



LASER MACHINE

Operation Manual

Model: Falcon, Legend, Barracuda, Sapphire

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Read and understand the operation manual before using this machine.

Failure to follow operating instructions could result in death or serious injury.

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CO₂ Laser Safety & Policies

WARNING: The safety precautions below are mandatory guidelines that must be followed. LightObject will not be held responsible for damages or injuries resulting from improper use of the laser machine.

DO NOT operate the laser machine until you have been properly trained.

DO NOT make contact with any exposed wires on the machine.

DO NOT use any unapproved or unsafe materials such as Polyvinyl Chloride (PVC) which emits noxious gases that can harm your central nervous system.

DO NOT operate the laser near flammable/explosive substances.

DO NOT engrave on shiny metal or mirror as the laser beam can be reflected and deviate that may result in blindness or burn.

NEVER look directly at the laser while in operation and avoid exposure to laser.

NEVER set anything on top of the laser and/or on the worktable when not in use.

NEVER leave the laser machine running while unattended. Monitor the machine when it is running at all times to be able to hear and observe abnormalities and potential hazards.

NEVER push or pull on the laser head housing or gantry while the laser is running.

NEVER dismantle the laser machine as there are laser and high voltage parts that could harm or result in injury.

NEVER open the upper cover of the laser machine while it is running.

ALWAYS wear proper goggles during machine operation.

ALWAYS unplug the machine before making any further adjustments.

ALWAYS keep hands away from machine while operating and stand clear from laser tube area.

In Case of an Emergency:

TURN OFF the POWER SWITCH of the machine OR
Press the EMERGENCYSTOP button

Fire & Hazardous Materials

WARNING: Leaving the machine unattended while in use can result in a fire and substantial damage to the machine and the building it resides in. Any damage caused by fire that is not due to defects in workmanship or the machine itself will NOT be covered by the LightObject warranty.

Hazardous Materials: Any materials considered hazardous are NOT recommended to etch, cut or engrave. These materials can produce toxic fumes or cause the machine to not function properly.

Materials that should NOT be used on the machine:

Polycarbonate
PVC Compounds

Vinyl

Fumes produced by above materials can cause irritation to eyes, skin and the respiratory tract. This material should not be exposed to elevated temperatures.

Laser Safe Materials:

Acrylic, Wood, Leather, Plastics (ABS, POM, Polyimide, PP, Styrene), Fabric, MDF, Cardboard, Paper, Foam, Fiberglass, rubber

Accessories

Air Exhaust Fan
(optional)



Air Pump
(optional)



Air Exhaust Hose
(6" dia.)



Exhaust Hose
Clamps



Tubing for Water
Chiller



Laser Tube



Water Chiller
(sold separately)



Air compressor
regulator pressure
gauge moisture
filter



Other accessories

- 1) Spare tubing
- 2) Ethernet Network LAN cable
- 3) Sets of Keys
- 4) USB cable
- 5) Other tools for adjustment
- 6) CD (software)

NOTE: Optional software LightBurn is sold separately

First Time Laser Setup

The following components are required for operating the laser machine:

Air Assist: to blow smoke away from the beam, preventing damage to the lens and preventing burning the material.

Water Chiller: to circulate cool water into the laser tube to prevent the tube from overheating. The laser tube needs to be at a cool temperature of 15°C - 25°C or else the laser tube may overheat and potentially crack.

Silicone Tubing for Water Chiller and Air Pump: 2 hoses to transfer water for cooling of the laser tube and 1 hose to blow air around the laser head.

Air Exhaust Hose and Air Exhaust Fan: to provide ventilation removing fumes from laser machine.

Unpacking and Setting Up the Machine

- 1) Uncrate/unwrap the laser machine



- 2) Open up the laser machine and retrieve all accessories that may be inside the machine when shipped.
- 3) Once all of the accessories have been removed, you are now ready to begin setting up the machine.
- 4) Depending on the size of your laser tube, you may need to remove the side panel and install the laser tube extension case.



5) Place the laser tube on the laser tube mounts.



6) Connect the water tubing to the laser tube.



- 7) Be sure to connect the silicone tubing on both sides of the laser tube. Connect water tubing between chiller and machine. Chiller's outlet goes to machine's inlet. Machine's outlet goes to Chiller's inlet. The correct direction of water flow is from high voltage side (red wire) of the laser tube to the low voltage side.



(Chiller's back side for reference only)



Note: The water temperature should always be between 59-77 degrees Fahrenheit when running the machine. (15-25 Degrees Celsius).

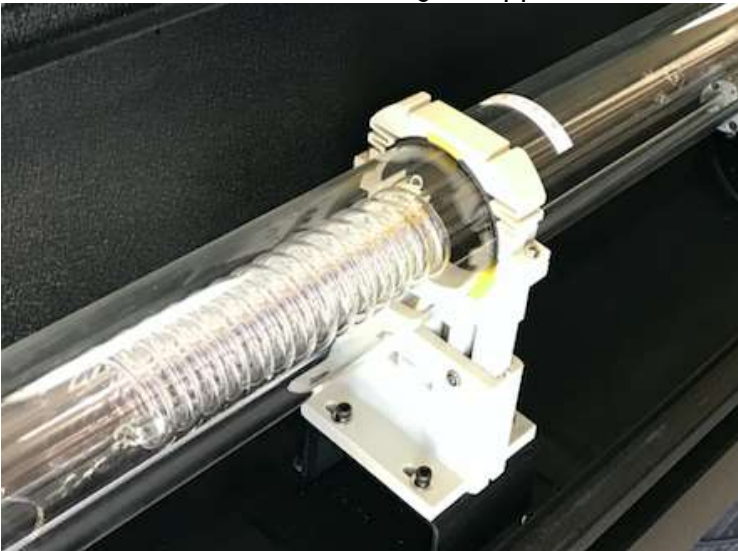
- 8) Fill up the water chiller with distilled water and power up, observe the water flow direction. Switch the input/output if it is wrong.

- 9) Check air bubble trapped in the laser tube. **Squeeze the water tubing or tilt the laser tube carefully to get rid of the big bubble.** Small bubbles are acceptable.



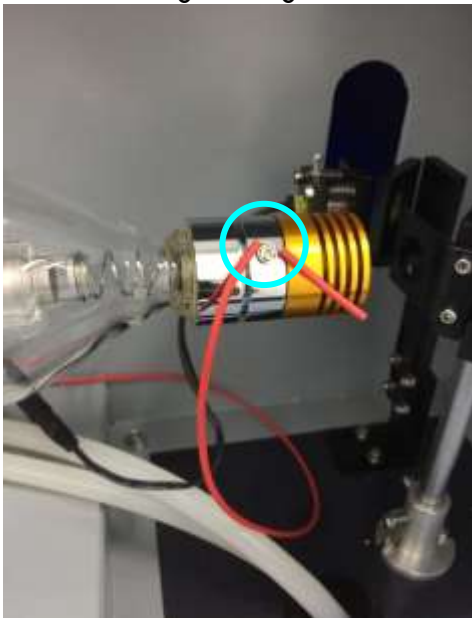
IMPORTANT: the tube can overheat quickly if large bubbles are present when the laser is firing which can cause the tube to crack.

- 10) Secure the laser tube on the laser tube mounts. Make sure its water outlet is in the proper direction so air bubble does not get trapped.

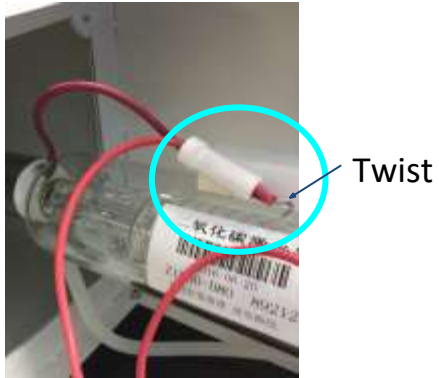




- 11) For screw type connection, clamp the wire under the screw. Put the rubber cap back on the tube on the high voltage side.



For wire type connection, make a secure twist. Then shield it with a piece of silicone tubing to prevent arcing. Make sure there is no moving parts around which could loosen the twist.



For pin type connection: Wrap the wire around the tube's metal pin. Fix the connection by proper soldering OR applying silicon glue. Make sure to shield it with a piece of silicone tubing to prevent arcing.



- 12) Hookup the power cord of the machine and power up the machine. Flip the main switch to ON position.



- 13) Release the emergency stop button.
- 14) Press the machine power button. The laser power button can be pressed later, when it is time to fire up the laser.

Installing Other Accessories

Exhaust Fan Installation

Some materials such as leather or wood generate larger amounts of smoke than other materials. An exhaust is necessary to remove harmful fumes and smoke. The exhaust must be ducted to the outside and away from any area where animals or humans congregate.

Connect the air exhaust hose by using the hose ring clamps provided, connecting the exhaust hose is done in the rear or underneath (varies based on machine). See picture below.



Turn the exhaust fan on when doing any cutting and engraving to remove the smoke and fumes.

You may cover up unused work bed's area so the suction can be concentrated.

Note: Avoid excessive length, kinks and turns when installing the exhaust duct/hose.

Air Assist

Connect the air pump to the laser machine air input. Turn on the air before doing any cutting or engraving to prevent any clouding on the lens and to prevent the material from burning.

Some CO2 cutter models come with high pressure tubing to enable easy upgrades for larger air compressor. An air pressure regulator is used along with an air compressor to adjust the air flow from your compressor to your laser machine.

Pull up the knob then rotate clockwise to increase the pressure.



Air Pump / Air Compressor

The Air Compressor (sold separately) are used to blow air through the laser head. This will blow away debris and smoke from the laser beam while allowing for a cleaner cut and protecting the lens.

The air compressor on/off switch should be close by and preferably on the same circuit as the water chiller and exhaust fan to ensure it is in operation while running the laser machine. New models come with an AC outlet (output the same voltage of the machine AC input) for air pump. When air assist is on, it will turn on the air pump at the same time.



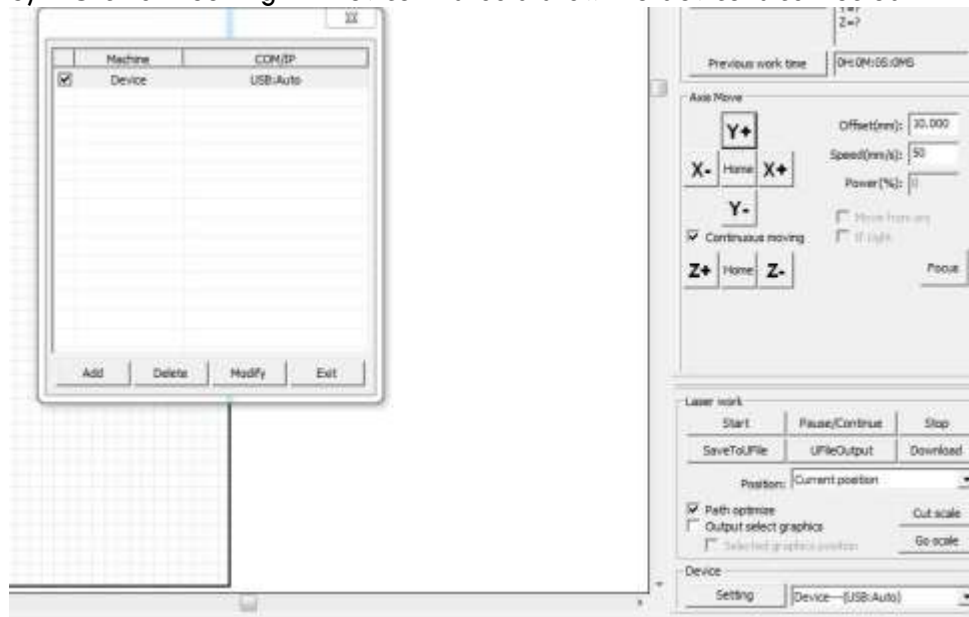
Connecting Laser Machine to Computer

The laser machine controller works with these software

- a) LaserCAD for Trocen, RDWorks for Ruida (for Windows only)
- b) LightBurn (for Mac and Windows)

Set up with RDworks

- 1) Download and install the software RDWorks from <http://www.rd-ac.com/>
- 2) Connect the USB cable.
- 3) Click on "Setting" in Device. It should show the device is connected.

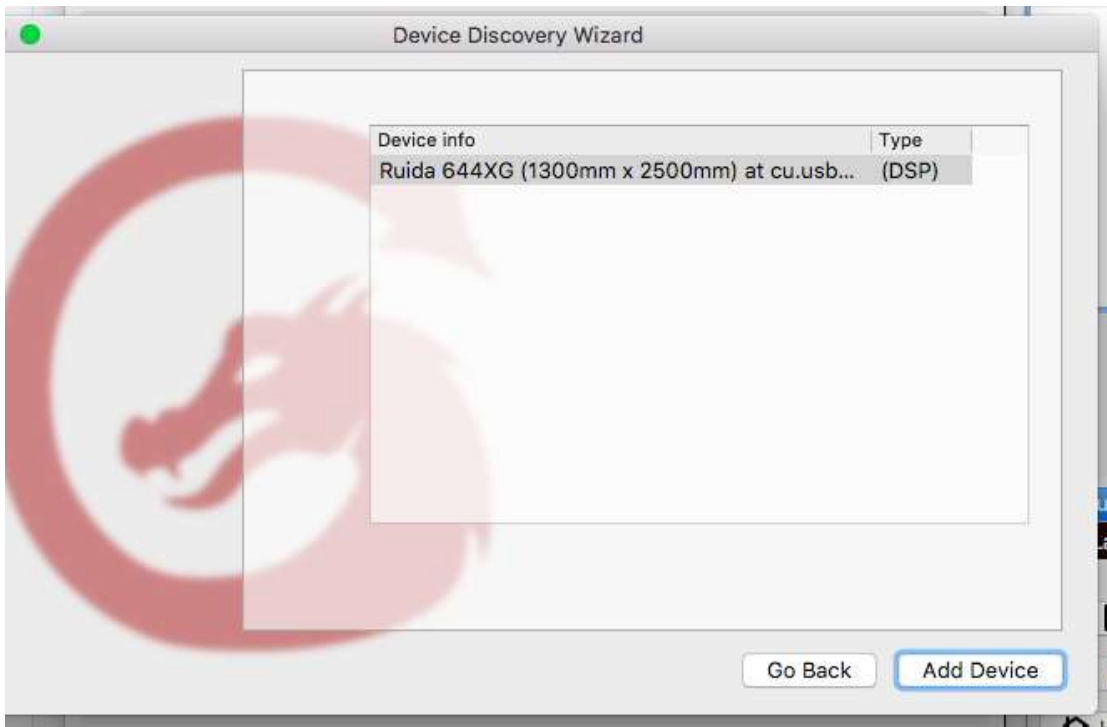
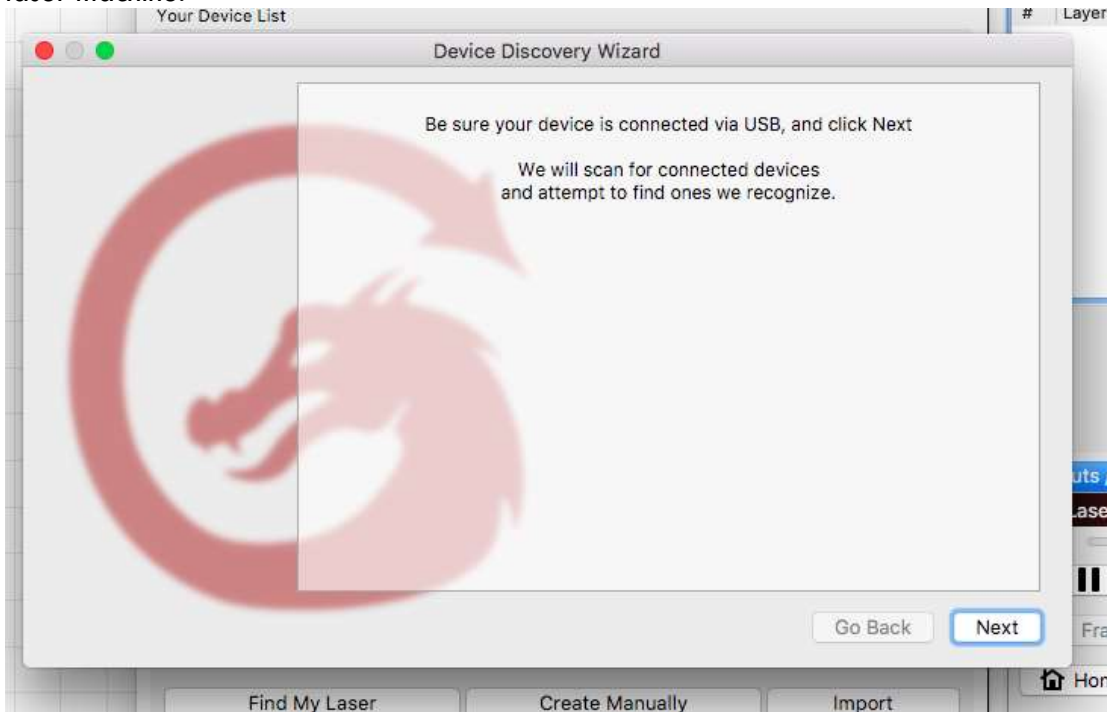


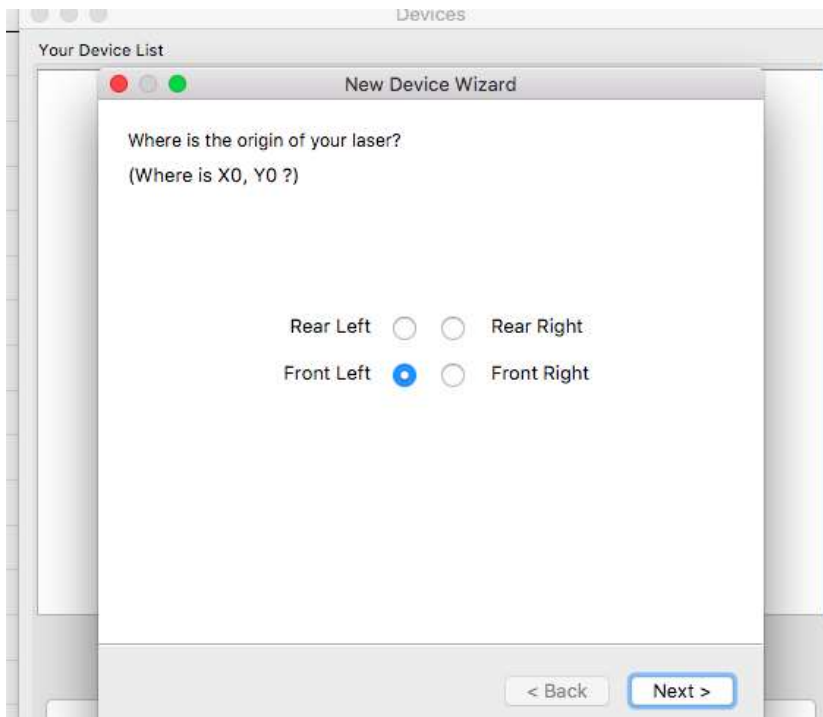
Set up with LightBurn

The following uses Ruida as an example

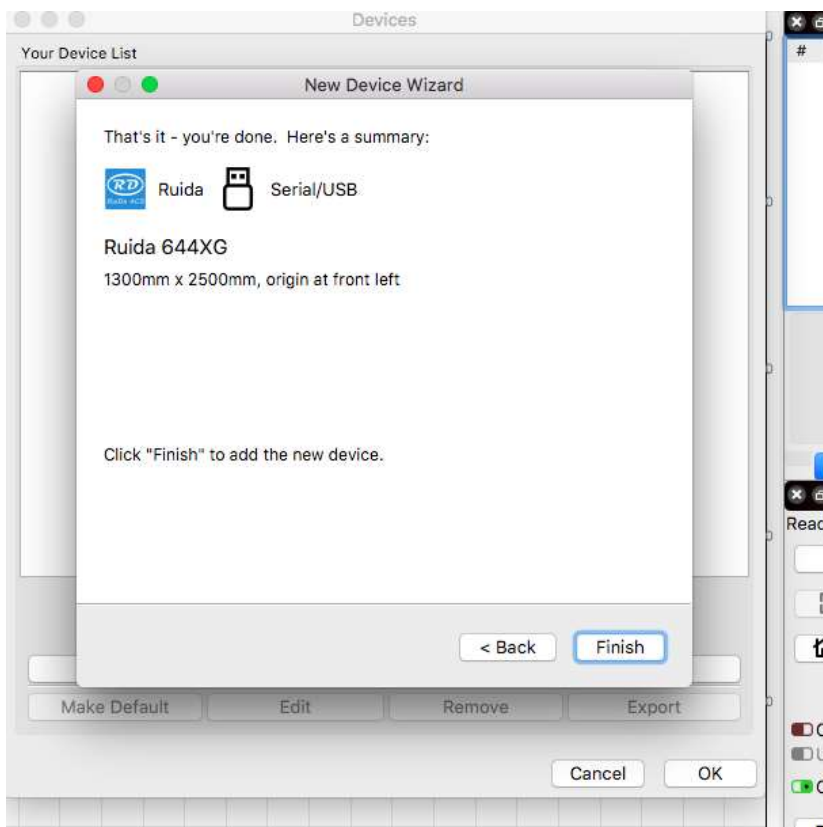
- 1) Download and install the software LightBurn from <https://lightburnsoftware.com/>
- 2) Connect the USB cable.

- 3) Follow the instruction from the screen, and it will guide you connecting the computer to the laser machine.





If machine origin is not set correctly, the job file sent to the controller could be mirrored.

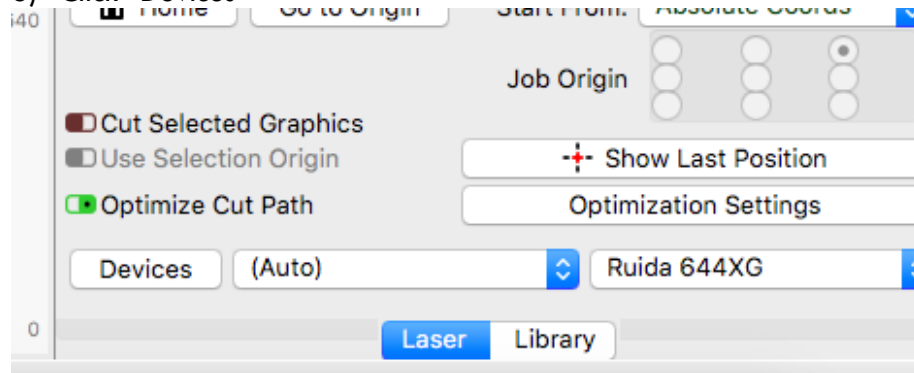


NOTE: Please refer LightBurn instruction manual and tutorials in their site for configuration and usage. Some controllers need to be set to USB instead of Serial/USB.

If you are using LAN connection, input the same IP address set on the laser controller.

NOTE: Please make sure LAN cable is connected between computer and laser machine.

- 4) Press Menu on the controller panel
- 5) Select "System config"
- 6) Select "Read"
- 7) IP address should be shown e.g.169.254.164.041 (depends your network)
- 8) Click "Devices"



- 9) Click "Create Manually"
- 10) Select "Ruida" in New Device Wizard", click "Next"
- 11) Choose "Ethernet/UDP"
- 12) Input the IP address you have seen in the DSP control panel e.g.169.254.169.041
- 13) Input the Name you would like to call it
- 14) Input the dimensions of the work area e.g. 1300mm for the width, 2500mm for the height
- 15) Select the origin, then click "Next"
- 16) It will show the setting, then click "Finish"

Sending Files to Laser Machine

Once you have established the connection between the computer and the laser machine, job files can be transferred.

To do this, click on the “Send” button(LightBurn) OR “Download” button (RDWorks) located on the right side of the laser software.

Alternatively, save the file as UFile and put in a USB stick. Then download the file from the USB stick on the laser control panel.

Control Panel Keypad

Note: Since the laser cutter can be connected to different controllers (e.g. Ruida RDC644XG), please always refer to the controller manuals for details.

Functions of typical keypad:

Reset: Reset the whole system;

Origin: Set the relative origin;

Laser: Fire the Laser temporary;

Frame: To track by the current file's frame;

File: The management of the memory and U disc files;

Speed: Set the speed of the current running layer, or set the direction keys' move speed;

Max. Power: Set the laser power of the current running layer, or set the "Laser" Key power.

Min. Power: Set the min laser power of the current running layer;

Start/Pause: To start or pause the work;

Left and right arrow: To move the X axis or the left/right cursor;

Up and down arrow: To move the Y axis or the up/down cursor;

Z/U: The Z/U key can be pressed when the system is idle or the work is finished. On pressing this key, it will show some entries in the interface, each entry includes some functions, Z axis move, U axis move, each axis to go home

Esc: To stop work, or to exit menu;

Enter: Validate the change;

Laser Current Control

It is important that the laser tube does not run with over current as it could damage the laser tube. Normally, we will limit the maximum current output by using software or laser power supply's potentiometer before it is shipped.

On the new model, there is a Manual/Auto switch. User may switch on the Manual/Auto switch, so that the current can be adjusted manually by turning the knob to increase or decrease the laser power. When it is in Auto mode, the power will solely follow the output set by the DSP controller.



Running the laser tube at low mA can make it last longer. Do not exceed max mA:

35~45W: 16mA
50W: 18mA
60W: 20mA
80W: 26mA
100~130W: 28mA
150W: 30mA

Z-table Control

If the machine is equipped with a powered z-table, it is recommended to disable the auto z homing for safety. During manual z homing, please make sure the laser head or gantry will not hit anything when the z table moves up.

Before z axis is homed, the z table cannot be moved upwards beyond the initial position. You may press stop during the z homing. Be careful when lowering z table if it is not homed, as it may go beyond the bottom limit.

Focusing the Lens

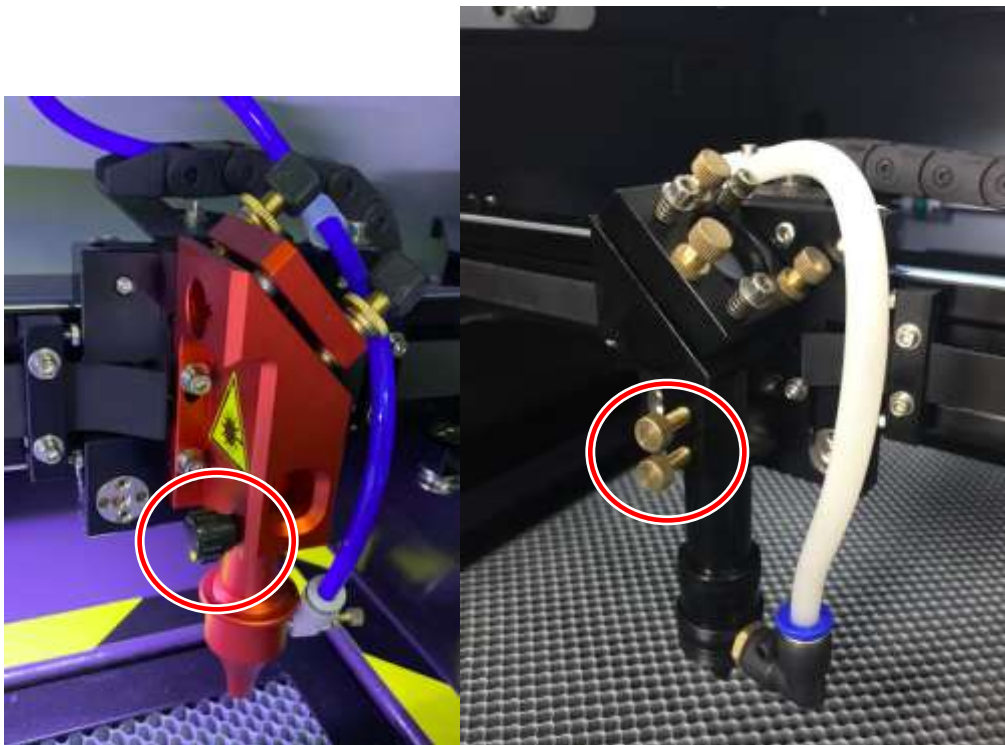
The lens should be adjusted and focused according to the thickness and type of material.

To adjust the focus, adjust the height of the cutting head to accommodate the thickness of the material.

Burn some dots on a piece of material, and try to find the smallest burn on the material by adjusting the height of the cutting head. When it is focused, the burn's diameter on the top surface of the material will be smallest.

OR

You may do a ramp test. Put a piece of wood at an angle like a ramp. Laser cut a line across it. Move the laser head over the narrowest section of burn mark. The gap is the focus height.



Note: Make sure optics are clean afterwards.

Engraving Adjustment:

The timing between laser firing and motors movement can be finetuned. Draw a 20mm by 5mm rectangle, and set the scan gap to be 1mm. Enable the offset adjustment, then send the job to the laser machine. It will mark five lines on the material. Keep adjusting the “offset” value until the lines line up. It needs one value for each speed the machine engraves at.

Engrave Reverse offset

Speed	Reverse Offset	<input checked="" type="checkbox"/> Enable
200.00	1.00	<input type="button" value="Add"/> <input type="button" value="Delete"/> <input type="button" value="Modify"/>
300.00	-0.10	

Rotary Usage:

If the machine is rotary ready, you can enable the rotary on the machine controller. If you are using a chuck type rotary, whenever you clamp a different diameter object, you need to change the diameter setting, then reset the machine. There is no homing limit switch for the rotary, so you may press stop when u-axis is homing. If a new rotary needs to be installed, put an object on the rotary, draw a vertical line with the length equal to the object’s circumference. Send the job to the laser and press framing. Under controller setting, keep adjusting the rotary pulse number until the object rotates 360 degrees. Reset each time the pulse number is changed.

Maintenance

Cooling:

Automotive antifreeze should not be used as a laser coolant. Distilled water shall be used. The coolant should always be clean and clear.

Focal lens:

This is the lens that is used to focus the laser beam. This lens should be cleaned before it gets dirty. The laser beam alignment should be checked after cleaning is completed. If there is any incident of fire or large issue of smoke/fumes, it is advised to check the lens. Use denatured alcohol and/or acetone as the cleaning solvent. Use a lens tissue or cotton tipped swabs.

The focal lens should be replaced if it is cracked, the coating is scratched/pitted, the core material is darkened, the coating is delaminating, or any other significant damage is found.

Mirrors:

Mirrors should be cleaned at least every three months. The first mirror (next to the laser tube) usually does not get dirty easily.

Laser Alignment

WARNING: DO NOT obstruct the path of the laser, beam is invisible!

NOTE: Due to transportation, the alignment may be off.

- 1) To make sure that the laser is properly aligned, place an adhesive note around the alignment housing next to the mirror.
- 2) Set the laser power low to avoid burning the paper.
- 3) Start with the first mirror; press the laser button once. If that mirror is aligned correctly, the burned marks should be at the same spot when the y gantry is at max and min travel(x gantry for second mirror). When the third mirror is aligned, the burn marks on the material should be concentric after moving the laser barrel up/down.
If it is not aligned, then the adjustment screws for each mirror must be adjusted. Please check our video online for detail.
- 4) Once the first mirror is done, repeat the steps to align the 2nd mirror.
- 5) When mirrors are aligned correctly, the mark will be in the center regardless of the x and y position (wherever the laser head moves).

Troubleshooting

The machine does not turn on:

Make sure to check below

1. Does the power supply function properly?
2. Is the emergency button pressed?
3. Is the power switch turned to the on position?

Laser does not fire:

Make sure to check below

1. Check if the water chiller functions properly. The laser machine has a water flow sensor connecting to the laser power supply. The laser will not fire if there is no water flowing through the sensor.
2. All covers are closed. There is one sensor for front cover and one for laser tube cover.