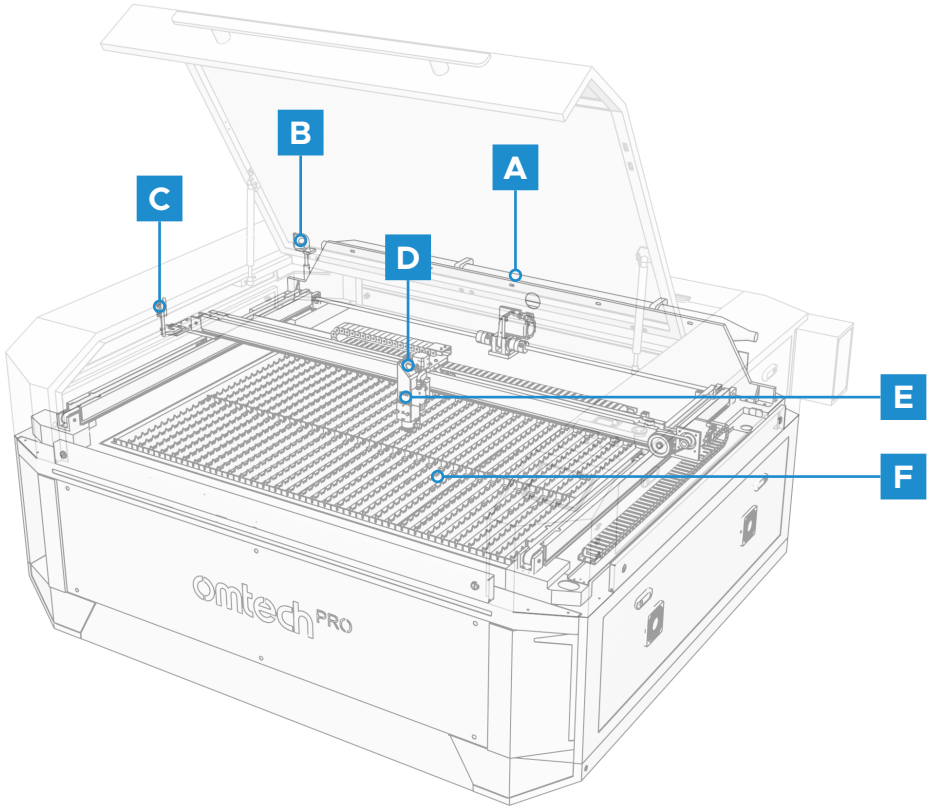
A	**Rear Access Door**	This door provides access to the laser bay, including the laser tube, its brackets, its electrical and cooling water connections, and the 1st mirror.
B	**Laser Tube**	During use, the gas mixture inside this long glass tube produces a powerful laser. Although the active laser should be directed into the main bay, its reflections may remain dangerous. Wear laser glasses while the tube is active.
C	**Laser Tube Connections**	These wires and tubes should come fully preconnected.
D	**Integrated Water Chiller**	This water chiller cools the laser tube without the need for other accessories.
E	**Exhaust Vent**	This vent should be connected to the fan to pull gases and airborne debris from the workbed.



F	**Main Power**	This port powers the engraver itself.
G	**Chiller Power**	This port powers the integrated chiller.
H	**Circuit Breakers**	These are the main power switches for the engraver and the chiller. They should be flipped off between sessions, as well as during any repair or maintenance.
I	**Ground**	This port can be used to electrically ground the engraver if standard three-prong outlets are unavailable.
J	**110V Supply**	This outlet can be used to power the fan, although it is best to use a different circuit if possible.
K	**Air Intake**	This port connects to your air assist to provide its pressurized air.

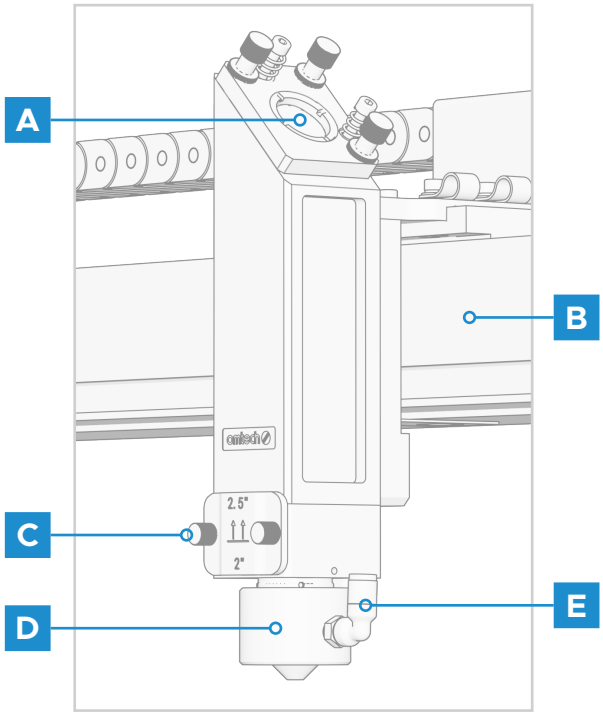
2. Introduction

2.3.3 Laser Path



A	**Laser Tube**	The glass tube that produces the laser is mounted on brackets and is immobile. Its connection with 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 invisible 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 left 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. For the best effect, it should be at the correct focal length from the upper surface of the material.
F	**Workbed**	The workbed can be adjusted in height to fit thinner and thicker materials, as well as adjusted between the aluminum knife blade and steel saw blade platforms. The open design allows better airflow beneath the material for stronger, faster, and cleaner engraving.

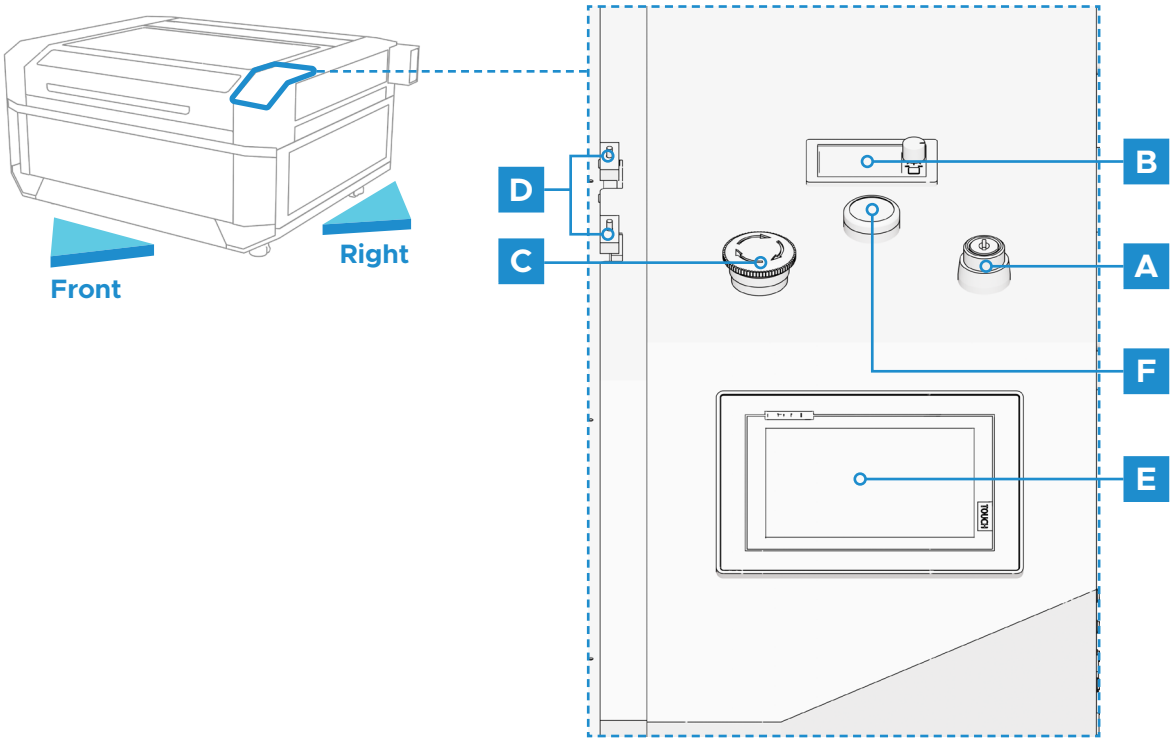
2.3.4 Laser Head



A	**3rd Mirror**	This adjustable-angle mirror transfers the laser from the 2nd mirror to the focus lens.
B	**X-Axis Rail**	This rail moves along the Y axis, with its range controlled by limit switches.
C	**Focus Lens**	This 20 mm lens directs and focuses the laser beam to its point of contact with your material.
D	**Autofocus Block**	This should be installed within the laser head casing during standard engraving.
E	**Air Assist**	This engraver blows pressurized air to kill sparks and blow away dust and debris as you engrave.

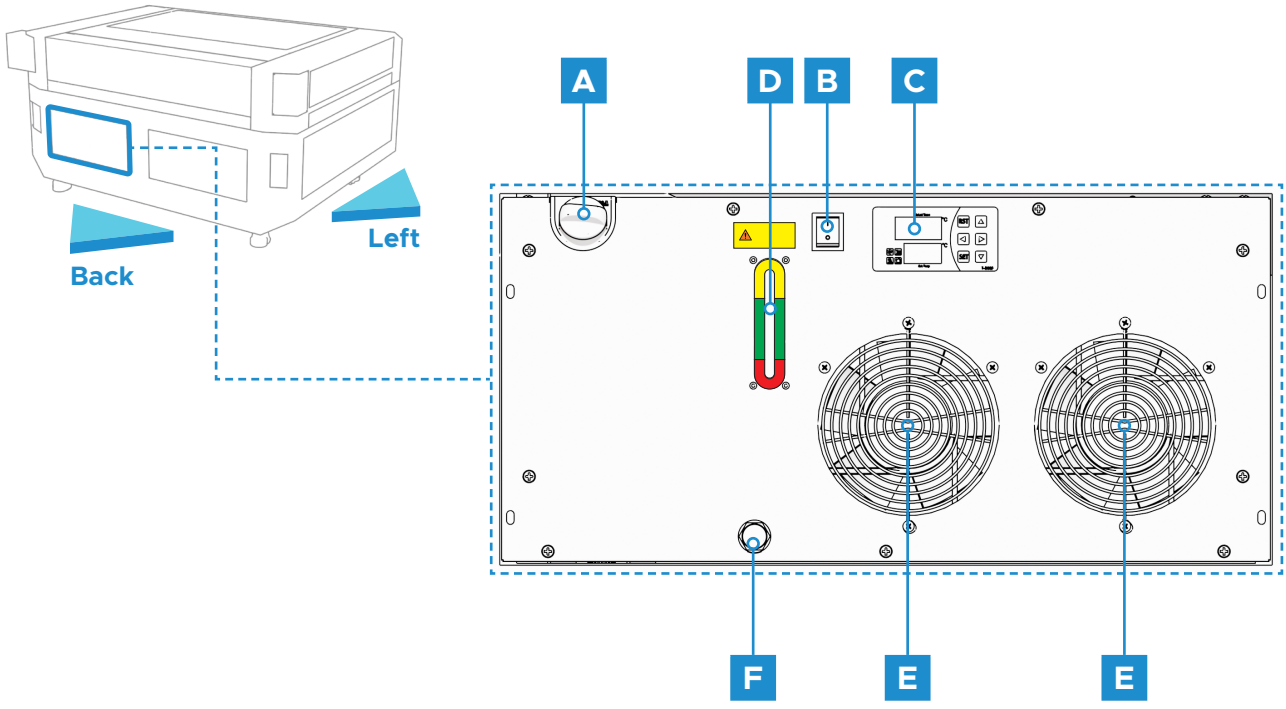
2. Introduction

2.3.5 Control Panel



A	**Laser Key**	This lock turns the laser power supply on and off, helping ensure that only approved operators can use your engraver.
B	**Ammeter**	This digital display shows the current being provided to the laser tube in mA. The knob to its right is its master power control. It should be turned completely clockwise to enable your software to use the engraver's full power range.
C	**Emergency Stop**	This button immediately cuts all power to the engraver but only leaves the chiller running in the event of an emergency. Rotate it up before use and push it down between sessions
D	**Interlock**	These switches automatically cut power to the laser tube if the protective cover is raised.
E	**Digital Touchscreen**	This is the main control panel for the laser.
F	**Power Indicator Light**	This light illuminates upon the booting up of the engraver.

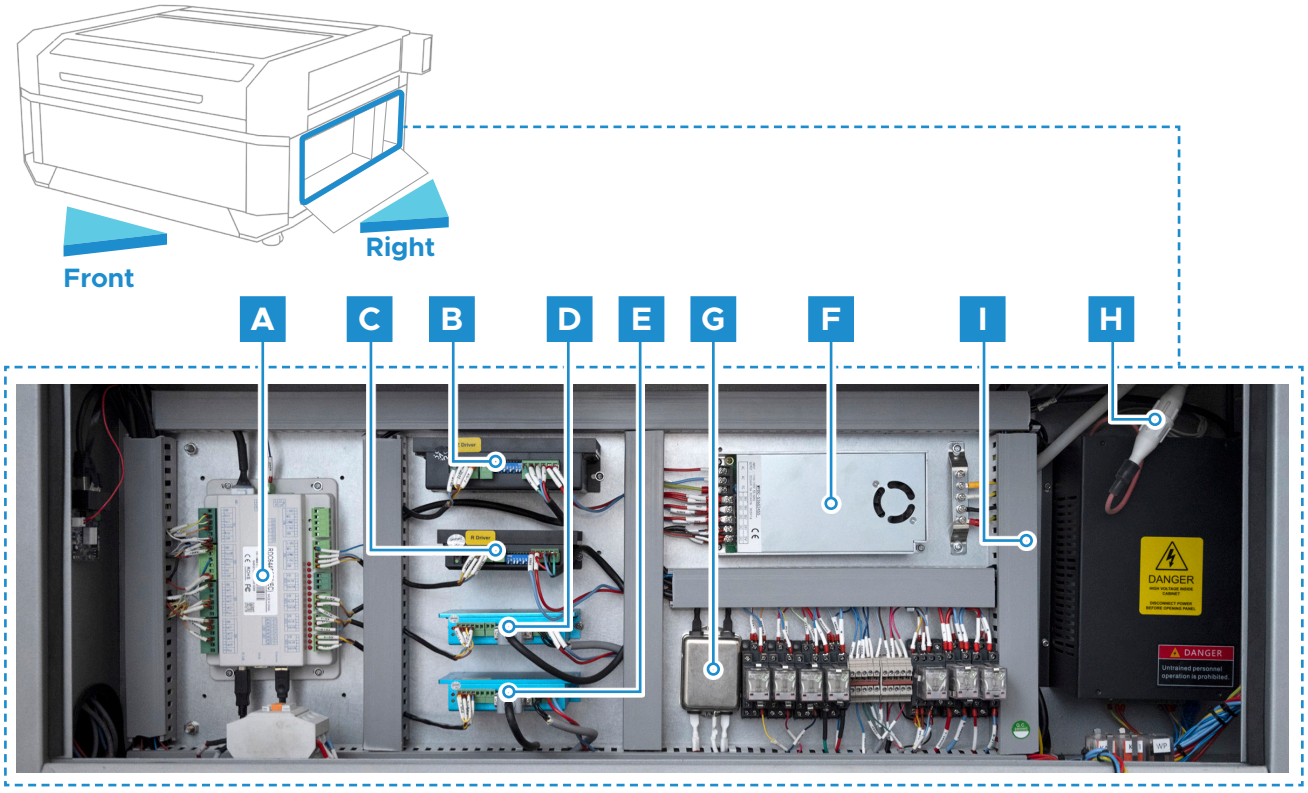
2.5 Water Chiller



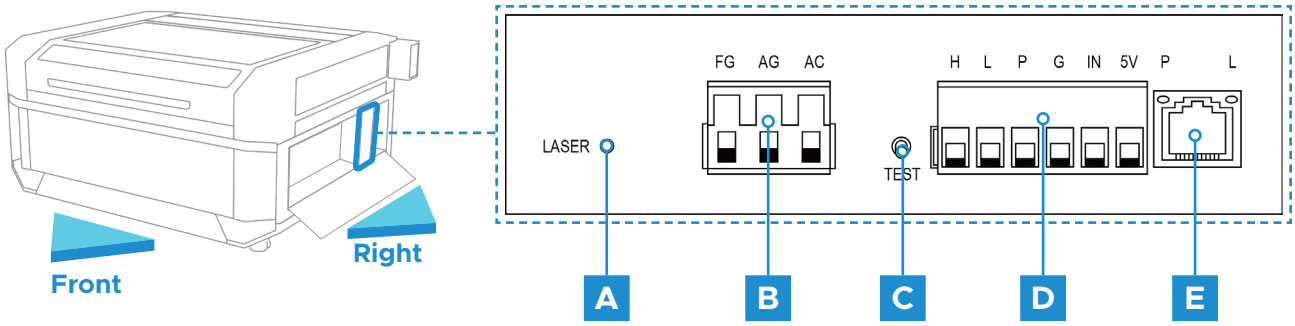
A	**Fill Port**	Use this port once it is time to refill the tank with deionized or distilled water, or laser-safe antifreeze.
B	**Power Switch**	Your water-cooling system should always be on during the use of the laser but should be switched off during draining, refilling, cleaning, repair, and other maintenance.
C	**Control Panel**	This panel can be used to fine-tune the chiller's operation.
D	**Water Gauge**	Maintain the cooling liquid level within the green **NORMAL** range at all times. You should also use the clear gauge to confirm that the liquid remains clean, particularly during initial testing.
E	**Cooling Fans**	Although these two fans may not activate at all during brief or low-intensity use, they come online and help keep the circulating water or antifreeze cool during extended and high-intensity operation. Be sure that they are well-ventilated and completely unobstructed during use.
F	**Drain Port**	Use this port to fully drain your system's antifreeze or distilled water.

2. Introduction

2.6 Electronics Bay



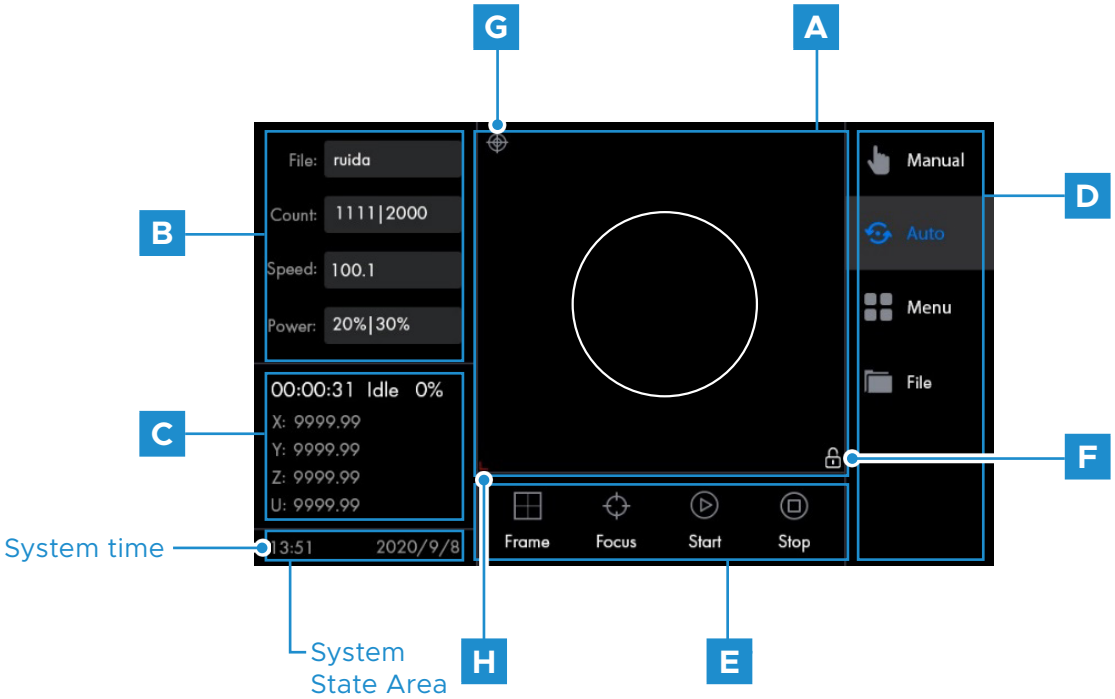
A	**Mainboard**	This circuit board controls the engraving process, responding to commands from your engraving software or the machine's control panel.
B	**Z-Axis Driver**	This device controls the motor that raises and lowers the workbed.
C	**Rotary-Axis Driver**	This device directs attached and enabled rotary devices.
D	**Y-Axis Driver**	This device powers the motor that moves the laser head along the X-axis rail.
E	**X-Axis Driver**	This device powers the motor that moves the laser head along the X-axis rail.
F	**Control Power Supply**	This device powers the machine's control panel and mainboard.
G	**EMI Filter**	This device helps protect the sensitive electronics in the mainboard from interference from the power supply.
H	**Anode Connection**	During replacement of the tube or power supply, use this socket to more easily and safely restore the high-voltage connection between the two.
I	**Laser Power Supply**	This device transforms standard electricity into the extremely high voltage necessary for the laser tube.



A	**Laser Signal Indicator**	This light shows when current is being sent to the laser tube.
B	**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).
C	**Test Button**	This button is used to attempt to test fire the laser when troubleshooting problems. (Remember to place a piece of laserable scrap material on the workbed before any such test firing.) If the laser fires successfully, the problem will usually be with the control panel or its connections.
D	**Connection Terminal**	This terminal block ensures that the water sensor, interlocks, etc. (P) can turn off the laser immediately in the case of an emergency, as well as offering active high (H) or low-voltage firing (L), potentiometer inputs (IN), a 5V DC power connection (5V), and a pin for return lines (G)
E	**Ethernet Connection**	This can be used for connecting testing devices while troubleshooting electrical issues. Its indicator lights show its connection to power (P) and the active laser (L).

2. Introduction

2.7 Touchscreen



No.	Display Areas	Definitions&Functions	
A	**Graphic Display Area**	Shows the currently loaded image and, during work, the position of the laser head.	
B	**Parameter Display Area**	**File**	Shows the name of the file being processed.
		Count	Shows the batch count and the total count (the current batch count for work with the currently loaded file; the current total count for work with the engraver).
		Speed	Shows the speed value (the 1st route and the 2nd route).
		Power	Shows the power value (the 1st route and the 2nd route).
C	**Coordinates Display Area**	Shows the current position of the laser head along the X and Y axes according to the system's current orientation and the current bed height (U) and laser head position (Z).	
D	**Menu Area**	**Manual**	Tapping once enters the manual menu.
		Auto	Tapping once enters the automatic function menu, which the system displays by default after being powered-on.
		Menu	Tapping once enters the menu submenu.
		File	Tapping once enters the file management menu.

No.	Display Areas	Definitions&Functions	
E	**Function Area**	**Frame**	Traces the outline of the current design for sizing.
		Focus	Enables the laser head to automatically focus.
		Start	Starts the current task.
		Stop	Stops the current task.
F	**Keyboard Lock**	When the strip of the display that shows the time is tapped, the control panel will be locked, with the panel displaying on the right corner of the graphic display area. Tapping the strip again unlocks the panel.	
	Network Status	This icon indicates that the system is connected to the Internet.	
G	**Position Mark**	This icon shows up after the positioning icon is tapped in the manual menu.	
H	**Screen Origin Position**	The graphic display area takes this coordinate point as a reference for displaying.	

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.

- Both laser nozzles and their accessories
- An integrated cooling system
- A ventilation system adequate for the materials you're working with (fan and ducts included)
- All applicable connection cables
- Laser and access 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.

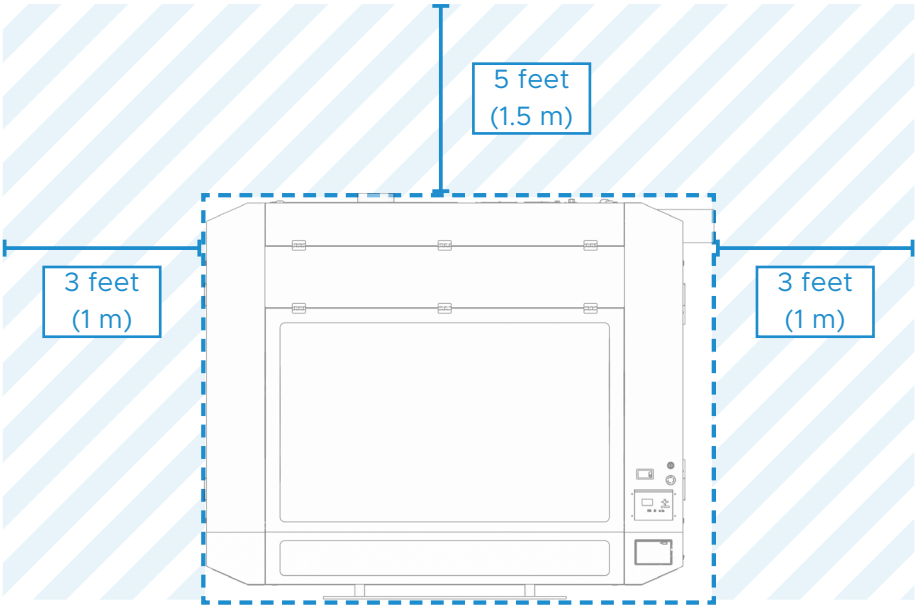
Any auxiliary equipment must be adjusted to the base machine. Queries may be directed to the dealer or manufacturer of such equipment.

3.2 Selecting a Location

Before you install your engraver, select an appropriate location for its use.

- Be sure that it meets all of the requirements discussed in the **Safety Information** above.
- The location should be stable, level, dry, and climate-controlled to provide an ambient temperature of 40–95°F (5–35°C) and an ambient humidity between 5–90%. In particular, the temperature and humidity together should not be close to the dew point. It is also advisable to use a windowless room or to use blinds and/or curtains to avoid exposure to the potential additional heat of direct sunlight.

- Provide 5 feet (1.5 m) of clearance behind the engraver for the chiller's fans and 3 feet (1 m) of clearance to the right of the engraver for the electronic bay's fans for maximum efficiency.



- The location should be free of dust and other airborne pollutants, and it should be well-ventilated enough to avoid the buildup of humidity from the operation of the chiller and 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 upper power cord for the chiller and the lower main power cord should be plugged into a compatible and stable power source via grounded 3-prong outlets on **SEPARATE 20 A** circuits. The external fan can be plugged into the engraver or use the same circuit as the chiller, but using a separate third circuit is recommended. If you will need to run all three engravers on a single circuit, a special high-amperage circuit (at least 35 A) will need to be specially prepared.
- The location should be away from children; sensitive EMI engravers; and any combustible, flammable, explosive, or corrosive materials.
- It is highly recommended to have an extra work table nearby to avoid placing objects on or directly adjacent to the engraver, which could become a fire or laser hazard. In particular, never place anything on the extension box or other parts of the laser bay. The laser's accessory box—including its hex wrenches and nozzles—can be stored in the lower left bay but it is better to provide a separate location for it nearby.

3. Installation

3.3 Unpacking Your Engraver

Your engraver arrives in a wooden crate with its accessories (including this manual) packaged inside. You should have placed the crate in a spacious flat area for unpacking, ideally near where you plan to operate the machine permanently. If you have not already done so, finish removing the crate from around your engraver.

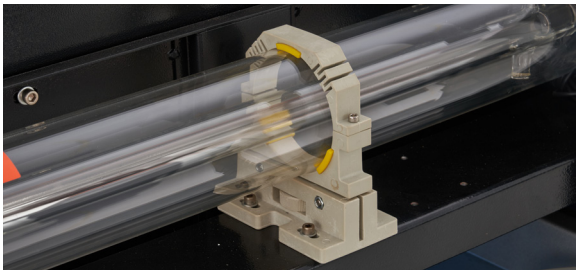
HEAVY LIFT!

Straining or crushing injury may occur from improperly lifting the machine or some of its parts. To reduce this risk, use a forklift (or other lifting equipment rated for the weight of this machine.

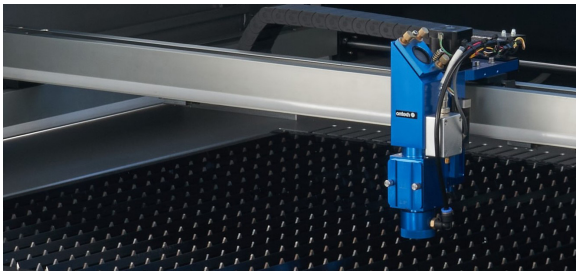
When your new engraver is delivered, the chiller is not filled with fresh laser-safe omtech antifreeze for safety during shipping. Users must fill the chiller with laser-safe antifreeze before operation.

Any leak during or after unpacking should be carefully cleaned to avoid direct contact or inhalation of the fumes.

1. Roll the engraver slowly and carefully into place. Position the clamps to lock the engraver firmly in place.
2. Retrieve the access keys from the main bay of the machine, along with the accessory's toolbox. Check that you have received all listed in the package list. (See §2.3.1 Package List on Page 13)
3. **CAREFULLY** remove the rest of the foam packaging material from around the laser tube, the viewing window, and the rest of the machine. The laser tube is a highly fragile object and should be handled delicately and as little as possible.



4. Inside the main bay, remove the nylon cable ties from the X axis and the steel blade table.



5. Open the rear access door to carefully check the laser bay and bottom left access door for any leakage. Once all tubes are checked, fill the chiller tank to a level near the top of the green **NORMAL** range on the gauge with more laser-safe antifreeze or pure distilled water.
6. 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 (See §8.7 Disposal Instructions on Page 133).

3.4 Electrical Grounding

This engraver employs a powerful laser. As discussed in the Safety Information above, it is extremely high voltage and potentially dangerous, so users must securely ground it to avoid the buildup of static electricity.

Using a standard 3-prong outlet will provide sufficient grounding. If you do not have access to a 3-prong outlet, you **MUST** ensure the proper connection of a grounding cable. The near end should be fastened to the ground port at the rear of the engraver. The far end of the cable should be securely connected to a metal rod driven at least 8 feet (3 m) deep into soil located at least 5 feet (1.5 m) from the machine. The resistance along the line should be no greater than 5 Ω.

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. Installation

3.5 Water Cooling Installation

The provided water chiller 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.

The water chiller is not prefilled with coolant. **ALWAYS** check whether the chiller has enough coolant before turning the power on.

Always fill the chiller 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.

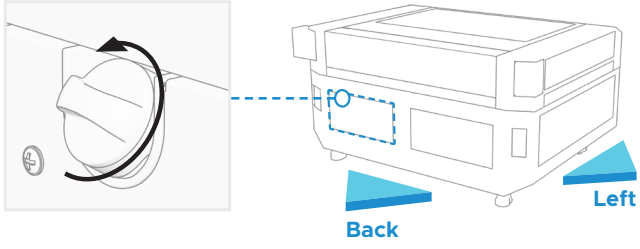
NEVER adjust the water level within the chiller while it and the laser are connected to power.

Fill the Water Chiller

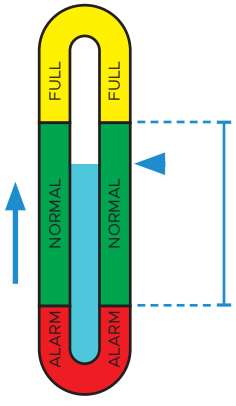
Your chiller arrived with no distilled water or omtech laser-safe antifreeze. You should fill the water chiller before operation (See §Refilling on Page 117).

To fill the water chiller:

1. Remove the fill port cap of the water chiller.



2. Fill the tank to a level near the top of the green **NORMAL** range on the gauge (**FULL** is actually overfilled) with distilled water or a custom-purpose laser-safe antifreeze.



3. Wait for a couple of minutes and check the cooling liquid level in the chiller.

   If it is below **NORMAL**, to fill the tank again:

   a. Open the rear access door to carefully check the laser bay and bottom left access door for any leakage.

   b. Once all tubes are checked, fill the tank to a level near the top of the green **NORMAL** range on the gauge with more laser-safe antifreeze or pure distilled water.

> DO NOT proceed with the following actions if any leakage has been detected. **IMMEDIATELY** contact the customer service.

4. Replace the fill port cap.

Set and Check the Water Chiller

1. Connect one of the provided power cords to the top right power outlet at the rear of the engraver.

   You can connect the engraver's main power cord to the other outlet at the same time but see §3.9 Main Power Connections (Page 54) first for important considerations.

2. Flip its circuit breaker on.

3. Flip on the power switch on the chiller itself.

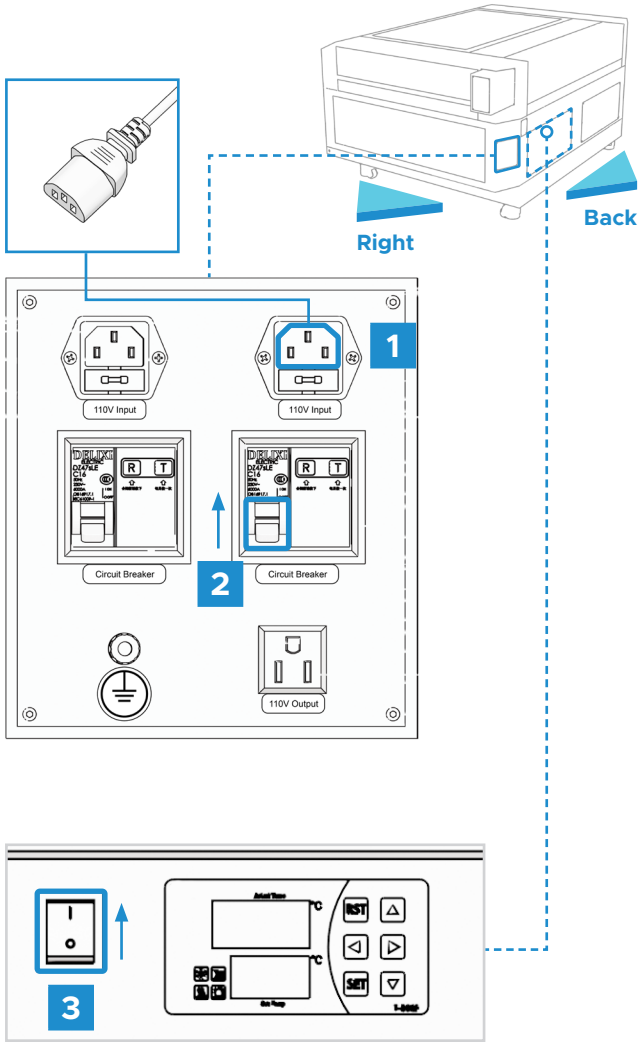
   The control panel displays the actual temperature and set temperature. The default setting is to keep the chiller within 3.6°F (±2°C) of 77°F (25°C).

   To change the target temperature:

   a. Press **SET**, and then use ▲ and ▼ to adjust the value up or down.

   b. Press **RST** to save your changes.

   For other adjustments, see §7.2 Water Chiller Adjustment (Page 106).



3. Installation

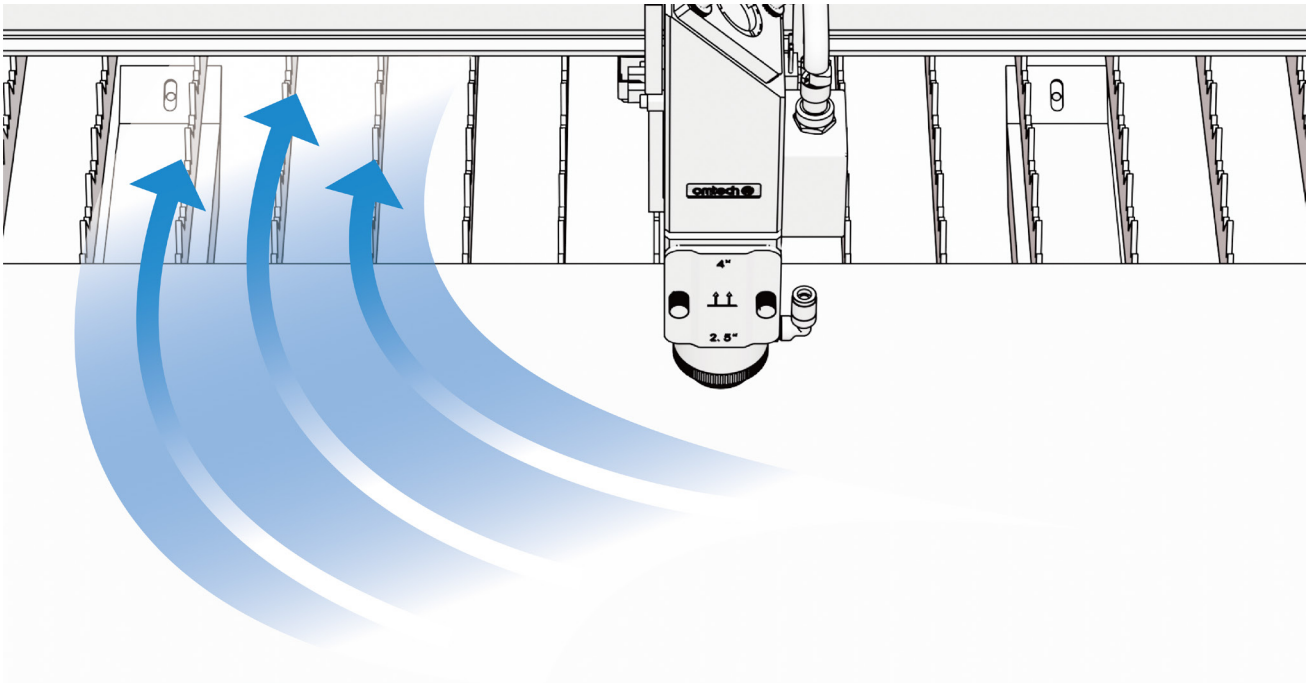
4. During its first use, press ▼ to speed the activation of the compressor.
5. Once the chiller is fully operational, its cooling liquid should begin to run through your machine and back into your tank. Pay attention to the following:
    - **ALWAYS** obtain visual confirmation that the liquid is flowing through the laser tube behind the top rear access door before starting your laser.
    - Check that the water level remains in the **NORMAL** area of the gauge after filling the cooling pathway for your engraver. If it has fallen to the **ALARM** level, check for any leaks and then add more distilled water or laser-safe antifreeze as necessary.
    - There may be alarms from the chiller or engraver when the chiller first begins operation. This is because of air bubbles being cleared from the line, which in normal use would pose a risk of overheating the laser tube. The bubbles should dissipate and the alarms should cease after a few minutes of operation. If any other alarms occur, see the Troubleshooting section for the meaning of the specific error code.
    - **NEVER** allow the liquid in the tank to become too hot to cool the laser. If you have deactivated the chiller's automated alarms, periodically check the liquid's actual temperature during prolonged use. If the liquid ever begins to approach 100°F (38°C), operate the laser at a lower power setting or pause its activity to allow time for the chiller to further cool the machine. When the water temperature exceeds a certain range of the set temperature, the chiller will sound an alarm. In the alarm state, the laser tube stops emitting the laser beam.
    - Your chiller includes a small amount of R-410A refrigerant. This should never present a hazard or need replacement but, if you ever notice the chiller struggling to cool your machine during normal operation, stop the use of the machine, make sure the area is well-ventilated, and have a trained and skilled professional contact Customer Service for instructions on how to check the refrigerant level, safely repair any leaks, and add additional refrigerant before further use.

NEVER attempt to adjust the refrigerant yourself without professional training.

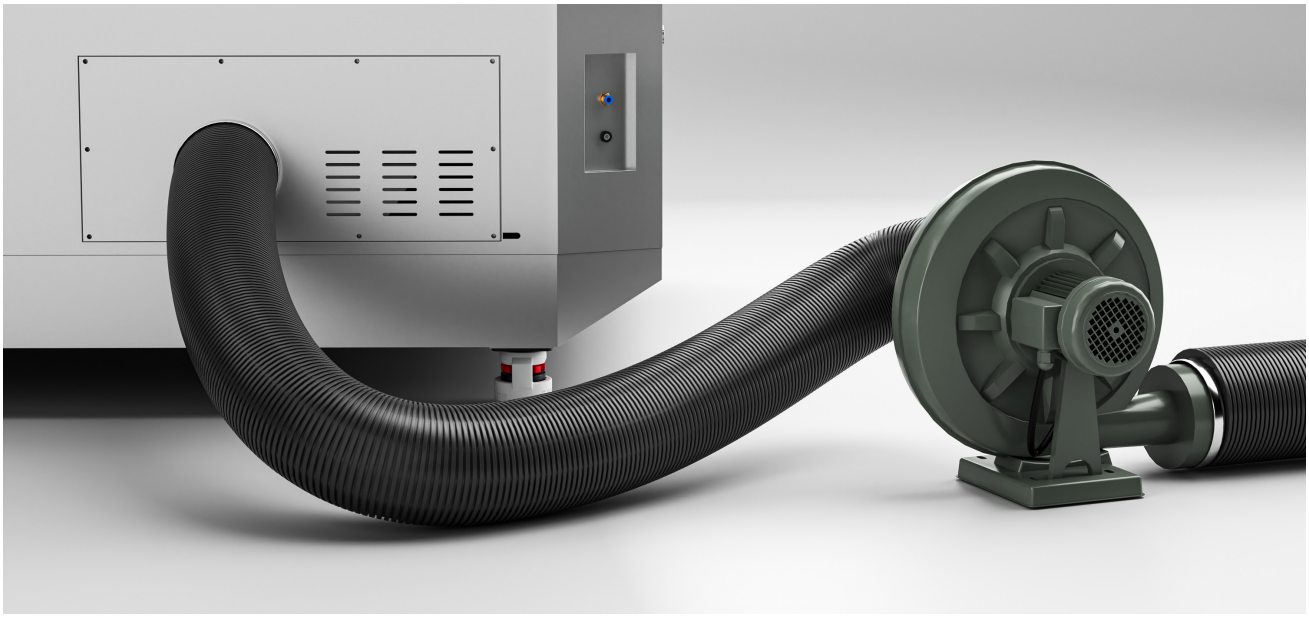
6. Flip off the power switch and circuit breaker, and disconnect the power cord after checking, setting, or each use.

3.6 Exhaust System Installation

The exhaust system is used to remove fumes and dust produced during engraving to keep your workspace clean and safe.



The fan can be plugged into the outlet on the back of the engraver if the water chiller use a dedicated line or if you have prepared a robust circuit able to handle the full load of the entire machine.



3. Installation

To install the external fan:

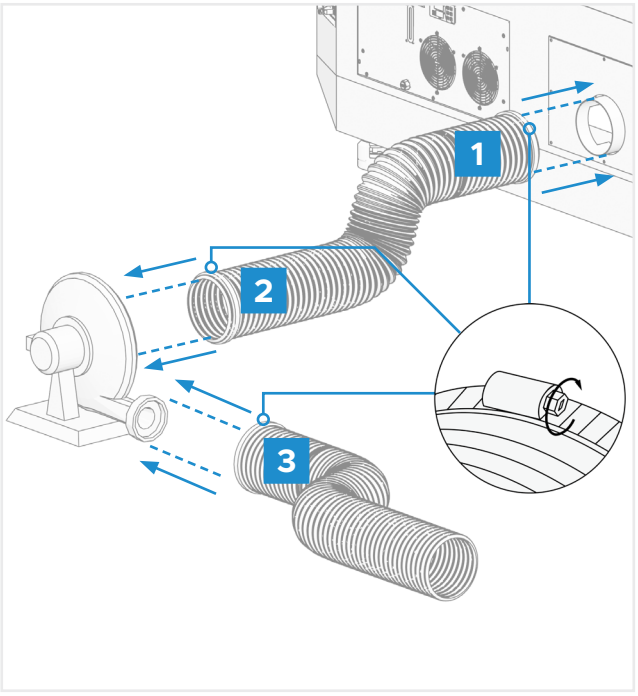
1. Attach one of the provided Ø150 mm exhaust hoses directly onto the exhaust vent on the rear of the engraver, fastening it into place with one of the hose clamps.

   The hose can be expanded to a full length of about 5 feet (1.5 m).

2. Fastened the other end onto the external fan's inlet with a second hose clamp.

3. Attach the second duct onto the fan's outlet with a third hose clamp.

   It can also be extended to a length of about 5 feet.



4. Fit the other end of the duct into a dedicated purifier, or directly place it out a window if the fumes are not hazardous and meet local and national air safety standards.
5. If additional ducts are necessary, ONLY use metal material ducts.

   Nonconductive materials such as PVC pipe cannot be safely grounded and can build dangerous static electric charges during use.
6. Seal all seams and connections tightly.

NEVER operate the laser if the fan and ducts are not working to purify or remove the fumes produced by the target material. Research materials before use and never operate the laser on any (such as PVC, Teflon, and other halogen-containing substances) that can produce corrosive, hazardous, or even deadly fumes.

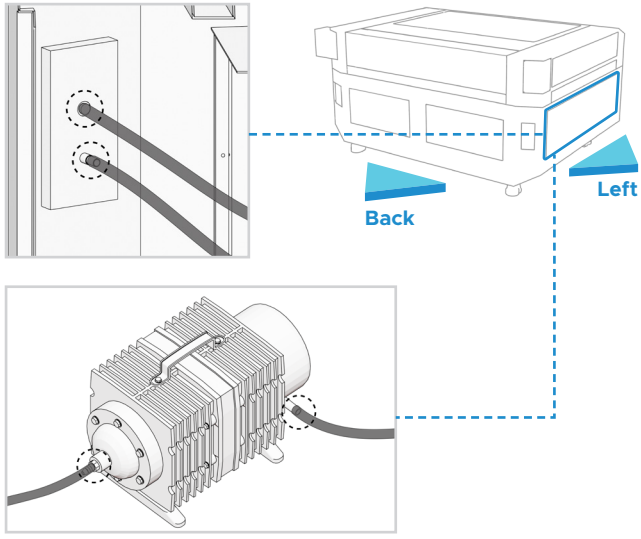
3.7 Air Assist System Installation

The air assist system for normal non-metal cutting and engraving should arrive preinstalled and correctly wired.

1. 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.

2. Check that its air intake filter is in place, clean, and not obstructed by any nearby objects.



3. Installation

3.8 Control Computer

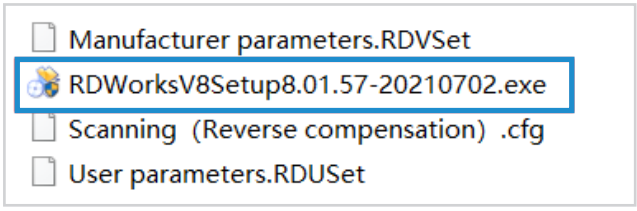
See the software manual for details on the requirements for the control computer. The control computer can be connected directly using the provided USB cable or through Wi-Fi. If the control computer is directly connected to the engraver, it should not be placed more than 15 feet (4.5 m) away to avoid possible interference to the signal on its line.

A Windows-compatible copy of RDworks V8 is provided on the USB flash drive that came with your engraver. Familiarize yourself with the software's image design features and laser control settings before using it to operate the laser.

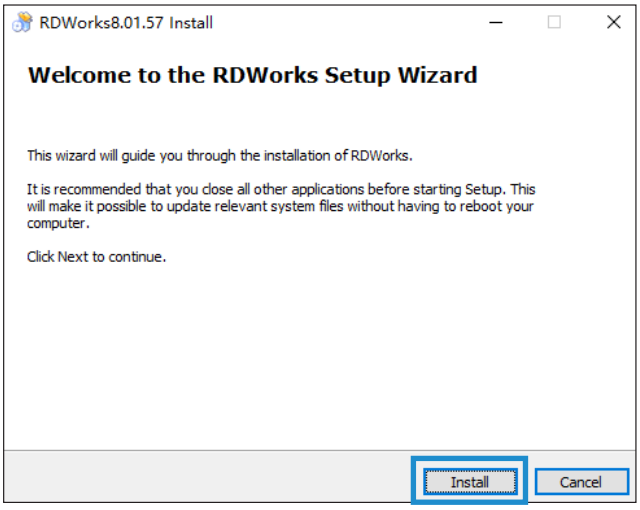
When you first configure your software to work with the laser, the device name to search for will be the mainboard model: **RDC6445GT5**. Make sure that you set the software to use an X axis length of **1000 mm** and a Y axis length of **600 mm**. The default origin position will be at the workbed's top left corner. If you change this in your software, be sure to also change the control panel settings to match. See §6.6.6 Setting Laser Head Return for details on this.

3.8.1 RDWorks V8 Reverse Compensation

1. Insert the provided USB flash drive into a port on your control laptop. Find the file as shown. RDWorksV8Setup8.01.57.

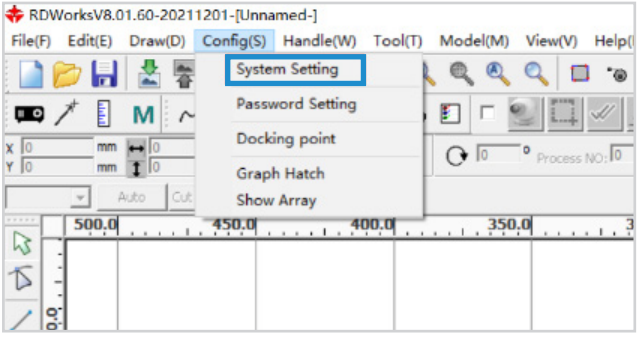


2. Click open the file and click “Install”. Choose a file route that you deem suitable.



3. When the installation is finished, click to run the program.

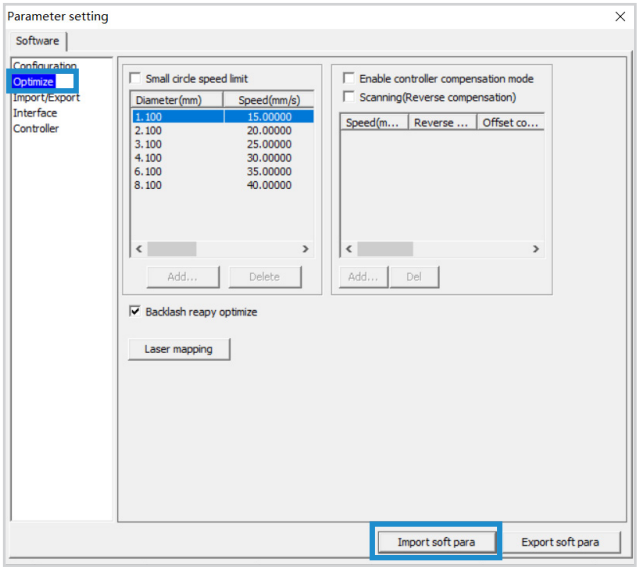
4. Click “Config” and then “System Setting”.



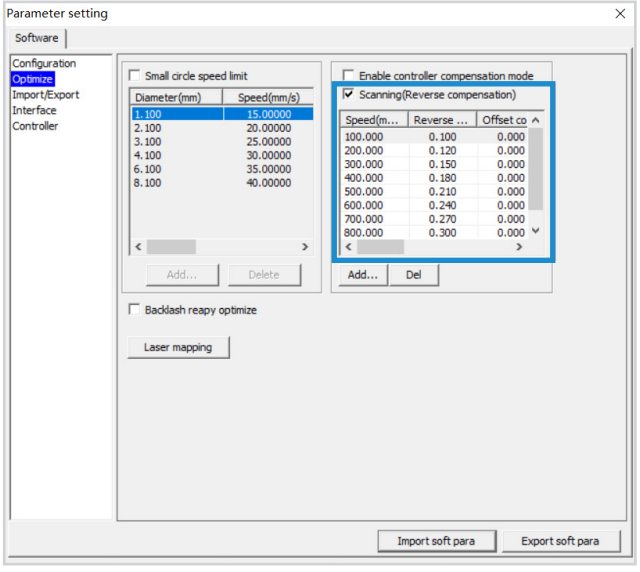
5. Click “Parameter setting” and then “Optimize” in the pop up as shown. Click “Import soft para”.

3. Installation

6. Choose “Scanning (Reverse compensation)” under the directory of the provided flash drive.

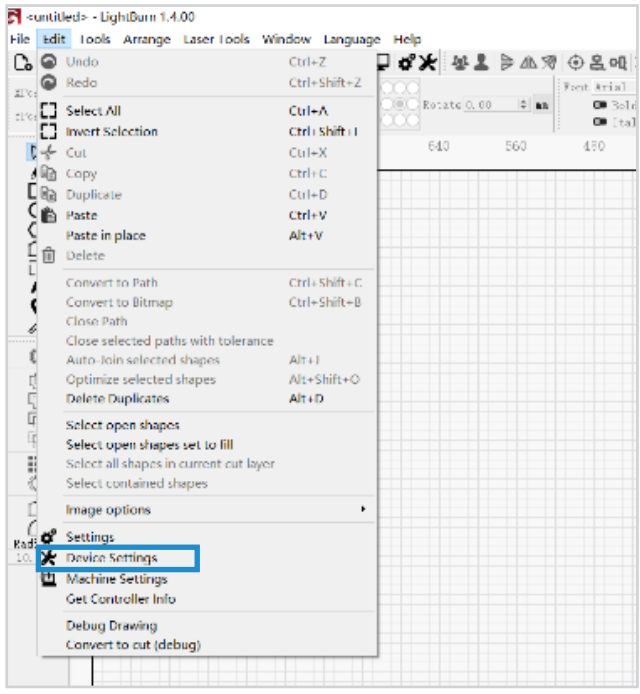


7. Click “Optimize” again to ensure that the Engraver Reverse Offset has been imported as shown. Tick the box before “Scanning (Reverse compensation)”

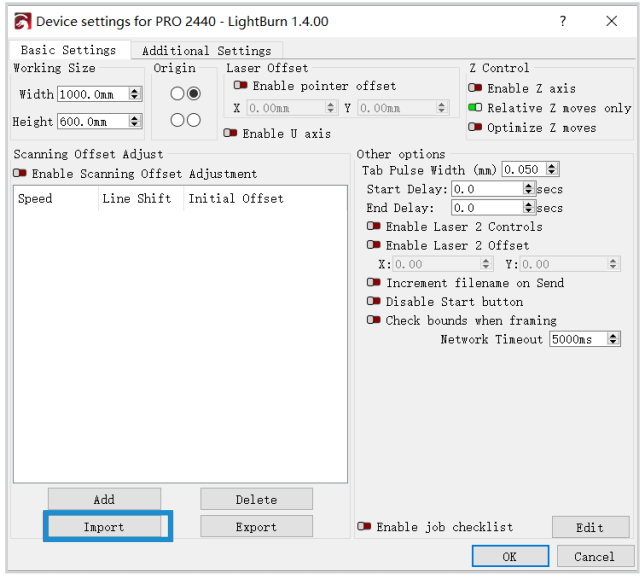


3.8.2 Lightburn Scanning Offset

1. Click open your Lightburn, then “Edit”, and then “Device Settings”.



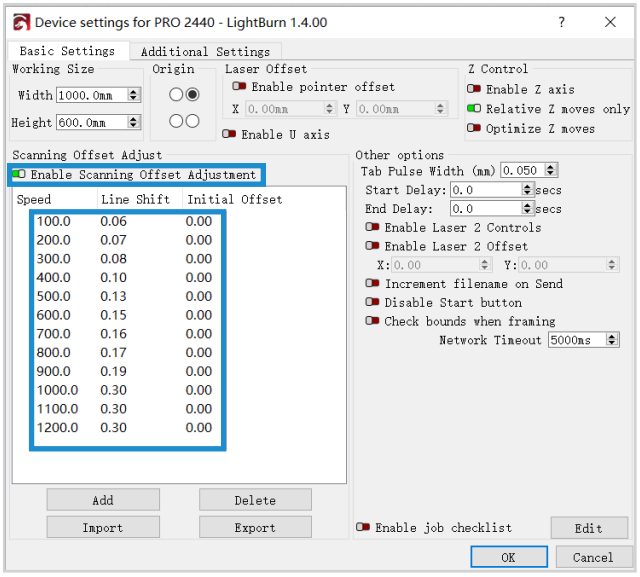
2. Click “Import” in the pop-up that shows up.



3. Find and choose the “Scanning Offset Adjust” in the provided flash drive.

3. Installation

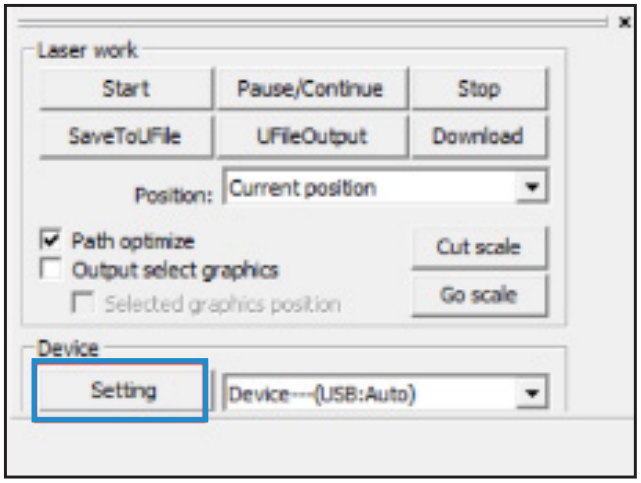
4. Enable the scanning offset adjustment by clicking green the toggle switch as shown.



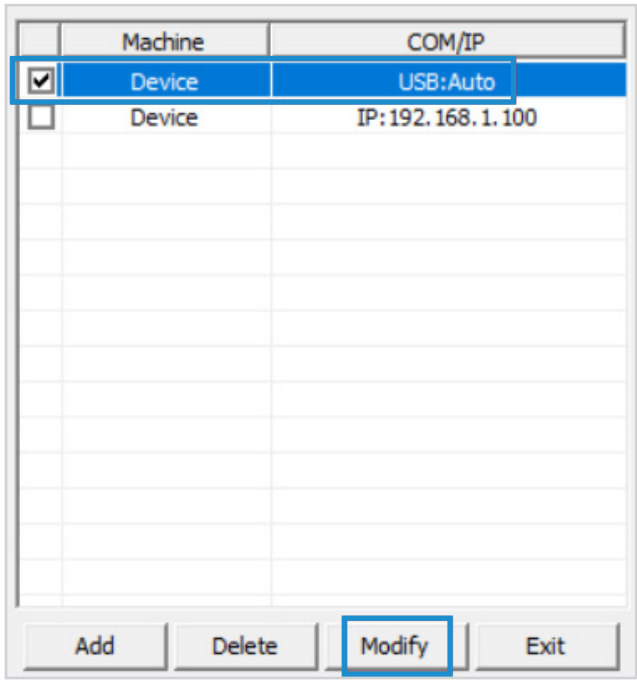
3.8.3 Connection Through the USB Cable

RDWorks V8

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

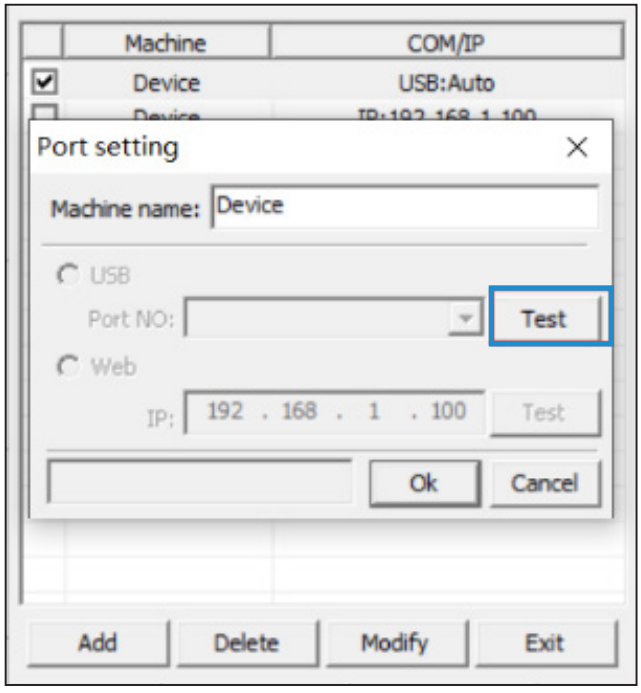


3. Click to tick the box as shown. Click “Modify”.



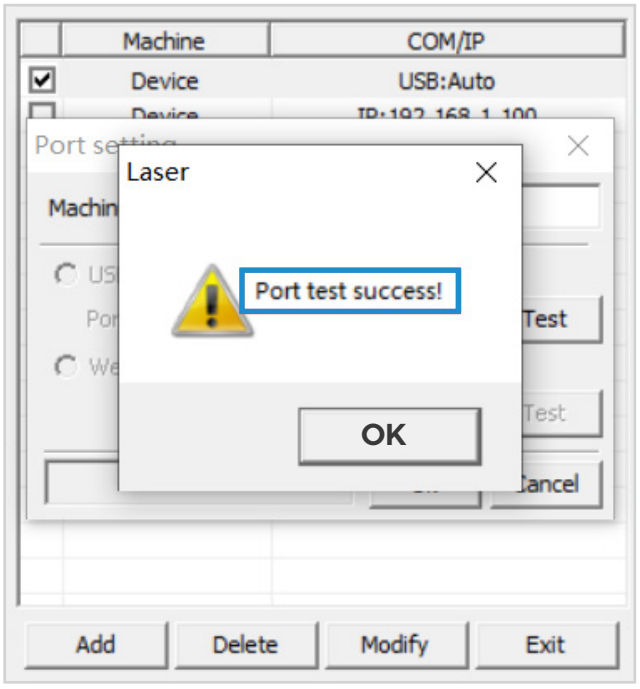
4. Click “Test” in the dialogue box that shows up as shown.

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



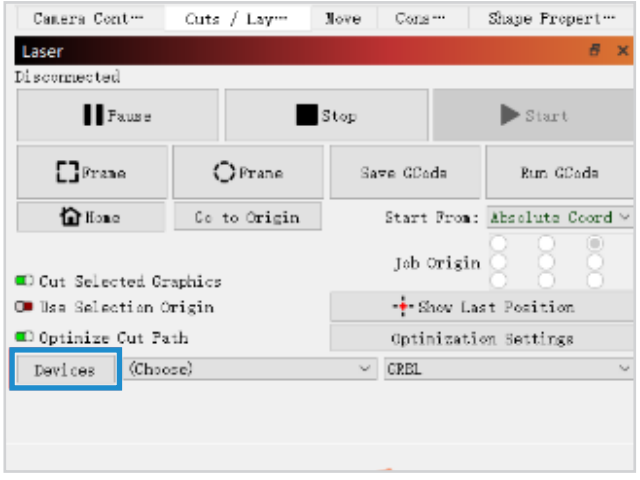
3. Installation

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

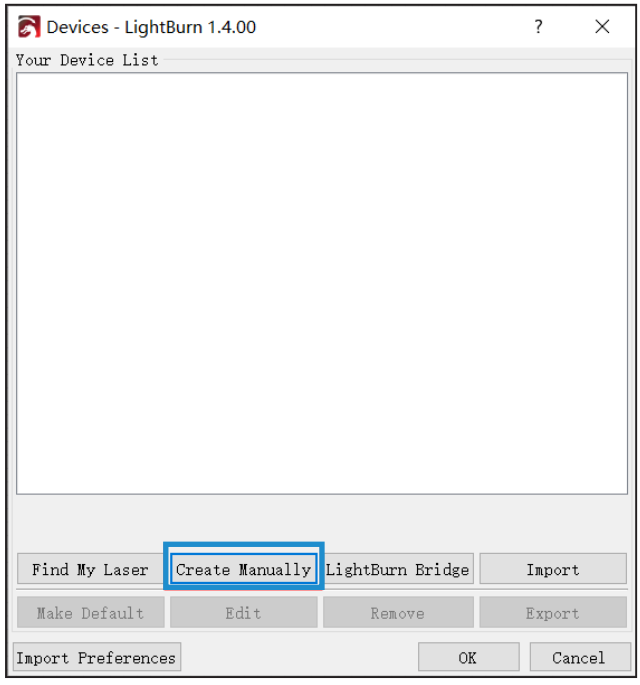


Lightburn

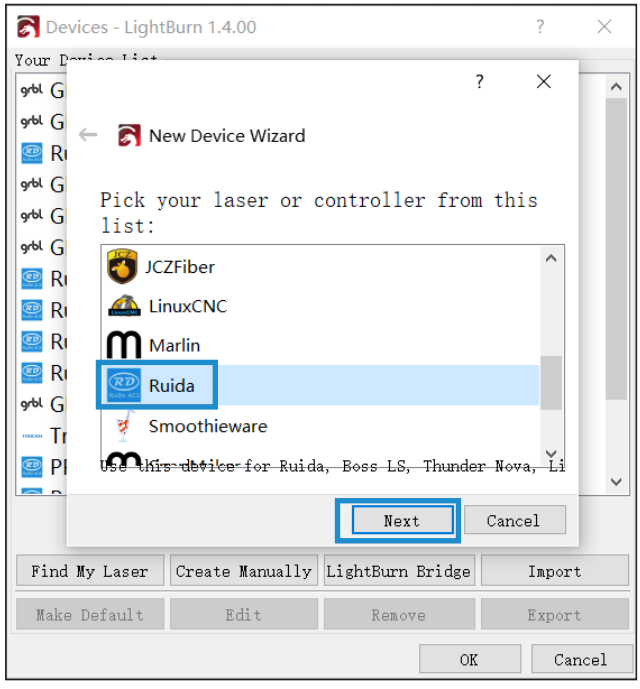
1. Initiate Lightburn on your control computer and connect it to your engraver using the provided USB cable.
2. Click “Device” as shown.



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

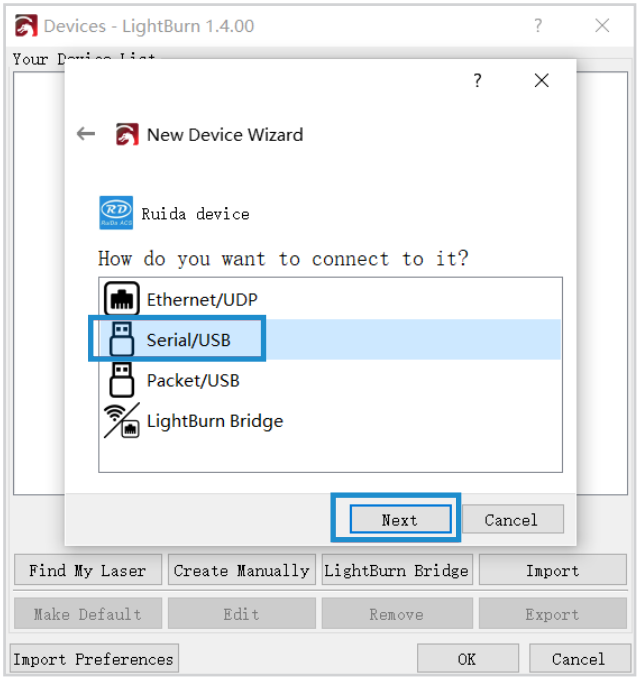


4. Choose “Ruida” and click “Next”.

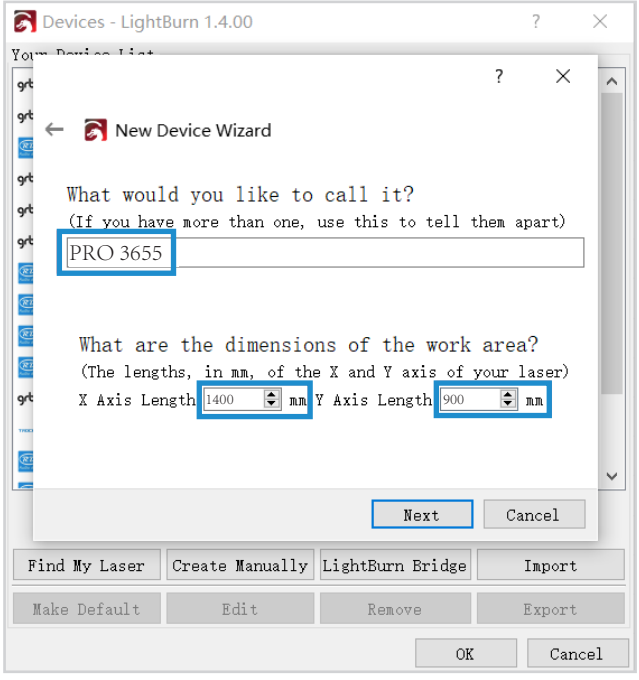


3. Installation

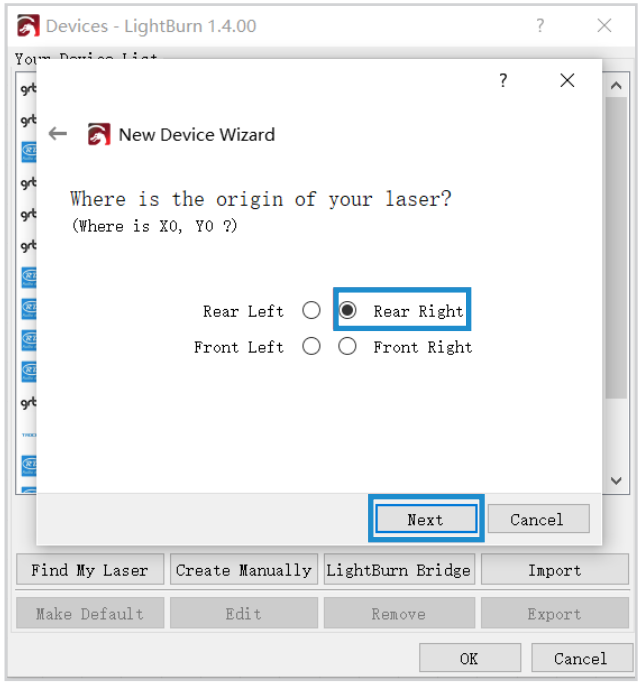
5. Choose Serial/USB and then “Next”.



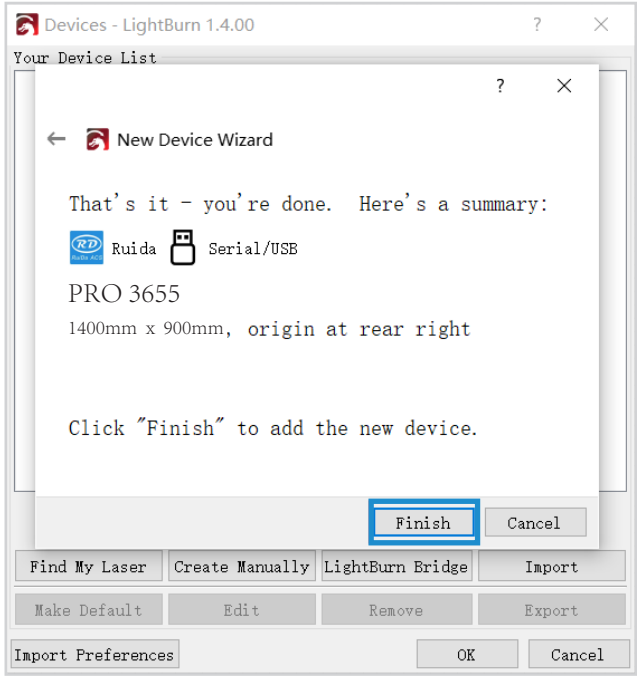
6. Enter the circled engraver name and X and Y axis length. Click “Next”.



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

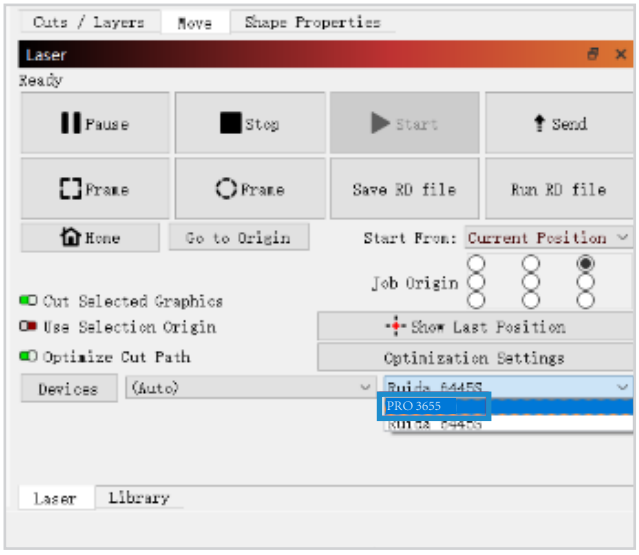


8. Confirm your configuration and click “Finish” to close the pop-up.



3. Installation

9. Click the device drop list in the lower right corner and choose “PRO 3655”. The engraver is connected when the system shows “Ready”.

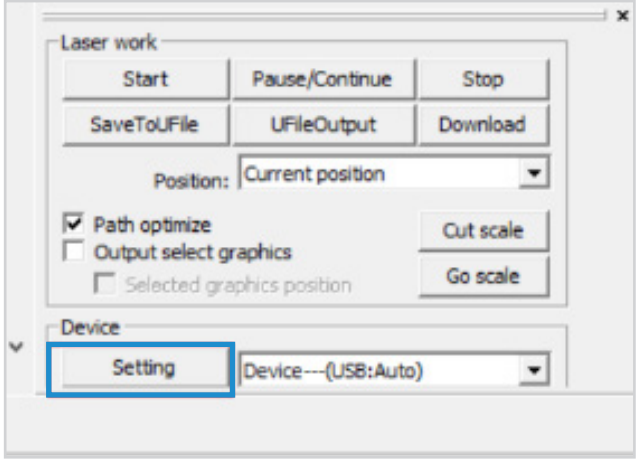


3.8.4 Connection Through Wi-Fi

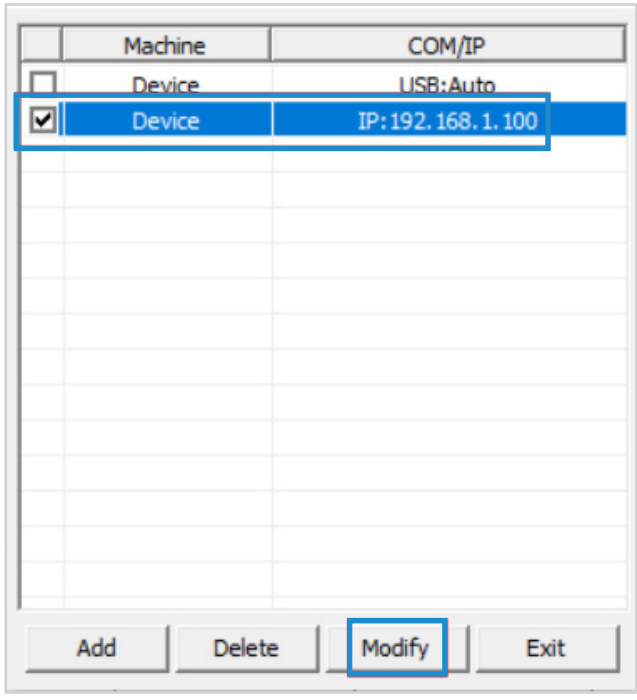
RDWorks V8

1. Enable Wi-Fi on your computer. Search or select network “OMTECH PRO 3655”. Enter the passcode (123456abc) to connect your control computer to the laser engraver.

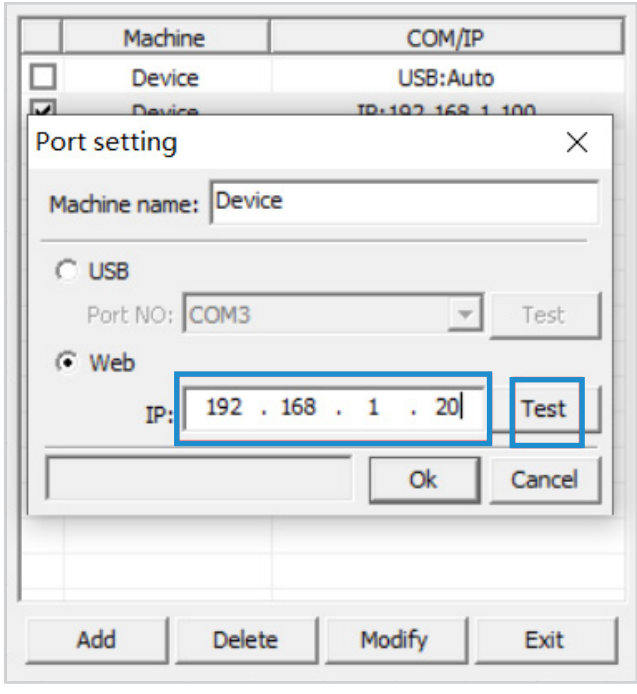
2. Initiate RDWorksV8. Click “Setting”.



3. Click to tick the box before “Device”, being sure the IP address is as shown. Click “Modify”.

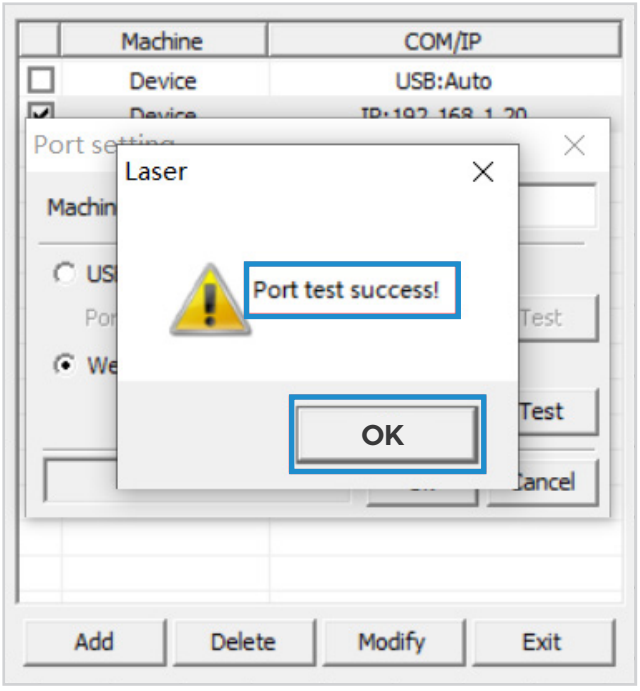


4. Set the IP address to “192.168.1.20” in the pop-up that shows up. Click “Test”.



3. Installation

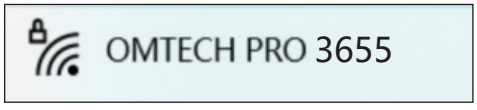
5. You should see the pop-up as shown. Click OK.



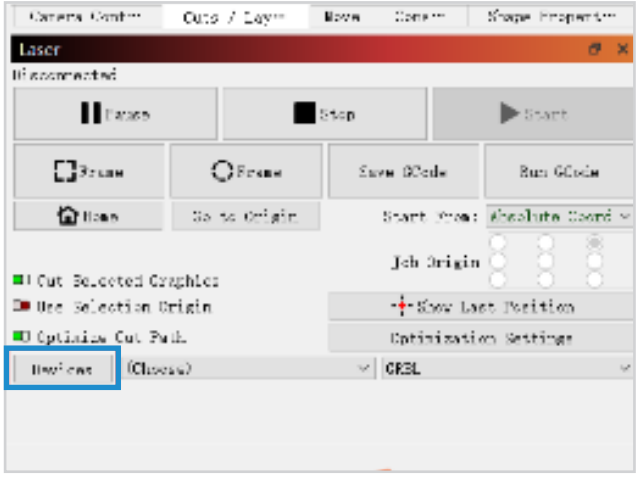
6. Click “Exit” to return to the home interface.

Lightburn

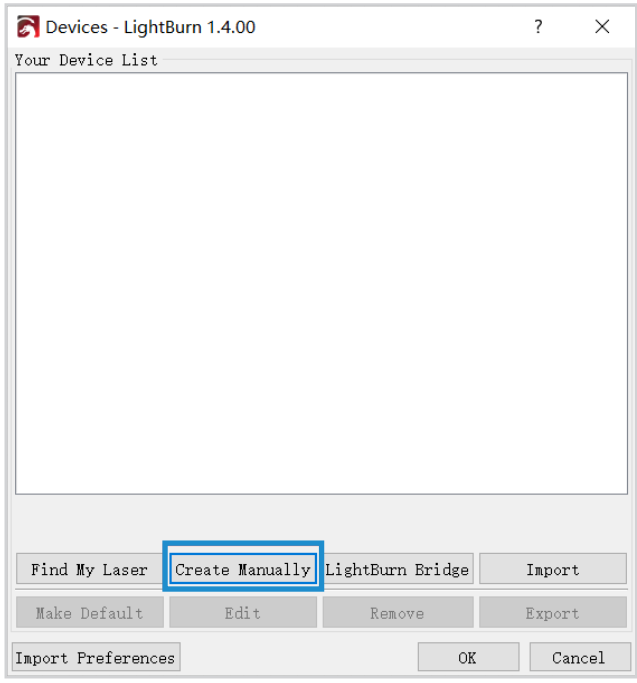
1. Enable Wi-Fi on your computer. Search or select network “OMTECH PRO 3655”. Enter the passcode (123456abc) to connect your control computer to the laser engraver.



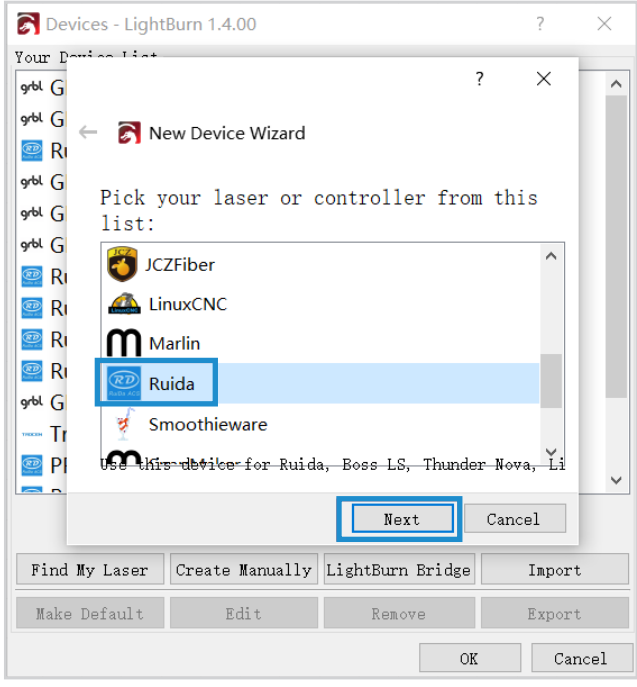
2. Initiate Lightburn and click “Device: in the lower right corner as shown.



3. Click “Create Manually” in the dialogue box as shown.

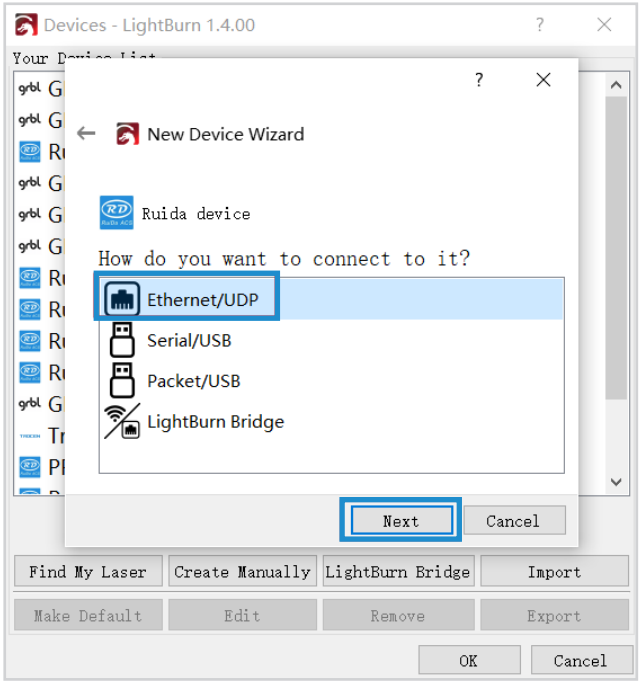


4. Choose “Ruida” from the list and click “Next”.

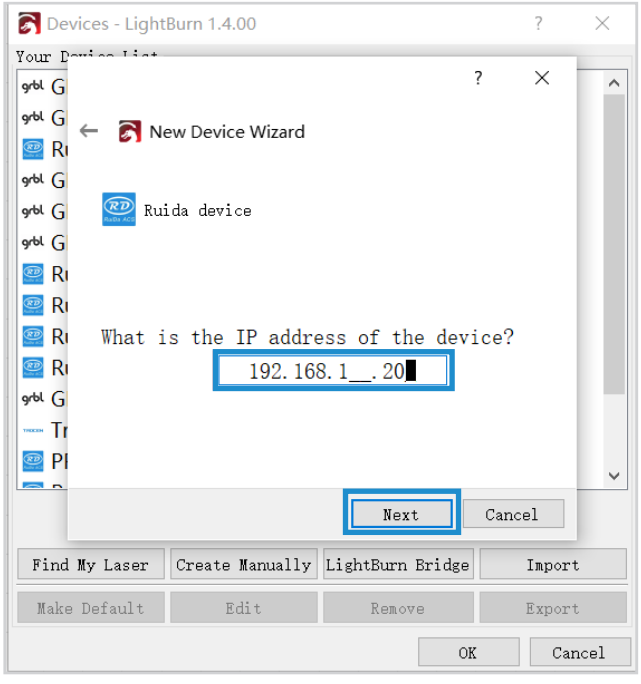


3. Installation

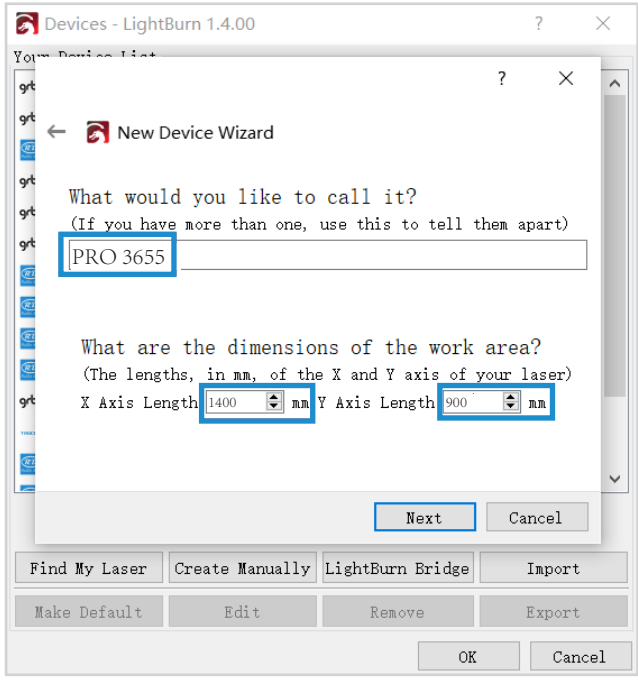
5. Choose Ethernet/UDP and click “Next’ in the pop-up as shown.



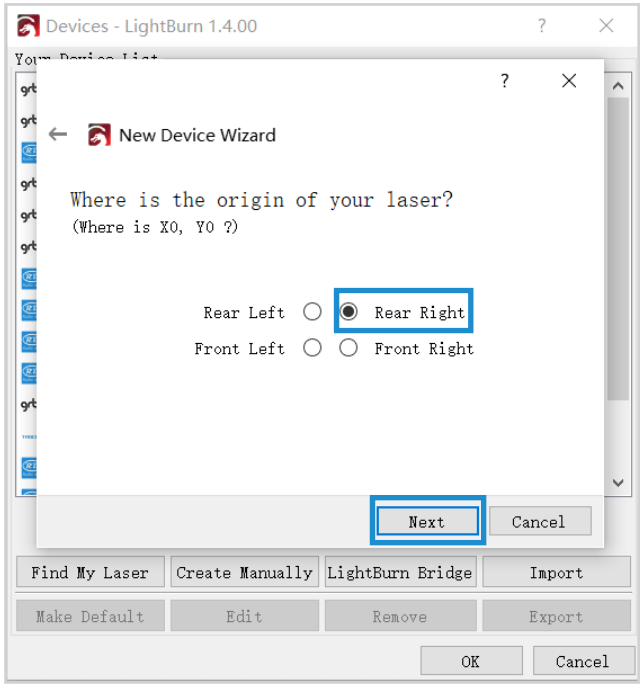
6. Enter “192.168.1.20” in the dialogue box as shown. Click “Next”.



7. Enter the engraver name, X axis length, and Y axis length as shown. Click “Next”.

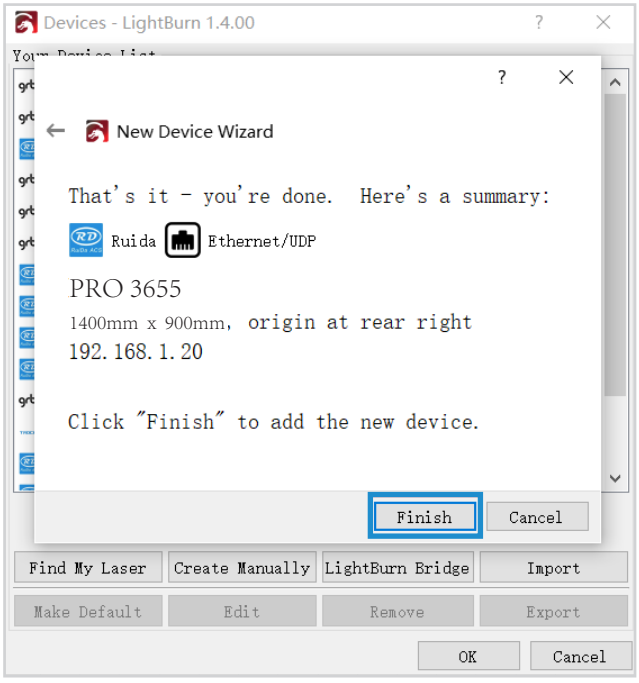


8. Set the engraver origin to “Rear Right” and click “Next”.

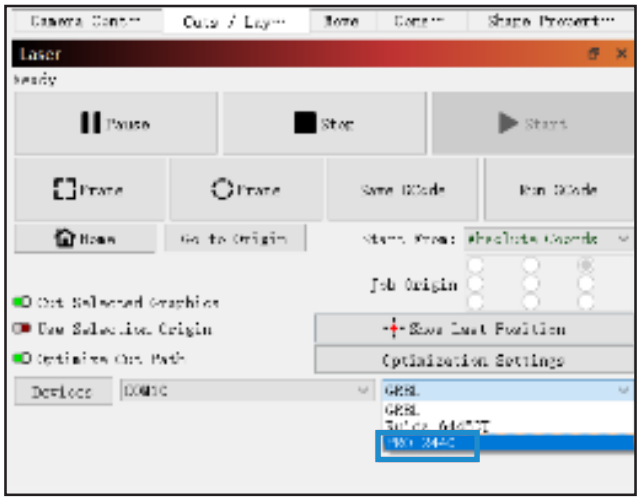


3. Installation

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



10. Click the device drop list in the lower right corner and choose “PRO 3655”. The engraver is connected when the system shows “Ready”.



DO NOT connect your computer to the engraver with a network cable. The port marked with “Ethernet” on the engraver is for internet connection.

3.9 Main Power Connections

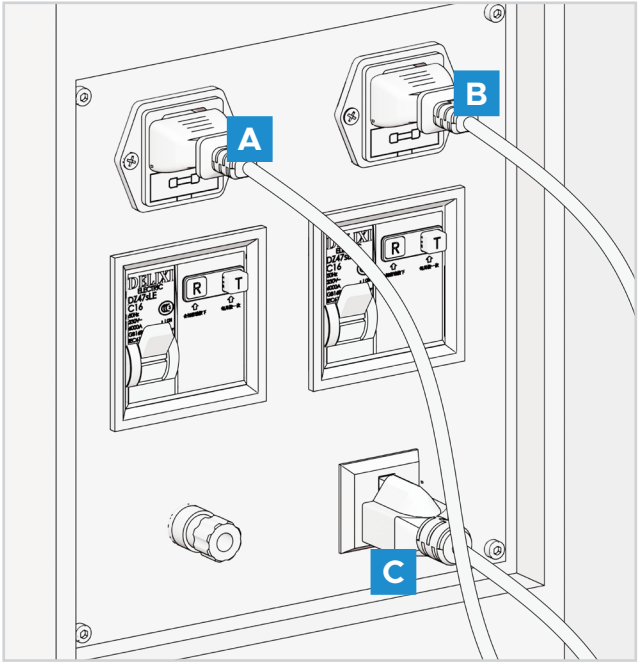
Under **NO** circumstances should you switch on the engravers if the voltages do not correspond or if your circuits will be unable to handle the necessary load.

Fluctuation along the lines should be less than 5%. If it is exceeded the engravers' own fuses will blow to protect its internal electronics. They are located below the connection sockets and are accessible from the exterior.

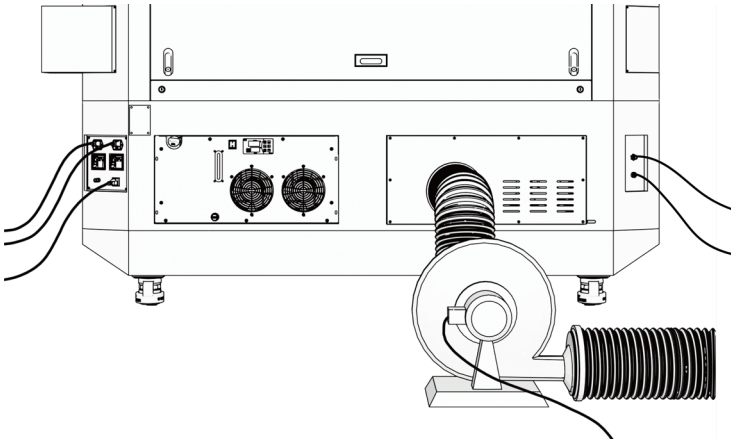
DO NOT connect this engraver to standard extension cords, power strips, or surge protectors.

1. Confirm that the label beside the connection sockets matches your power supply.
2. Connect one end of the two power cables (main power cable A and water chiller cable B) to the connection sockets and the other ends to grounded outlets.

   The combined electrical load of all the major components of this engraver will draw over 30 A. If you have not prepared a robust dedicated line, keep the engraver and chiller on two separate 20 A circuits.
3. Plug the external fan into the outlet on the engraver (C) or use a separate 15 A or 20 A circuit (recommended).



With the hardware all set, proceed with the software and control computer.

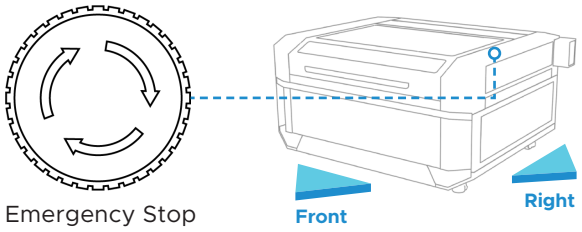


4. Initial Testing

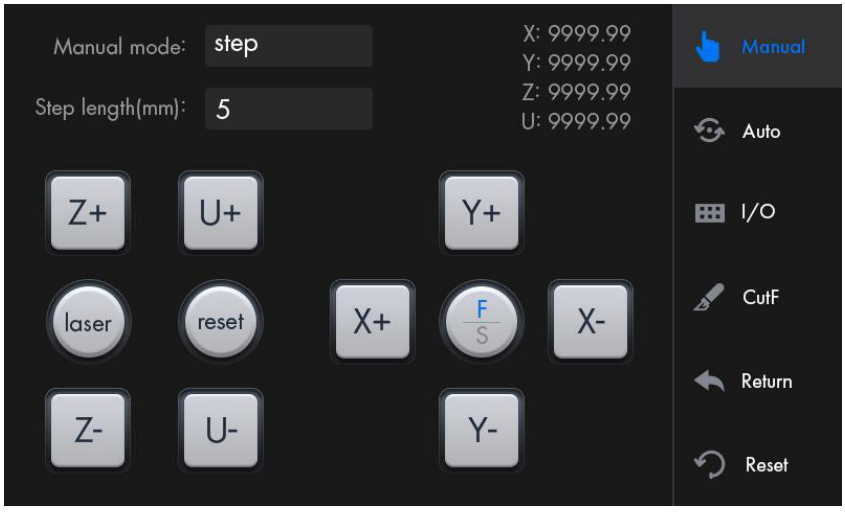
4.1 Emergency Shutoff

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

When your engraver arrives, its emergency stop button is already pressed and must be rotated up to allow the engraver to function. You should test that it works properly before conducting **ANY** other work with your machine.



1. Flip both circuit breakers on.
2. Visually confirm that water is flowing through the entire tube and all air bubbles have been removed and that the power indicator.
3. Place a piece of laserable scrap material on the workbed under the laser head and close the cover.
4. Twist the emergency stop clockwise to release it and turn the ammeter knob fully clockwise if it is not already in that position.
5. Insert and turn your laser key to activate the laser power supply.
6. Tap the box next to Power in **Parameter Display Area** from the main menu. Set reset the maximum and minimum laser power to 12%. Tap **OK** to confirm the modification and exit the current menu.
7. Tap “Manual” in the main menu, and the following menu pops up.



8. Tap Z+, Z–, X+, X–, Y+, and Y– so that that the laser head is about 1 or 2 inches above the laserable scrap.
9. Hold (laser) and the laser head should start firing laser beam continuously.
10. Hit the emergency stop and observe whether the laser stops instantly.

If the laser continues to fire, the laser key is not working and must be replaced before the engraver can be used. Flip off the circuit breakers and contact customer service.

4.2 Emergency Switch

1. Repeat steps 1–9 above.
2. Turn the laser key to its “OFF” postion and observe if the laser stops immediately.

If the laser continues to fire, the laser key is not working and must be replaced before the engraver can be used. Flip off the circuit breakers and contact customer service.

4.3 Cover Shutoff (Interlock)

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

Test that the cover shutoff works properly before conducting any other work on your machine.

1. Follow the procedure above(§4.1 Emergency Shutoff) for testing the emergency stop to start up your machine and fire a low-strength test beam into any piece of laserable scrap material.
2. 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.

4. Initial Testing

4.4 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, test that the water shutoff works properly before conducting any other work on your machine.

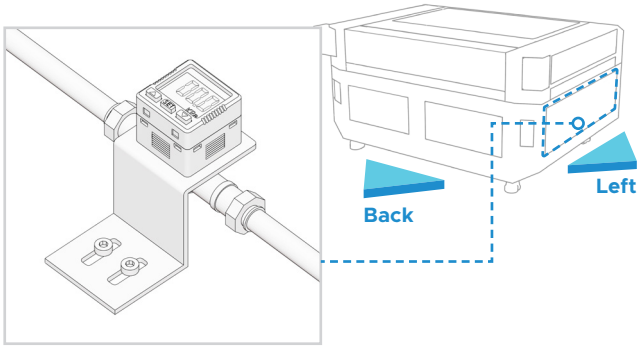
1. Follow the procedure above(§4.1 Emergency Shutoff) for testing the emergency stop to start up your machine and fire a low-strength test beam into any piece of laserable scrap material.
2. Turn off the water chiller using its separate power switch.
3. Attempt to fire the laser again.
4. If the laser does not fire, the automatic shutoff is working fine; simply restore power to the water chiller and continue setting up your engraver.

> 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.

4.5 Air Assist Shutoff

Because of the danger posed by sparks during engraving and the risk of damage to the laser nozzle and focus lenses from fumes and debris, this engraver also shuts off the laser automatically when the air assist system malfunctions.

Test that the air assist shutoff works properly before conducting any other work on your machine.



1. Follow the procedure above(§4.1 Emergency Shutoff) for testing the emergency stop to start up your machine and fire a low-strength test beam into any piece of laserable scrap material.
2. Cut off the flow of air by crimping or tying the air hose between the rear of the machine and the air assist's digital controller behind the lower left access door.

> Take care not to damage the hose itself in this procedure.

3. 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 hose to restore access to the air intake and continue setting up your engraver.

4.6 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 a full optical alignment test as part of setting up your machine. See §8.3 Laser Path Alignment for step-by-step guidance.

4.7 Security

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

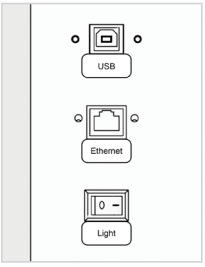
5. Typical Operation Sequence

5.1 Operation Overview

> Operate this laser engraver only in accordance with all the instructions provided in this manual. Failure to follow the guidelines detailed here can result in property damage and personal injury.

The engraver is operable either through:

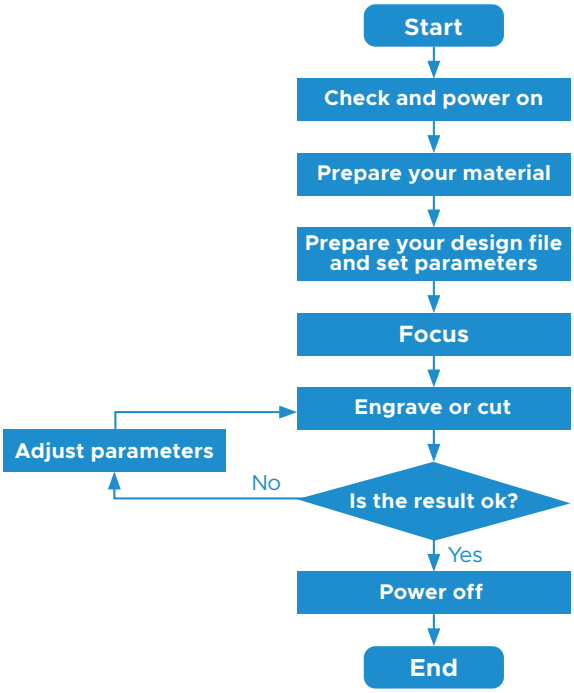
- The built-in control panel,
- A USB cable connection with your computer,
- The engraver's in-built Wi-Fi module.



Most of the operations are automated. The, X+, X–, Y+, and Y– icons in the manual menu can be used to move the laser head along the X and Y-axis guide rails and the Z+, Z– can be used to raise or lower the workbed.

More often, you will create designs as graphic files on the control computer, load them on the engraver, and then engrave or cut them. The software can be used to create different layers with different power settings, speeds, and other parameters.

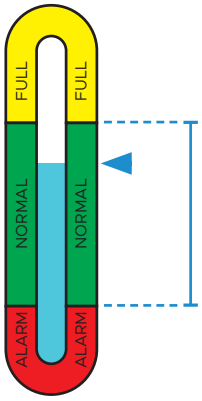
Once everything is perfect, press "Focus" to autofocus the laser head, press "Frame" to preview the size of a preset frame around your engraving design, press start to begin engraving, and press "Stop" to stop and reset the laser head back to the origin.



5.2 Pre-Engraving Preparation

5.2.1 Checking

1. Make sure the power supply is ok.
2. Check and fill the water chiller.
   a. Inspect the water chiller's gauge to ensure that your cooling liquid is completely clear and in the upper half of the green "NORMAL" zone.
   b. If the level is low, fill the chiller with the laser-safe antifreeze or distilled water.



3. Ensure proper ventilation.
   a. Turn on the fume extractor system and check its functionality.
   b. Make sure that any back-up ventilation systems are in place and running smoothly.

NEVER operate the laser if the fan and ducts are not working to purify or remove the fumes produced by the target material. Research materials before use and never operate the laser on any (such as PVC, teflon, and other halogen-containing substances) that can produce corrosive, hazardous, or even deadly fumes.

4. Open the engraver's cover, confirm the air assist is working well, blowing air through the nozzle.

5. Typical Operation Sequence

6. Adjust the workbed if necessary.

Honeycomb Bed

For lightweight materials requiring close support: wood, fabric, leather, thin veneers

Aluminum Knife Bed

For heavy or rigid materials that are self-supporting and might damage the honeycomb bed and heat-sensitive materials (for example, acrylic, plastic) needing high airflow to avoid surface damage

Steel Saw Blade Bed

For processing metals or heavier materials that demand a more robust support during high-power cutting operations

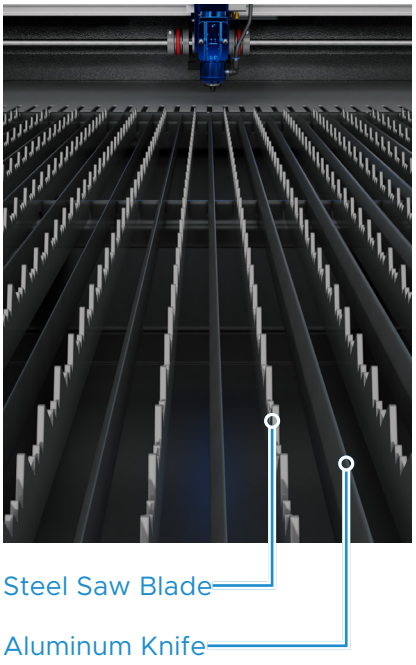
Aluminum Knife Bed and Steel Saw Bed Integration

For a broad range of materials, including heavy or rigid items that can self-support and perfect for heat-sensitive materials such as acrylic and plastic, whose safe operation requires increased airflow

The steel saw blades add increased strength to the table, providing superior support and durability for intensive cutting tasks.

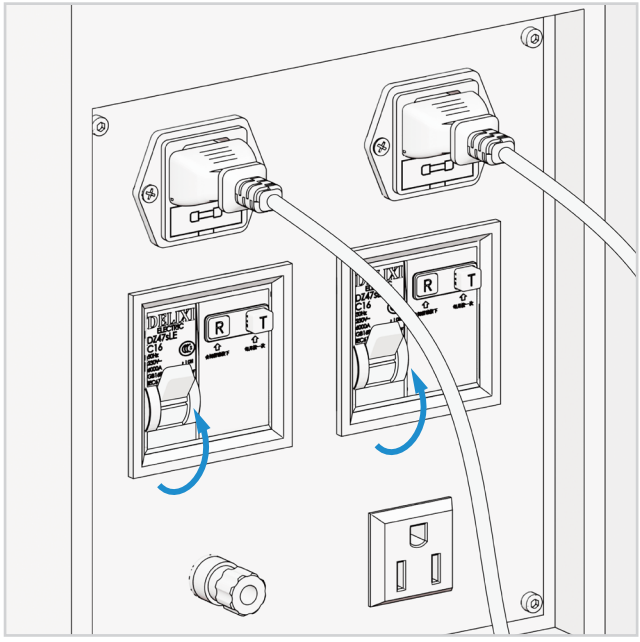
Custom Support

For irregularly shaped workpieces without self-support.



5.2.2 Powering on

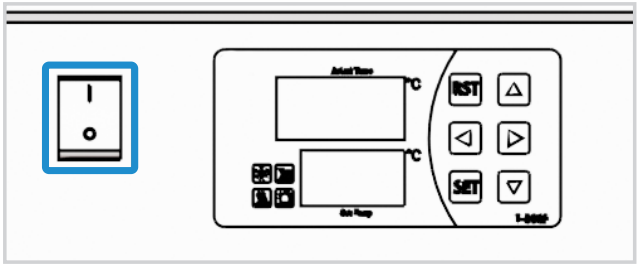
1. Flip both circuit breaker switches to the ON position.



2. Turn on the water chiller by pressing **POWER** switch to — position.

   For detailed information about water chiller temperature setting, see §7.2 Water Chiller Adjustment (Page 106).

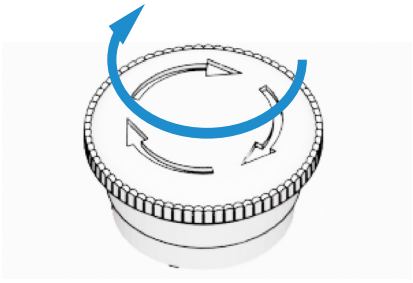
   See §3.5 Water Cooling Installation (Page 31) for what needs to be carefully checked when the chiller is fully operational.



3. Turn on the fume extractor or additional ventilation system.

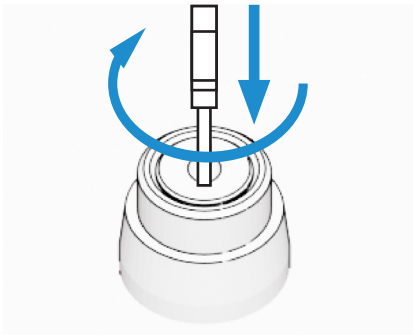
4. On the control panel, slightly rotate the emergency stop button clockwise until it pops up.

   The laser head automatically resets and then moves to the set zero point.

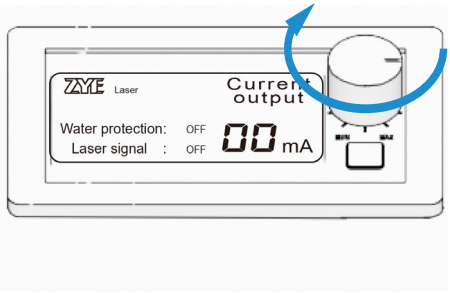


5. Typical Operation Sequence

5. Use the key to activate the laser lock.



6. Turn the ammeter knob clockwise to its maximum setting.

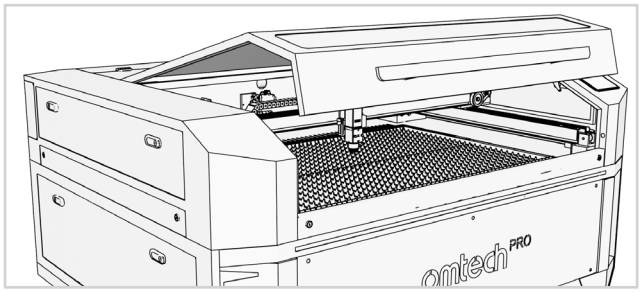


7. Flip the light switch below the Ethernet port to — position for best view results.
8. Wait until the engraver is in the standby mode and ready to use.

Status Indicator Light
- Green: Operational mode
- Blue: Standby mode
- Red: Alert mode

5.2.3 Preparing Material

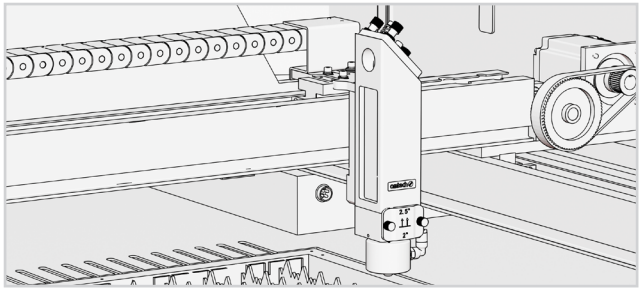
1. Open the engraver's cover.



2. Place a sample piece of your material on the workbed.

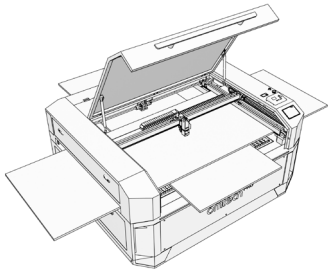
   The default location of the laser head's zero position is at the top right corner of the workbed. This can be changed by moving either your design or the engraver's origin position using the control panel or your engraving software.

   For instructions on material safety, see §1.7 Material Safety.



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, rear, or side pass-through doors.



3. Close the engraver's cover.

5. Typical Operation Sequence

5.2.4 Preparing the Engraving Pattern

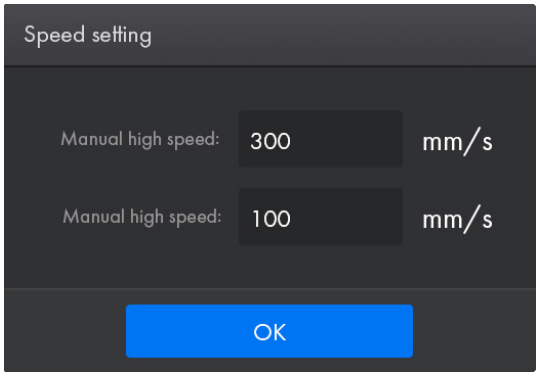
Step 1. Create the design.

Create the design that you'd like to engrave or cut. (See §5.5 for engraving spherical or cylindrical objects.) You can do this directly in your engraving software or use any other graphics program to create the image and set its engraving parameters. Files should not exceed 128 MB in size. Larger images will need to be reduced in resolution or divided into pieces for separate engraving.

Step 2.Set the Parameters.

Speed Levels

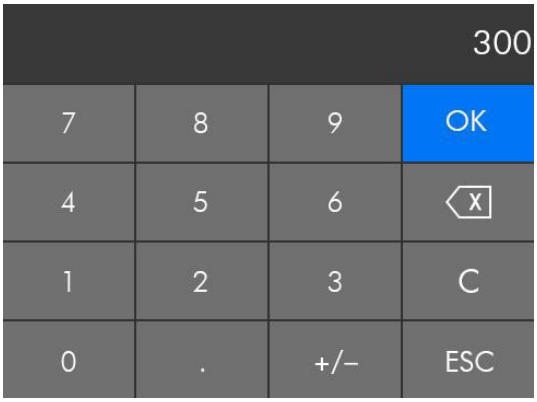
1. Tap "Speed" in **Parameter Display Area** from the home menu, and the right pop-up shows up.



When the system is idle, the speed parameters controls the manual high speed and manual low speed. That is, the speed range that the laser head can be manually moved to reach, which is convenient for debugging and calibrating.

When the system is running or paused, those speed parameters control the processing speed of the laser head.

2. Tap the parameter box to show the numeric keyboard as shown.
3. Set the value to that you desire.
4. Tap OK to confirm the modification and exit the current menu or tap ESC to cancel the modification and exit the current menu.



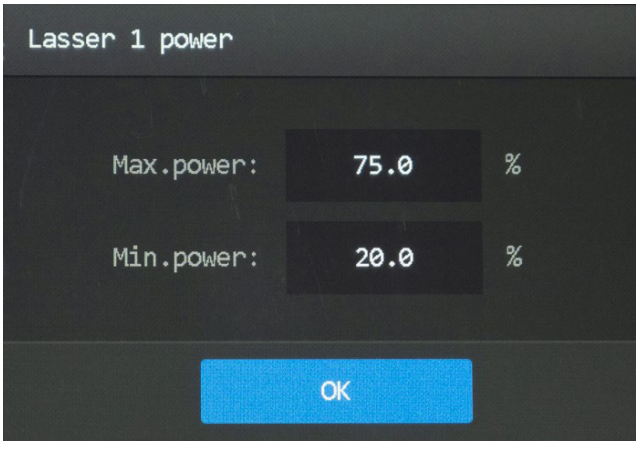
The exact speed value deepends on the material, its thickness, among other things. To aceive the best resultant pattern, See §5.6 for speed recommendation for specific materials.

5. Typical Operation Sequence

Power Levels

- All powers are displayed as percentages (%) of the engraver's rated power. Running your laser above 70% risks shortening your laser's service life. If you find power settings of 70% or lower do not produce the results that you need, for most materials it is better if you first attempt to increase the amount of energy per unit area by slowing the laser or running more loops before further increasing the power setting itself.
- The threshold for the lowest setting is around 10% and the laser will not have sufficient voltage to fire at settings below this. It is NOT recommended to use the laser tube at full capacity either, especially for extended periods. The recommended maximum power setting is 70%, as prolonged use above that amount will shorten your laser's service life. To increase the 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. You can also try grids of possible settings at first to find what works best with your material.

1. Tap Power in **Parameter Display Area**, and the following menu pops up.
2. Tap the parameter box to enter the power that you desire to use.
3. Tap OK to confirm the modification and exit the current menu.



The exact power value deepends on the material, its thickness, among other things. To aceive the best resultant pattern, See §5.3 for power recommendation for specific materials.

Step 3. Place a sample piece of your material on the workbed.

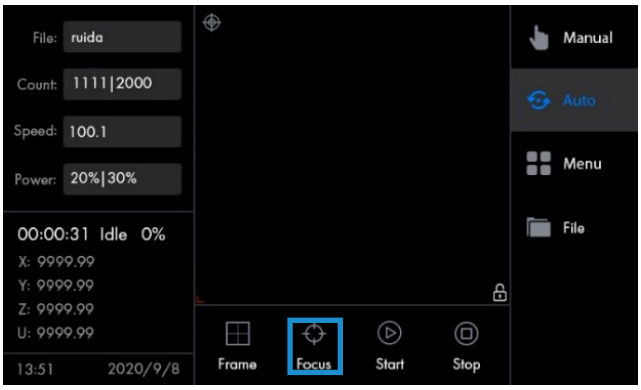
- The standard location is in the top right corner of the workbed. This can be changed by moving either your design or the engraver's origin position using the control panel or your engraving software.
- If you will be adjusting the laser head or its nozzles, it can be helpful to briefly cover the material with something soft and wide to catch any loose parts that might accidentally be dropped during the process. Remove any such material before engraving.
- For heavier pieces of material, be careful to distribute its weight as evenly as possible across the reinforced supports. For larger pieces of material, you may open the front, rear, or side pass-through doors.

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.

5. Typical Operation Sequence

5.2.5 Autofocusing

Tap the focus icon and the laser head should start move toward the simple material, stopping when the correct focal height has been reached.



- It is recommended that you start each session by pressing . This lets you check that the laser will begin where you want and that your material is correctly placed.
- Activate the standard autofocus by tapping . The autofocus will be done automatically. The workbed will be moving upward and then keep moving upward even though the laserable material has contacted the laser head. This is normal. Feel at ease. After pressing against the laser head for a while, the workbed will start moving downward and then stop at a perfect focal height.

5.3 Engraving Proper

Step 1. Tap ▷ to engrave your design.

Step 2. Tap ⊡ on the control panel to completely stop work, return to the beginning of the design, and reset the laser head back to its origin

Step 3. Open the cover and check that the engaved pattern is desired. If not, adjust the parameters as needed. For details, see §5.6**.**

Step 4. Remove the sample material and place the actual material for engraving.

Step 5. Tap ▷ to initiate.

- **DO NOT** stare continuously at the active laser even while wearing laser glasses but watch during use for possible issues like sparks and be prepared to quickly extinguish a fire if necessary.
- To halt the engraving, tap ⊡ on the control.
- 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**.

5.4 Wrappping-up

Step 1. Once the laser has stopped, examine the quality of your first run and adjust the laser parameters on the control panel or in your engraving software as necessary to create the desired effect.

By default, your chiller will attempt to keep its cooling liquid between 77° and 88°F (25–31°C) to ensure optimal functioning. If this range restricts your work too much, for a somewhat shorter service life, you can adjust the chiller's settings. (See §7.2 below.) The laser tube should still be able to run indefinitely so long as the cooling liquid remains below 100°F (38°C). Once this temperature is reached, however, stop work and allow time for your system to cool before resuming use.

5. Typical Operation Sequence

Step 2. Once you have finished engraving, close your software and then turn off your machine in the following order:

1. Turn and remove your laser key.
2. Turn the ammeter down.
3. Press the emergency stop.
4. Allow time for the ventilation and cooling systems to continue running, cooling the laser and removing any remaining fumes or dust.
5. Turn off the external fan, and then the water chiller.
6. Flip down the circuit breaker at the rear of the engraver.

Step 3. Fully clean the workbed and check if the lens or any mirrors require cleaning. Use the bottom left access panel to remove, empty, clean, and replace the debris tray. Store everything neatly away.

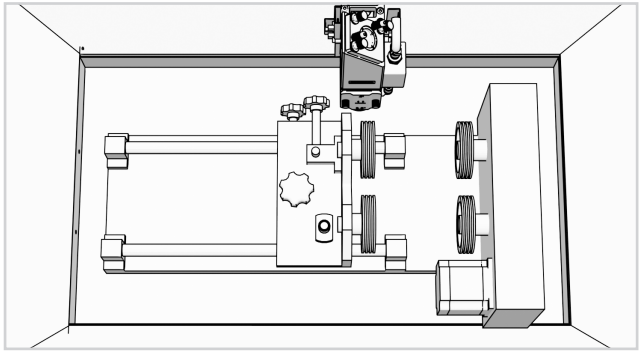
5.5 Rotary Operation

5.5.1 Installing a Rotaty Attachment

Cut the power to the engraver before installing the attachment.

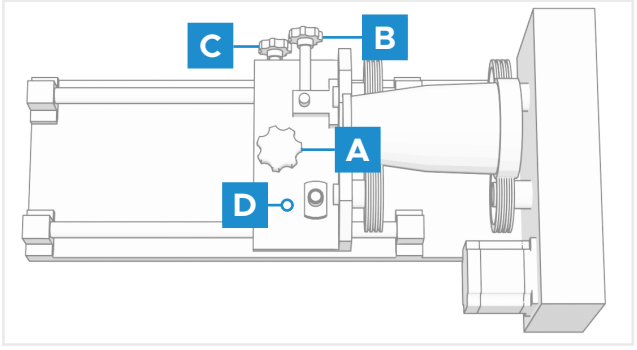
PRO 3655 does not come with a rotary attachment but is compatible with standard four-pin models.

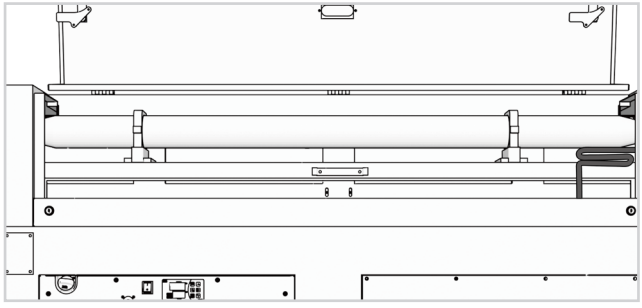
1. Remove the steel saw bed or the aluminum knife bed and the support bar of the blade.
2. Place your rotary axis in an open area.



3. Put the material and adjust the position using its knobs.
   a. Use the knob A to adjust the vertical position, and then use the knob B to tighten and secure it.
   b. Loosen the knob A, slide the base D to adjust the horizontal position, and then tighten knob A to secure it.
4. Check the height of workbed is appropriate.

   If necessary, lower the workbed (using and keys) to provide room for the laser head to pass over your axis and material.
5. Connect the rotary axis cord to the rotary port at the back of the main bay.

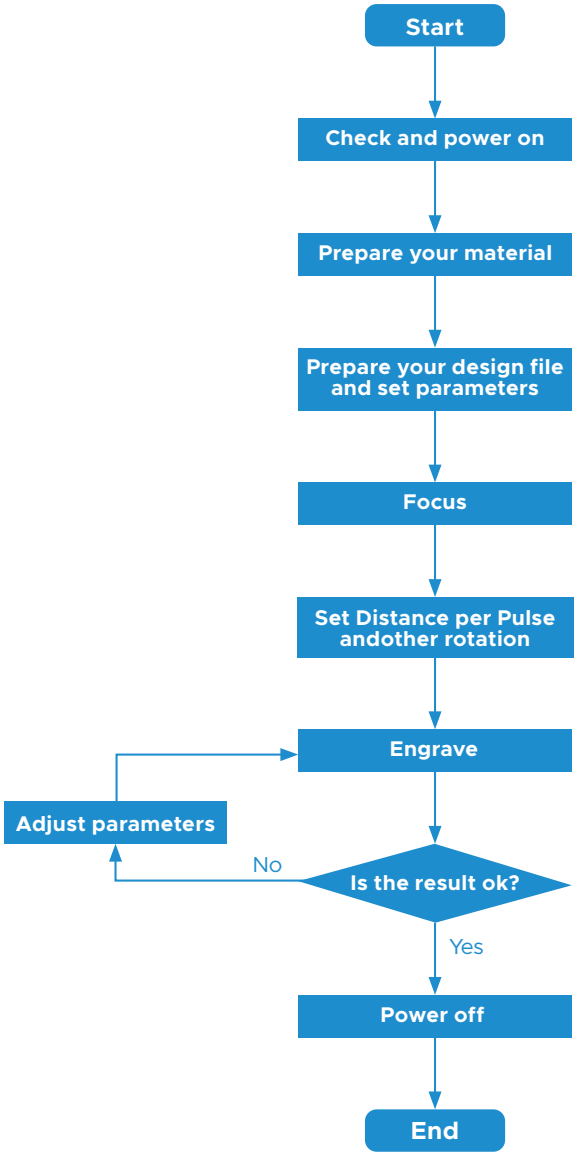




5. Typical Operation Sequence

5.5.2 Engraving Procedures with a Rotary Attachment

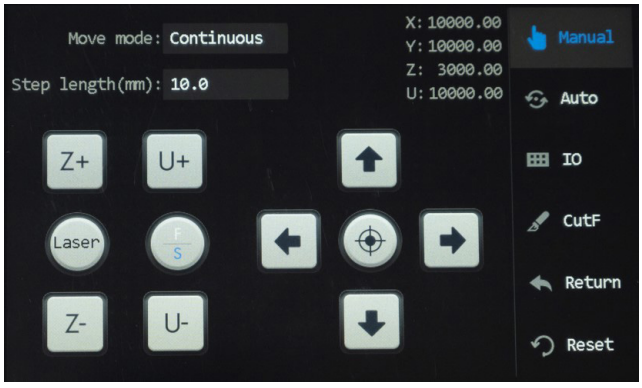
In typical workflows, designs are created by using graphic files on a control computer, then transferred to the engraver for execution. Here are the main operation steps:



5.5.3 Engraving Procedures Proper

Step 1. Prepare your engrave material per §5.2 Pre-Operation Preparation.

Step 2. Tap “Manual” in the main menu, and the following menu pops up.



Step 3. Insert the provided focal height ruler between the laser head and the obeject to te engraved.

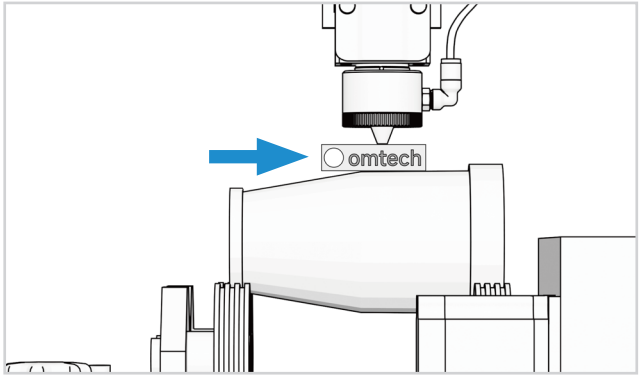
Step 4. Use the arrow up and dow keys to move the laser head closer to the ruler, stopping when the laser head gently rests above the ruler.

Step 5. Remove the ruler.

Step 6. When finished with focusing, flip the rocker switch to —

The rotation of the rotary attachment will be controlled by the engraver’s Y axis settings.

Step 7. Follow §5.3 Engraving Proper and §5.4 Wrapping up for the rest of the the engraving process.



5. Typical Operation Sequence

5.6 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.

Average Engraving Settings

Despcrition		Glass	Leather		Clear Acrylic	Stone/Tile	Wood
			Genuine	Faux			
130 W	Power (%)	16	16	15	15	18	18
	Speed (mm/s)	275	450	475	375	185	225

Despcrition		Glass	Leather	Acrylic	Stone/Tile	Wood
150 W	Power (%)	16	16	15	18	18
	Speed (mm/s)	275	450	375	185	225

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.

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.

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.

Despcrition		Thickness			
		1/16 in.	1/8 in.	1/4 in.	1/2 in.
130 W	Power (%)	17	24	28	37
	Speed (mm/s)	40	25	9	6

Despcrition		Thickness			
		1/16 in.	1/8 in.	1/4 in.	1/2 in.
150 W	Power (%)	17	23	27	35
	Speed (mm/s)	45	26	40	7

Metal

This engraver is not designed for cutting nor engraving metals.

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.

5. Typical Operation Sequence

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 highspeed 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.

Description		Thickness of Acrylic						
		1/16 in.	⅛ in.	¼ in.	½ in.	¾ in.	1 in.	1⅛ in.
130W	**Speed (mm/s)**	30	15	7	6	5	2	1
	Power (%)	17	25	30	37	42	55	58

Description		Thickness of Acrylic							
		1/16 in.	⅛ in.	¼ in.	½ in.	¾ in.	1 in.	1⅕ in.	1⅗ in.
150W	**Speed (mm/s)**	35	16	8	7	6	3	2	1
	Power (%)	16	24	30	35	40	53	55	58

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.

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.

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.

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.

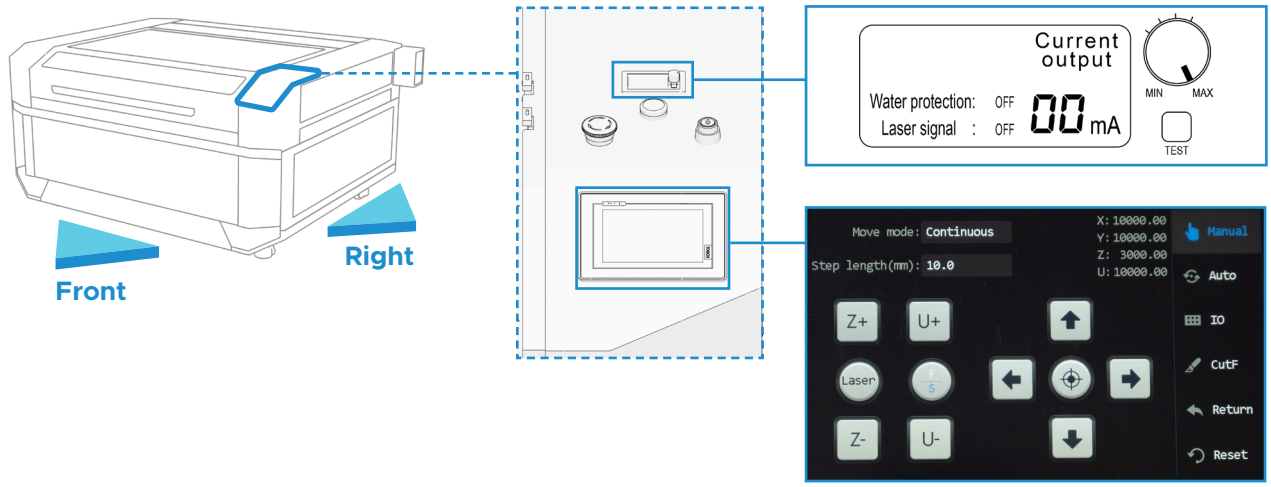
Description		Thickness of Baltic Birch Plywood							
		1/16 in.	⅛ in.	¼ in.	½ in.	¾ in.	1 in.	1⅛ in.	1¼ in.
130W	**Speed (mm/s)**	35	16	8	7	6	5	3	2
	Power (%)	18	25	27	32	37	42	47	55

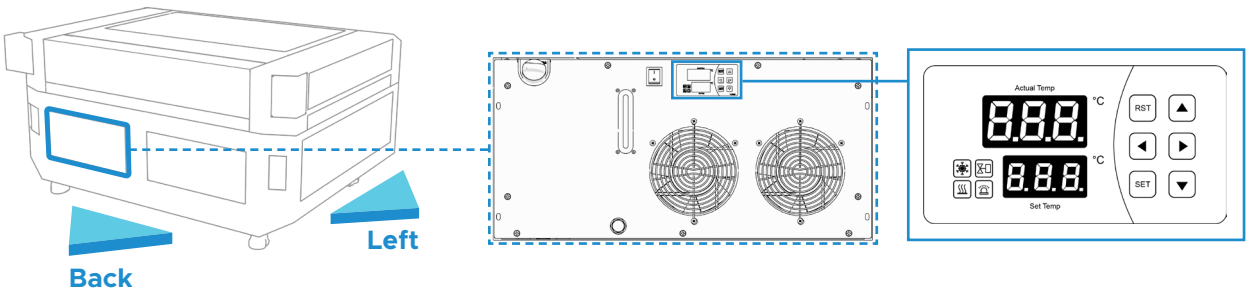
Description		Thickness of Baltic Birch Plywood							
		1/16 in.	⅛ in.	¼ in.	½ in.	¾ in.	1 in.	1⅛ in.	1⅛ in.
150W	**Speed (mm/s)**	40	17	9	8	7	6	4	2
	Power (%)	18	24	26	30	35	40	45	52

6. Touch Screen Operations

6.1 Overview

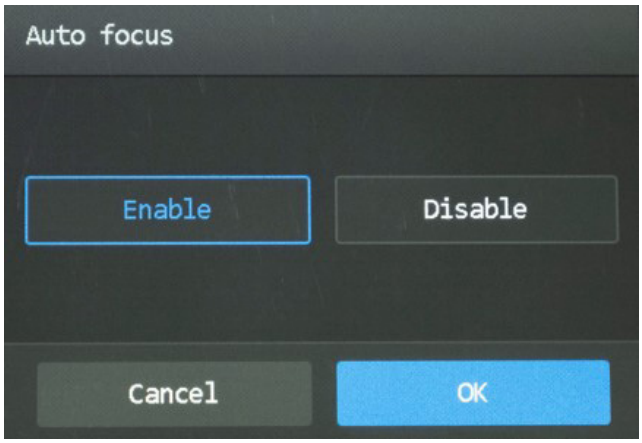
Operate this laser engraver only in accordance with all the instructions provided in this manual. Failure to follow the guidelines detailed here can result in property damage and personal injury.





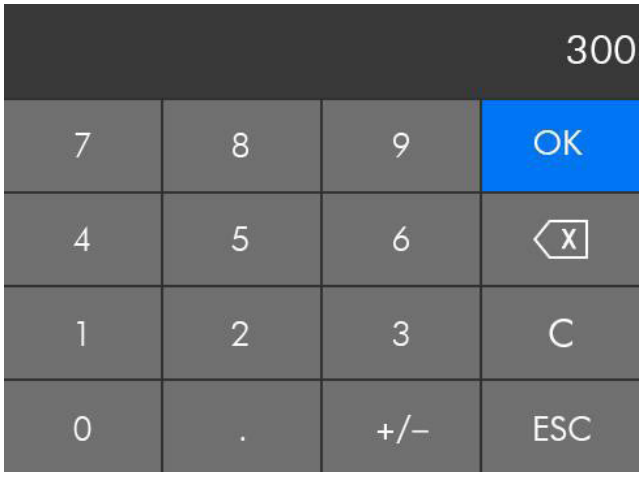
There are also small adjustable digital displays for the air assist system located behind the bottom left access door and for the laser power supply located behind the bottom right access door, but these should never be adjusted or need monitoring during regular use.

All the settings and parameters on the touchpad can be accessed and changed through tapping. For settings that pop out, their alterations and confirmations are done through tapping Enable or Disable. Tap OK to save the change.



For parameters with numeric values,

1. Tap the value to enter the value, and a numeric keyboard shows up as shown:
2. Enter the value needed and tap OK to save the change and exit the current menu. Tapping **ESC** cancels the modification and exits the current menu.

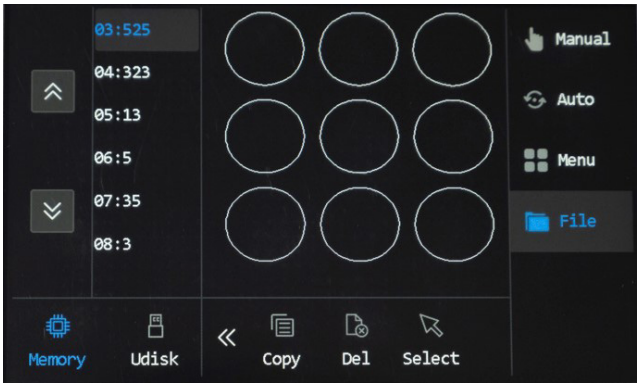


6. Touch Screen Operations

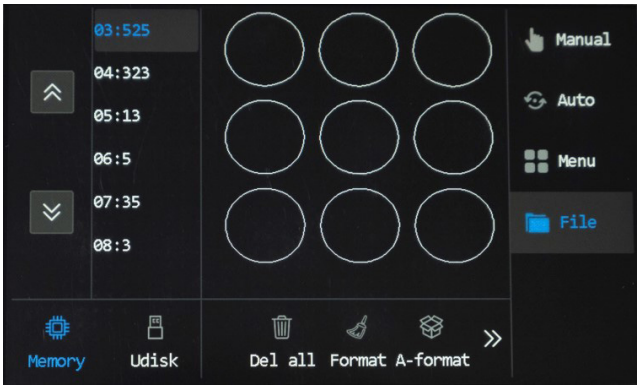
6.2 File Management

System Memory Files

In the main menu, tap **File**, and the following menu pops up.



Files are listed in the left column and a preview of a selected file is shown in the graphic display area. When there are multiple files, use the up and down icons to scroll through the file list.



To see the preview of a certain file, tap the file, and the preview shows up in the middle of the screen. Tapping the icon resembling a cursor readies the file for processing.

The memory and U disk icons in the lower left corner are used to switch between the system memory and a USB flash drive.

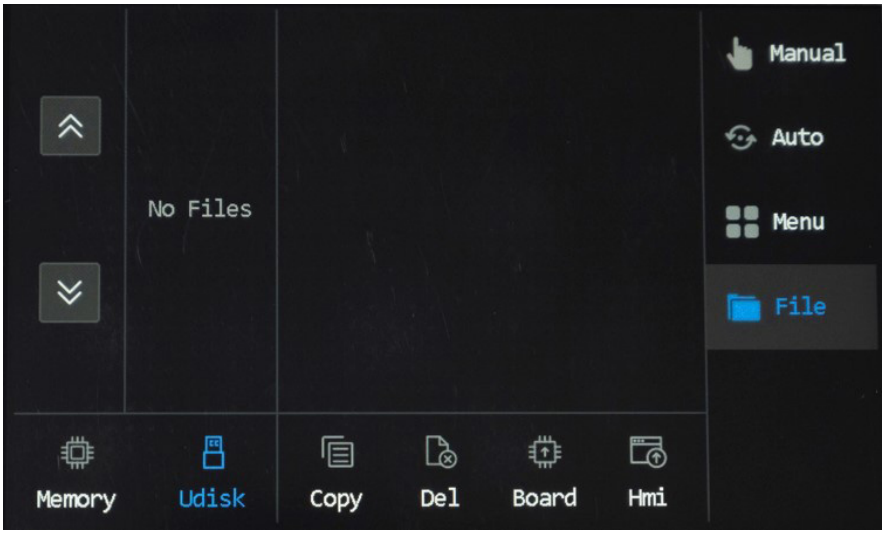
Icons	Functions
Copy	Copies the selected file to U disk.
Del	Deletes the selected file.
Select	Selects the currently selected file as processing file.
Del All	Deletes all memory files.
Format	Quickly releases memory.
A-Format	Formats system memory.

USB Files

- The system is compatible with FAT32 and FAT16 USB file formats. For best results, however, store your files under the root directory of the USB flash drive so that the system can recognize them quicker and easier.
- By default, the system dissects a file name exceeding 8 characters and shows it in more than one word. Also, the system cannot recognize file whose names consist of characters other than English and Arabic numerals. All files exported from the system to a flash drive are stored under the root directory of such storage gadget.

1. Tap **File** (if you haven't done this), and the file management menu pops up.
2. Tap **Udisk** to switch the memory route to the USB flash drive that's connected.

The 4 icons in the middle are for managing the USB files.

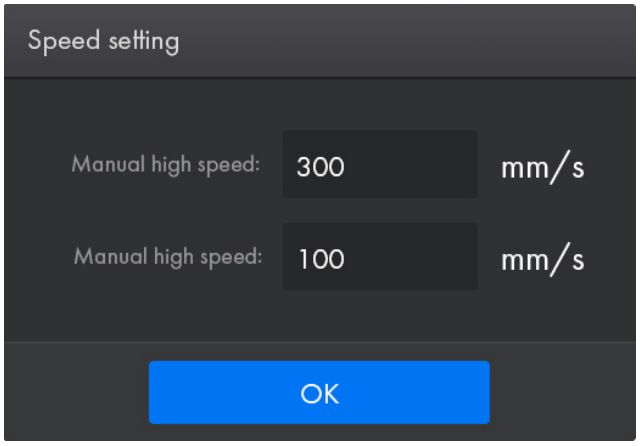


Icons	Functions
Copy	Copies the selected file from the flash drive to the system memory.
Del	Deletes the selected file.
Board	Upgrades mainboard program through the USB flash drive.
Hmi	Upgrades the control panel program through the USB flash drive.

6. Touch Screen Operations

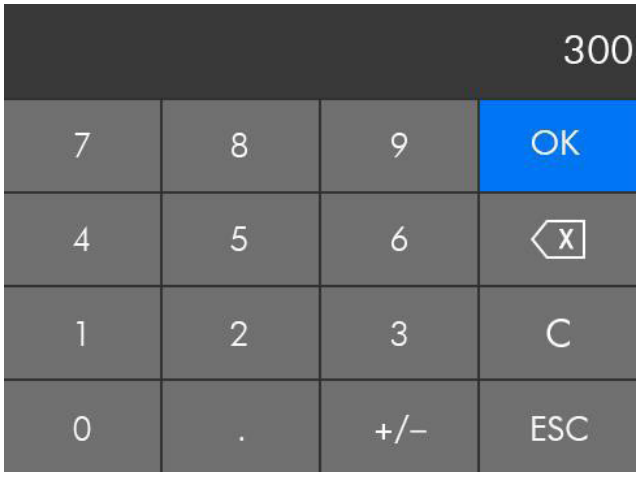
6.3 Setting Speed Levels

1. Tap **Speed** in **Parameter Display Area** from the home menu, and the following menu shows up.



- When the system is idle, the speed parameters controls the manual high speed and manual low speed. That is, the speed range that the laser head can be manually moved to reach, which is convenient for debugging and calibrating.
- When the system is running or paused, those speed parameters control the processing speed of the laser head.

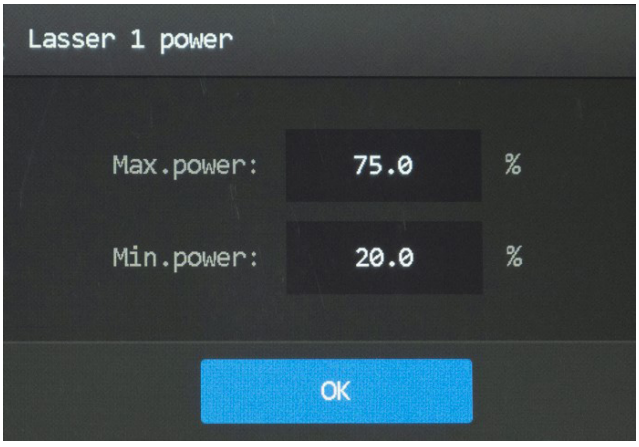
2. Tap the parameter box to show the numeric keyboard as shown.
3. Set the value to that you desire.
4. Tap **OK** to confirm the modification and exit the current menu or tap **ESC** to cancel the modification and exit the current menu.



6.4 Setting Power Levels

- All powers are displayed as percentages (%) of the engraver's rated power. Running your laser above 70% risks shortening your laser's service life.
- If you find power settings of 70% or lower do not produce the results that you need, for most materials it is better if you first attempt to increase the amount of energy per unit area by slowing the laser or running more loops before further increasing the power setting itself.

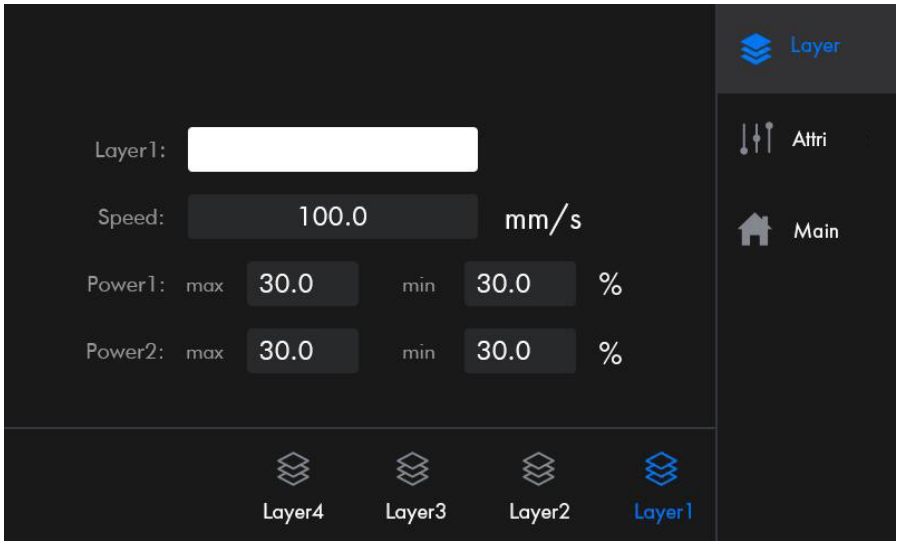
1. Tap Power in **Parameter Display Area**, and the following menu pops up.
2. Tap the parameter box to enter the power that you desire to use.
3. Tap OK to confirm the modification and exit the current menu.



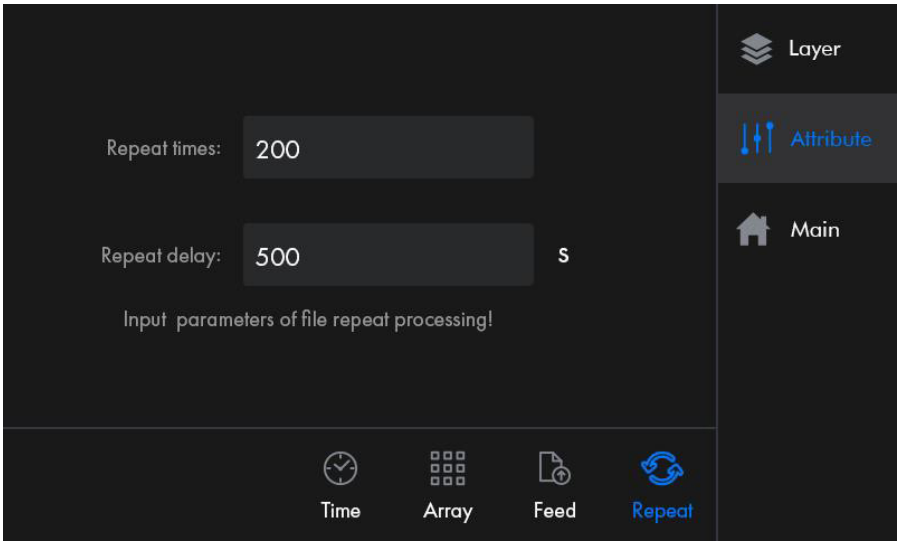
6. Touch Screen Operations

6.5 Setting File Parameters

When in the main menu, tap the filename of the file to be processed on the left upper corner, and the menu as shown pops up.



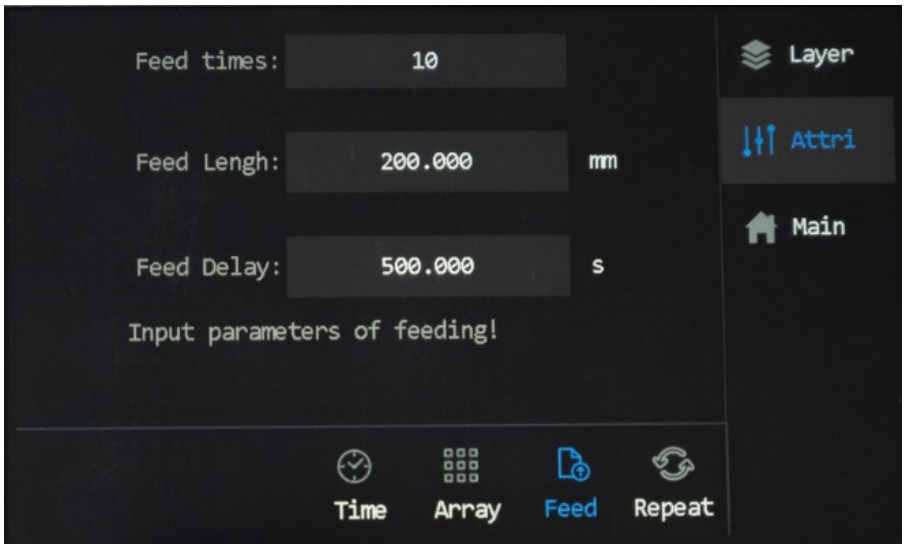
Submenus	Functions
Layer	Encompasses the speed and power, which can be customized for each layer of the file under this filename to your needs. At the bottom of the menu shows all the layers of the file. If the total number of layers exceeds 6, use the left/right arrows to browse through the layers. The corresponding layer information will be displayed synchronously after the icon of each button is tapped.
Attribute	Encompasses four parameters concerning the way a file is processed.



Icons	Functions
Repeat times	Sets how many times the process will be repeated.
Repeat delay	Sets the interval between two repeated processing.

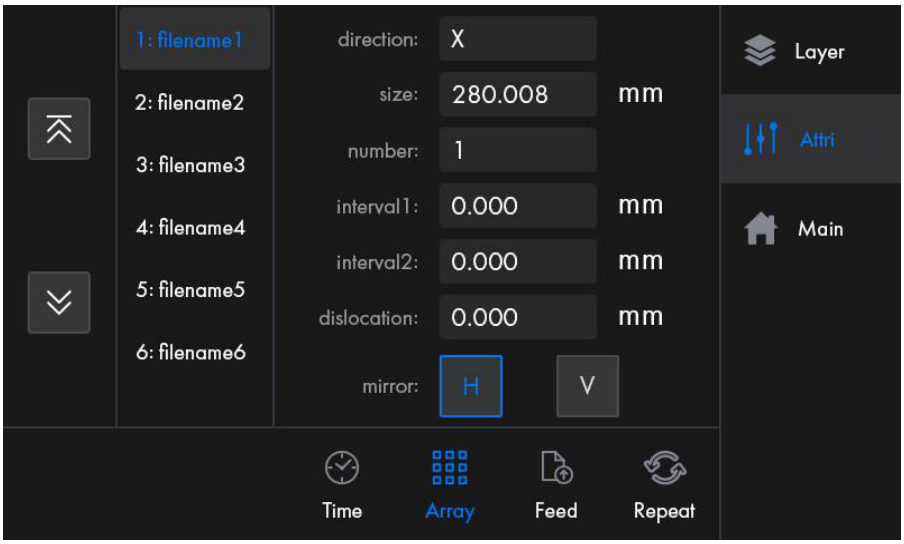
Once the repeat times and delay has been set and saved, the change will apply to all the files that are currently on the system's worklist unless it suffers a power breakout or being turned off.

6. Touch Screen Operations



Icons	Functions
Feeed Time	Sets how many continuous times the system feeds the laserable workpiece during one engraving task.
Feed Length	Controls the length of the workpiece that is conveyed onto the workbed.
Feed Delay	Sets the interval between two consecutive workpiece feed.

Submenus	Functions
Array	Encompasses all the array information of the file under the filename that you have tapped in the main menu, including direction, size, number, interval1, interval2, dislocation, and mirror.



Listed on the left are all the array names for this file. Use the up and down button to scroll through all the array names if there are many of them. After being tapped, the information of the selected array is displayed as shown

Icons	Functions
direction*	Determines how an array will be formed, along the X or Y axis.
size	Determines the size of array elements. The alteration is disabled.
number	Controls the number of array elements along the X/Y axis.
Interval 1	Controls the graphic element interval value of the odd-numbered rows of the array.
Interval 2	Controls the graphic element interval value of the even-numbered rows of the array.
dislocation	Controls the dislocation value of the array graphics along the X/Y axis.
mirror	H selected, even-numbered rows are mirrored in the X/Y direction; V selected, even-numbered columns are mirrored in the X/Y direction. Tap the icon blue to enable this feature.

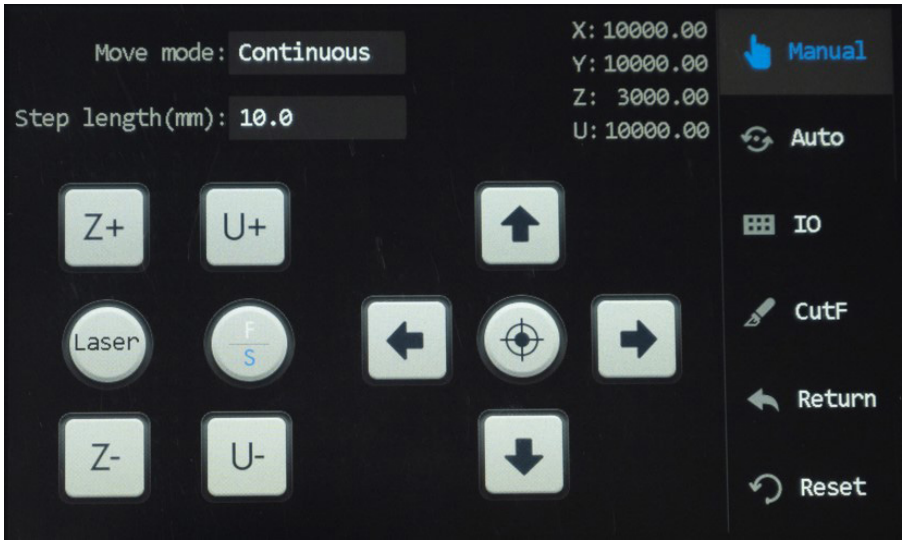
*Changes to this parameter automatically change other parameter values in this menu.

The array information of a file that contains multiple array names is not modifiable.

6. Touch Screen Operations

6.6 Setting Axes' Movement

Tap **Manual** in the main menu, and the following menu pops up.



This menu is mainly for manual debugging, including axes (X, Y, Z, & U) motion, manual laser firing, positioning, IO diagnosis, frame cutting, return and system reset, and aligning the laser path. To exit this menu, tap **Auto** in this menu.

6.6.1 Movement Adjustment

Step Movement

To check that the laser head and the workbed can move normally for a set distance under manual mode:

1. Tap **Manual** in the main menu, and the menu above pops up.
2. Tap **Manual mode** and select **step**.
3. Set "Step length" to a value that you desire (other than zero). Tap (F/S) to use a set slow or fast speed.

> When **F** is in blue, the selected axis travels at a fast speed. When **S** is in blue, the selected axis travels at a slow speed. For speed adjustment, see §6.3 Setting Speed Levels.

4. Tap any axis icon, and the laser head or workbed should move for the distance that you set.

Continuous Movement

To check that the laser head and the workbed can move continuously under manual mode:

1. Tap **Manual mode** and select the other option than **step**.
2. Tap (F/S) to use a set slow or fast speed. When **S** is in blue, the selected axis travels at a slow speed. For speed adjustment, see §6.3 Setting Speed Levels.
3. Tap any axis icon, and the laser head or workbed should move as you tap the icon and stop as you release.

6.6.2 Manual Laser Firing

Tap (laser) and the laser head should fire laser beam. The laser stops as the icon is released.

> Always make sure there is a laserable workpiece under the laser every time before you fire the laser.

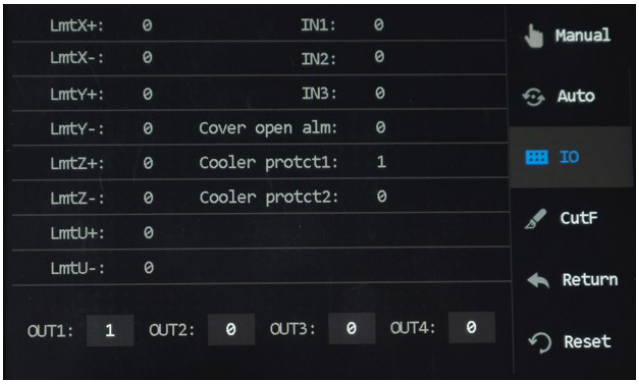
6.6.3 Laser Head Positioning

Tapping (⊕) sets the current position of the laser head as a positioning point.

6.6.4 IO Diagnosis

Tap **IO**, and the menu pops up as shown.

The alteration of those parameters is currently disabled.

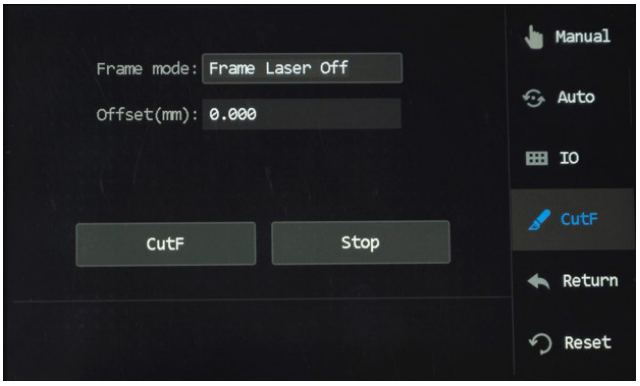


6. Touch Screen Operations

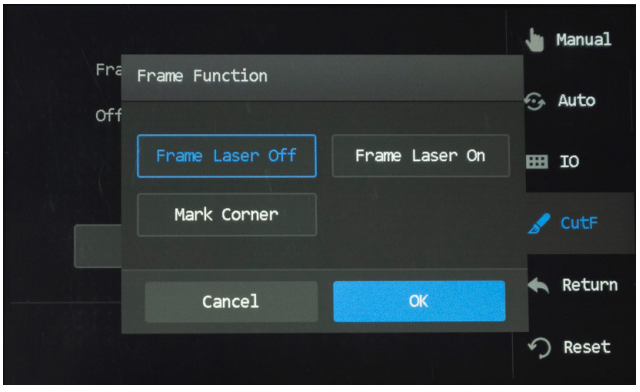
6.6.5 Frame Cutting

Tap **CutF**, and the menu as shown pops up.

To cut a frame at a set distance from the outer circumference of the design file:

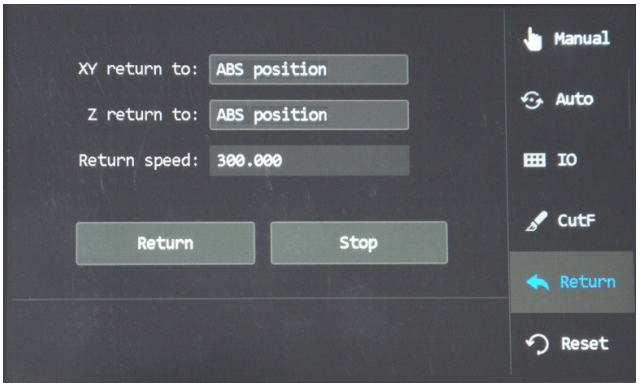


1. Tap the box after **Frame mode** and choose **Frame Laser On**. Choosing **Frame Laser Off** disables the laser. Tapping “Mark Corner” sets the laser to cut a hole at each corner of the frame.
2. Set your desired distance between the frame to be cut and the outer circumference of the design file.
3. Tap **CutF** and the laser should start firing. To stop, tap **Stop** to shut off the laser.



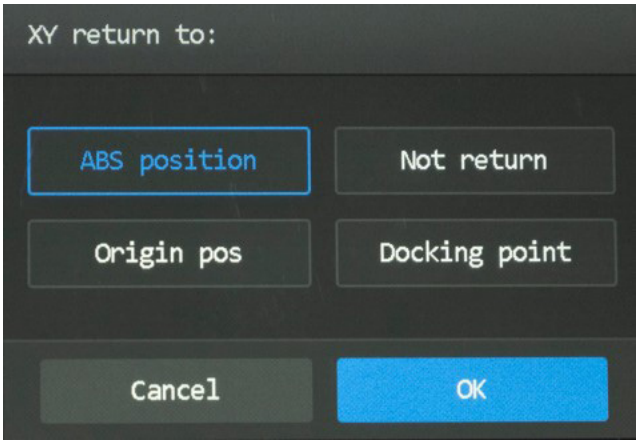
6.6.6 Setting Laser Head Return

Tap **Return** to enter the frame cutting setting menu as shown.



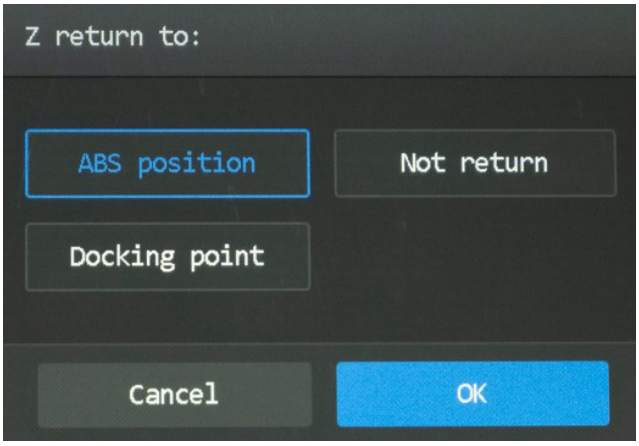
Under **XY return to**, there are four options for the laser head's return: **ABS position**, **Not return**, **Origin pos**, and **Docking point**.

Icons	Functions
ABS postion	Sets the laser head to return to the mechanical origin along the X and Y axis.
Not return	keeps the laser head where it stops after an engraving task.
Origin pos	Sets the laser head to the default origin along the X and Y axes.
Docking point	Sets the laser head to return to a preset X and Y coordinates.



Under **Z return to**, there are three options for the laser head's vertical position.

Icons	Functions
ABS postion	Sets the laser head to return to the mechanical vertical origin
Not return	Keeps the laser head where it stops after an engraving task.
Docking point	Sets the laser head to return to a preset Z coordinate.



After selecting the options for the laser head to return, tap OK to return the laser head. As this happens, the system should be showing the status of the X, Y, and Z return at the bottom of the menu as shown above. To stop, tap **Stop**.

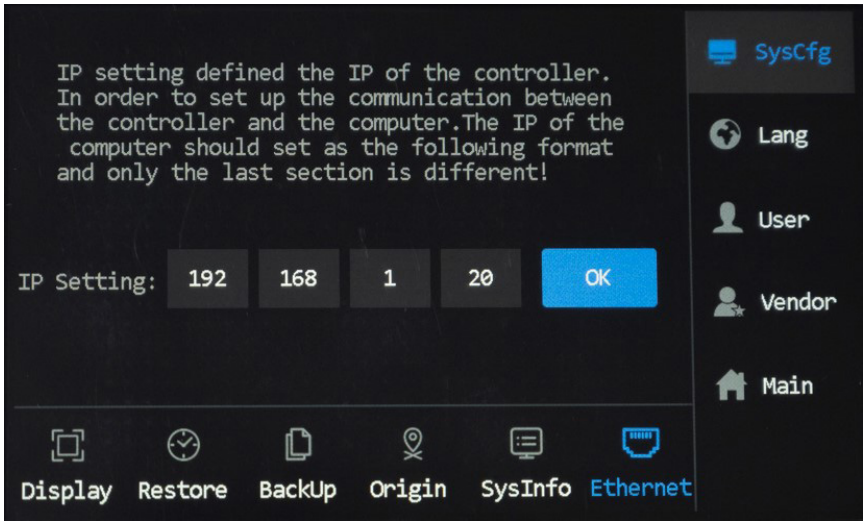
6.6.7 System Reset

Tapping **Reset** resets the system and modifications.

6. Touch Screen Operations

6.7 Menu Submenu

Tap **Menu** in the main menu, and the menu submenu shows up as shown.



This menu includes **SysCfg**, **Lang**, **User**, **Vendor**, and **Main**.

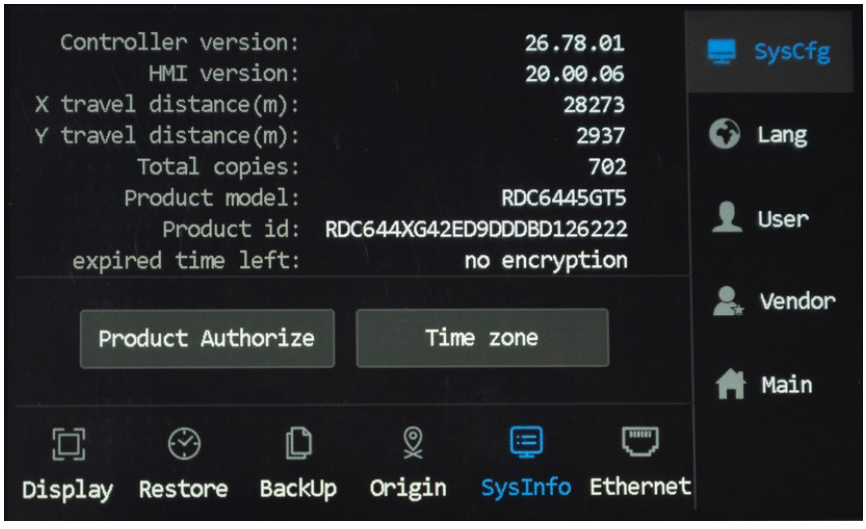
6.7.1 SysCfg

Ethernet

Tapping **Ethernet** accesses the IP setting. Tap to change the value and tap OK to save your change.

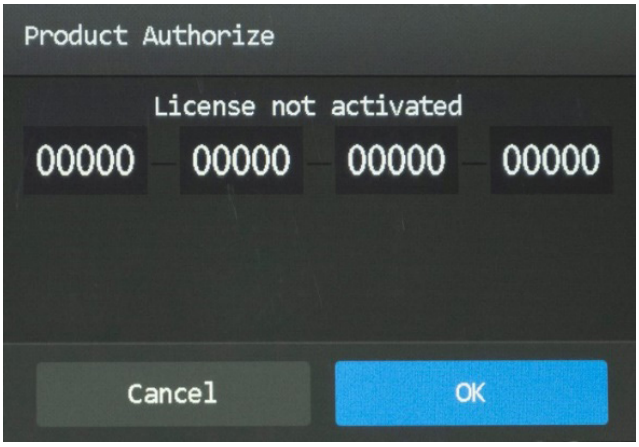
Sysinfo

Tapping **SysInfo** accesses the system information menu, where the product activation and time zone can be set.



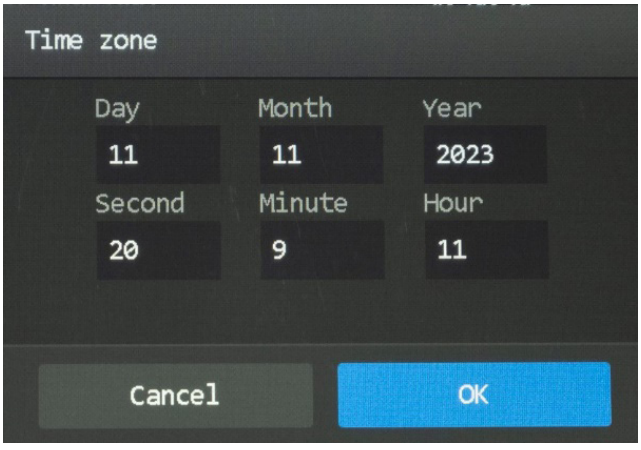
Product Activation

1. Tap **Menu>SysCfg>Sysinfo>Product Authorization**, and the pop-up as shown shows up.
2. Enter your product authorization/activation code.
3. Tap **OK** to confirm. Tapping **Cancel** closes the pop-up and returns to the **SysInfo** menu.



Setting Time Zone

1. Tap **Menu>SysCfg>Sysinfo>Time zone**, and the pop-up as shown shows up.



2. Tap to change the time.

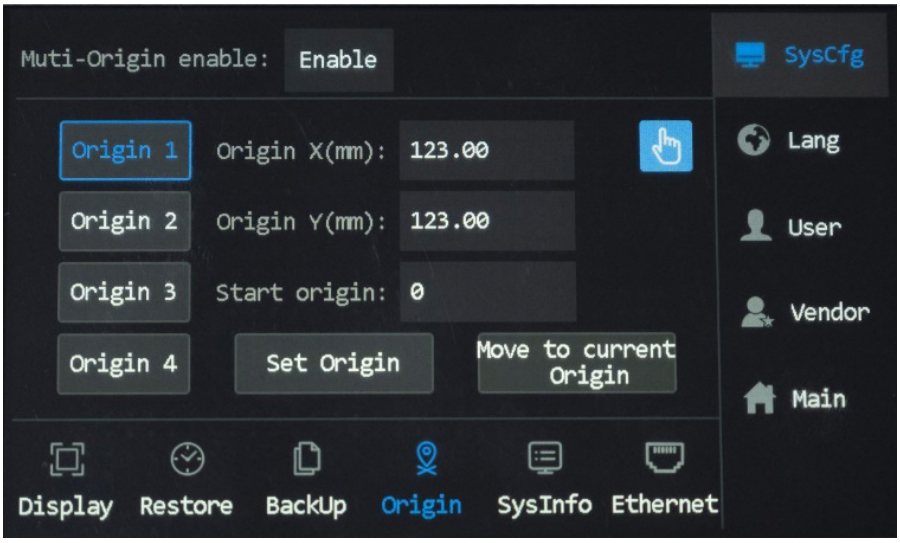
> If the change is password protected, enter your passcode.

3. Tap **OK** to save your change. Tapping **Cancel** exit the current menu and returns to the **SysCfg** menu.

6. Touch Screen Operations

Setting Multi-Origins

Tap **Origin** from the **SysCfg** menu, and the menu as shown shows up.

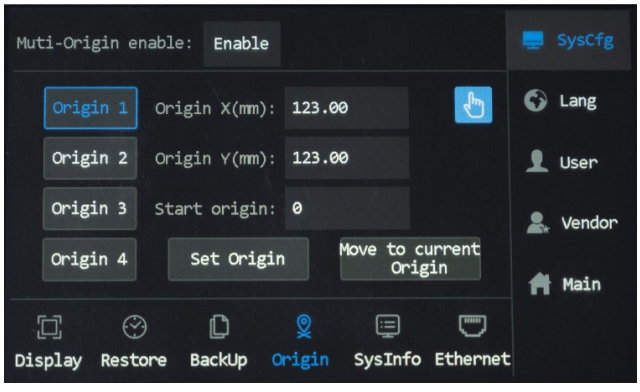


To enable this menu, tap the box after **Multi-origins enable** and set the option to Enable. With **Disable** selected, the system has a single default origin that the laser head returns to.

There are four customizable Origins. You can set them either through putting in desired coordinates or tapping keys to move the laser head to desired coordinates.

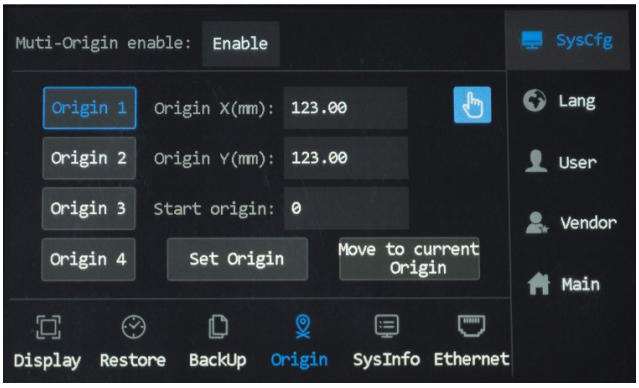
Inputing an Origin

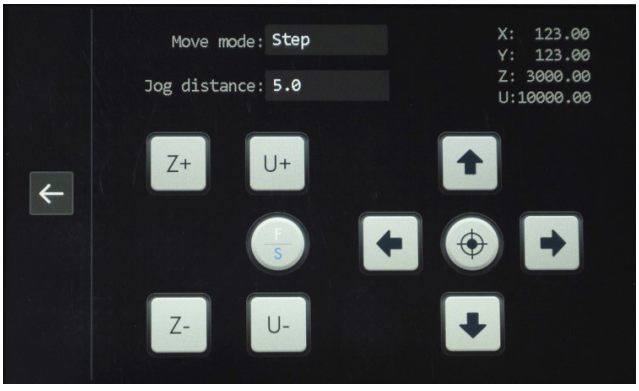
1. Tap to choose an origin, **Origin 1** as is in the case demonstrated below.
2. Put in your desired X & Y coordinates. If you are unsure whether the coordinates you put in will be the position you want the laser head to move to, tap **Move to current Origin**.
3. The laser head should automatically move to the coordinates you put in. Adjust as needed.
4. After setting a desired origin, tap **Set Origin** to save. To delete and reset a set origin, tap **Cancel origin** and repeat step 2.



Manually Seting an Origin

1. Tap to choose an origin, **Origin 1** as is in the case demonstrated below.
2. Tap . And the menu as shown shows up.
3. Use the keys (Z+, Z–) and the arrows to move the laser head to a desired position in relation to the workbed. (U+ and U– are disabled.) To change the way and distance the laser head moves, see §6.6 Setting Axes' Movement.
4. Once set, tap to return to the origin menu.
5. Tap **Set Origin** to save the settings. To delete and reset a set origin, tap **Cancel origin** and repeat Step 2.



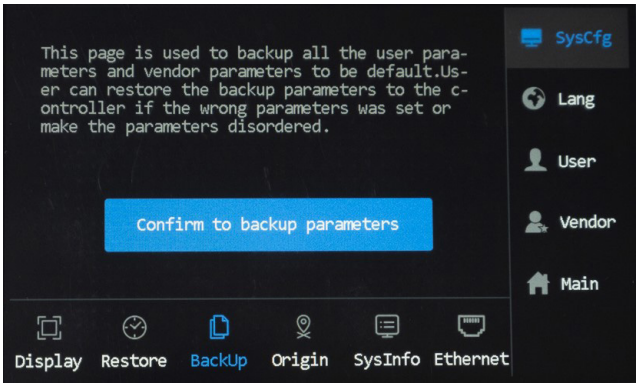


- The customized origins only work when "Multi-origins enable" is set to "Enable". When a set number of origins is set, say 4 origins, there will be 5 origins (0–4) for the laser head to start from, with 0 being the coordinates set by tapping the position mark from the main menu.
- Any two of the origins 1–4 can be set the same. For instance, origin 1 and 2 are set the same and they are both enabled. After the engraving is finished starting from origin 1, the system will automatically start from the same coordinates with origin 1. However, no one of the customized origins can be set to be the same as the 0 origin.
- When all customized origins are disabled, the laser head returns to the 0 origin by default.
- When a set of customized origins are enabled, the system will circle through the set sequence of the origins. For instance, there are 4 customized origins enabled and the engraving has been initiated from the main interface, the system will circle through the origins in the sequence that they are set.
- If the engraving is initiated directly and wirelessly from the control computer and the current position of the laser head is set as the origin, the laser head will start from the current coordinates regardless of the origins set by tapping SysCfg >Origin.

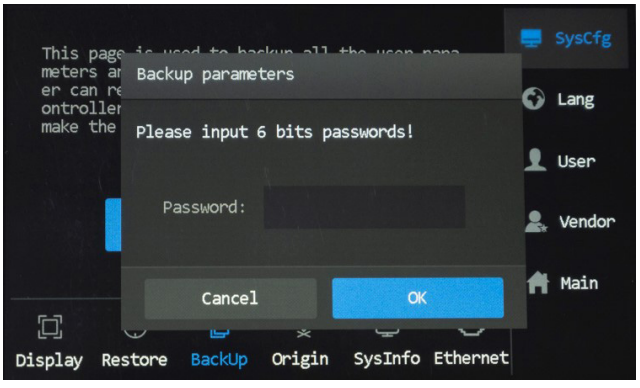
6. Touch Screen Operations

Backing up Factory Parameters

1. Tap **Back Up**, and the menu as shown shows up.
2. Tap “Confirm to backup parameters” to back up the current set parameter values.



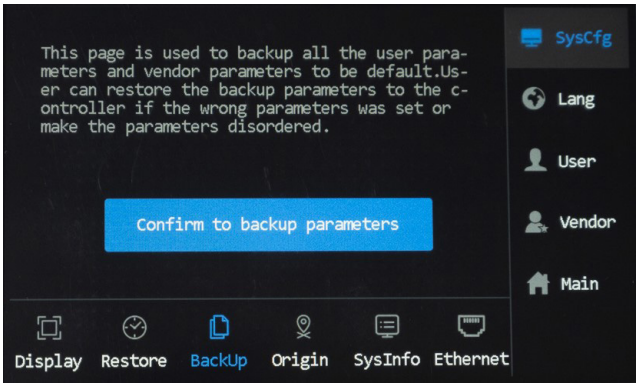
3. Enter your passcode in the pop up that shows up.



Use this feature upon powering on the engraver so that the factory defaults of the parameters can be stored for future restoring the factory parameter values.

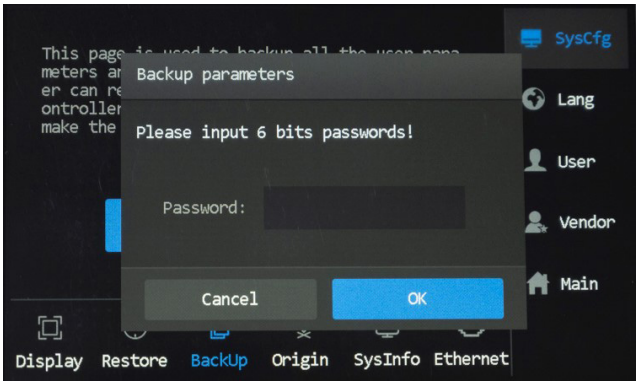
Restore Factory Parameters

Tap “Restore”, and the menu as shown shows up.



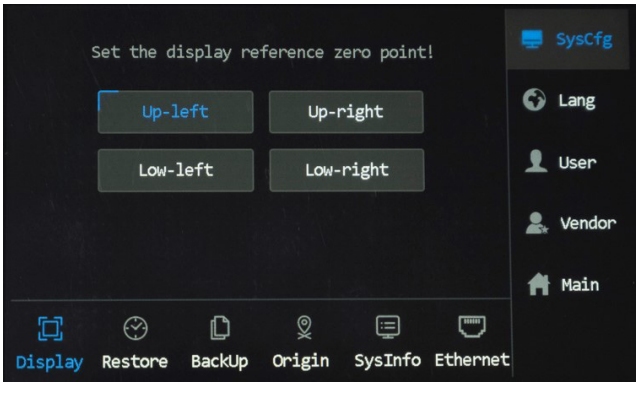
To restore factory parameter values:

1. Tap “Confirm to restore default parameters to controller!”
2. Put in your passcode.
3. Tap OK.



Setting the Screen Orientation

1. Tap **Display**, and the menu as shown shows up.
2. To set a different screen orientation, tap one of the four options that you desire.

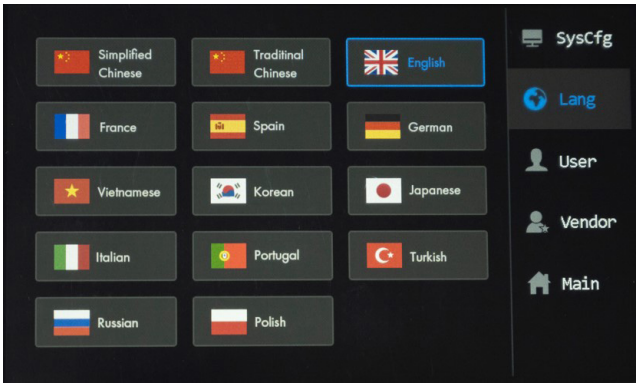


Note that your screen shows your engraving design the way you set your screen. For instance, if the screen origin is set at the Up- left, then a design will be shown in its original orientation. If you change the screen origin to Low-left, then the design will be shown flipped down along the X axis. If you change the screen origin to the Up-right, then the design will be shown flipped right along the Y axis.

6. Touch Screen Operations

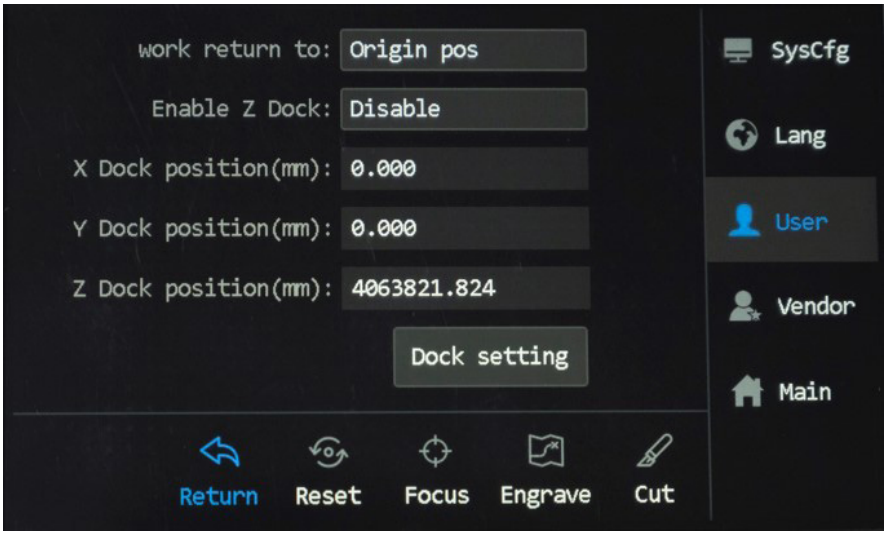
6.7.2 Language Settings

1. Tap **Menu>Lang**, and the menu as shown shows up.
2. Tap to select a language that you desire to use. The change will take effect immediately after a language is selected, and the system returns to the main menu automatically.



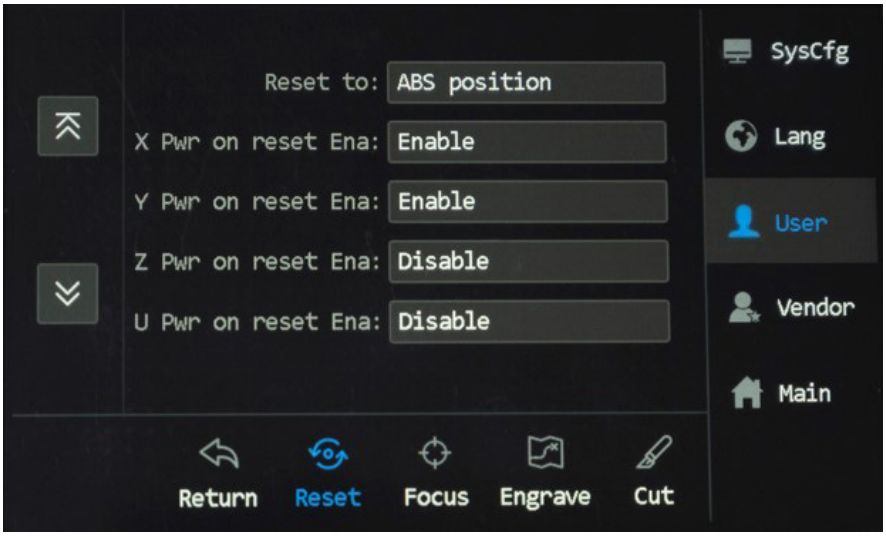
6.7.3 User Parameters

Return Submenu



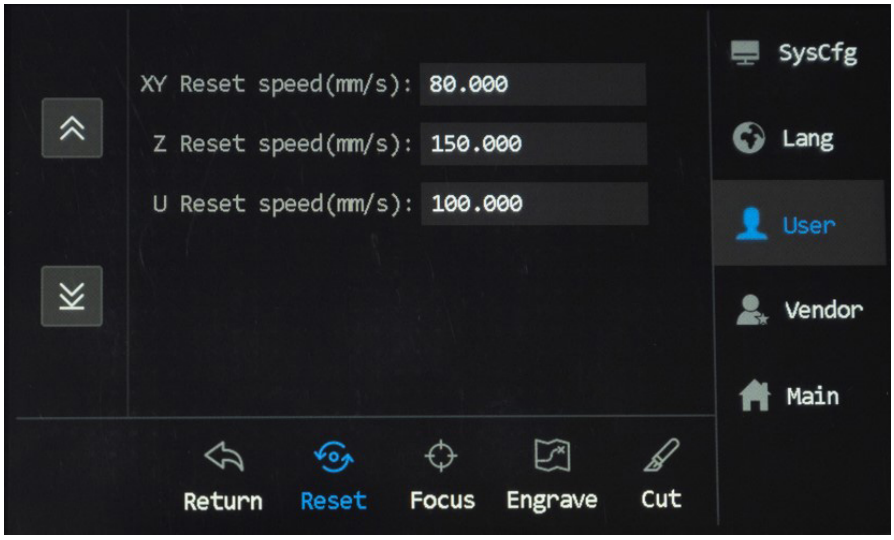
Parameters	Options	Functions/Meanings
work return to	**Origin pos**	Sets the laser head to return to the default origin.
	ABS position	Sets the laser head to return to the mechanical origin.
	Docking Point	Sets the laser head to return to the preset origin(s).
	Not return	Keeps the laser where it is.
Enable Z Dock	**Enable/Disable**	Enables and disables the laser head's return to a set Z coordinate.
X Dock position(mm)	**Numerical**	Sets the laser head to return to a set X coordinate.
Y Dock position(mm)	**Numerical**	Sets the laser head to return to a set Y coordinate.
Z Dock position(mm)	**Numerical**	Sets the laser head to return to a set Z coordinate.

Reset Submenu



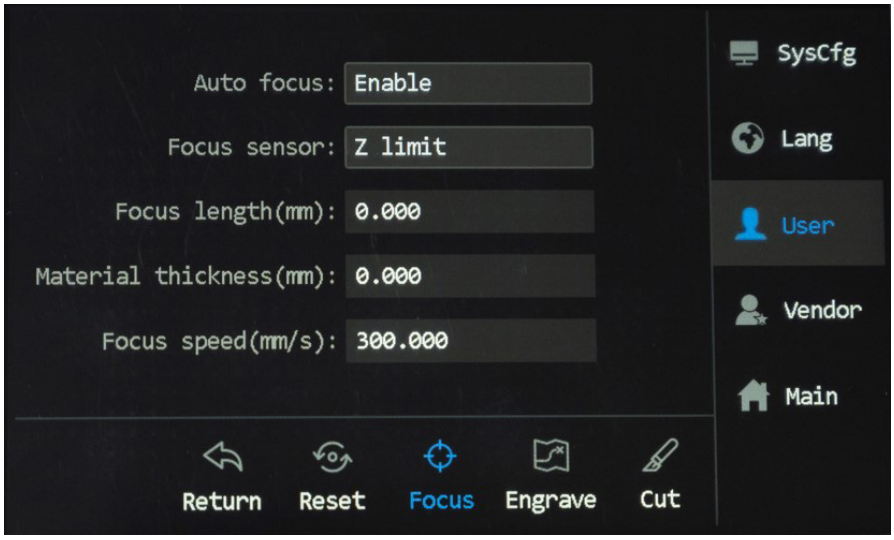
Parameters	Options	Functions/Meanings
Reset to	**Origin pos**	Sets the laser head to return to the default origin.
	ABS position	Sets the laser head to return to the mechanical origin.
	Docking Point	Sets the laser head to return to the preset origin(s).
	Not return	Keeps the laser where it is.
X Pwr on reset Ena	**Enable/Disable**	Sets the laser head to its X origin upon powering up.
Y Pwr on reset Ena	**Enable/Disable**	Sets the laser head to its Y origin upon powering up.
Z Pwr on reset Ena	**Enable/Disable**	Sets the laser head to its Z origin upon powering up.
U Pwr on reset Ena	**Enable/Disable**	Disabled

6. Touch Screen Operations



Parameters	Options	Functions/Meanings
XY Reset speed (mm/s)	**Numerical**	Sets the laser head's return speed along the X and Y axes.
Z Reset speed (mm/s)	**Numerical**	Sets the laser head to its Z origin upon powering up.
U Reset speed (mm/s)	**Numerical**	Disabled

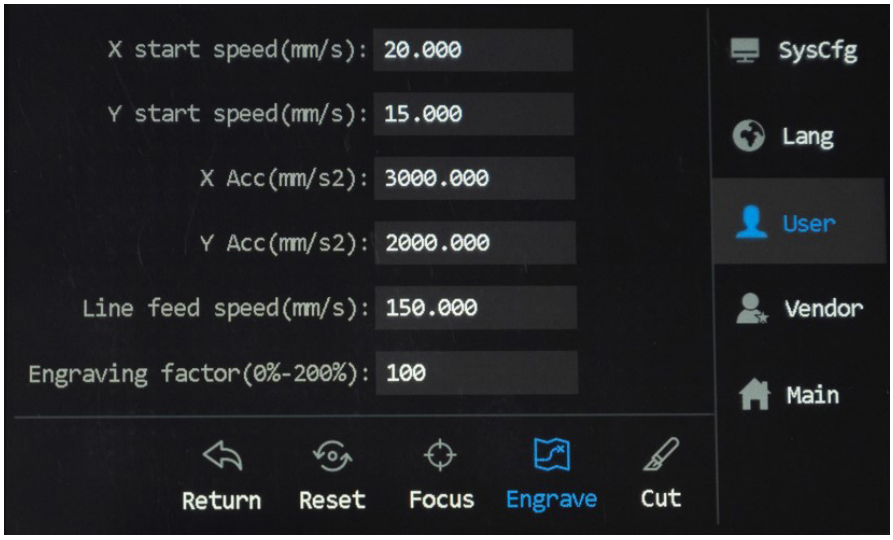
Focus Submenu



Parameters	Options	Functions/Meanings
Auto focus	**Enable/Disable**	Enables or disables the auto-focusing of the laser head.
Focus sensor	**Z limit**	Selects the focus sensor.
Focus length(mm)	**Numerical**	Sets the focal length.
Material thickness (mm)	**Numerical**	Sets the material thickness.
Focus speed (mm/s)	**Numerical**	Sets the focusing speed of the laser head.

6. Touch Screen Operations

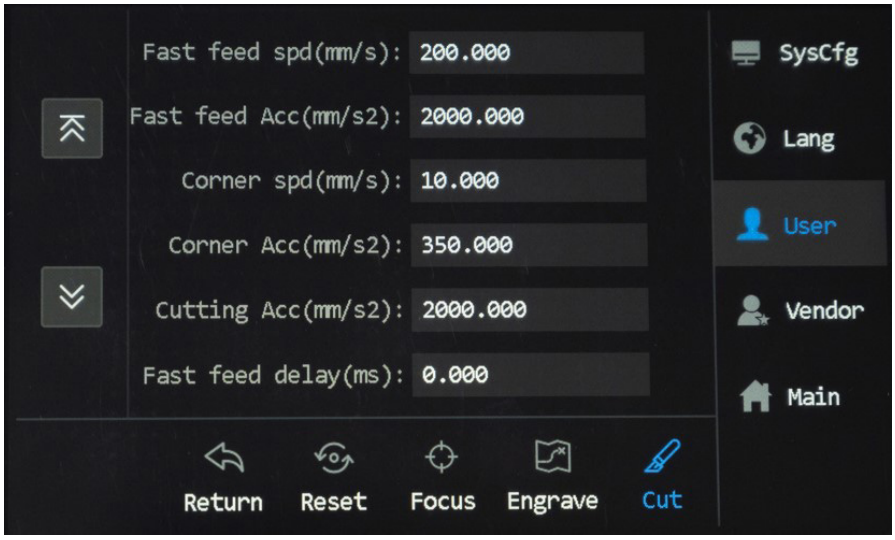
Engrave Submenu



Parameters	Options	Functions/Meanings
X start speed (mm/s)	**Numerical**	Sets the speed at which the laser head starts along the X axis.
Y start speed (mm/s)	**Numerical**	Sets the speed at which the laser head starts along the Y axis.
X Acc (mm/s²)	**Numerical**	Sets the laser head's acceleration along the X axis.
Y Acc (mm/s²)	**Numerical**	Sets the laser head's acceleration along the Y axis.
Line feed speed(mm/s)	**Numerical**	Sets the speed at which the laser head travels between lines.
Engraving factor*	**Numerical**	Sets the overall speed of the laser head.

*This parameter was set at the factory to match the Line feed speed and does need adjustment. If you have changed this by accident, contact the customer service to reinstate it or for customizing them.

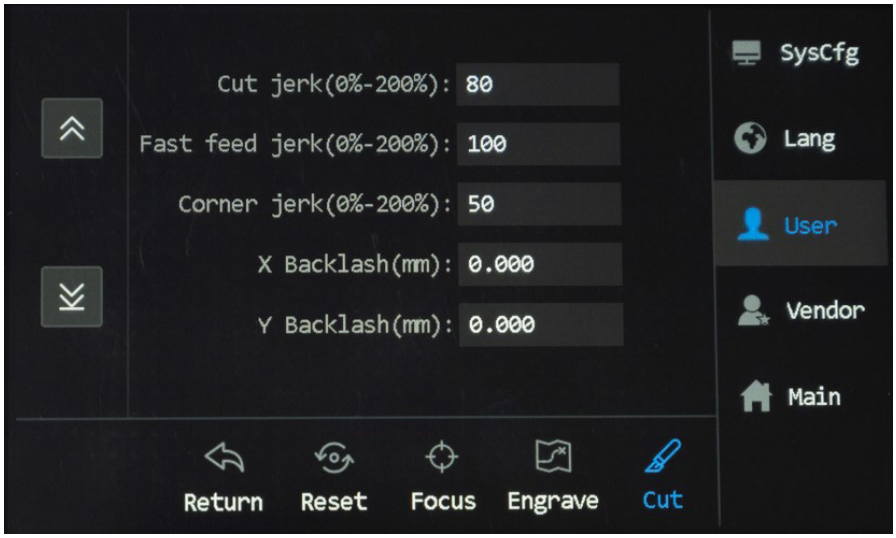
Cut Submenu



Parameters	Options	Functions/Meanings
Fast feed speed	**Numerical**	Sets the speed of the laser head when not firing laser beams.
Fast feed acc(mm/s²)	**Numerical**	Sets the acceleration of the laser head when not firing laser beams.
Corner spd[1]	**Numerical**	Sets the speed of the laser head when making sharp turns.
Corner acc(mm/s²)	**Numerical**	Sets the acceleration of laser head when making sharp turns.
Cutting acc(mm/s²)	**Numerical**	Sets the acceleration of the beaming laser head.
Fast feed delay(ms)[2]	**Numerical**	Sets the time the laser head rests for after travelling without beaming.

- [1]If your engraving design has a lot of serrated or zigzag patterns, set the parameter at a value that best suits your design. Practice on scrap materials first.
- [2]When set to zero, the laser head doesn't rest after traveling without beaming. When set to a certain value, the laser head slows down upon the completion of traveling without beaming and rest for the set milliseconds.

6. Touch Screen Operations



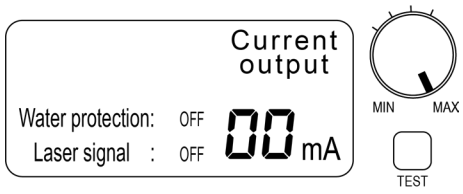
Parameters	Options	Functions/Meanings
Cut jerk (0–200%)	**Numerical**	Sets the speed of the laser head when beaming in percentages.
Fast feed jerk (0–200%)	**Numerical**	Sets the time the laser head rests for after travelling without beaming in percentages.
Corner jerk (0–200%)	**Numerical**	Sets the speed of the laser head when making sharp turns in percentages.
X Backlash	**Numerical**	Does not need adjusting.
Y Backlash	**Numerical**	Does not need adjusting.

7. Adjustment

7.1 Ammeter Adjustment

The ammeter knob can be used as a master control for the laser's power settings. When it is set to anything other than 100%, it reduces the engraving software or control panel's power settings by a proportionate amount.

For example, when the ammeter knob is set straight up at 50% and the design instructs the laser to cut a line at 20% power, the laser will actually fire at 10%. As such, the knob can be used to ensure that your laser alignment and other tests are done at low safe power levels and can also be turned completely down to 0% when making adjustments in the main bay.



General use is not recommended. It is safer to fully deactivate your laser tube during adjustments in the main bay. Familiarize yourself with your software and control system's methods of power adjustment and use those for most purposes. This will ensure you always have full understanding and full control of your laser's power level. Generally, use the ammeter knob as another layer of redundancy during setup and shutdown, helping you avoid any potential accidental firing of the laser.

7.2 Water Chiller Adjustment

Your water chiller should arrive **NOT** prefilled but properly configured to work without adjustment.

ALWAYS make sure the chiller has been filled to **NORMAL** with the correct laser-safe anti-freeze or distilled water.

The default setting is to try to keep the laser-safe antifreeze within 3.6°F (±2°C) of 77°F (25°C) at all times and to stop work if the water reaches 104°F (40°C), which should safely handle standard cutting and engraving. An alarm also sounds if the water temperature falls to 50°F (10°C), preventing use in freezing conditions.

During normal use, the upper display will tell you the current temperature of the cooling water and the lower display will tell you the current target temperature. Both are given in degrees Celsius.

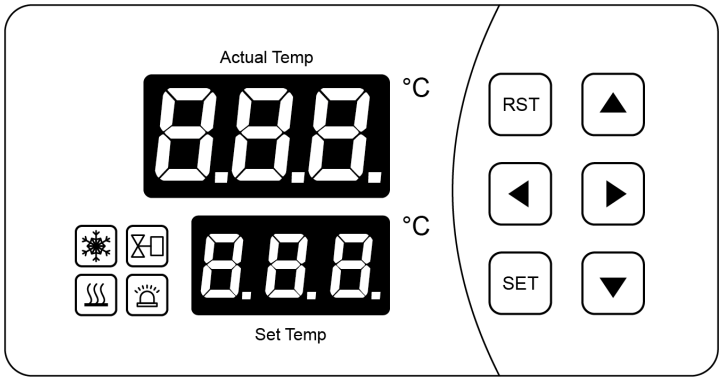
7. Adjustment

7.2.1 Changing Temperature Display

- Press ▶ once to display the ambient temperature ("t1") detected by the chiller's sensors.
- Press ▶ again to display the water's current flow rate in deciliters per minute (0.1 L/min. or 0.03 gpm).
- Press ▶ again or wait 20 seconds without pressing any key to exit.

7.2.2 Changing the Target Temperature

1. Press **SET**, use ▲ and ▼ to adjust the value up or down.
2. Press **RST** to save your changes. (When the chiller is in "intelligent mode", this adjustment will set the relative difference between the ambient temperature and the water instead.)



7.2.3 Other Adjustment

For all other adjustments, enter the mode menu first:

1. Hold **SET** and ▲ together until the upper window reads 00 and the lower window reads PAS.
2. Use ▲ and ▼ to adjust the value to the default passcode 8.
3. Press **SET** to enter the mode menu and set parameters.

   The following are control mode selections.

Params	Meaning	Range	Default Values	Case 1	Case 2
F0	Water Temperature(1)	F9–F8	25	N/A	28
F1	Temperature Difference(2)	−15 to +5	−2	−3	N/A
F2	Cooling Hysteresis	0.1–3.0	0.1	0.5	2.0
F3	Control Mode(3)	0, 1	0	1	0
F4	Overheated Water Alarm	1–20	10	10	5

Params	Meaning	Range	Default Values	Case 1	Case 2
F5	Overchilled Water Alarm	1–20	15	10	10
F6	Overheated Room Alarm	40–50	45	45	45
F7	Password	00–99	8	8	8
F8	Highest Allowed Water Temperature	F0–40	30	31	30
F9	Lowest Allowed Water Temperature	1–F0	20	25	5

1) Applicable only to the constant temperature mode (F3=1).

2) Applicable only to the intelligent mode (F3=0).

3) 0=constant temperature mode; 1=intelligent mode.

Case 1: The chiller is in intelligent control mode and requires the water to be between 77–88°F (25–31°C). With the ambient room temperature kept constant, the water temperature will remain 5°F (3°C) lower than the room temperature with a deviation of ±0.9°F (±0.5°C). An alarm will sound if the water temperature is 18°F (10°C) higher or lower than this target.

Case 2: The chiller is in constant temperature mode and requires the water to be at 82°F (28°C) with a deviation of ±3.6°F (±2°C). An alarm will sound if the water temperature is 9.6°F (5°C) higher than this target or if the water is 18°F (10°C) lower than this target.

It is recommended that you use your engraver in a climate-controlled area with a set target temperature. If using your engraver in other conditions is unavoidable, use laser-safe antifreeze.

The device address should not be changed. If it ever accidentally is reset, return it to its default setting of “1”. To remove all changes and restore all factory default settings, wait at least 30 seconds after the chiller has been turned on and then hold ▲ and ▼ simultaneously until the display reads “rE” and then automatically resets.

If any alarms activate after all air has been cleared from the lines during initial setup (§3.5), find the specific error code in §8.5 below and make the necessary adjustments to handle it.

8. Maintenance

8.1 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.
- 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 or laser-safe antifreeze must be provided to the system at all times.
- The workbed must be cleaned, the waste bin emptied, and the coolant level confirmed every day.
- The 3rd mirror and focus lens must be checked every day and cleaned if required.
- The other mirrors, exhaust system, cooling fans, and air intake filter must be checked every week and cleaned if required.
- The beam alignment and the wiring connections—especially those for the laser power supply—should be checked weekly.
- The guide rails should be cleaned and lubricated at least twice a month.
- All other parts of the laser machine must be checked once a month and cleaned where required.
- Replace your coolant every three months for best results. Even if it is visibly clean month after month, drain it, clean the entire system, and the replace it at least once a year.
- In commercial settings, keep a cleaning and maintenance log in a clearly visible location near the engraver. Have operators date and sign the log as cleaning and maintenance are carried out.

8.2 Cleaning

8.2.1 Cleaning the Main Bay and Engraver

Main Bay & 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

Step 1. Turn off and unplug the engraver.

Step 2. Slide out the tray.

Step 3. Empty loose waste, rinse dust and fine debris off, dry, and replace the 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.

8. Maintenance

8.2.2 Cleaning the Focus Lens

The lens has a durable coating and won't be damaged by correct and careful cleaning. You should check the lens and the third mirror daily and clean them if there is any debris or haze on their surfaces. Your laser will be less efficient and heat buildup on the oil or dust itself can damage them.

***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.
- 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.

*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.

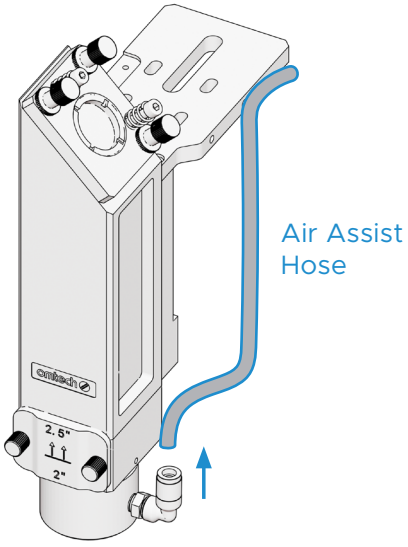
Tools Needed:

- Pressurized Air
- Hex Wrench
- Cotton Swab
- Lens Cleaning Fluid
- Lens-safe cloth/tissue

Step 1. Move the workbed to about 4 inches (10 cm) beneath the bottom of the lens nozzle.

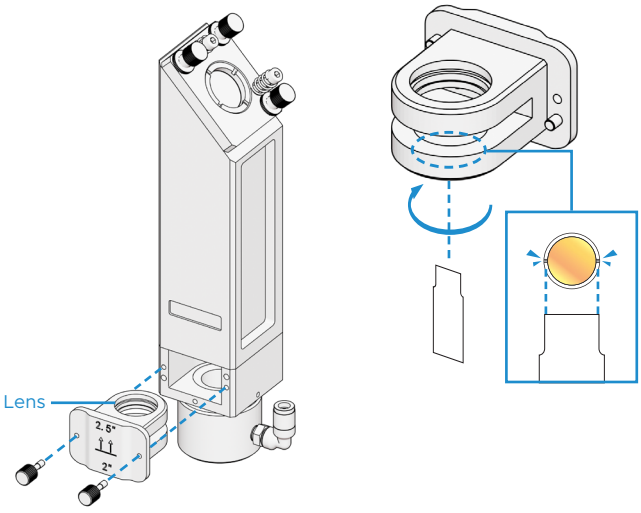
Step 2. Move the laser head to a convenient location and put soft material underneath it so the lens will be protected if it accidentally falls loose during removal or replacement.

Step 3. Remove the air assist hose from the laser nozzle.



Step 4. Loosen the bolt in the upper part of the laser head that holds the middle part in place.

Step 5. Carefully slide the middle part of the laser head out and remove the lens from its casing.

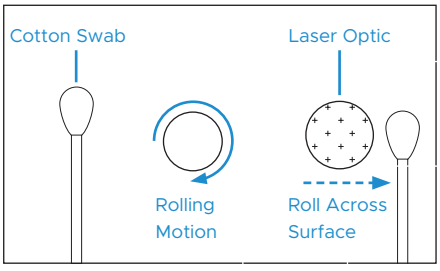


Step 6. Examine the lens's O-ring and—if necessary—clean it with a cotton swab and lens-cleaning fluid.

Step 7. Remove any coarse dust from the lens as well as possible by applying pressurized air.

Step 8. Examine the lens's surfaces. If it is necessary to clean it, begin by flushing its surfaces with lens-cleaning fluid.

Step 9. Set it on a lens-safe cloth, apply more cleaning fluid, and allow about one minute for it to take effect. Gently wipe it clean with a lens tissue wetted with the cleaning fluid. Repeat the process on the other side of the lens.



NEVER use the same cleaning tissue twice. Dust accumulated during the first use might scratch the other side of the lens during the second.

Step 10. Examine the lens's surfaces again. Repeat the process above until no dust or haze is present.

Step 11. Return the lens and its O-ring to their housing, being careful that the lens's rounded convex side is facing upward away from the workbed.

Step 12. Carefully reassemble the laser head in reverse order and then restore the nozzle connections.

8. Maintenance

8.2.3 Cleaning the Mirrors

Camera, Mirrors, & Focus Lens

Cleaning Frequency: Daily, after each use

Disconnect the engraver from power before cleaning.

- The surfaces of these mirrors are scratch-prone. Avoid direct contact with fingers or pressing hard, which could cause scratches by grinding debris into the lenses.
- Remember to let the clean fluid used for cleaning dry before further use.

Tools Needed:

- Lens brush
- Laser-safe microfiber cloth/cotton swab
- Alcohol/laser-safe cleaning solution

To clean Mirrors 1, 2, and 3.

Step 1. **DISCONNECT THE MACHINE FROM POWER**.

Step 2. Thoroughly wash and dry your hands.

Step 3. Bow any particulates off mirror surface.

Step 4. Drench the microfiber cloth in the cleaning solution, squeezing excess solution.

Step 5. Wipe clean the mirrors in gentle, cicular motion.

Step 6. Check the surfaces of the mirrors.

If any particulates or surface stains remain, repeat steps 3–6.

If any particulates or surface stains are still present after second cleaning, they are most likely permanently burned into surface. Replace the mirrors.

- The surfaces of these mirrors are scratch-prone. Avoid direct contact with fingers or pressing hard, which could cause scratches by grinding debris into the lenses.
- Remember to let the clean fluid used for cleaning dry before further use.

8.2.4 Cleaning the Exhaust System

Exhaust Pipe & Fan

Cleaning Frequency: Weekly*

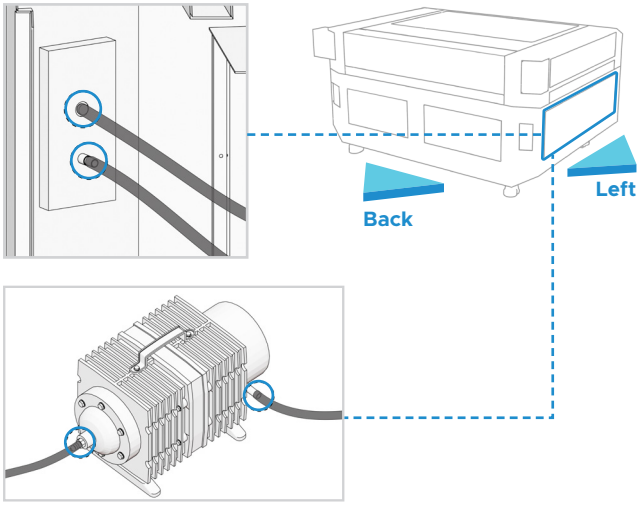
*The rate of dust accumulation on the exhaust fan and pipe will vary depending on the materials processed and the working environment's air quality.

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

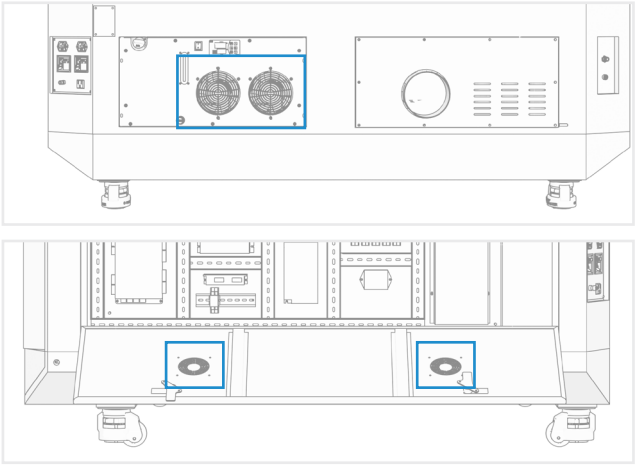
Tools Needed:

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

Step 1. Check the intake filter for the air assist at least once a week, cleaning it as needed.



Step 2. Check the condition of the cooling fans for the water chiller and the bottom right access door. Use a small brush, vacuum, or compressed air to gently clear any visible dust.



8. Maintenance

Step 3. Check the main fan and surrounding ducts 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.

Step 4. Check the seams and joints of the ducts 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.

8.2.5 Cleaning the Water Chiller

Cooling System Cleaning

- Disconnect the engraver from power before cleaning.
- If the chiller has antifreeze in it, **DO NOT** add citric acids/mild detergent or bleach into the liquid. **ONLY** do so if the chiller has distilled water in it.

Under normal circumstances, the coolant should stay clear for a long time. Despite that, we recommend keeping a close eye on the cleanness of the coolant. If it ever becomes visibly dirty, clean the system and refill with a new identical coolant.

Tools Needed:

- Funnel
- Citric acid/Mild detergent and bleach
- Distilled water/laser-safe coolant
- Clean Water

Step 1. Turn off and unplug the engraver.

Step 2. Access the chiller drain port and fully drain the coolant.

Step 3. If you have been using distilled water as the coolant,

a. Using a funnel, add a solution of clean soft water with citric acids or a mild detergent and bleach through the chiller fill port.

b. Resume power to the chiller.

c. Run the chiller for about ten minutes to clear the system and drain the liquid.

d. Process a few cycles of refilling and draining to clear any remaining residue.

e. Once no debris or residue is being rinsed out with the water, refill the tank with distilled water.

Step 4. If you have been using laser-safe antifreeze,

a. Fully drain the chiller.

b. Using a funnel, fill the chiller with a solution of clean soft water with citric acids or a mild detergent and bleach through the chiller fill port.

c. Resume power to the chiller.

d. Run the chiller for about ten minutes to clear the system and drain the liquid.

e. Process a few cycles of refilling and draining to clear any remaining residue.

f. Once no debris or residue is being rinsed out with the water, refill the tank with distilled water.

8. Maintenance

Refilling

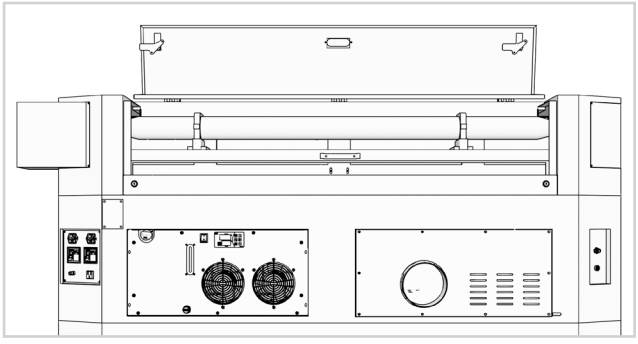
NEVER touch or adjust your laser's water supply while it is still turned on or connected to power.

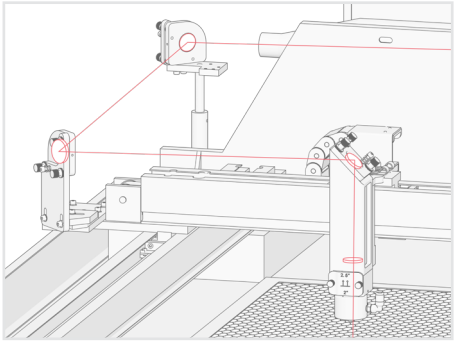
Your chiller should arrive with no prefilled coolant or antifreeze. It is recommended that you use OMTech laser-safe antifreeze for safety. Always fill the chiller with distilled water or a custom-purpose laser-safe antifreeze. Using deionized or tap water for any purpose but rinsing out cleansers (see 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. Fill the tank to the green "NORMAL" level. ("FULL" is actually overfilled.)

It is recommended to change your coolant every three months to prevent any need for cleaning and rinsing the system. Alternatively, if your coolant remains clear month after month, drain it at least once a year, being sure to run the full cleaning routine described above to remove any microbial growth, corrosion, or impurities from the cooling system.

8.3 Laser Path Alignment

A properly aligned laser beam is important for the overall efficiency of the machine and quality of its work. This machine went through a complete beam alignment before shipping. When the engraver first arrives and about once a week during normal operation, however, 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.





You will need to place a piece of tape at each stage of the laser path, marking it to confirm that that stage remains correctly aligned. When it is not, you will use the laser tube's brackets or the screws 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.

- 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.
- Perform a beam alignment at low power levels: 15% or less. Any higher percentage will cause the laser to ignite the testing tape instead of marking it. Be sure that you set the Max. Power (not Min.) to 15%

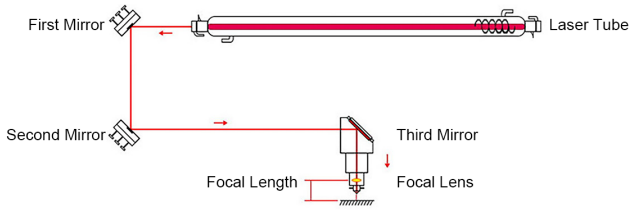
8. Maintenance

8.3.1 Laser Tube 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.

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.



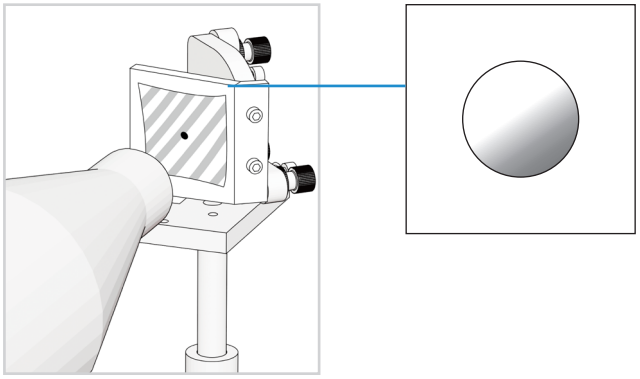
Tools Needed: Masking tape

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

Step 1. Put on safety goggles and open the rear access door to expose the laser tube and Mirror 1.

Step 2. Attach a piece of masking tape to the mirror's frame.

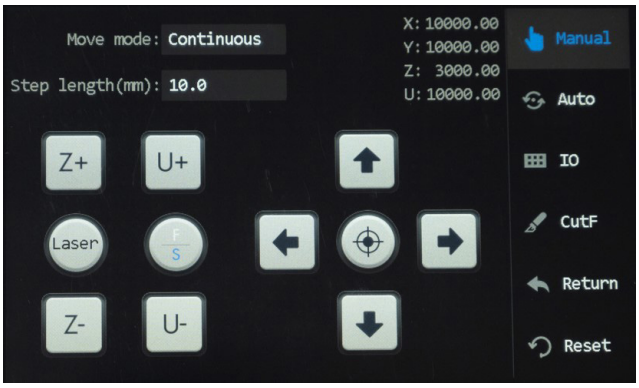
Step 3. Close the cover



Step 4. Turn on the machine and set the power level to 15% of the maximum power or lower.

Step 5. Tap **Manual** in the main menu, and the following menu pops up.

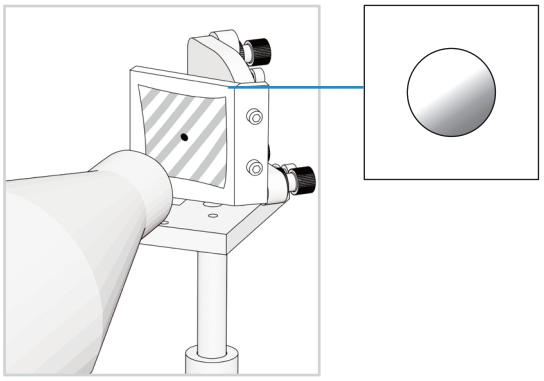
Step 6. Tap (laser) to manually fire the laser. You should be able to see a small mark on the tape. If it is not noticeable, tap again.

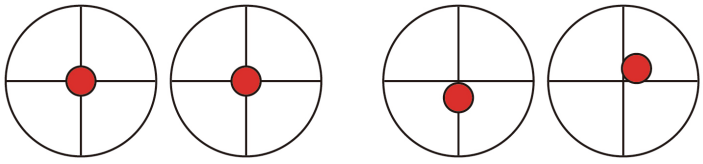


- Tapping (laser) activates the laser. Always make sure the path is clear between the laser and its target.
- Never allow foreign objects between the laser and its target. Take care not to leave any part of your body in
- the laser path while pressing the (laser) button.

8. Maintenance

Step 7. Check that the burnt hole on the tape is at its center.





These marks are OK.

These marks require adjustment.

If not,

a. Cut the power to your laser.

b. Carefully adjust the laser tube in its brackets by loosening its bolts.

> Be careful not to over-loosen any bolts and not to overtighten them. Only adjust one stand at a time.

c. Use rubber shims to elevate or remove the existing shim to lower the laser's position on the bracket.

d. Once the laser tube's elevation is adjusted, you will need to check the alignment of Mirror 1, 2, and 3.

e. When finished with adjusting the tube, repeat steps 2–8 until the burnt hole falls perfectly at the center of the tape.

8.3.2 Mirror 1 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.

Once emitted from the laser tube, the laser beam hits Mirror 1, which reflects it to Mirror 2. That is to say, when the laser tube is properly aligned with Mirror 1, to align Mirror 1 is actually to align it with Mirror 2.

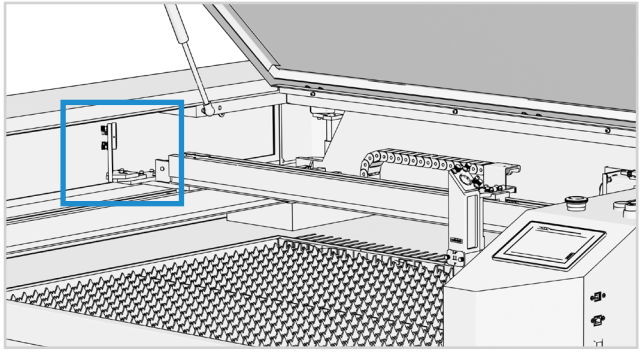
Tools Needed: Masking tape

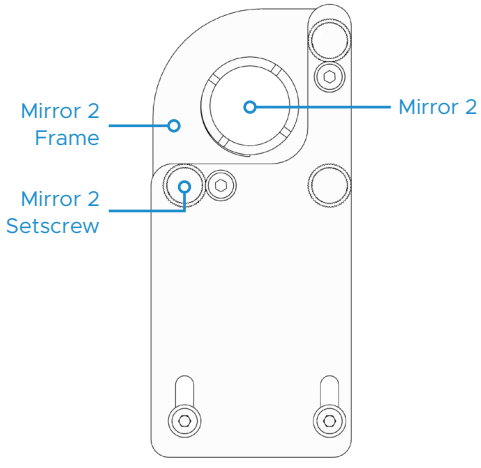
Step 1. Tap **Manual** in the main menu.

Step 2. Use the direction arrows on the control panel to send Mirror 2 to the back of the bed along the Y axis.

Step 3. Attach a piece of masking tape to the mirror's frame.

Step 4. Put on safety goggles and turn on the machine and set the power level to 15% of the maximum power or lower.



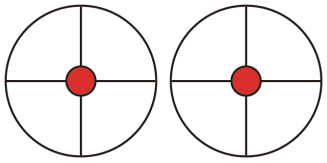


8. Maintenance

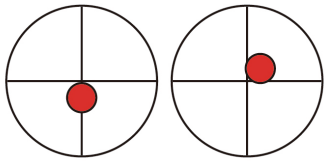
Step 5. Close the cover.

Step 6. Fire the laser.

Step 7. Check that the burnt hole on the tape is at its center.



These marks are OK.

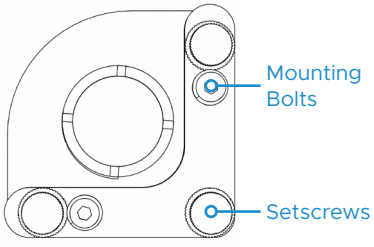


These marks require adjustment.

If not,

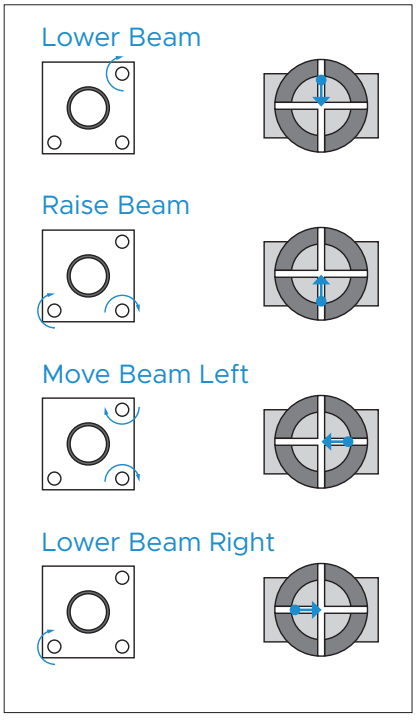
Step 8. Cut the power to your laser and open the rear access door to expose Mirror 1 as shown.

If the last burnt hole is way off-mark, you may need to loosen the mounting bolts of Mirror 1 to slide it into a better position before fine-tuning the setscrews.



Step 9. Carefully turn the setscrews on Mirror 1 to adjust the angle and position of Mirror 1.

- 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.

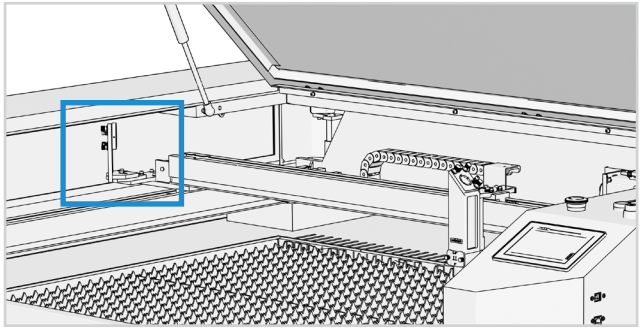


Step 10. When finished with adjusting the setscrews of Mirror 1, repeat steps 3–9 until the burnt hole falls perfectly at the center of the tape.

Step 11. When Mirror 1 is all set, use the direction arrows on the control panel to send Mirror 2 to the front of the bed along the Y axis.

Step 12. Attach another piece of tape to the frame of Mirror 2.

Step 13. Repeat steps 2–9 until the burnt hole on Mirror 2 is at the center of the tape.



8. Maintenance

8.3.3 Mirror 2 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.

Once reflected by Mirror 1 and then Mirror 2, the laser beam hits Mirror 3. That is to say, when the laser tube is properly aligned with Mirror 1 and Mirror 1 is well aligned with Mirror 2, to align Mirror 2 is actually to align it with Mirror 3.

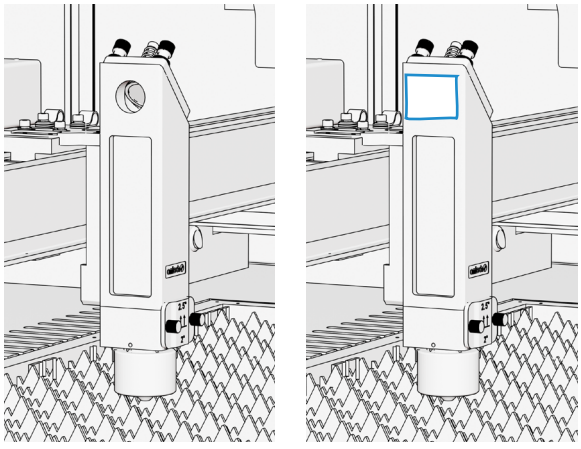
Tools Needed: Masking tape

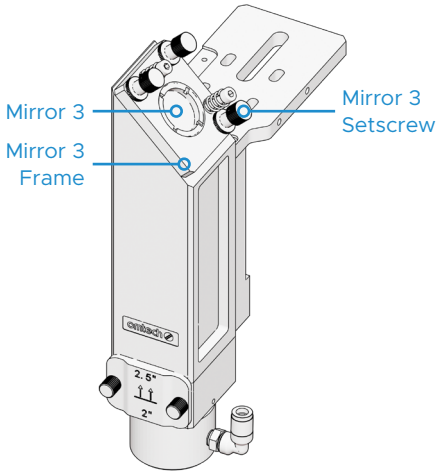
Step 1. Attach a piece of masking tape to the frame of Mirror 3.

Step 2. Put on safety goggles and turn on the machine and set the power level to 15% of the maximum power or lower.

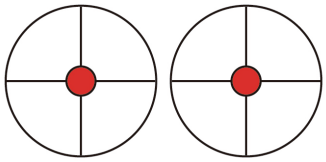
Step 3. Close the cover.

Step 4. Fire the laser.

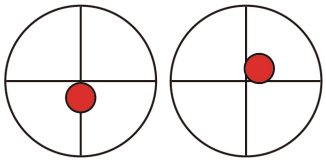




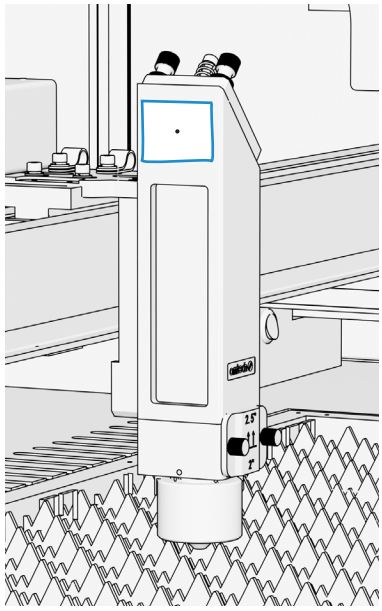
Step 5. Check that the burnt hole on the tape is at its center.



These marks are OK.



These marks require adjustment.

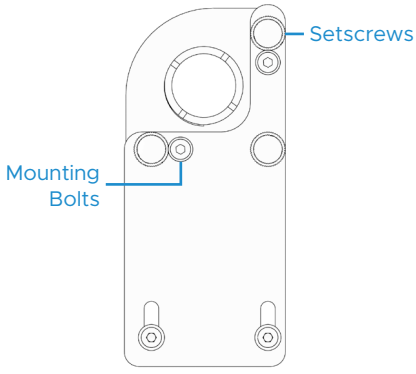


If not,

Step 6. Cut the power to your laser.

> If the last burnt hole is way off-mark, you may need to loosen the mounting bolts of Mirror 2 to slide it into a better position before fine-tuning the setscrews.

Step 7. Carefully turn the setscrews on Mirror 2 to adjust the angle and position of Mirror 2.



Step 8. When finished with adjusting the setscrews of Mirror 2, repeat steps 2–6 until the burnt hole falls perfectly at the center of the tape on Mirror 3.

8. Maintenance

8.3.4 Mirror 3 Alignment

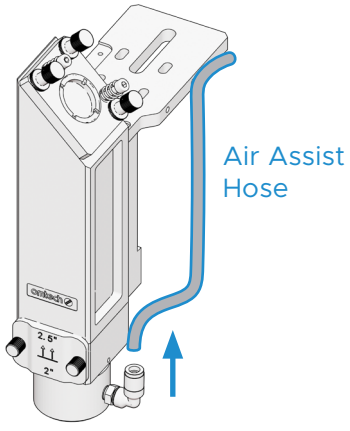
- Wear safety goggles during the entire aligning process.
- Avoid attaching the tape directly to the mirror.
- Less than 15% of the Max. power (not Min.) should be sufficient to leave a clear mark without setting the testing tape on fire.
- Always make sure the path is clear between the laser and its 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.

Tools Needed: Masking tape

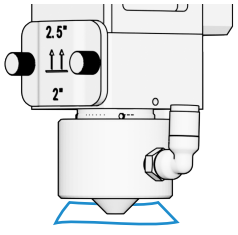
With the laser beam well aligned among the laser tube, Mirror 1, and Mirror 2, it goes through Mirror 3, the last mirror, and eventually passes through the lenses in the laser head, where it gets focused and fired to the laserable material.

To align Mirror 3 with the workbed:

Step 1. Detach the air assist hose from the laser head.



Step 2. Attach a piece of tape to the laser head's aperture, applying some force. This will form a ring on the tape and help check the alignment.

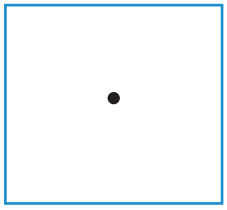


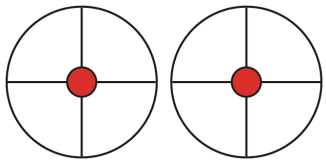
Step 3. Put on safety goggles and turn on the machine and set the power level to 15% of the Max. power (not Min.) or lower.

Step 4. Close the cover.

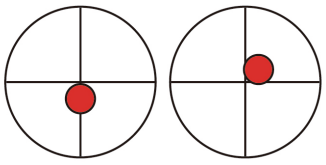
Step 5. Fire the laser.

Step 6. Check that the burnt hole on the tape is at its center as shown.





These marks are OK.

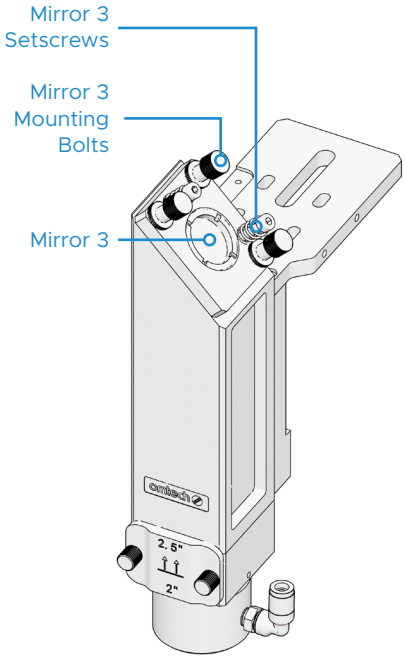


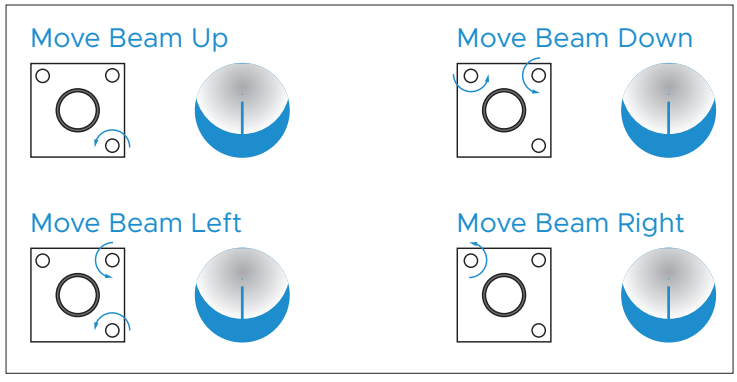
These marks require adjustment.

If not,

a. Cut the power to your laser.

> If the last burnt hole is way off-mark, you may need to loosen the mounting bolts of Mirror 3 to slide it into a better position before fine-tuning the setscrews.





b. Carefully turn the setscrews on Mirror 3 to adjust the angle and position of Mirror 3.

- 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.

Step 7. When finished with adjusting the setscrews of Mirror 3, repeat steps 3–6 until the burnt hole falls perfectly at the center of the tape.

Step 8. Use the direction arrows on the control panel to send Mirror 3 to the far right.

8. Maintenance

Step 9. Repeat steps 3–6 until the burnt hole is at the right center of the tape.

When the laser is well centered along the entire path from the tube to the workbed, your laser mirrors are all correctly calibrated and (assuming they are clean) performing at optimum efficiency.

8.4 Lubrication

8.4.1 Rail

Lubrication Schedule: Every two weeks

Disconnect the engraver from power before lubricating the rail.

Tools Needed:

- Cotton cloth
- White lithium grease

Step 1. Disconnect the engraver from power.

Step 2. Gently move the laser head out of the way.

Step 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.

Step 4. Lubricate both the rails and screws with white lithium grease.

Step 5. Gently move the laser head and X axis to coat the lubricant evenly along both rails.

Step 6. Raise and lower the workbed to distribute the lubricant evenly along the screws.

8.4.2 Workbed Elevation Bolts

Lubrication Schedule: Every two weeks

- Disconnect the engraver from power before lubricating the rail.
- **KEEP YOUR HAND CLEAR OF THE MOVING WORKBED WHILE APPLYING GREASE**.

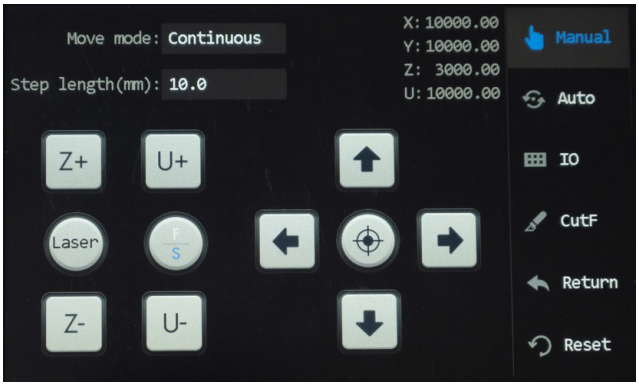
Tools Needed:

- Cotton cloth
- White lithium grease

Step 1. Disconnect the engraver from power.

Step 2. Open the rear access door to access the bolts.

Step 3. Tap **Manual** in the main menu, and the following menu pops up.



This menu is mainly for manual debugging, including axes (X, Y, Z, & U) motion, manual laser firing, positioning, IO diagnosis, frame cutting, return and system reset, and aligning the laser path. To exit this menu, tap “Auto” in this menu.

Step 4. Clean any contaminated grease off the bolts using a piece of cloth.

Step 5. Apply some new lithum grease at the middle of the bolts.

Step 6. Use the up and down keys to move the workbed along it full stroke of motion along the bolts.

Step 7. Raise and lower the workbed to distribute the lubricant evenly along the screws.

8. Maintenance

8.5 Error Messages

The chiller may display the following error messages:

Code	Meaning	Typical Solution(s)
E1	Ultrahigh Room Temp. Alarm	Cool the area directly around the engraver.
		Pause work until the room itself cools.
		Move the engraver to a cooler area.
		Contact customer service for information on checking the wiring for the chiller's ambient temperature sensor.
E2	Ultrahigh Water Temp. Alarm	Pause work while leaving the chiller running to cool the water.
		Drain a portion of the heated water and add cooler water or laser-safe antifreeze. (Do not add ice.)
		Check the chiller's F6 alarm setting (§7.2 Water Chiller Adjustment on Page 106). Restore it to 38–45°C if it has been mistakenly set any lower.
		Contact customer service for information on checking the wiring for the chiller's water temperature sensor.
E3	Ultralow Water Temp. Alarm	Pause work while leaving the chiller running to heat the water.
		Drain a portion of the cold water and add warmer water or laser-safe antifreeze. (Do not use water above 45°C.)
		Contact customer service for information on checking the wiring for the chiller's water temperature sensor.
E4	Ambient Temp. Sensor Error	Contact customer service for information on checking the wiring for the chiller's ambient temperature sensor.
E5	Water Temp. Sensor Error	Contact customer service for information on checking the wiring for the chiller's water temperature sensor.
E6	Low Water Flow Alarm	Check the water pipes for any bubbles, obstructions, or kinks. Carefully clear them and straighten the hoses.
		Check the chiller's F10 alarm setting. Restore it to 0.5 dL/min. if it has been mistakenly set any lower.
		Contact customer service for information on safely clearing other blockages &/or checking the wiring for the flow sensor.
E7	Water Pump Alarm	Check the chiller and engraver's electrical connections.
		Check the chiller and engraver's power supply for any irregular voltage or current.
		Contact customer service for information on other electrical tests and/or checking the wiring for the pump sensor.

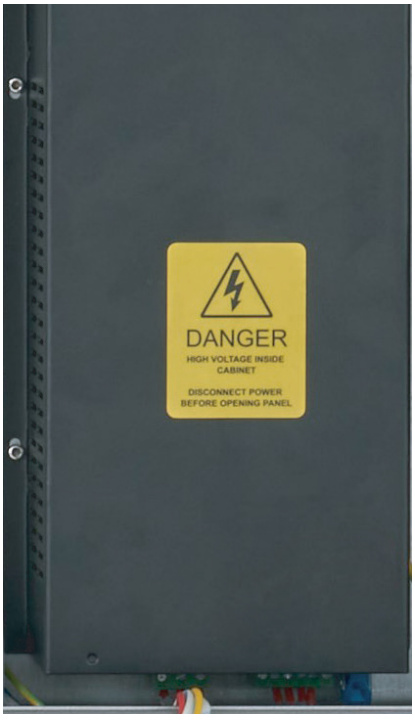
In addition to these alarms, the chiller will also sound or cause alarms when the water is outside its correct operating range, when the water level is low, or when air bubbles are present in the line. See §7.2 for details. Also note that the chiller needs good ventilation for proper functioning, including at least 5 feet (1.5 m) of unobstructed space in front of its cooling fans.

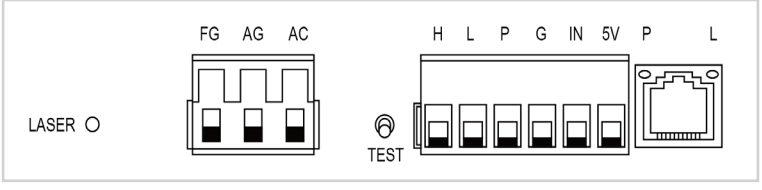
8.6 Parts Replacement

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

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. If you replace the power supply with an identical model, you will be able to use the same screw terminal blocks as a unit. If you change to a different power supply, refer to the following diagram to move the wires to the correct placement on the new unit. The high-voltage anode wire should be





FG: Main ground connection

AC1: Neutral wire to the main power connection

AC2: Live wire to the main power connection

H: Live wire to receive active high-voltage firing commands

L: Live wire to receive active low-voltage firing commands

P: Live wire(s) to the water sensor etc.

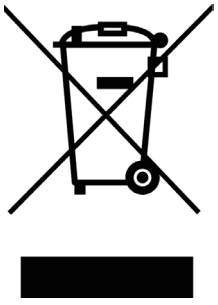
G: Neutral wire(s) to the water sensor, PWM level shifters, etc.

IN: Live wire(s) to receive PWM and other power adjustment commands

5V: 5V DC connection(s) to power PWM level shifters, potentiometers, etc.

8. Maintenance

8.7 Disposal 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. This engraver's R-410A refrigerant also requires special handling for reuse or legal disposal. Contact your local authorities or dealer for advice.

PRO 3655 Cabinet Laser Engraver

User Manual

USB-3655-U1 USB-3655-US Rev. 31 May 2024