# Beam & Blaze CNC CO2 Laser

## Operation Manual



Installation
Operation
Safety
Maintenance

CANCAM
CNC MACHINES

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# INTRODUCTION

**WE THANK YOU** and congratulate you for choosing a ***CanCam*** CO2 Laser System.

We suggest that everyone operating this ***CanCam*** machine reviews this manual carefully, including all the health and safety warnings and notices, **BEFORE** operating any equipment.

Serious personal injury and/or property damage will result from improper use.

We also suggest that you keep this manual nearby the machine during operation for convenient reference.

This manual covers installation, operation, safety, and maintenance procedures to keep your ***CanCam*** machine running at its best.

***CanCam*** is a Canadian owned and operated CNC machine manufacturer.

Our mission is to provide you with quality technology that allows you to create, invent, and produce your products with confidence at an affordable cost.

For the digital version of this manual and other helpful resources, please visit our website at ***WWW.CANCAM.CA***.

# SAFETY

**⚠ WARNING!**

**Improper or unsafe operation of this machine will result in personal injury, including death, and/or damage to the equipment.**

**This machine is automatically controlled and may start at any time.**

## BEFORE YOU BEGIN

1. Read **ALL** instructions **BEFORE** assembling or operating this machine.

**⚠ WARNING!**


**CLASS IV Laser, extremely dangerous!**

2. This machine is a **CLASS IV** laser device, which emits invisible radiation, and can be extremely dangerous.

**⚠ WARNING!**

**Fire and burning hazards.**

3. This laser will instantly ignite clothing, paper, wood, plastics, other common items, and even flesh and eyes.

**⚠ WARNING!**

**High-voltage electrocution hazards.**

4. This laser uses lethal high-voltages. Take care when working with high-voltage, or risk serious injury and even death.

5. Take care to avoid serious injury and/or blindness.

**⚠ ATTENTION!**

**Wear infrared eye protection.**

6. Always use infrared eye protection when operating this laser. Failure to wear proper eye protection may result in permanent blindness.

7. **DO NOT** operate high-power lasers near flammable/hazardous materials, children, animals, etc.

**⚠ ATTENTION!**

**Vent fumes properly.**

8. Make sure exhaust fumes are properly ventilated.

9. Be aware of all of your working materials' various characteristics.

**⚠ ATTENTION!**

**Pinching, crushing, and entanglement hazards.**

10. Avoid pinching, crushing, and entanglement hazards with moving parts.

11. The user is solely responsible for the safe operation of this machine.

12. **ONLY** properly trained and authorized individuals should operate or service this machine.

13. The operator must check the machine **BEFORE** start of work for external visible damage and defects.

14. Notify supervisor immediately of anything (including behaviour during operation) that might affect safe operation.

15. **DO NOT** operate this machine if damaged.

16. **DO NOT** operate this machine unattended.

17. Make sure the machine is properly grounded **BEFORE** powering on.

18. The machine should be placed where it will **NOT** experience interference from sources of excessive heat, stray electricity, strong magnetism, electromagnetic interference (EMI), etc.

19. The machine should be placed where any exhaust fumes can be safely and quickly vented.

20. Make sure the chiller is working properly and there are **NO** air bubbles in the laser tube **BEFORE** activating the laser.

21. **DO NOT** place any flammable/explosive materials close to the equipment.

22. In case of fire or other damage, turn off the power **IMMEDIATELY**.

23. **DO NOT** place any objects that may reflect the laser inside the working area. Stray laser rays may cause damage or serious injury.

24. While the machine is working, operators should continuously examine the working conditions. Check that the laser ray has **NOT** been blocked and the air pump and chiller are working properly. Listen for unusual noises, and watch for fire or other malfunctions.

25. When voltage is unstable, **DO NOT** start the machine. Voltage regulators are recommended where necessary.

26. Preparation, retooling, change of work piece, maintenance, and repair must **ONLY** be performed by properly trained personnel while the equipment is powered off and locked out.

27. **DO NOT** override any safety devices. Overriding safety devices will result in serious injury, and even death.

### TRAINING & AUTHORIZATION

Only trained and authorized personnel should work on this machine. Untrained operators present a hazard to themselves, others, and the machine. Improper operation will void the warranty.

### DAMAGED PARTS

Check for damaged parts and tools **BEFORE** operating the machine. Any part or tool that is damaged should be properly repaired or replaced by authorized personnel. Do not operate the machine if any component does not appear to be functioning correctly, and immediately contact your shop supervisor.

### PERSONAL PROTECTIVE EQUIPMENT

Use appropriate eye and ear protective equipment while operating the machine, including safety glasses/goggles and ear protection.

### SAFETY FEATURES

**DO NOT** operate the machine unless all safety features are installed and activated, including accessible **EMERGEMCY STOP** switches. Never override or deactivate a safety feature.

The **EMERGEMCY STOP** switch is the large, circular red switch located near the control panel. Pressing the **EMERGEMCY STOP** will instantly stop all motion of the machine.

Be aware of the **EMERGEMCY STOP** locations and ensure unobstructed access to them.

This machine is equipped with a safety interlock system with magnetic sensors on the observation window.

The magnetic sensors will deactivate the laser when the acrylic lid of the machine is open. After the door is closed, the laser will reactivate.

### ELECTRICAL PANEL

The electrical panel should be closed and the key and latches on the control cabinet should be secured at all times, except during installation and service.

### MODIFICATIONS

**DO NOT** modify or alter this equipment in any way. If modifications are required, all modifications must be handled by ***CanCam***. Any modification or alteration of any ***CanCam*** machine could lead to personal injury and/or damage to the machine and will void your warranty.

### LOCAL REGULATIONS

Consult your local safety codes and regulations before operating your ***CanCam*** router.

## SAFE MATERIALS

CO2 lasers use high heat to cut or etch the work material, so only use materials and ventilation systems that are safe and meet or exceed local emission standards.

Never work unknown or unfamiliar materials, which can emit dangerous and even deadly fumes.

## SUITABLE MATERIALS

### PLASTICS (REGULAR)

- **ABS** (acrylonitrile butadiene styrene)
- **ACRYLIC** (also known as Plexiglas, Lucite, PMMA)
- **DELRIN** (POM, acetal)
- **KAPTONTAPE** (Polyimide)
- **MYLAR** (polyester)
- **PETG** (polyethylene terephthalate glycol)

### PLASTICS (DIFFICULT)

- **POLYETHYLENE** (PE)
- **HIGH DENSITY POLYETHYLENE** (HDPE)
- **NYLON**
- **POLYPROPYLENE** (PP)

### STYRENE

Two-tone acrylic-top colour different than core material, usually for custom instrumentation panels, signs, and plaques.

### FOAM

Depron foam, often used for RC planes.

### OTHER

- **CLOTHS** (leather, suede, felt, hemp, cotton)
- **PAPERS**
- **RUBBERS** – only if they DO NOT contain chlorine Teflon (PTFE, Polytetrafluoroethylene)
- **WOODS** (balsa, birch, poplar, red oak, cherry, holly, MDF, etc.)

### ETCHING ONLY

- **STAINLESS STEEL**
- **MILD STEEL**

### UNSUITABLE MATERIALS

- **METALS**
- **POLYCARBONATE** (PC, Lexan) due to toxic fumes
- **PVC** (Cintra)
- **VINYL**
- Any materials containing chlorine

## SAFETY LABELS

### MANUFACTURER'S LABEL

This label is located on the rear panel of the machine. All product information such as Serial Number, Model Numbers, Laser Power, and Electric Power can be found here.

Before seeking any further tech support, always provide the manufacturer with the information on this label.

## CDRH LABEL

This label indicates the class level of laser radiation.


## LASER APERTURE LABEL

This label indicates the laser aperture. Normally you can find this label inside the machine. Please take extra caution around this area when you conduct maintenance.

## LASER PATH DANGER LABEL

This label indicates the laser path. Take extra care of this area when machine is active. Avoid direct exposure to visible or invisible beam.


## LASER PATH CAUTION LABEL

CO2 laser machines are very safe under normal functioning conditions. However, in case of any accident, the Laser Path Warning Label will be affixed on the possible laser path.

When operators are nearby these paths, they should be careful to avoid injury while the machine is operating.

## LASER WARNING LABEL

This label indicates that the machine is capable of emitting laser radiation.


Pay attention to the laser radiation source and path, and avoid exposure to direct or indirect radiation.

| NOTE: |
| --- |
| **The shop owner is responsible to make sure that everyone who is involved with installing and operating the machine is thoroughly informed about the installation, operation, and safety instructions provided with the machine BEFORE they perform any actual work.**<br><br>**The ultimate responsibility for safety rests with the shop owner and the individuals who work with the machine.** |

Please contact ***CanCam*** anytime safety issues need to be addressed. Safety is our top priority, and we are always eager to hear about suggestions to improve the safety of our machines.

You can visit us at ***WWW.CANCAM.CA***.

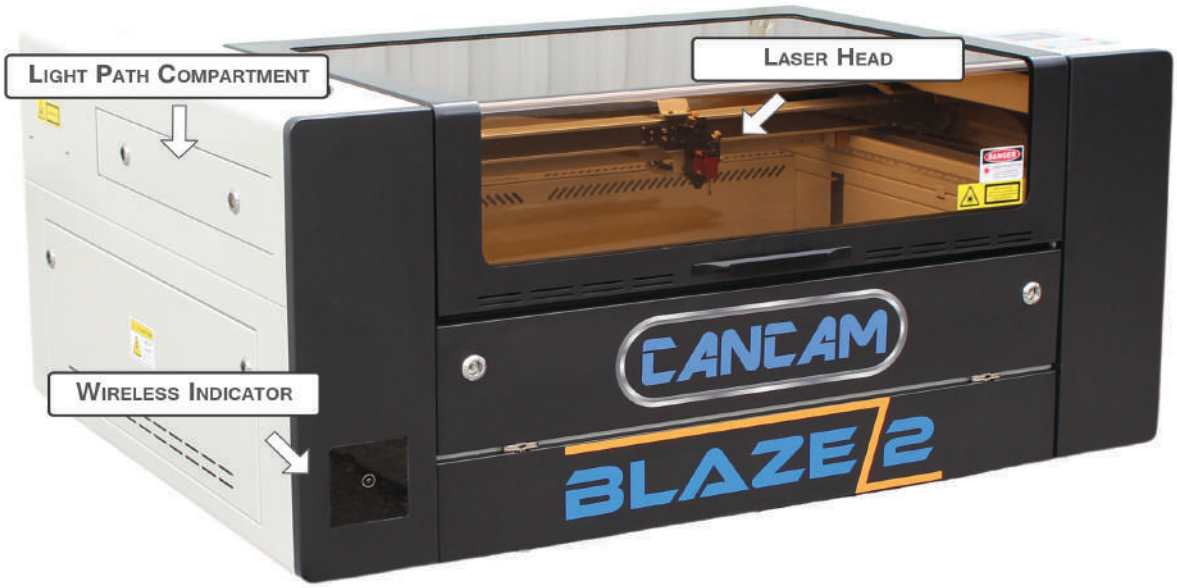
Or, call us toll-free at **1-555-510-2295**.

We would be glad to hear from you.

**STAY SAFE!**

# OVERVIEW

## MACHINE ANATOMY


Gantry
Laser Head
Mirror
Rotary Port
Manufacturer Label
Laser Tube Compartment
Internal Air Filter
Light Path Compartment
Internal Chiller
Focus Mirror
Laser Tube

# TECHNICAL PARAMETERS

## LASER CLASSIFICATION

**CDRH LASER SAFETY:** Class IV (4) Laser

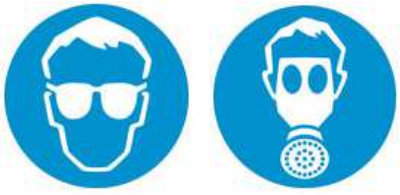
**⚠ WARNING!**


**CLASS IV Laser, extremely dangerous!**

**Class IV (4) laser product is any laser that, during operation, permits human access to levels of laser radiation in excess of accessible emission limits.**

**Class IV (4) levels of laser radiation are considered to be an acute hazard to the skin and eyes from direct and scattered radiation.**

**Class IV (4) laser products may have removable panels that, when displaced, permit access to levels of laser radiation ranging from Class II (2) to Class IV (4).**



## LASER EQUIPMENT

| | |
|---|---|
| LASER TYPE | CO2 |
| WAVELENGTH | 10600nm |

## SPECIFICATIONS

| | BLAZE | BEAM |
|---|---|---|
| HORIZONTAL PROCESSING ENVELOPE | 500x300mm<br>700x450mm<br>900x600mm | 1000x700mm<br>1300x900mm<br>1400x900mm<br>1600x1000mm |
| VERTICAL PROCESSING ENVELOPE | 100mm<br>150mm | 200mm |
| MACHINE FOOTPRINT | 900x710x430mm<br>1100x845x480mm | 1295x1520x1125mm<br>1380x1920x1240mm<br>1480x1925x1125mm<br>1650x2220x1240mm |
| LASER POWER | 30-100W | 80-150W |
| CUTTING THICKNESS | 0-10mm | 0-30mm |
| ENGRAVING SPEED | 1200mm/s | 1000mm/s |
| NET WEIGHT | 105Kg<br>135Kg<br>150Kg | 390Kg<br>430Kg<br>450Kg<br>530kg |
| VOLTAGE | 110V | 110V |
| RATED POWER | 1200W | 1200W |
| MINIMUM FONT SIZE | 1.0x1.0mm | 1.0x1.0mm |
| POSITION ACCURACY | <=0.01mm | <=0.01mm |
| MAX SCANNING PRECISION | 4000 DPI | 4000 DPI |
| AMBIENT TEMPERATURE RANGE | 15–35°C (59-95°F) | 15–35°C (59-95°F) |
| AMBIENT HUMIDITY | 40-70% | 40-70% |

**NOTE:** Don’t operate in the presence of condensation.

## DISPOSAL

**⚠ ATTENTION!**

**DO NOT dispose machine with domestic waste!**

**Electronic devices must be disposed according to local regulations on electronic waste disposal.**

**Please inquire with local waste disposal authorities.**

# INSTALLATION

## UNPACKING MACHINE

### ACCESSORIES INSIDE THE BOX

- Power Cable
- LAN/Ethernet Cable
- Exhaust pipe fastening piece
- USB Stick
- Spare Fasteners

## SETUP

Our CO2 lasers' compact integrated design makes installation easier than ever. Simply follow the following five (5) steps:


1. Fill water tank

   a) Remove cap for the water inlet.

   b) Add approximately 1.9L of pure water into the tank.

| NOTE: |
| --- |
| **We suggest using purified/distilled water to avoid unwanted build-up of impurities.** |

2. Install the exhaust pipe

   a) Attach exhaust pipe fixture with four (4) screws.

b) Place ring-clamp around the end of the pipe, place the pipe on the fixture, and then fasten ring-clamp tightly (as shown).

c) Route exhaust pipe to appropriate ventilation outlet and secure tightly (consult local emissions regulations).

3. Connect computer to the machine with data cable or Wi-Fi adapter.

a) **USB** - connect one end of the USB cable to a USB port on the computer, and the other end to the USB port on the machine.

b) **WI-FI** - See Wi-Fi Setup in the next chapter.

4. Connect power.

a) Verify outlet meets the power requirements of the machine (see Specifications).

b) Connect (female) power cable to the power input on the machine.

c) Connect (male) power cable to the outlet.

5. Turn on machine.

   a) Rotate E-stop to the ready position.

   b) Press the green power button.

The machine will power on, and the laser head will home.

**⚠ ATTENTION!**

**For first time installation:**

**DO NOT operate the machine immediately after the machine is first turned on.**

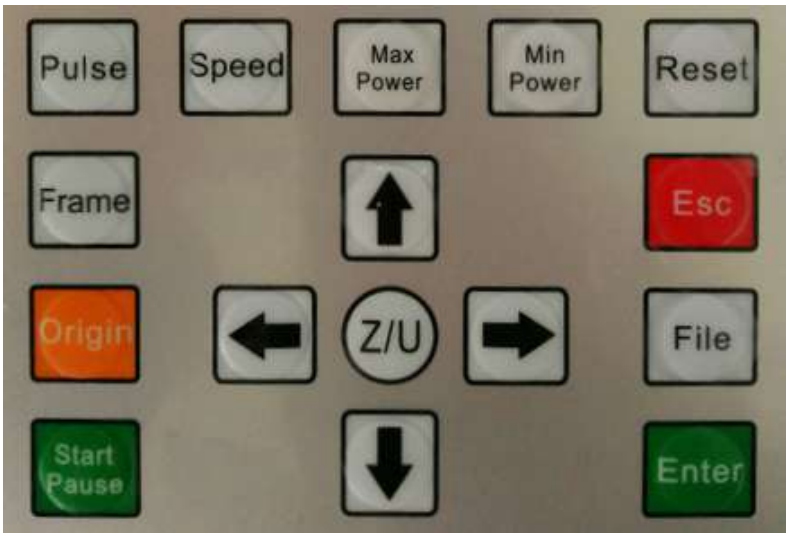
**Wait one or two minutes to let the water cooling system fill the laser tube fully.**

**You can open the back lid to check if the laser tube is full of water.**

**Once the laser tube is full of water, then you can activate laser.**

# OPERATION

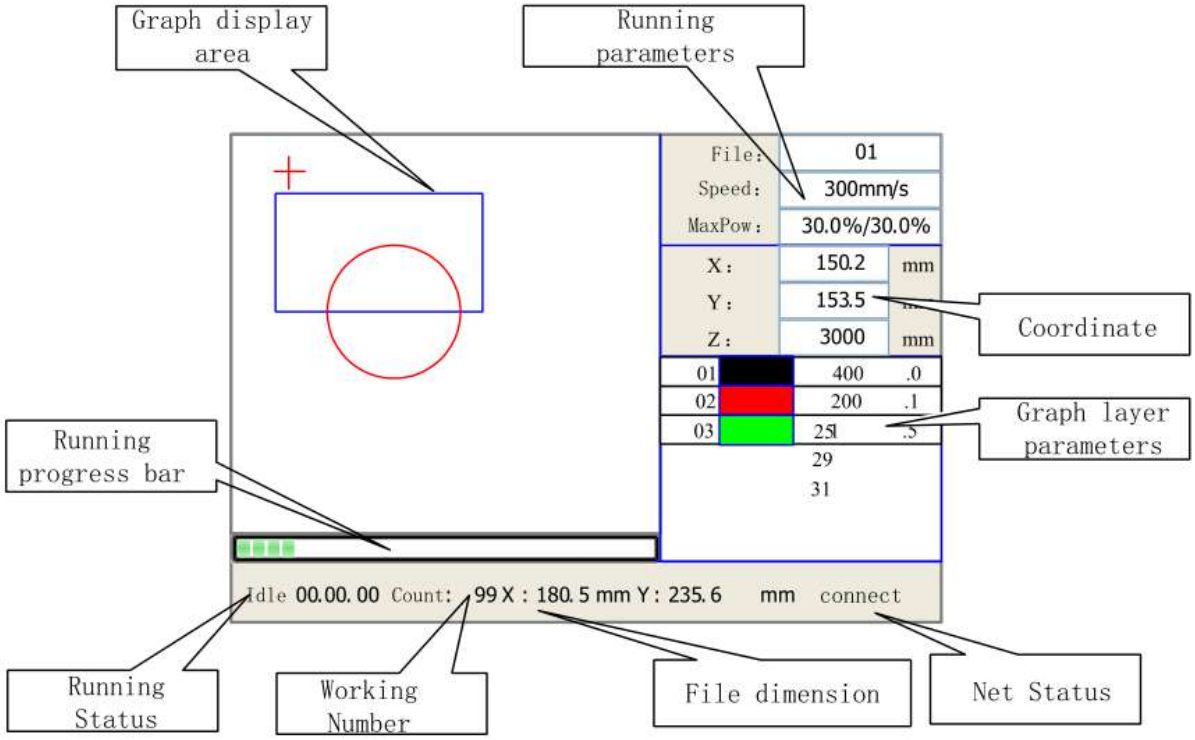
## CONTROL PANEL




| NAME | DESCRIPTION |
|---|---|
| **RESET** | Reset the whole system. |
| **ORIGIN** | Set the relative origin. |
| **PULSE** | Pulse the laser. |
| **FRAME** | Track by the current file's frame. |
| **FILE** | Manage files. |
| **SPEED** | Set the speed of current running layer, or set the direction keys' move speed. |
| **MAX. POWER** | Set the maximum laser power of current running layer, or set the power of "Pulse" Key. |
| **MIN. POWER** | Set the minimum laser power of current running layer. |
| **START/PAUSE** | Start or pause the work. |
| **LEFT & RIGHT** | Move the X-axis or the left/right cursor. |
| **UP & DOWN** | Move the Y-axis or the up/down cursor. |
| **Z/U BUTTON** | Extra functions menu, including: move Z-axis, move U-axis, Home each axis, etc. |
| **ESC** | Stop work, or to exit menu. |
| **ENTER** | Accept change. |

## MAIN INTERFACE

When the system is powered on, the screen will show as illustrated below:



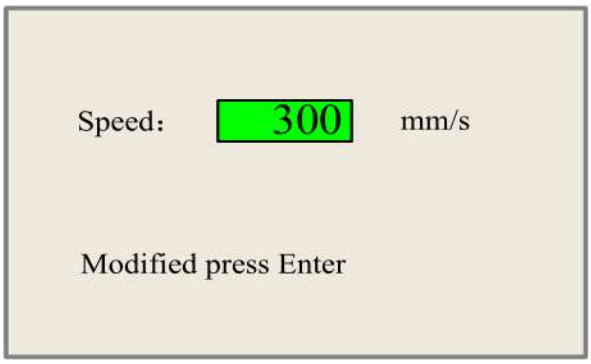

| NAME | DESCRIPTION |
|---|---|
| **GRAPH DISPLAY AREA** | Displays the whole file's track and the running track. |
| **RUNNING PARAMETERS** | Displays the running file's file number, speed, max power, etc. |
| **COORDINATE** | Displays the current coordinate of X, Y, and Z axes. |
| **GRAPH LAYER PARAMETERS** | Displays the layers' information for the current file, such as max/min power, speed, etc.<br>When system is idle, double click the layer to change the layer's parameters. |
| **RUNNING STATUS** | Displays current status of the machine, such as Idle, Run, Pause, Finish, etc. |

| NAME | DESCRIPTION |
|---|---|
| RUNNING PROGRESS BAR | Displays the progress bar of the current running file. |
| WORKING NUMBER | Counts the work number of the current file. |
| FILE DIMENSION | Displays the dimension of the current file. |
| NET STATUS | Displays the connection status of the Ethernet. |

When work is idle or finished, all keys can be pushed, users can select a file to run, set parameters, preview a select file, etc. But, when work is running or paused, some keys **DO NOT** respond when they are pushed.

## SPEED CONTROLS

Push the "Speed" button when the screen is on the main interface (as shown):

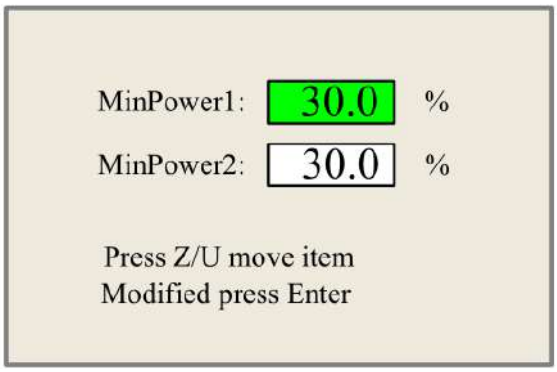


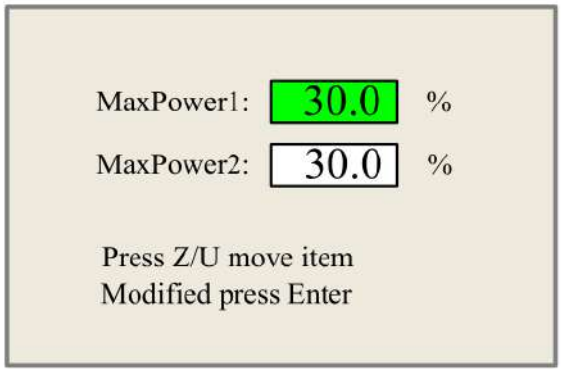

Push the "X+/-" buttons to move the cursor, and then push the "Y+/-" buttons to change the value.

Push the "Enter" button to save the change, or push the "Esc" button to invalidate the change.

## POWER CONTROLS

From the Main Interface, push the “Max Power” or the “Min Power” buttons to change these values (as shown):



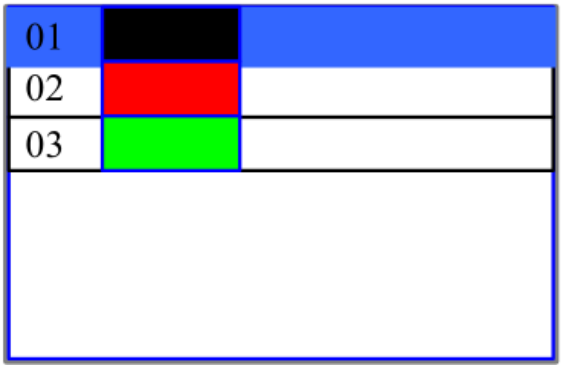



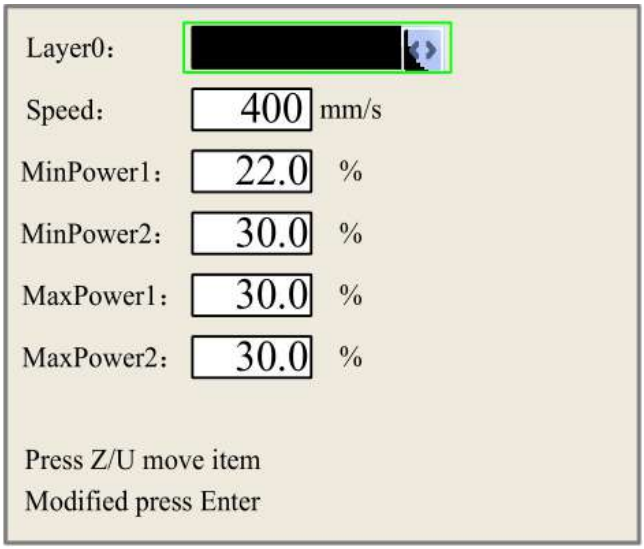

Pushing the “Z/U” button moves the cursor (green block), then “Y+/-” and “X+/-” buttons change the value.

## LAYER PARAMETERS

After selecting a file to preview on the Main Interface, users can press “Enter” to let the cursor move to the first layer.

Then “Y+/-” buttons will select each layer, and “Enter” will display the selected layer’s parameters (as shown).



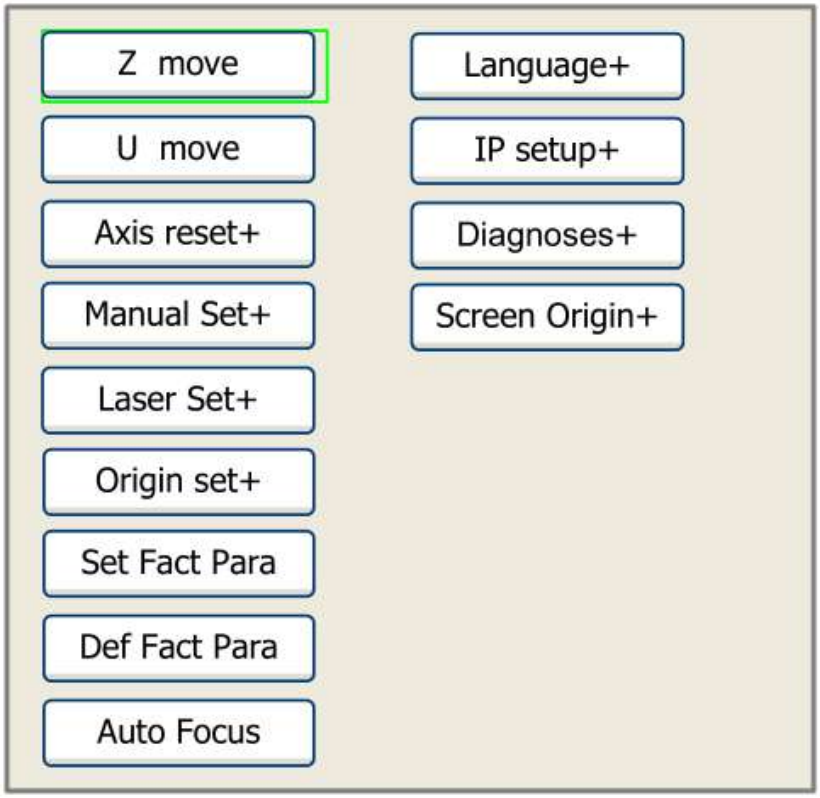

“Z/U” buttons move the cursor to each parameter.

"Y+/-" and "X+/-" buttons change the value.

"OK" confirms the change, and "Esc" cancels the change.

## Z/U BUTTON

When the system is idle or the work is finished, the Z/U button can be pressed to access additional functions (as shown).



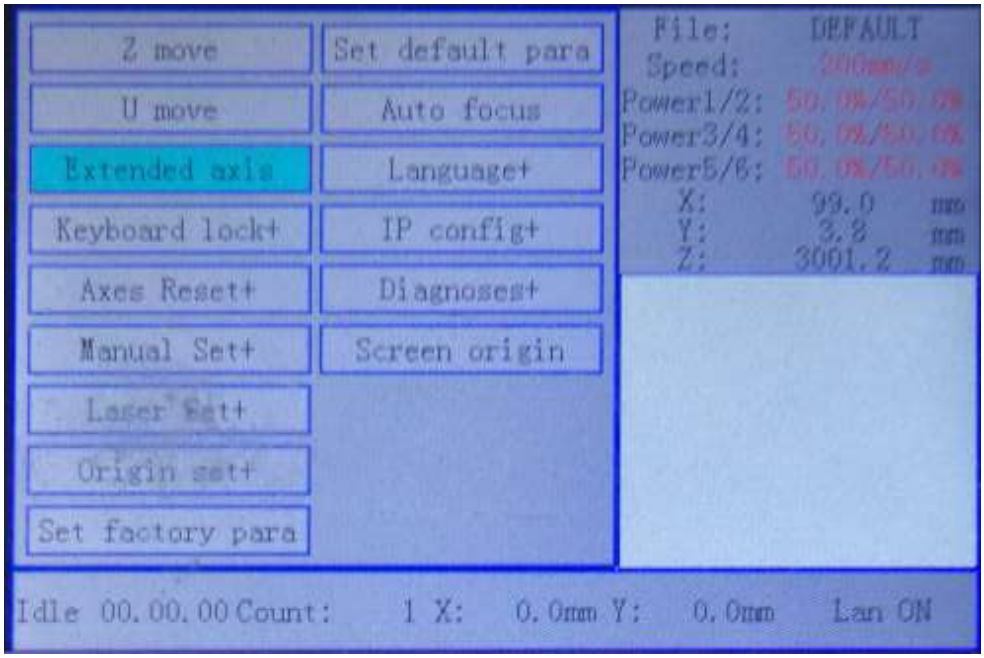

Push "Y+/-" buttons to move the cursor, and then press the "Enter" button to display the sub menu.

**Z MOVE:** when highlighted, "X+/-" buttons move the Z-axis.

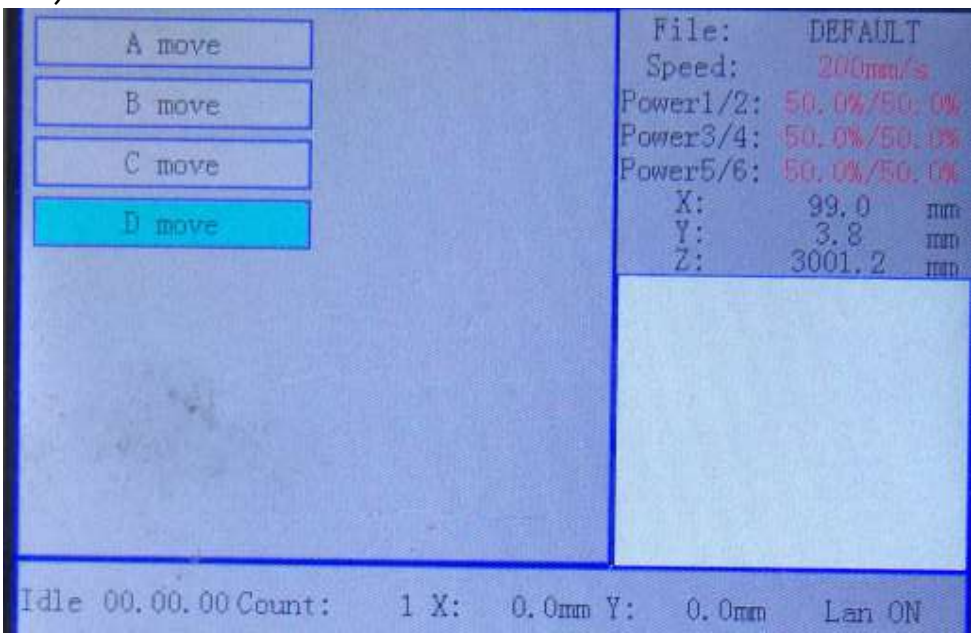
**U MOVE:** when highlighted, "X+/-" buttons move the U-axis.

| NOTE: |
| --- |
| **If your machine has the "Extended Axis" Menu, then your machine has 4 axes.** |

Moving the table up/down is different from the Z-axis. You can follow the instructions below to control the up/down of the work-table.




Press the “Z/U” button on the control panel, choose “Extended Axis”, and then press “Enter” to access the secondary menu (as shown).

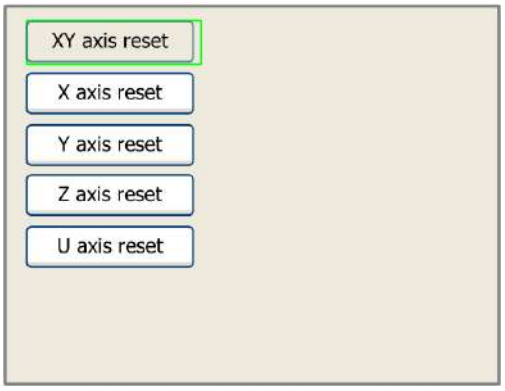


Select “D move”, then the worktable can be moved up/down by pressing the arrow buttons.

## AXIS RESET+

Select “Axis Reset+” from the Z/U Menu to reset any axis.

Use the “Y+/-” buttons to select the axis to reset, and press “Enter” to confirm the selection (as shown).

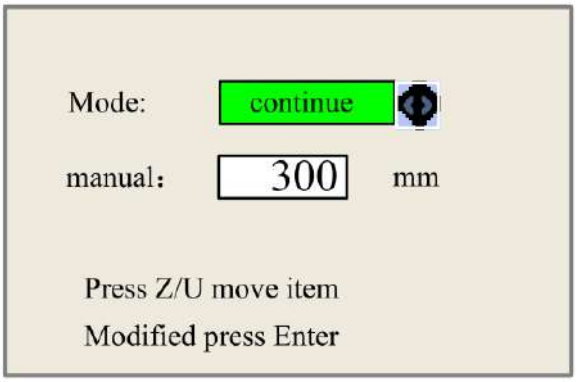



The screen will show some information when resetting an axis.

## MANUAL SET+

Select “Manual Set+” from the Z/U Menu to adjust manual movement.

Press the “Z/U button to move the cursor, and then press the “X+/-” buttons to change the value (as shown).



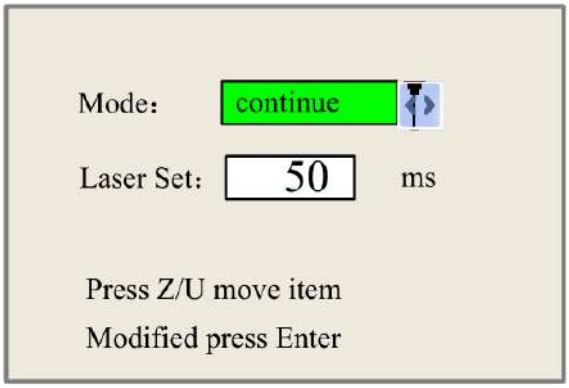
When the mode is set to “manual” pressing a direction button one time will cause the corresponding axis to move the designated distance.

When the mode is set to “continue”, pressing a direction button will cause that axis to move until the button is released.

## LASER SET+

Select “Laser Set+” from the Z/U Menu to adjust laser activation.

Press the “Z/U” button to move the cursor, and then press the “X+/-” buttons to change the value (as shown).



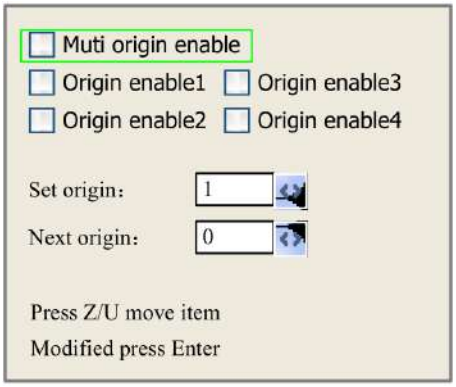

When the mode is set to “manual” pressing the Pulse button once will cause the laser to light for the designated time period.

When the mode is set to “continue”, pressing the Pulse button will cause the laser to light until the button is released.

## ORIGIN SET+

Select “Origin Set+” from the Z/U Menu to adjust the workpiece origin.

Press the “Z/U” button to move the cursor, and then press the “Enter” button to activate/deactivate each item (as shown).




Select “Set origin”, then press the “X+/-” buttons to change the X-axis value.

Press the “Y+/-” buttons to change the Y-axis value.

Confirm by pressing “Enter”.

### ENABLE MULTIPLE ORIGINS

If multiple origins is disabled, the system will use a single-origin, **ORIGIN 0**, which can be set with the “Origin” button.

If multiple origins is enabled, the system will use multiple origins, **ORIGIN 1-4**, and the “Origin” button will be unavailable. Instead, each origin must be enabled and set in this menu.

### ENABLE ORIGIN 1/2/3/4

Once “multiple origins” is enabled, origins 1-4 can be independently enabled or disabled.

### SET ORIGIN 1/2/3/4

Once “multiple origins” is enabled, origins 1-4 can be set to the current X/Y coordinate by selecting each origin as the value for “Set origin” and pressing “Enter”.

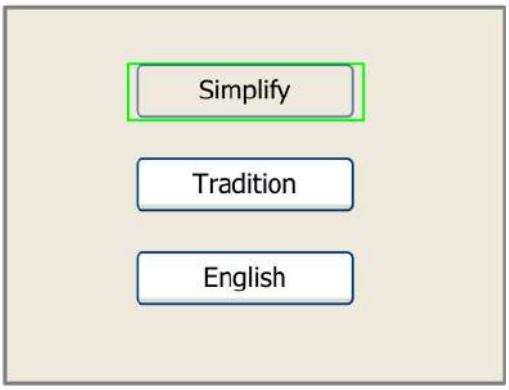
### NEXT ORIGIN

To start the location of the next work at another origin, set the value of "Next origin" to origin 1-4 (must be enabled).

Next origin **CANNOT** be set to origin 0.

## LANGUAGE+

Select "language+" from the Z/U Menu to choose from the available languages.

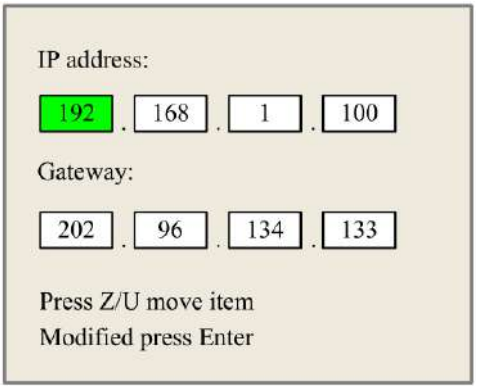



## IP SETUP+

Select "IP Setup+" from the Z/U Menu to configure IP settings.

| NOTE: |
| --- |
| **See your network administrator for correct IP settings.** |

Press the "Z/U" button to move the cursor, and then press the "X+/-" buttons to change the value (as shown).

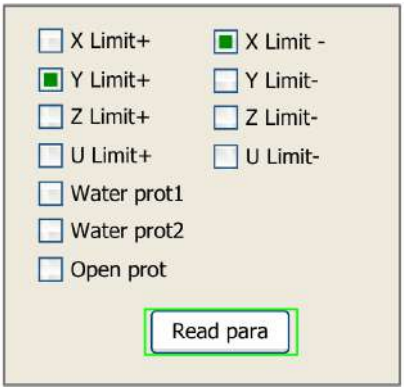


Press “Enter” to confirm IP settings, or press “Esc” to cancel changes.

## DIAGNOSES+

Select “Diagnoses+” from the Z/U Menu to access the diagnostic page.

The diagnostic page displays the status of limit switches and other important components or sensors, such as water protection, that are vital to the machine’s operation (as shown).




When each input is validated, the item highlights green, otherwise the item is grey.

Press “Read para” to refresh the diagnostic page.

## SCREEN ORIGIN+

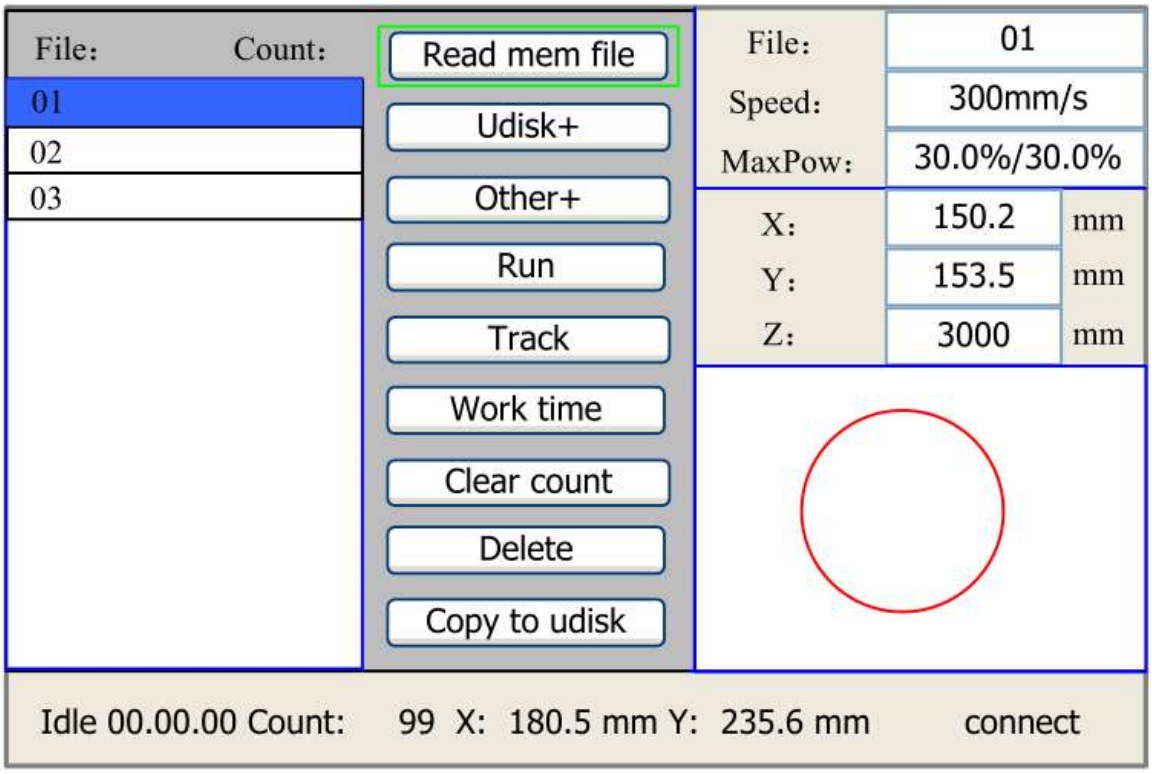
Select “Screen Origin+” from the Z/U Menu to adjust the display graph.

Set “Origin locat” to the desired orientation, top left, top right, bottom left, or bottom right.

| NOTE: |
| --- |
| **Make sure “Origin locat” is set to “TOP RIGHT”** |

## FILE KEY

Pressing the “File” button from the Main Screen accesses the File Menu (as shown).




The File Menu displays the current file’s name, work speed, and preview.

Pressing the “X+/-” buttons moves the cursor between the file list (left) and the menu items (right).

Pressing the “Y+/-” buttons moves the cursor up/down/

Press “Enter” to select the desired file for preview.

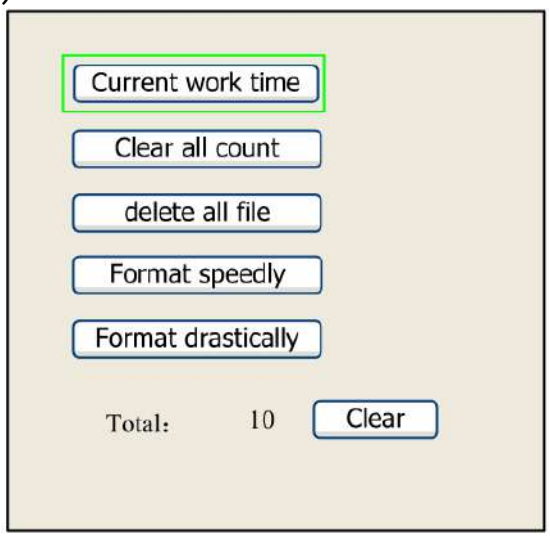
Press “Esc” to cancel the current file selection.

### FILE MENU

**READ MEM FILE:** read memory file list

**UDISK+:** read Udisk file list

**OTHER+:** (as shown)




**CURRENT WORK TIME:** forecast current file's running time (accurate to 1ms)

**CLEAR ALL COUNT:** clear running times of every file in memory

**DELETE ALL FILE:** delete all memory files

**FORMAT SPEEDILY:** quick format memory (**WARNING!** deletes all files in memory)

**FORMAT DRASTICALLY:** fully format memory (**WARNING!** deletes all files in memory)

**TOTAL:** displays total running times of all the files

**CLEAR:** clear total running times

**RUN:** run selected file

**TRACK:** track selected file (optional)

**WORK TIME:** forecast selected file's running time (to 1ms)

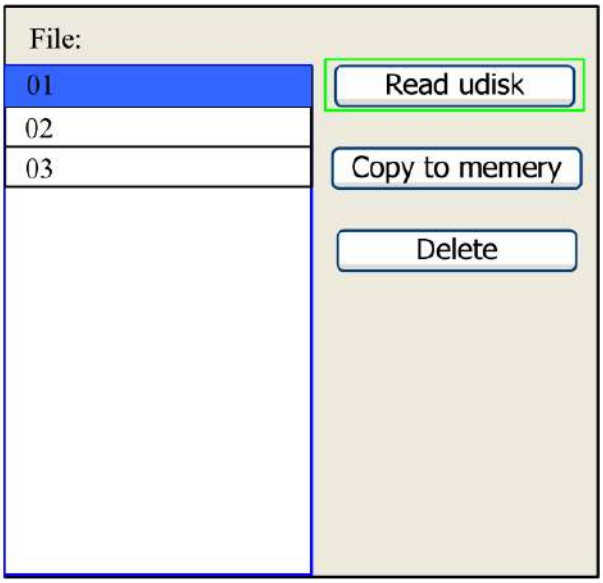
**CLEAR COUNT:** clear running times of selected file

**DELETE:** delete selected file in the memory

**COPY TO UDISK:** copy selected file to Udisk

### UDISK FILE

Selecting “Udisk” from the File Menu accesses the Udisk file menu (as shown).




**READ UDISK:** read the file list in the Udisk

**COPY TO MEMORY:** copy the target Udisk file to the memory

**DELETE:** delete the selected Udisk file

## WI-FI SETUP

| NOTE: |
| --- |
| **Wi-Fi is an optional function.** |

If your machine is equipped with a wireless adapter and is in range of a wireless router, you can use the following instructions to connect your machine to your network.

| NOTE: |
| --- |
| **Wireless signals are affected by distance from source and obstacles (like walls/ceilings/floors) as well as electromagnetic interference.** |

For best performance, place wireless receivers as close to the router as possible, in as direct a line as possible, while avoiding electrical interference.

Generally, the further from perpendicular a signal travels through obstacles, the weaker the signal.

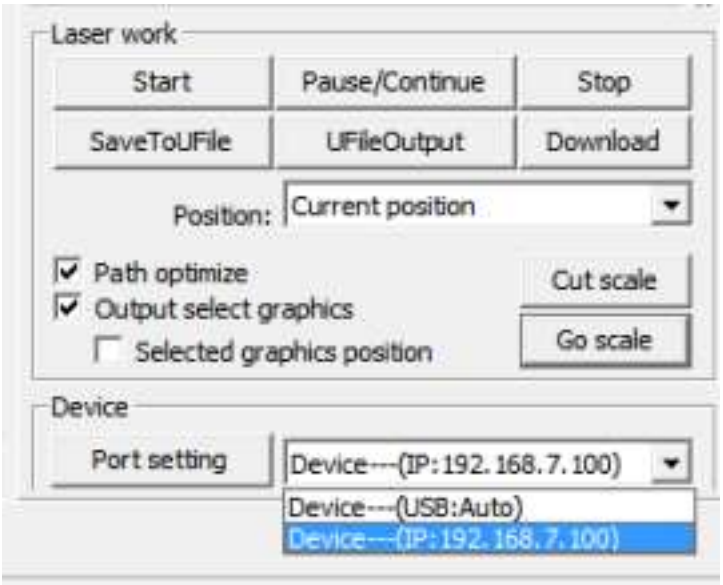
Press the “Wi-Fi” button to activate the machine’s wireless adapter.

When the green light is blinking, the Wi-Fi is available.

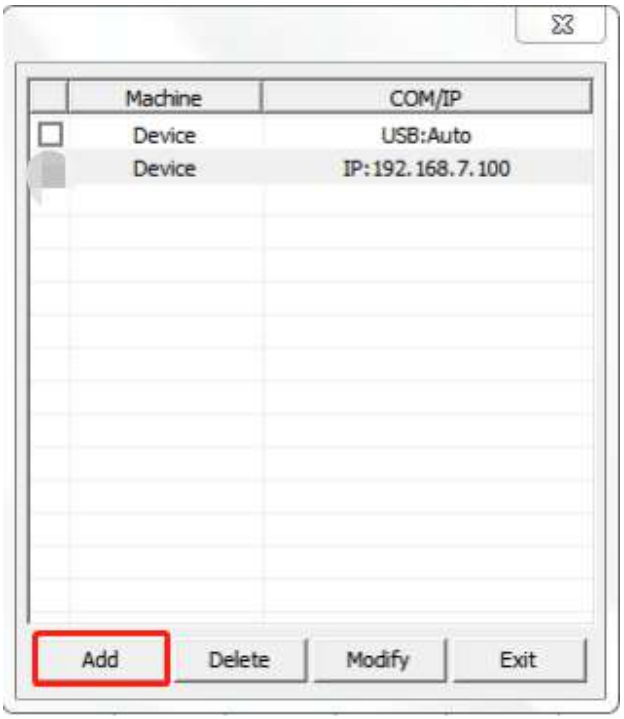
From the computer’s network interface (located on the Windows taskbar or Control Panel), you can connect to an available wireless network.

Once the machine is connected to your wireless network, launch the RDworks application to setup and test the connection.

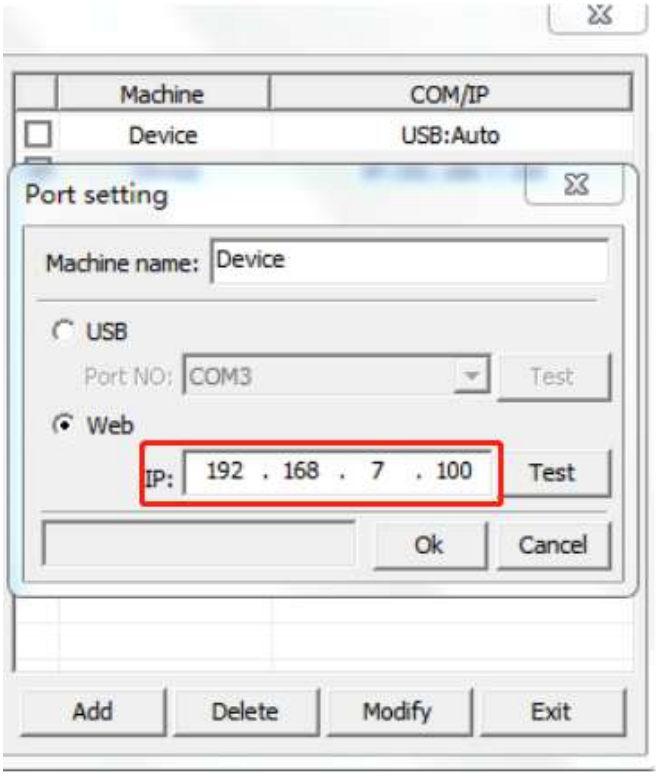
At the bottom right of the Main Screen, under “Device”, select device with IP (as shown).



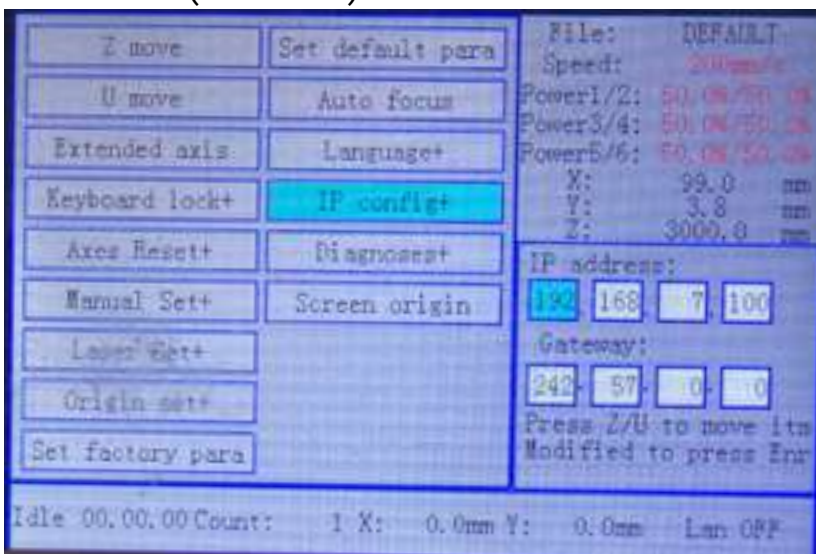
Then click “Port setting” to open the port setting window (as shown).




Next, click “Add” to confirm that the IP is set to the machine’s IP (as shown).

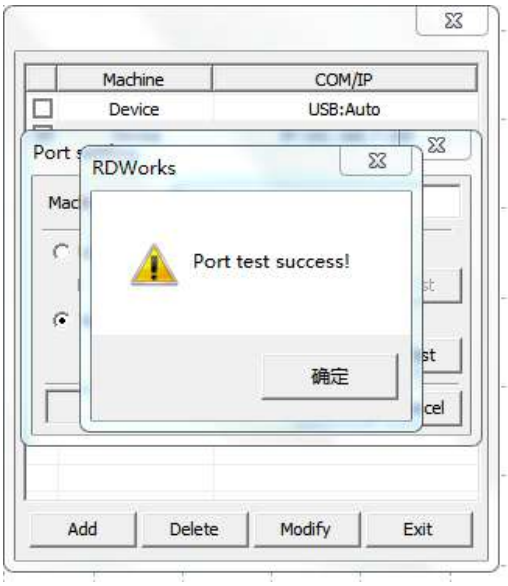


To confirm the machine's IP, select "IP config" from the machine's Main Menu (as shown).




Once the machine IP is confirmed in RDworks, click "Test" to confirm the connection.

If the port test is successful, then click "OK" and exit the port setting window (as shown). Your machine is now connected to your network.




If the port test is unsuccessful, then power down the machine and computer. Restart and reattempt these Wi-Fi setup instruc-

tions. Be sure the machine's IP is entered correctly in the RDworks port setting window.

If you are having trouble connecting, you may have to restart the wireless router (after turning the router off, wait 30 seconds before restarting).

But beware that turning off the router will disconnect all devices that might be connected to that router, and reconnecting might take many (5-10) minutes.

## AUTOFOCUS

| NOTE: |
| --- |
| **Autofocus is an optional function.** |

The autofocus function simplifies focusing the laser for beginners and experienced users alike.

1. First, place the work material on the working surface, and adjust the probe so it is over the work material (as shown).
2. Then, select "Autofocus" from the machine's control panel and press "Enter".

The head will lower until the probe touches the material, and then the head will reset.

Once the head comes to a complete stop, the laser is focused.

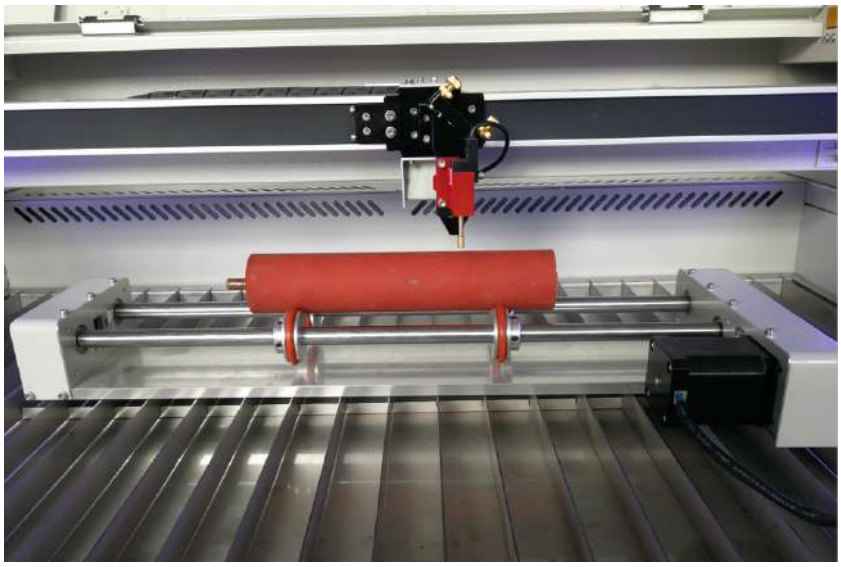
# 4TH AXIS ROTARY DEVICE

| NOTE: |
| --- |
| **The 4th axis rotary device is an optional function.** |

The rotary engraving function allows you to engrave on cylindrical objects, like wine bottles, pipes, etc.

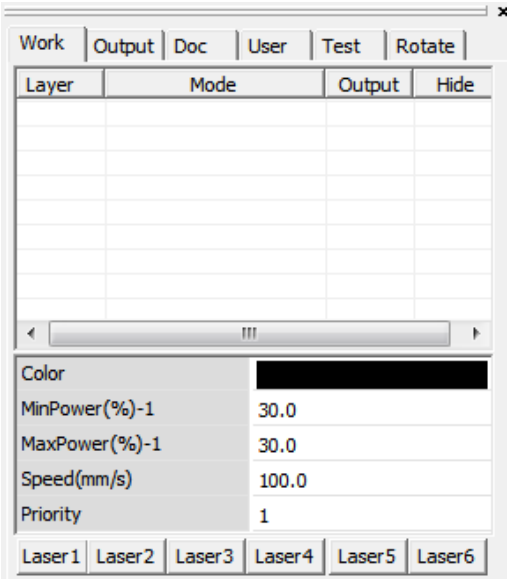
## 4TH AXIS SETUP

Adjust the worktable height to fit the rotary device, and then place the rotary device on the machine's worktable (as shown).

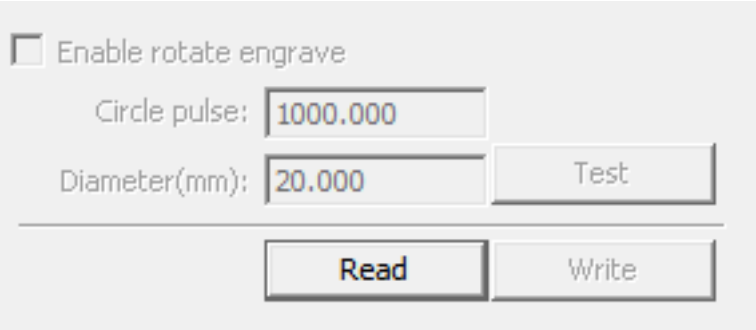


Plug the rotary device into the rotary port on the right side of the machine (as shown).

Then, launch RDworks from the computer to configure the software for the rotary device.

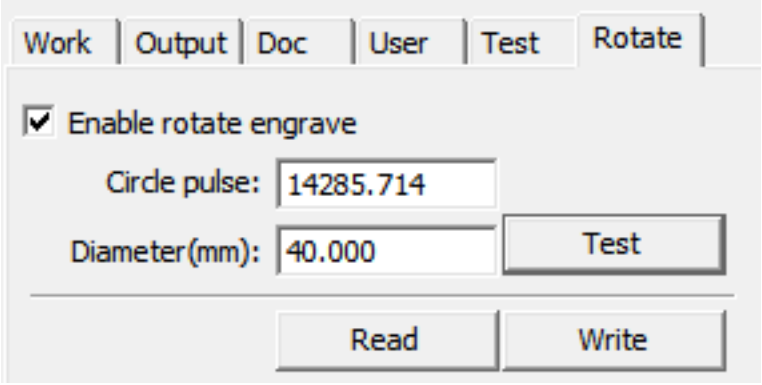


At the upper-right corner of RDwork's main screen, click "Rotate" to open the setup window (as shown).




Click "Read" and RDwork will detect the rotary device.

Enable rotate engrave and confirm "Circle pulse" is set to 14285.714 and "Diameter" is set to 40mm (as shown).




Then, click "Write" to confirm the settings.

Now, the machine is ready to engrave using the 4th axis rotary device.

## DISABLING 4TH AXIS

To disable the 4th axis rotary device:

Return to RDwork's main screen and click "Rotate" in the upper-right corner.

Uncheck the "Enable rotate engrave" option.

The 4th axis rotary device is now disabled. You can disconnect the device from the machine port and remove from the worktable.

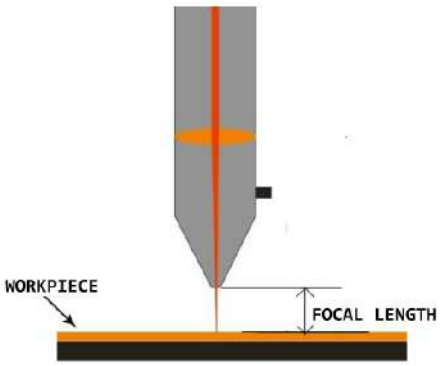
## FOCUSING LASER

The laser must be re-focused every time a material with a different thickness is worked.

The laser uses highly concentrated energy, so focusing is very important to the machine's proper function. The ideal distance between the material and the laser is that which produces the smallest dot, because the smallest possible dot is the most powerful and precise.

1. Place a piece of white printing paper (or other thin flat material) on the worktable.

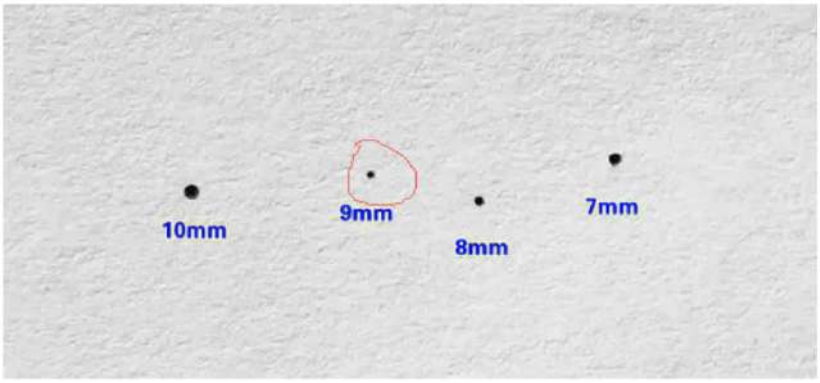
2. Press the "Up/Down" arrows on the control panel to adjust the distance form the paper to the laser head to about 20mm (as shown).




3. Press the "Pulse" button on the control panel. The laser will fire and make a mark on the paper. Note the focal length for this mark.

4. Then, adjust the distance slightly closer (-1mm) and make another mark. Note the focal length for this mark too.

5. Repeat Step (4) until you have a pattern of marks that get smaller and then bigger (as shown).




6. The smallest mark is the ideal focal length for this laser. Record this focal length, or make a small block of wood/acrylic, for future convenience.

7. Confirm the focal length.

**⚠ ATTENTION!**

**Always be careful—especially when focusing thick material—not to allow material to collide with the lens housing. These collisions can cause serious damage to the machine.**

## FOCUS TOOL

The focus tool is a piece of rectangular acrylic made by the manufacturer, usually included with the machine's accessory bag.

When the laser head is positioned so the focus tool touches the work material, it should be at the correct focal length.

Simply confirm the focal length.

## FIRST ENGRAVING TEST

To confirm your machine is ready to begin engraving, perform the following test:

1. Power on the computer and the laser.
2. Place the work object onto the worktable in the desired position. Usually, the object is positioned in the upper-right corner. Measure the dimensions of the work object.
3. Use the arrow keys to ensure that the laser head is positioned over the work object.
4. Focus the laser (see Previous Section).
5. Import and/or select graphic to be engraved.
6. Set the graphic up in the software.
7. Start engraving or cutting.

## ADJUSTING OPTICAL PATH

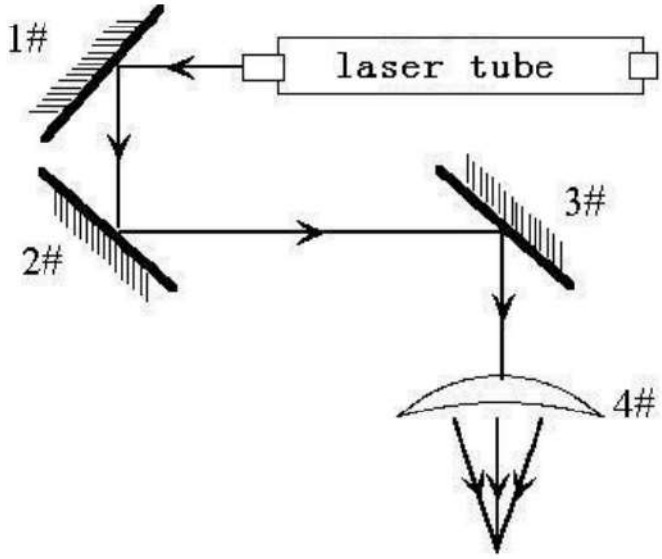
**⚠ WARNING!**


**This machine is a Level 4 laser, which can cause serious permanent injury, including burned flesh and blindness.**

**Always wear proper personal protective equipment, like infrared protective eyewear, and be aware of both the light path and the potential for errant laser beams.**

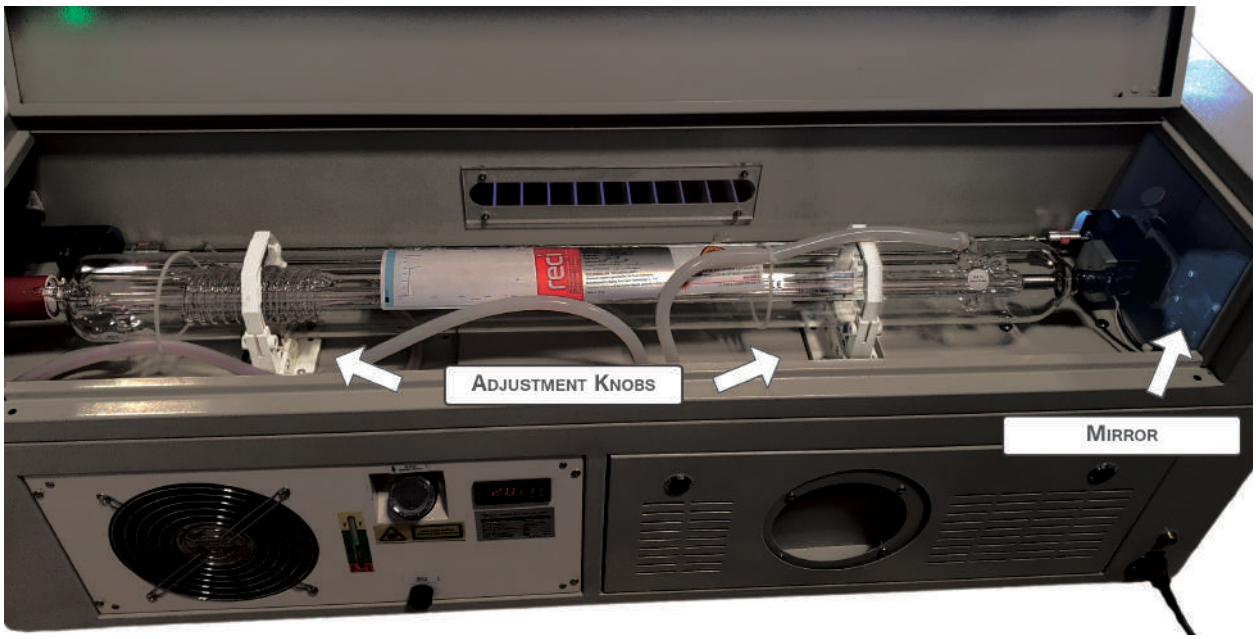
Usually, before shipping the machine, we have already calibrated the laser's optical path.

But, after transportation or during common use, the optical path may deviate, resulting in an abnormal path or no laser.



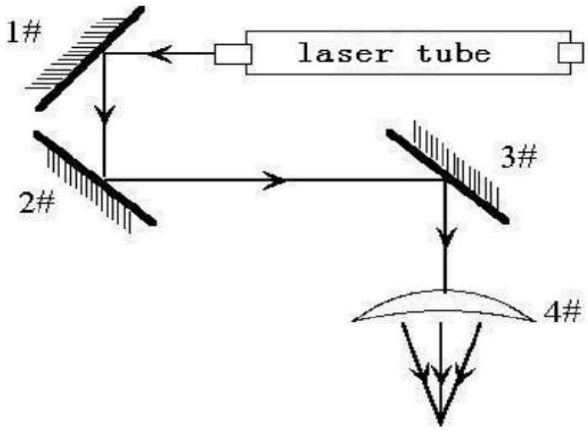

To adjust the optical path:

1. Ensure laser beam is going from the laser tube to the centre of reflector mirror #1 using the adjustment knobs at the base of each bracket.



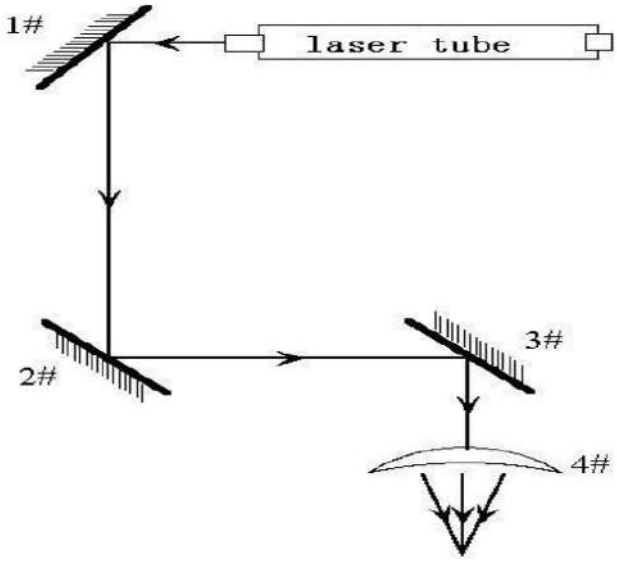

2. Stick double-sided tape on mirror #2.

3. Move the laser beam to closest location of laser tube (as shown).




4. Select suitable power, and press “Pulse” to mark the tape.

5. Move the beam to the position farthest from the laser tube (as shown).



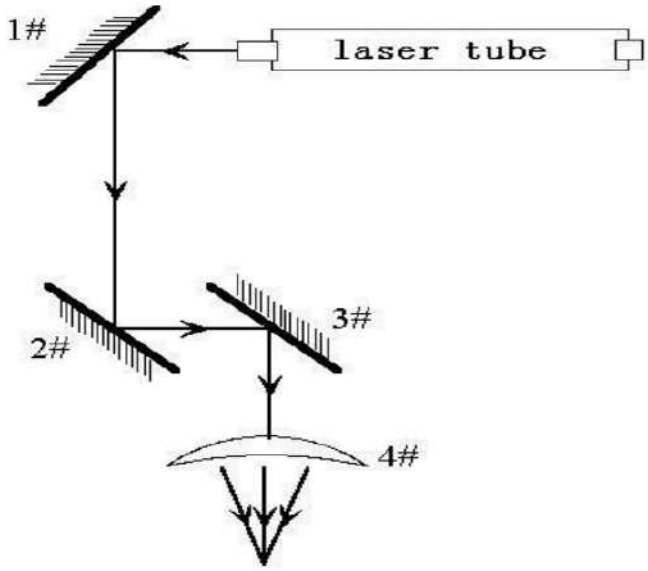

6. Press “Pulse” to make another mark on the tape.

7. If the two marks are not in the same spot, then adjust the screws on the back of mirror #1 so the laser will line up with the first mark.

8. Repeat steps (2) through (7) until the two spots overlap completely in the centre of the hole.

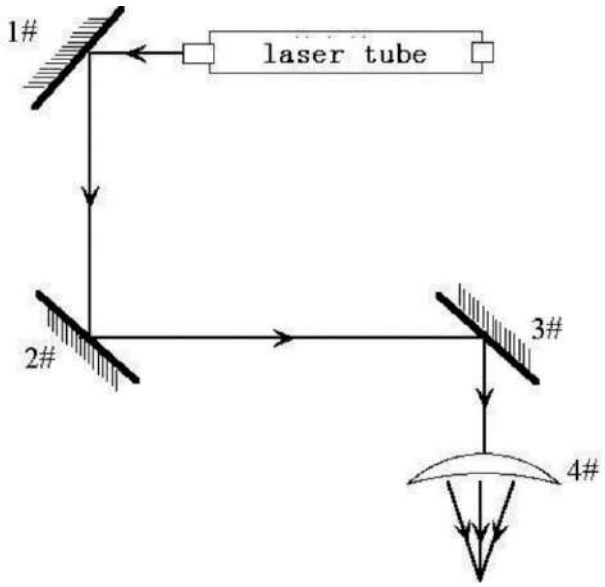
9. Stick double-sided tape on mirror #3.

10. Move mirror #3 to the nearest position to #2 mirror (as shown).



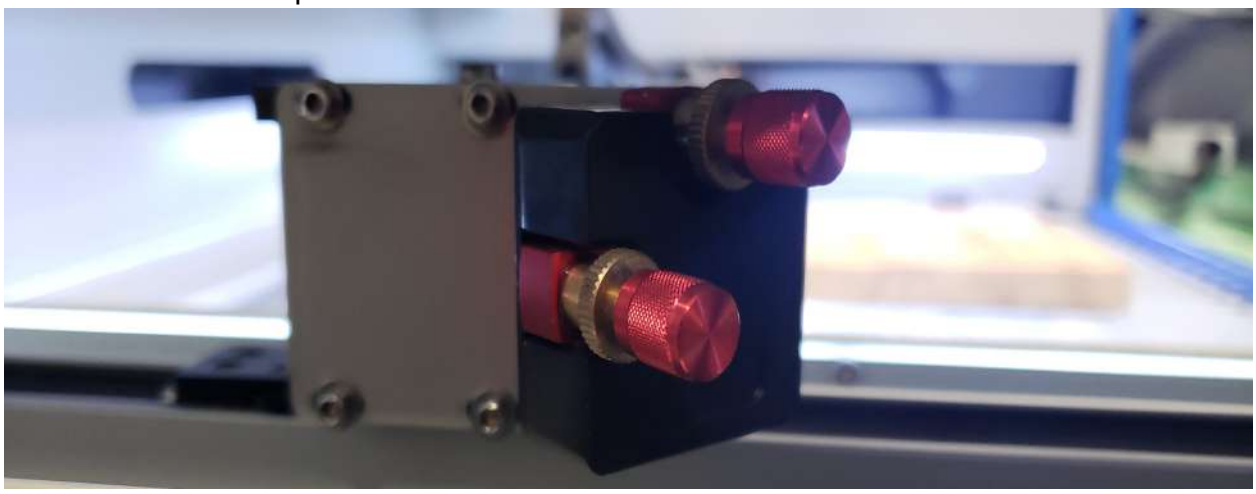

11. Select suitable power, and press “Pulse” to mark the tape.

12. Move mirror #3 to the position farthest from mirror #2 (as shown).




13. Press “Pulse” to make another mark on the tape.

14. If the two marks are not in the same spot, then adjust the screws on the back of mirror #2 so the laser will line up with the first mark.



15. Repeat steps (9) through (14) until the two spots overlap completely in the centre of the hole.

16. Stick double-sided tape on reflector #3.

17. Press “Pulse” to make another mark on the tape.

18. If the mark is too high or low, raise or lower the laser tube accordingly. Inside and outside biases: only move the laser tube in or out to adjust. Then, repeat the process from step one.

When the mark is centred on mirror #3, the optical path is aligned properly.

## ADJUSTING RED BEAM COMBINER

The Red beam combiner combines the laser beam and the red aiming beam, which is convenient for precisely positioning the laser head.

To adjust the red beam combiner:

1. Mark a piece of scrap material with a pen/marker.

2. Set the laser to an appropriate power setting for engraving that material.

3. Then align your mark with the aiming dot and press “Pulse” to make another mark.

4. If the two marks are not aligned, then use a 4mm hex key (aka: Allen wrench) to adjust the alignment screws (as shown).

Repeat until the lasers are aligned properly.

# MAINTENANCE

## GENERAL UPKEEP

Before each use, the user should check over the entire machine for signs of damage and debris. Report any damage to a supervisor and clear any and all debris from the machine before operating.

## MAINTENANCE SCHEDULE

The following maintenance schedule is recommended. More frequent use will require more frequent cleaning.

### FOCAL LENS

The lens used to focus the laser beam should be cleaned at least once per week.

### MIRROR #3 (LASER HEAD)

Mirror #3 is located directly above the focal lens. This mirror should be cleaned at least every month.

### MIRROR #2 (GANTRY)

Mirror #2 is located at the end of the gantry. This mirror should be cleaned at least once every two (2) months.

### MIRROR #1 (LASER TUBE)

Mirror #1 is located directly in front of the laser tube. This mirror should be cleaned at least once every three (3) months.

Mirror #1 **CANNOT** be removed from the laser tube or replaced, so take care not to damage it.

**⚠ ATTENTION!**

**Mirror #1 *CANNOT* be removed from the laser tube. Be careful!**

### LINEAR RAILS CLEANING

The linear rails are located across the left and right sides of the machine and across the gantry. These rails should always be clean, without rust, and be lightly lubricated with oil (wet to the touch). Check the linear rails at least every month to make sure they are clean and lubricated.

### LINEAR BEARINGS

The linear bearings are located under the gantry (to mount the gantry to the side rails) and under the focal head (to mount the focal head to the gantry). Check that the linear bearings are well-greased every month.

These bearings have grease fittings for pushing lubricant into the ball bearing areas with a grease gun. If you do not have a grease gun, you can push grease into the fitting using your finger until no more grease can be inserted.

### RUBBER BELTS

A pair of rubber belts work together to move the gantry from front to rear. Each rubber belt should be checked for appropriate tension at least every six (6) months.

The two side belts should be the same tension and should be tensioned on the same maintenance schedule.

If one belt is tensioned more often than another, then that belt could become stretched more than the other.

It is difficult to describe how tight the belts should be, but there should be no slack, sagging, or flapping. If the belt appears to be worn on one side, check the bearing alignment or damage to the matching bearings.

## LENS CLEANING AND REPLACEMENT

The lens is one of the few parts of the machine that need regular maintenance. Over time, dust and debris will build up on the lens, requiring periodic cleaning.

If there is any incident of fire or large issue of smoke/fumes, then we advise checking and cleaning the lens.

Regularly cleaning your lens will help it to last longer before replacement. More frequent use will require more frequent cleaning.

The lens is small, about 20mm across, with two (2) distinct sides: one flat and one convex (curved out). When reinstalling, the curved side always faces the laser path, away from the working platform.

Different sized lenses can be inserted as well, but be aware that different sized lenses have different focal lengths.

### TO CLEAN THE LENS:

1. Remove the focal tube.
2. Remove the two (2) screws securing the mounting bracket to the focal tube.

> ⚠ **ATTENTION!**
>
> **Handle the lens carefully to avoid damaging or scratching the lens, or even leaving fingerprints.**

3. Using acetone or (alcohol-free) lens cleaner and a non-scratch cloth (cotton swabs or lens paper), remove any dirt from the lens with soft circular motions. Use

a dry non-scratch cloth with soft circular motions to remove any excess solvent.

| NOTE: |
| --- |
| **Look for a reflection in the lens to help see any dirt on the surface of the lens.** |

4. Check the lens for damage, and replace if necessary. 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.

Some minor blemishes are acceptable, but will waste power and therefore reduce laser power at the target material. Any dirt, contaminate, or damage to the lens will cause the lens to become damaged faster.

5. When reassembling the lens housing, make sure to place the flat side down towards the working platform. Remember, the curved side of the lens always faces the laser beam.

6. To reassemble the focal tube, first place the lens, then insert the washer, and finally secure the ring nut to a snug fit plus a quarter turn.

| ⚠ ATTENTION! |
| --- |
| **Do NOT over-tighten the ring nut.** |

7. After the lens has been cleaned or replaced, the optical path should be realigned (see Adjusting Optical Path in the previous Chapter).

## MIRROR CLEANING

It is possible to clean the mirror in its mounting bracket, but we highly advise removing the mirror from its position and thoroughly cleaning it.

Using acetone or (alcohol-free) lens cleaner and a non-scratch cloth (cotton swabs or lens paper), remove any dirt from the mirror with soft circular motions. Use a dry non-scratch cloth with soft circular motions to remove any excess solvent.

The mirror should be replaced if it is pitted/scratched, rusted, discoloured from heat damage, or any other significant damage is found. Some minor blemishes are acceptable, but will waste power and therefore reduce laser power at the target material. Any dirt, contaminate, or damage to the mirror will cause the lens to become damaged faster.

After the mirror has been cleaned or replaced, the optical path should be realigned (see Adjusting Optical Path in the previous Chapter).

## ADDING/CHANGING WATER AND CLEANING WATER TANK

This machine’s water cooling system is built in and sealed. Therefore, adding water should not be necessary.

However, we suggest users change the water and clean the water tank every six (6) months.

To empty the water tank, remove the two (2) bolts beside the water tank, and then slide the water tank out to expose the water outlet.

Place a bucket under the outlet, and then unscrew the cap of the outlet to drain the water into the bucket.

Once the tank is fully drained, clean the tank with fresh water. Replace the water outlet cap, then slide the water tank back in and replace the two (2) bolts. Finally, re-fill the tank with fresh purified/distilled water.

## STORING THE LASER

Keep the laser machine in a clean, dry, warm location with no vibration.

> **⚠ ATTENTION!**
>
> **Improper storage of this machine will cause damage to the machine, and will result in less effective operation of the machine.**

### HUMIDITY

Humidity can cause the metal parts of the laser machine to rust (oxidation), including the mirrors. We advise controlling the humidity level in the laser work area, including the use of dehumidifiers. Clean the mirrors regularly and check for rust.

## TROUBLESHOOTING

| SYMPTOM | PROBLEM | SOLUTION |
|---|---|---|
| NO MOVEMENT | No power | Connect power |
| | Machine misconfigured | Reconfigure machine |
| LASER WON'T TURN OFF | Machine misconfigured | Reconfigure machine |
| UNSTABLE LASER | Water flow issue | Clean water tank, water pump, and pipe |
| | Voltage instability | Add voltage regulator |
| ABNORMAL SELF-TEST | Machine misconfigured | Reconfigure machine: X and Y axis direction, limit position parameters |
| MACHINE UN-RESPONSIVE AFTER DATA OUTPUT | Machine not on | Turn on machine |
| | Wrong data port chosen | Choose correct port |
| | Machine not grounded | Ground machine |
| | Missing USB driver | Install USB driver |
| NO LASER | Chiller not working | Fix chiller |
| | Optical path mis-aligned | Adjust optical path |
| MACHINE NOT DETECTED | Computer not con-necting to machine | Change USB cable, wireless adapter, or computer |

CANCAM

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