**THANK YOU FOR CHOOSING FLUX,
IT IS A GREAT HONOR FOR OUR TEAM.**

The FLUX HEXA is our newest generation flagship machine that brings together our years of experience in laser technology. We know that good maintenance will keep your machine in top condition for years to come. In this manual, you will learn how to use your HEXA, and how to make the most of the laser processing characteristics of various materials. If you have any questions about the operation of your machine, please feel free to contact us via our website. Finally, we would like to thank our customers, partners, and friends again for your trust as we continue to strive to bring you the very best user experience.

Cheers,
FLUX Team

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CH 1
Before Getting Started

Labels

The HEXA has 6 labels in total. Warning labels describe potential risks. Please familiarize yourself with all safety guidelines before use.

1. Product label

FLUX HEXA

Manufactured Date : October 2021

Input: ☐ 100-127V ☐ 200-240V AC 50/60 Hz
Rated : 800W
Model Number : FHX1

CLASS 1 LASER PRODUCT
CLASSIFIED IEC 60825-1 2014
Complies with 21 Chapter 1, Subchapter J.

FLUX Technology Inc.
3F, No. 89, Ln. 298, Huandong Rd.,
Yangmei Dist., Taoyuan City, Taiwan
Made In Taiwan

flux3dp.com

CE FC

On the bottom right corner of the back of the machine

2. Laser light warning label

- please avoid eye or skin exposure to laser beam.

AVOID EYE OR SKIN EXPOSURE
Invisible Laser Radiation Is Emitted From This Aperture.

On the right side of the first reflective mirror outlet (circle outlet)

CAUTION
CLASS 4 INVISIBLE LASER RADIATION WHEN OPEN
AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION

On the left and back side of the machine

CAUTION
CLASS 4 INVISIBLE LASER RADIATION
WHEN OPEN AND INTERLOCKS DEFEATED
AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION
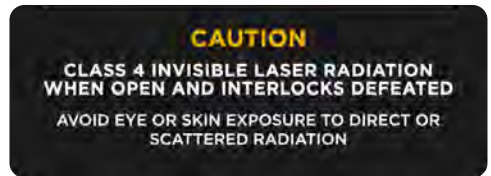
Below the screen

3. Fire hazard warning label

- please do not operate machine unattended

DANGER FIRE HAZARD
DO NOT OPERATE MACHINE UNATTENDED
REFER TO THE USER MANUAL FOR ADDITIONAL INFORMATION REGARDING MATERIAL SAFETY

Below the screen

CH 1-2
Safety Precautions

Please read the following safety precautions carefully before operating the HEXA. Since the HEXA generates a high-power laser, improper operation may result in fire, visual impairment, skin burns, inhalation of toxic substances, and other harmful or adverse health effects to person or property.

Please consult FLUX regarding any usage or safety concerns.
support@flux3dp.com / (+886) 2651-3171
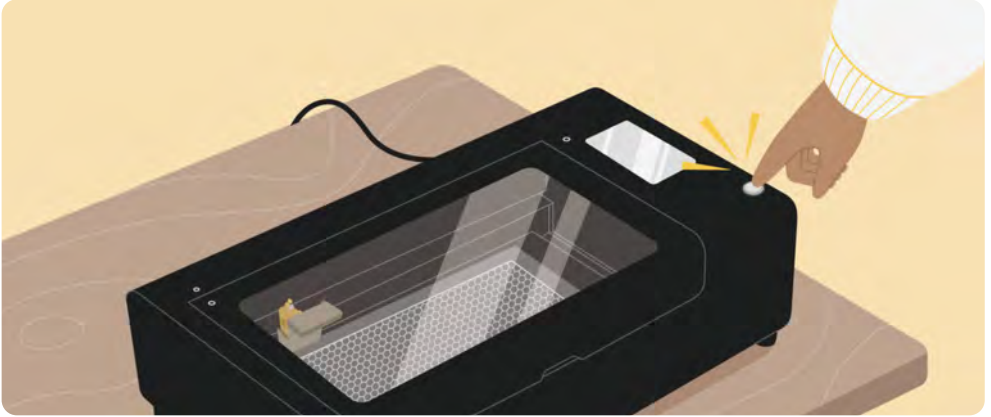
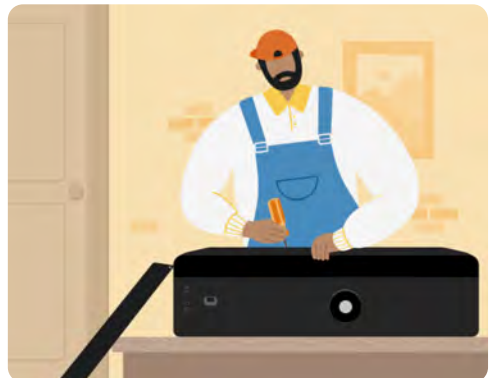Do not leave the HEXA operating unattended. Press pause if you need to step away.
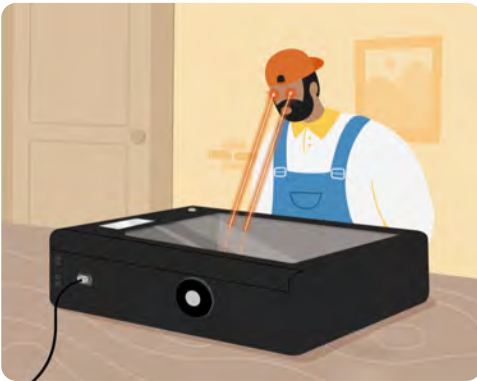
Do not stare at the light produced by the laser while the machine is cutting and engraving.

Please confirm the material to be engraved will be safe to burn at high temperatures.

Always have an accessible, functioning fire extinguisher in the work space.

Do not disassemble the HEXA without prior authorization from FLUX.

Operators

○ Confirm that users intending to operate the machine have read all safety precautions carefully and will follow the instructions in the manual.

✕ DO NOT let minors operate the HEXA alone.

Working Environment

○
- Place the machine on a level, stable surface, ensuring there is no overhang or tilt.
- Place the machine in a well-ventilated indoor space with windows. Do not place the machine outdoors, in the basement, under a metal roof, or in other confined spaces.
- Set the open end of the HEXA's vent hose outside of a window.
- In case of rain or extreme weather, please stop using the machine and put the vent hose away indoors. Do not expose the machine to high humidity, splashing rain, or direct sunlight.
- Stored the machine at an ambient temperature between 5°C and 40°C and humidity between 10% and 70%.
- The HEXA should be operated at an ambient temperature between 5°C and 25°C (if the power is below 40%, the ambient temperature may be be relaxed to as high as 30°C).

✕
- DO NOT place any liquids or flammables near the machine.
- DO NOT let children play near the machine.

Safety Switch

- Lifting the door cover should trigger the safety switch to suspend the operation of the machine and stop the output of the laser. If the machine fails to suspend operation after the cover is lifted, please stop using the machine, turn off the power, and contact customer service immediately.
- For your safety, do not put your hands, eyes, or other parts of your body near the operating area of the laser.
- When adjusting the optical path, please make sure to close the door cover before testing to prevent injury in case the safety switch fails.

- DO NOT operate the machine in case of safety switch failure.
- DO NOT try to disable the safety switch.
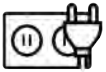
Power and Wires

- Verify that the model you received is the correct voltage (110V or 220V).
- Ensure that the 3rd prong of the socket is grounded. An ungrounded circuit may cause static interference, affect performance, or increase the risk of electric shock.
- If the power cord is damaged, stop using the machine immediately.
- Always turn off the power and disconnect the plug before cleaning. Do not try to service or disassemble the machine without authorization from FLUX.

DO NOT bend, twist, pull, or put heavy objects on the cables or plugs. Keep cables and plus away from heat sources.

🔥 Fire Risk

🟢
- Regularly clean the debris under the honeycomb table of the machine.
- In case of fire, turn off the power immediately and unplug the power cord. Use a wet towel to extinguish the fire. Note: water may irreversible damage the machine.
- If the fire is relatively large, use a fire extinguisher. Note: the dry powder or foam from the fire extinguisher may cause irreversible damage to the machine.
- If the fire spreads, please call the fire department immediately for assistance.

❌
- Please see "Material Tips - Hazardous Materials (p.111)" for a list of materials that are not suitable for lasers processing and for more information.
- DO NOT try to cut multiple boards at once by stacking materials in the machine.
- DO NOT operate the machine unattended.

☁️ Ventilation

🟢
- Set the open end of the HEXA's vent hose outside of a window or connect to an air purifier.
- If you detect strong odor or heavy smoke, please stop using the machine. Make sure the vent hose is properly connected and the ventilation system is working properly before use.

Additional Operation Notes

- Have two or more people move the machine to avoid injury.
- Wearing gloves while cleaning honeycomb table or material to avoid being scratched.
- In case of burns, please flush with cold water and consult a doctor immediately.
- Wear a mask and laser safety glasses with the protection level of OD5 (energy penetration rate 10^{-5}) when opening the cover.

- DO NOT stare at the light produced by the laser during operation.
- Strong vibrations may cause the optical path to shift or the laser tube to be damaged.

CH 1-3
Product Specifications

This manual is applicable to HEXA.
Software version: 1.9.X.
Firmware version: 4.0.X.
The illustrations are mainly for macOS.

	HEXA Upgraded Design	**Beambox**Pro Wide Operating Space Industrial Engraving
Laser Specifications		
Laser power	60W	50W
Cutting thickness*	10mm	8mm
Working depth	125mm	80mm
Maximum engraving speed	900mm/s	300mm/s
Weight	58kg	48kg
Wavelength	10640nm	10640nm
Machine		
Size (length/width/height)	1110x670x273mm	990x670x250mm
Maximum working area	730x410mm	600x375mm
Camera preview area	730x395mm	600x360mm
Touch panel	7" 1024 x 600 LCD	1024 x 600 LCD
Camera lens	2 Mega pixels	2 Mega pixels
Transmission interface	Wi-Fi / Ethernet /USB	Wi-Fi / Ethernet
Add-on		
Rotary	◯	◯
Autofocus	Built-in	✕
Diode laser module	✕	✕
Software		
File format	JPG / PNG / SVG / DXF / AI / PDF	
Operating system and browser	Windows / macOS / Linux / Chrome / Safari**	

*: Cutting thickness (Cut an acrylic sheet once with Power: 70% and Speed: 5mm/s)

Beambox
Wide Operating Space
Industrial Engraving

beamo
Compact Size
Detachable Bottom Cover

Beambox	beamo
40W	30W
5mm	3mm
80mm	45mm
300mm/s	300mm/s
40kg	22kg
10640nm	10640nm

Beambox	beamo
800x670x250mm	615x445x177mm
400x375mm	300x210mm
400x360mm	300x195mm
1024 x 600 LCD	1024 x 600 LCD
2 Mega pixels	2 Mega pixels
Wi-Fi / Ethernet	Wi-Fi / Ethernet

Beambox	beamo
○	○
✕	○
✕	○

JPG / PNG / SVG / DXF / AI / PDF

Windows / macOS / Linux / Chrome / Safari**

**: Supported devices for browser version are those with either viewport width or height over 1024 pixels.

CH 1-4
Laser Engraving Principle

Laser engraving focuses a high-power laser beam on the surface of the engraving material that instantly heats or vaporizes the material to create an indentation or a cut in the path of the laser beam.
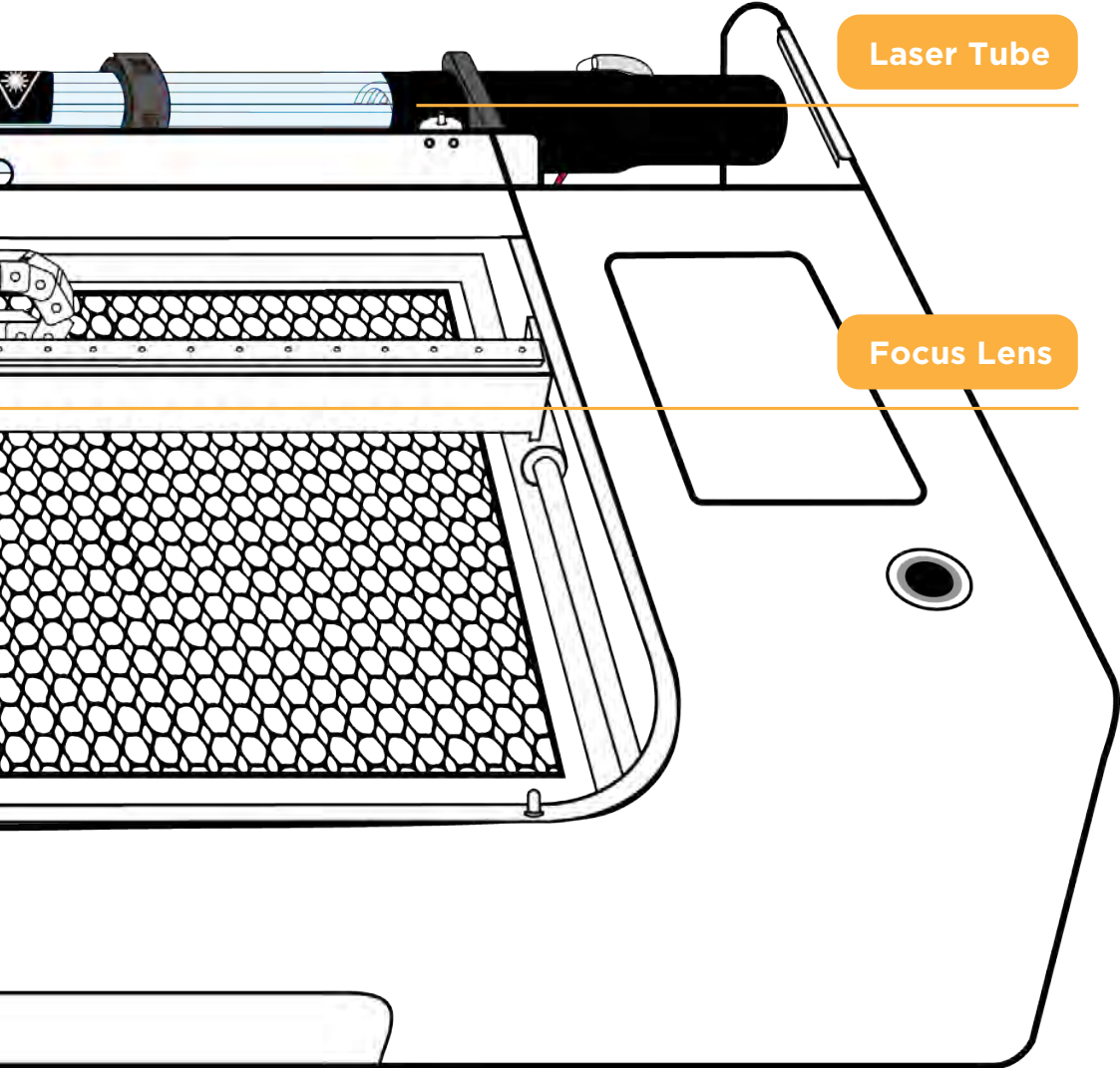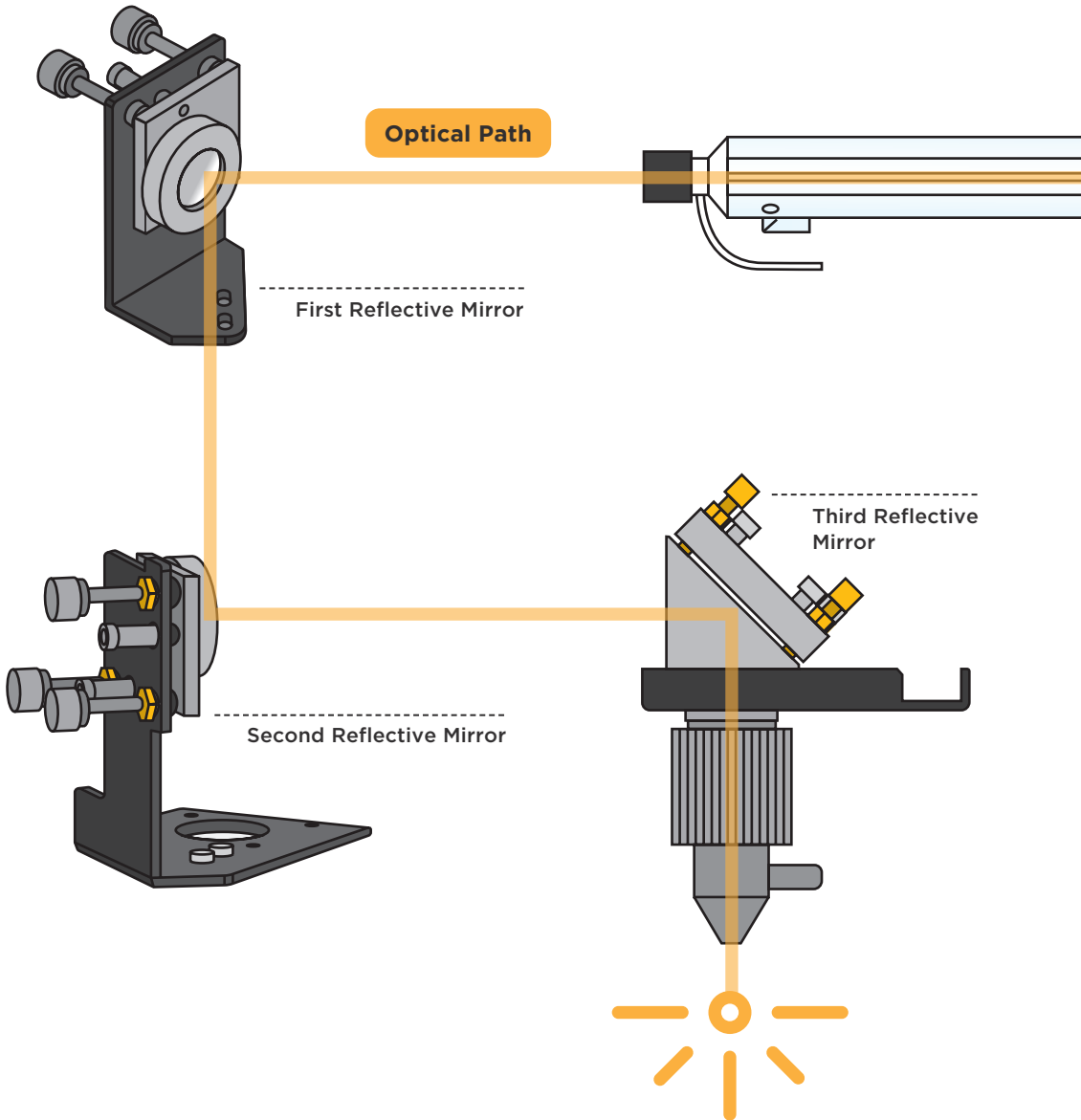
Reflective Mirrors

First
Reflective Mirror

Second
Reflective Mirror

Third
Reflective Mirror

Laser Tube

Focus Lens

Laser Principle

Optical Path

First Reflective Mirror

Second Reflective Mirror
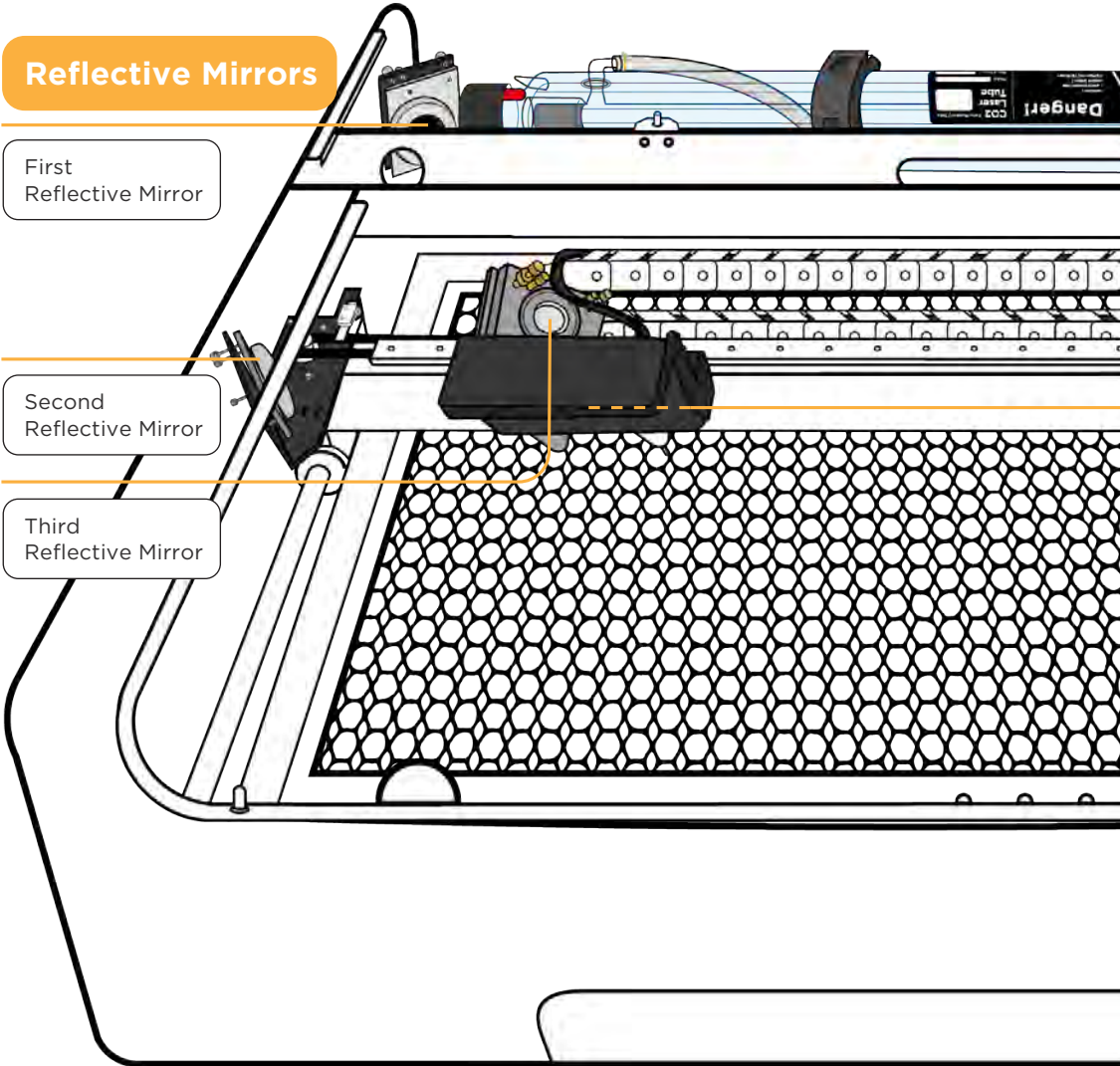
Third Reflective Mirror

Reflective Mirrors

There are three reflective mirrors inside the machine. The position of the first mirror is fixed, while the motor can move the second and third mirrors to direct the laser beam to any position on the work table. The second mirror moves forward and backward along the Y-axis, while the third mirror moves left and right along the X-axis.

Laser Tube

The HEXA is equipped with a 60W CO2 laser. The electric current excites the CO2 gas inside the sealed glass tube to produce an invisible laser with a wavelength of 10.6 μm. The light emitted from the end of the laser tube is about 5 mm in diameter. Due to its small divergence, this laser beam can be transmitted inside the machine with little energy loss.

Exploded view of laser head
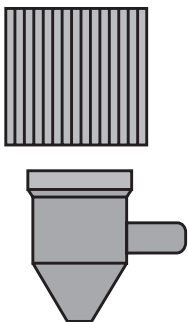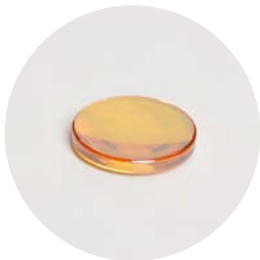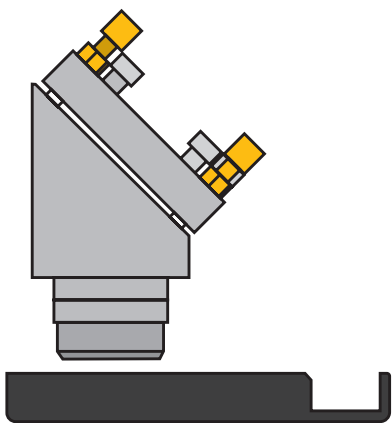
Focus Lens

The third reflection directs the laser beam to the surface of the engraving material. A glass focus lens inside the laser head focuses the beam of about 5mm diameter to about 0.2mm diameter to create a higher energy density that is sufficient to instantly burn through non-metallic materials such as wood and acrylic, metal materials after anodizing, or stainless steel after specific spry processing.

CH 2
Start

CH 2-1
Unboxing

Two or more people are required to lift
the machine to avoid injury.

01   The box contains the machine and the accessory box.

02   Take the machine out the box and place it on a stable surface. Please keep the original carton and cushioning material for future use.

03   The accessory box contains : 1 | Torx screwdriver, 2 | 2.5mm hexagonal wrench, 3 | 3mm hexagonal wrench, 4 | Double head wrench, 5 | Lubricating oil, 6 | Funnel, 7 | Vent hose, 8 | Power cord, 9 | Double-sided tape, 10 | Clamp, 11 | USB cable, 12 | Wi-Fi dongle, 13 | Pyramid cones, 14 | Manual, 15 | Wood piece, 16 | A4 (Letter size) paper.

04

Machine front :

1 | Laser head, 2 | Honeycomb table,

3 | Probe, 4 | Height adjustment button,

5 | Door cover, 6 | Touch panel, 7 | Power button.
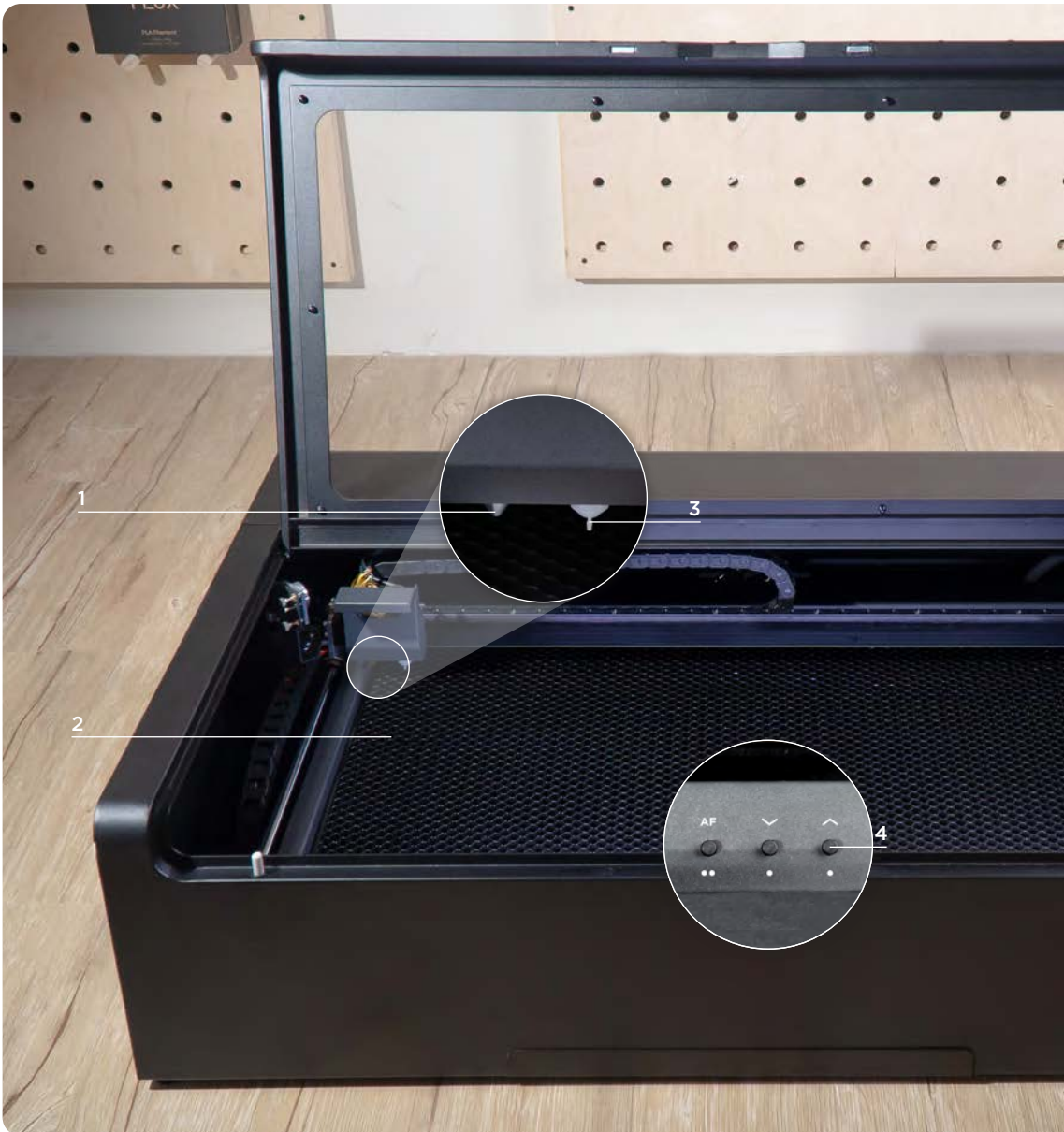
05 Machine rear :

1 | USB-A port
2 | USB-B port
3 | Ethernet port
4 | Power supply
5 | Water pump cover
6 | Ventilation fan and exhaust port
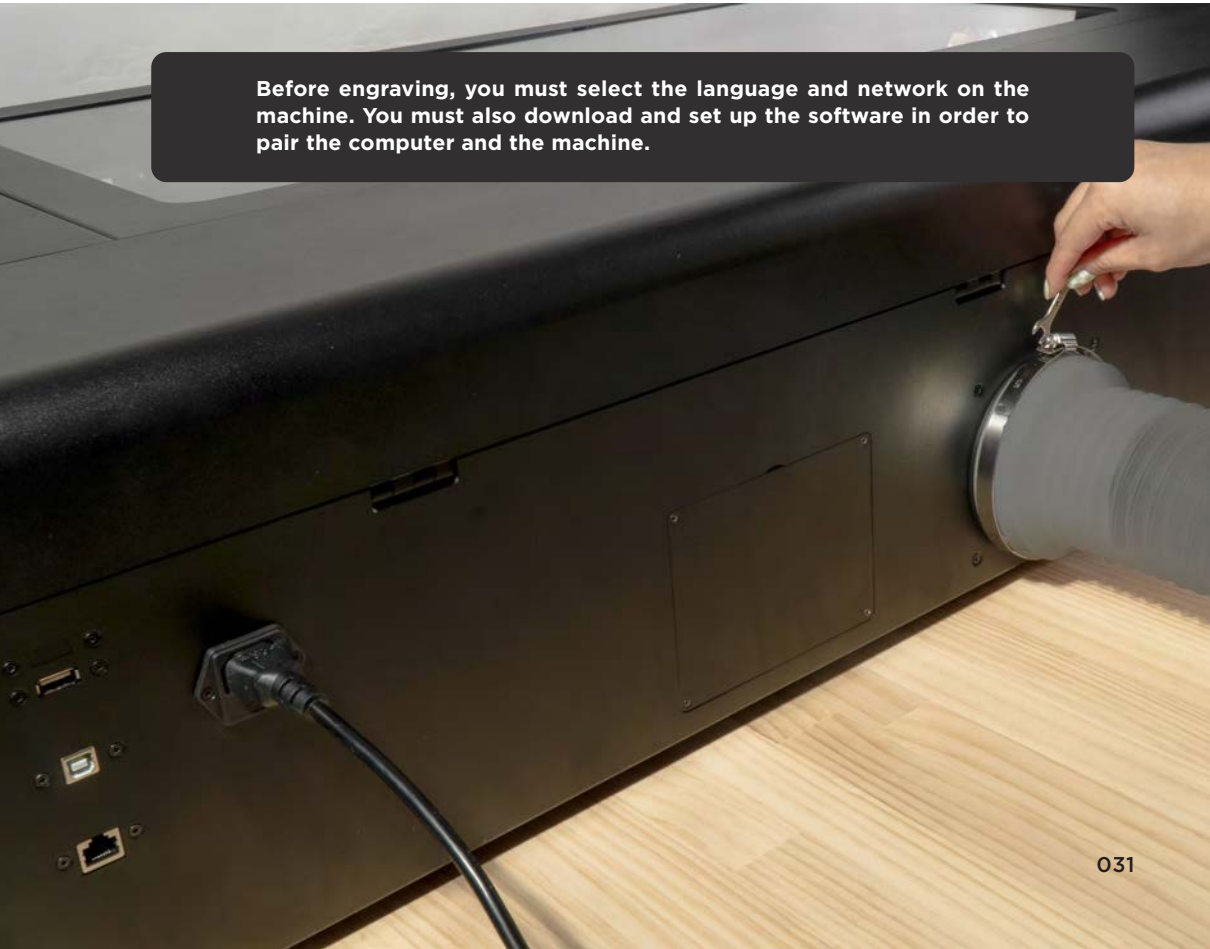
06 Machine right :

1 | USB-A port

CH 2-2
Assembly and Setup

Please read the safety precautions carefully before operating the machine.

Prepare machine for use.

01   Plug the power cord into the rear of the machine and into the outlet.

02   Place the clamp from the smaller end of the vent hose and thread through to the larger end. Place the larger end of the vent hose into the exhaust port. Tighten the clamp using the provided double head wrench until the vent hose is secure.

03   Turn on the machine by pressing the power button. The first startup may take up to two minutes.

04   Follow the machine prompts:
a. Select interface language > b. Read fire hazard warning carefully (as shown on the next page) > c. Run the Startup Test > d. Set up the internet connection > e. Tear off 2 mirror protective films. Please refer to 【Connection Settings】(p.48) for other connection methods. Make sure the machine and any connected devices are on the same local area network.

05   After setup, please must fill the water tank to 80% full to ensure the normal operation of the water cooling system. Insufficient water in the cooling system will damage the laser tube.   Please refer to the user manual 【5-4 Water changing and adding】(p.171) step8 for more detail.

Before engraving, you must select the language and network on the machine. You must also download and set up the software in order to pair the computer and the machine.

FIRE HAZARD

Refer to the user manual for additional information before using your FLUX Laser

* Do not stare at the flame generated by the laser.

* Do not operate machine unattended.

* Do not try to service, repair, or modify the machine without authorization from FLUX Support.

* Be sure to have a properly maintained fire extinguisher near the machine at all time.

* Please make sure that the processed material does not pose a hazard when burned at high temperatures.

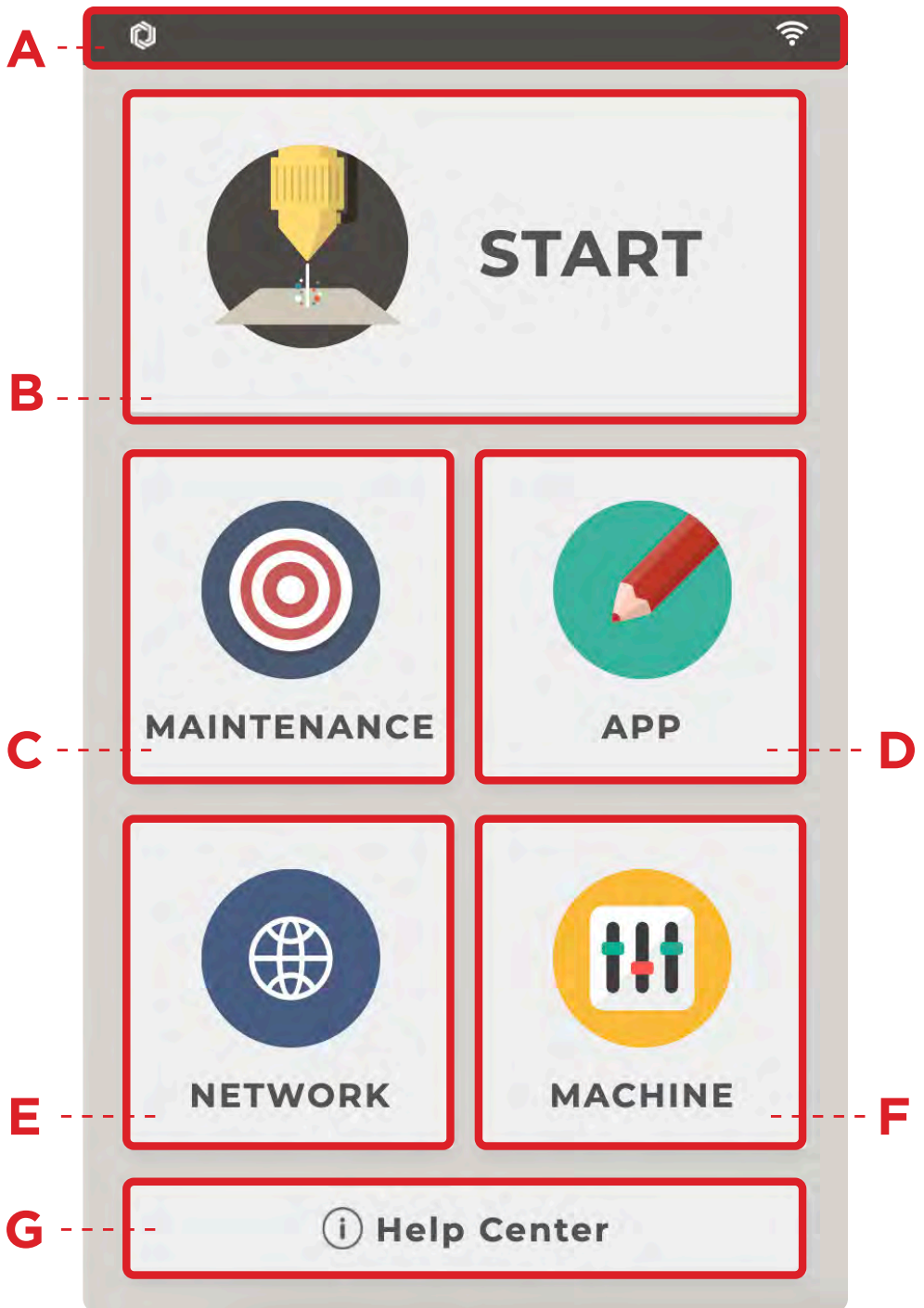* Periodically remove the cutting grid and clean debris from the work area.

Back   Agree

CH 2-3
Machine Interface

Introduces the machine interface and the seven key functions.

A

START

B

MAINTENANCE

C

APP

D

NETWORK

E

MACHINE

F

ⓘ Help Center

G

A : Status Bar

Check the machine status

B : START

Manage work files

C : MAINTENANCE

Toggling maintenance
mode, repair and troubleshooting

D : APP

Pairing mobile devices to machine

E : NETWORK

Check network status, network settings

F : MACHINE

Machine details, language,
and hardware related settings

G : HELP CENTER

Help Center access

# A：Status Bar

Check the machine status

The status bar shows the temperature, whether it is connected to Beam Air, water flow, and door cover opening/closing status, as well as network connection type of the machine. Generally, clicking the status bar returns to the home page, and while carving will refresh the page.

Status Bar	Icons			
Temperature / Beam Air	Temperature	28°C	Beam Air connected	BA
Water pump	In Progress		Standby	
Cover	Cover open		Cover closed	
Drawer	Drawer open		Drawer closed	
Network connection	Wireless network		Ethernet network	

B：START

There are two ways to transfer the working tasks, either via Beam Studio software or by USB flash drive. Either method can be used to find and use the files from "START" after transfer.
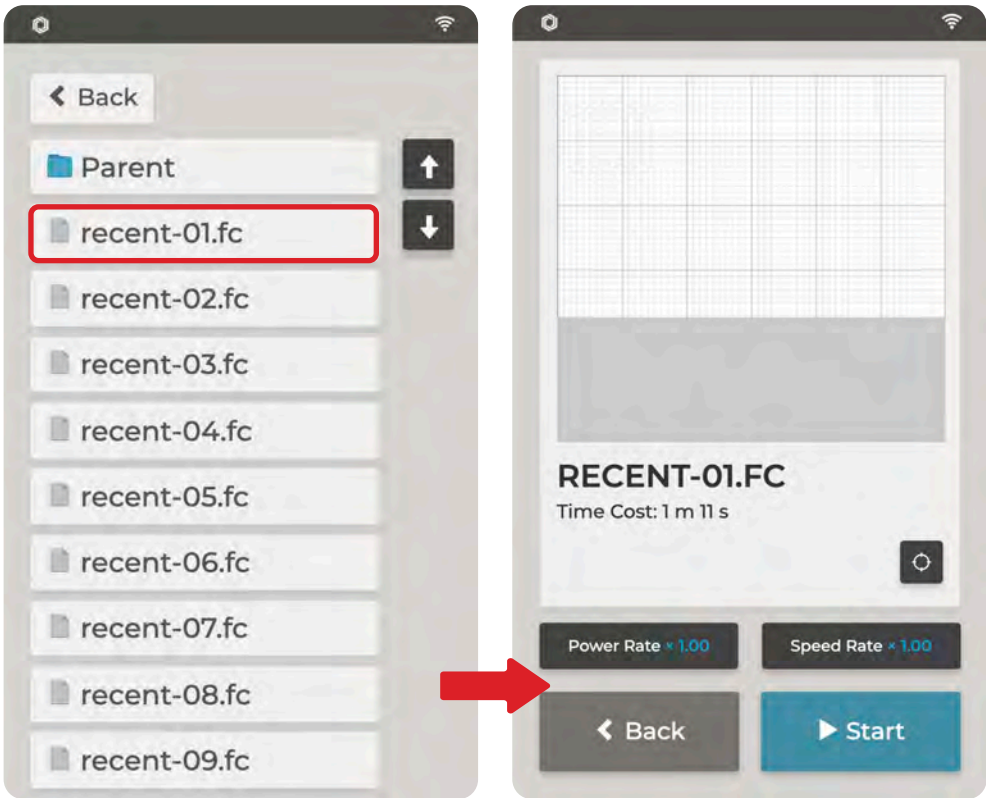

1. **Tasks sent to the machine from Beam Studio : "Built-in Memory" > "Recent" > specific tasks.**
   The machine can store up to 15 tasks sent by Beam Studio, and recent-01. fc will be the latest task sent.

2. **Files read from USB flash drives : USB flash drive > specific tasks.**
   There is no limit to the number of files that can be viewed on a USB flash drive.

Select the file to display the real position of the image in the working area, the estimated processing time, and the real-time power and speed rate.
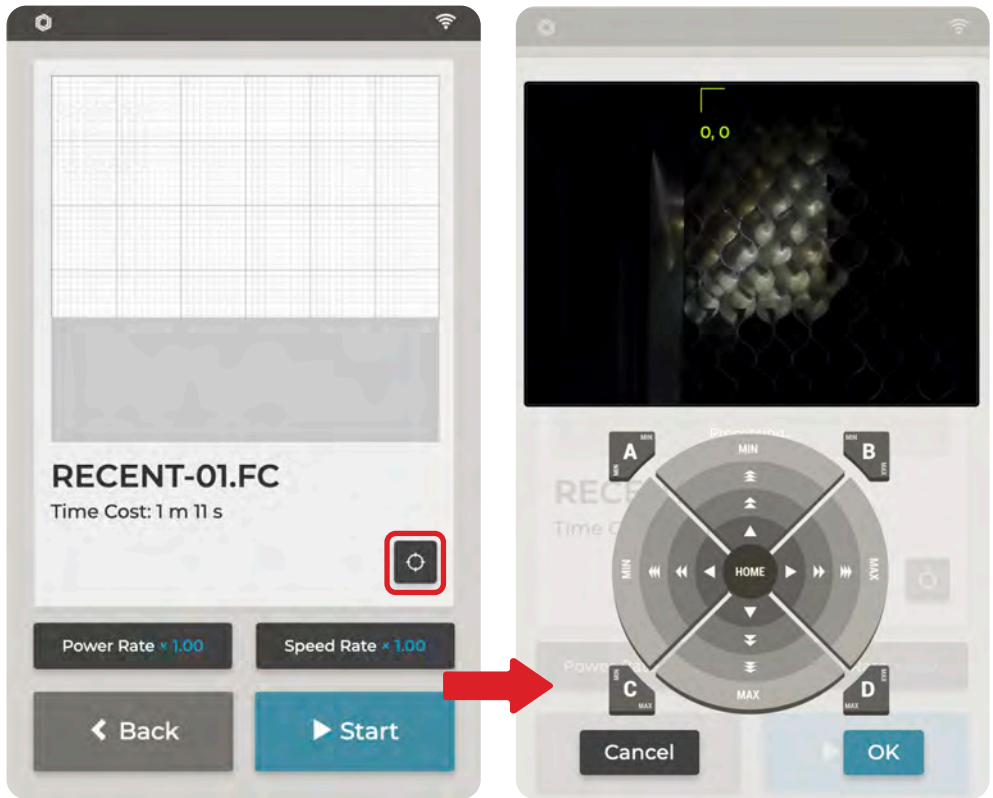

The origin point may be manually set before processing, and the power rate and speed rate can be set at any time during the process.

To set the start point manually, click ⬡ , then move the laser head from the starting position (0,0) to the desired position, then click OK.
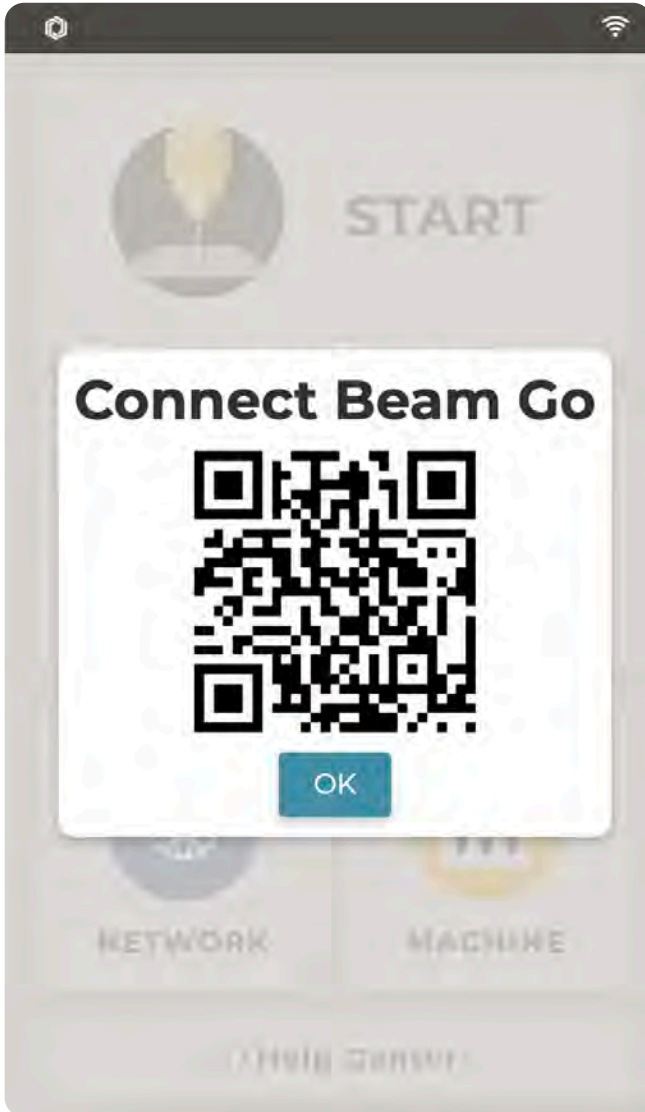
C : MAINTENANCE

During maintenance and repair, enter the MAINTENANCE page. This is intended mainly for hardware switch and signal display. It is highly recommended to operate this page only after reading the subsequent maintenance chapter and/or under the guidance of customer service.
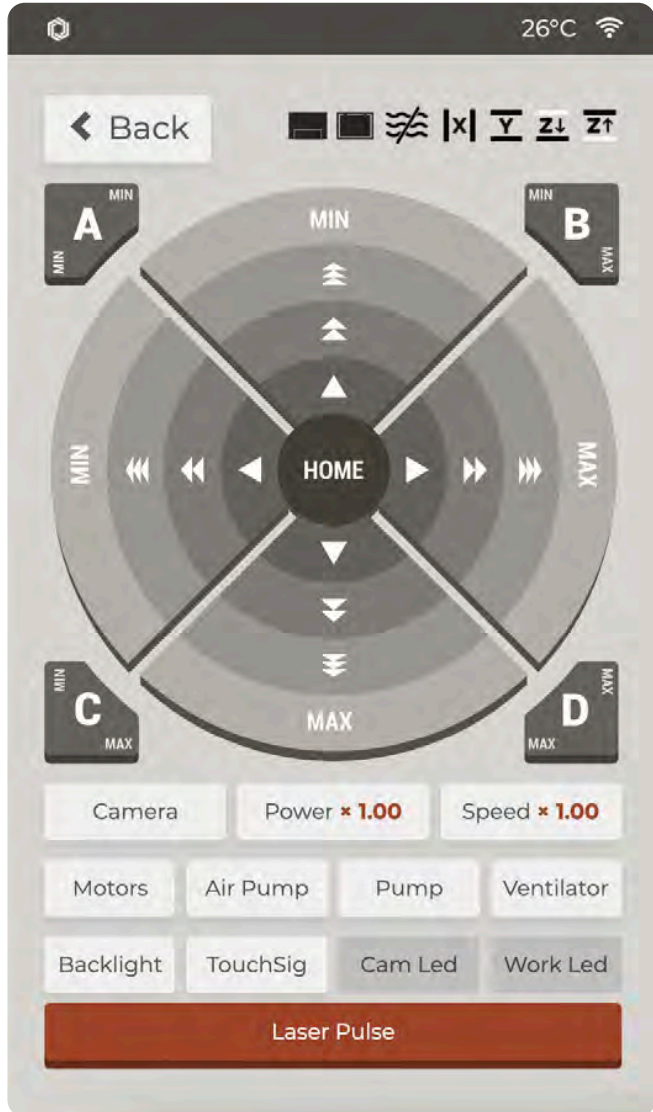
D：APP

Pairing mobile
devices to machine

Download the Beam Go
app and connect your
mobile device to the
same wireless network.
Click on the APP and
scan the QR code to pair
your mobile device with
your machine.

* Beam Go is the mobile
version of the Beam
Studio.

E : NETWORK

This screen displays the network IP address and confirms whether the connection via Wi-Fi or the Ethernet cable is active (the MAC address for the active interface will have a value).

Advanced Settings : Manually assign a Static IP for the machine in this menu, including the IP address, subnet mask, and gateway.

Start Remote Assistance : Initiate a guided support session with customer service.
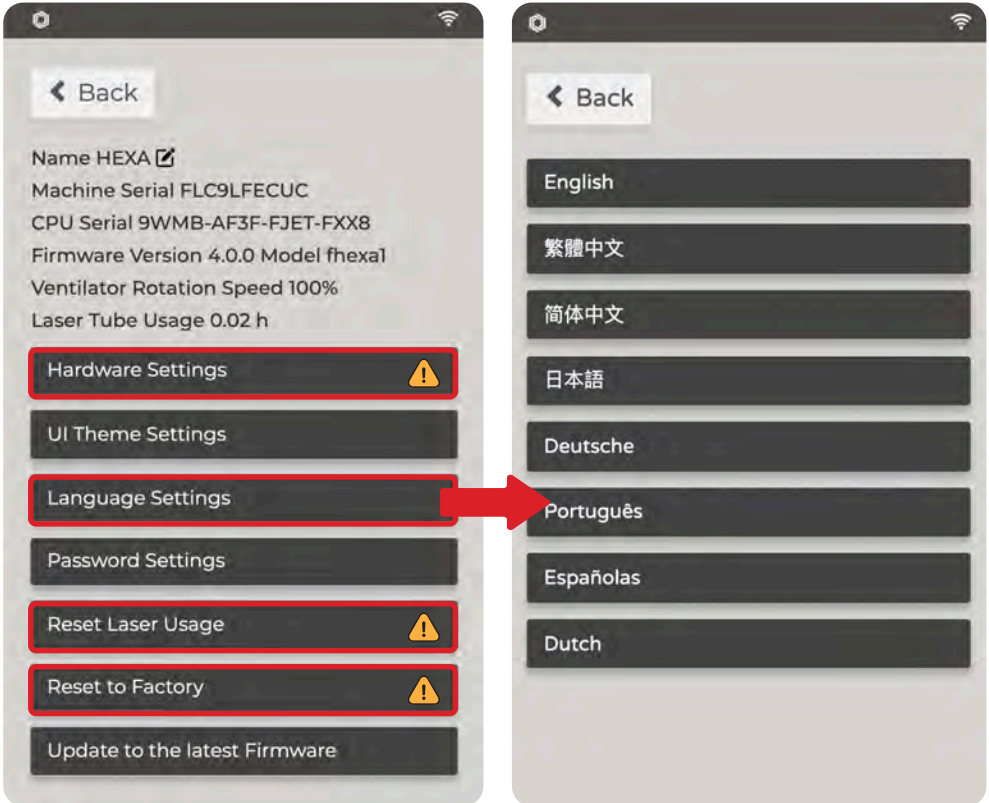

Note: When using a wireless (Wi-Fi) or wired network (except for direct connection), the machine automatically obtains an IP address through DHCP or can be manually assigned a Static IP.

F : MACHINE

Machine details, language,
and hardware related settings

If you have any issues, refer to section G : Help Center.

CAUTION : Do not use the "Hardware Settings", "Reset Laser Usage", or "Reset to Factory" settings without express instructions from customer service to avoid damaging the machine.

Once the connection password is set, you must enter the connection password when connecting to the machine for the first time. The password can be modified or disabled.
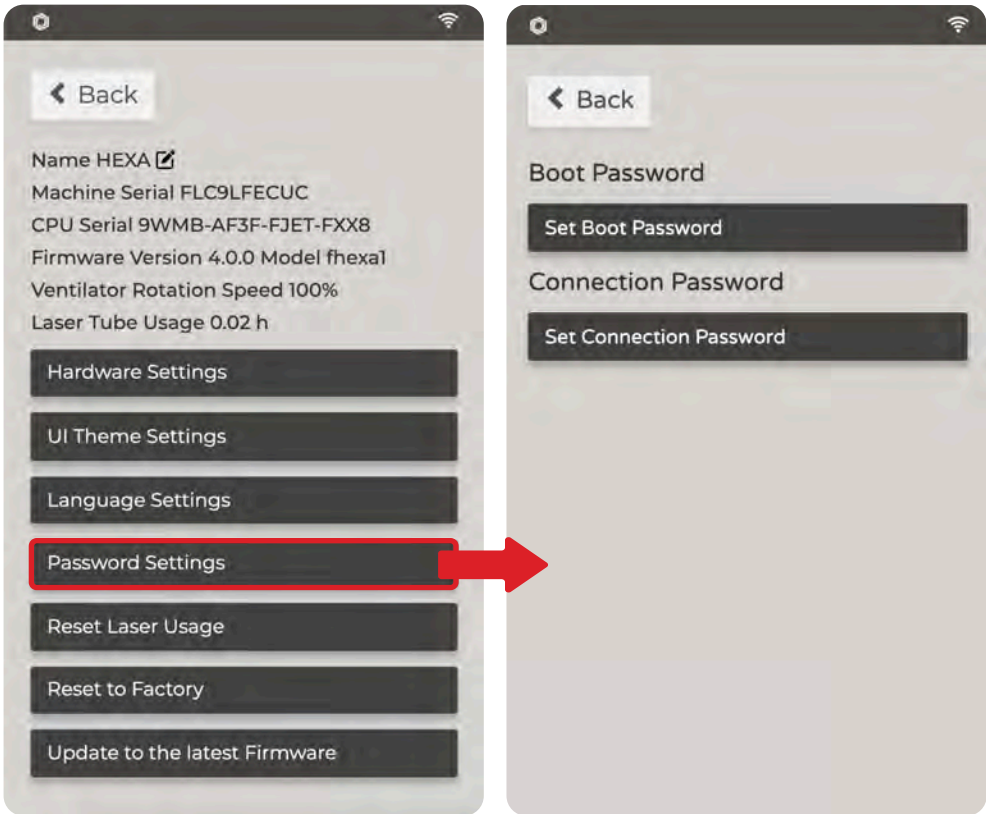
Update the firmware to the latest version by clicking "Update to the latest Firmware". You can also update the firmware through the software interface (See【Software Operation】 "Menu" - "Machines" (p.89))

Alternatively, you may update the firmware from a USB flash drive. The storage size must be <= 64GB, formatted as FAT32. Rename the firmware file downloaded from the website as autoupdate.fxfw. Plug the USB flash drive into a USB port then restart the machine.
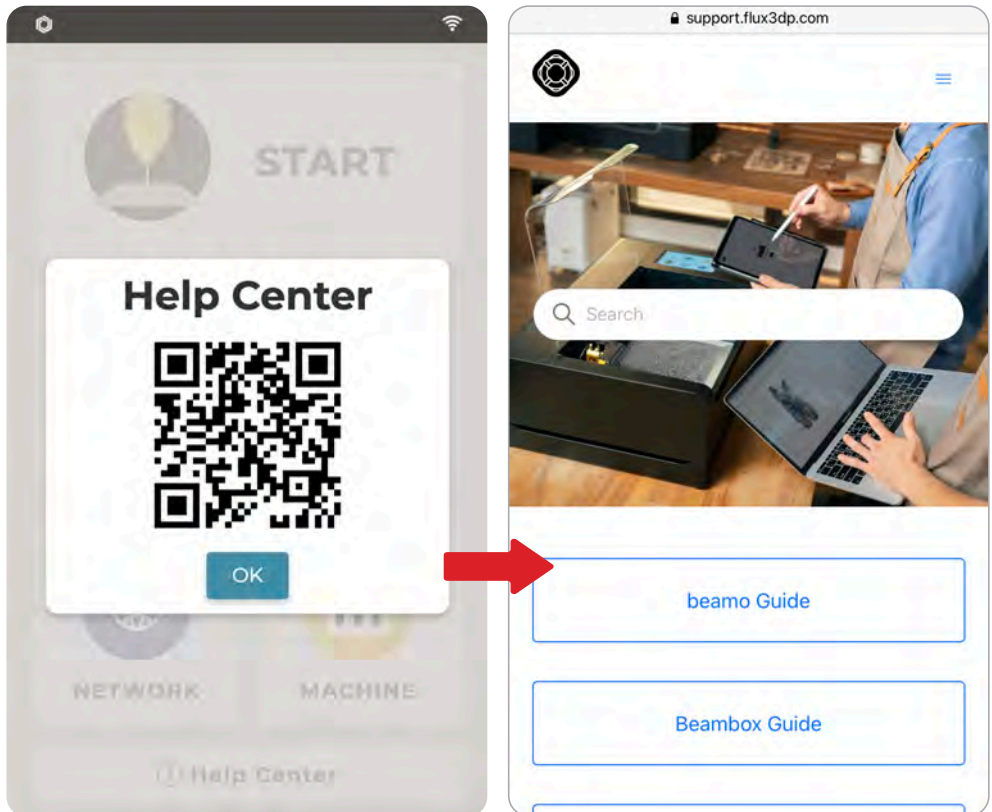
> **The firmware upgrade process takes a few minutes. Do not turn off the machine during the process.**

G : HELP CENTER

Help Center access

If you have any questions, please click "HELP CENTER", scan the QR code, and search the Help Center on the FLUX official website for possible solutions.
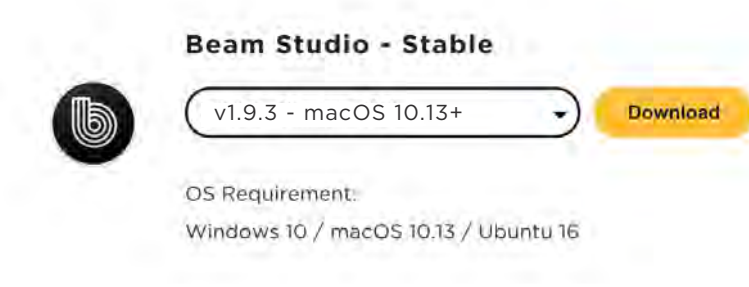
CH 2-4
Software Installation and Activation

Download the latest version of Beam Studio from the official FLUX website.

Please go to the official FLUX website > "Support" > "Downloads" and select the appropriate version of Beam Studio from the drop-down list based on your operating system.

Beam Studio（ beamo / Beambox / Beambox Pro / HEXA ）

Beam Studio - Stable

v1.9.3 - macOS 10.13+ ▾   **Download**

OS Requirement:
Windows 10 / macOS 10.13 / Ubuntu 16

For macOS

Make sure you select the correct macOS version. Some features are not available on older versions of macOS. To verify your system version, select Apple Menu > "About This Mac" > Version. Once the download is complete, open the file from the Downloads folder. Drag the application icon into the Applications folder, and open Beam Studio.

If you are unable to open the file because it is from an unidentified developer, open "System Preferences" > "Security & Privacy", click on lock to modify > "Open Anyway".

For Windows

Make sure you select the correct operating system architecture: X86 for 32-bit and X64 for 64-bit. Once the download is complete, please run the installer. Beam Studio can be opened from the desktop or from C:\Users\User\ AppData\Local\ Programs\beam-studio\Beam Studio.

CH 2-5
Connection Settings

Explains the various connection installation methods. Once the machine is connected, it can be operated from the computer.

There are four ways to connect the machine to a computer: Wi-Fi, Wired Network, USB Connection, and Direct Connection.

1

Wi-Fi

**Necessary equipment
(Embeded in the machine) :**

- Built-in WiFi (2.4 / 5 GHz)

(Included in the accessory box) :

- WiFi dongle (2.4 GHz)

2
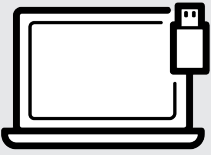
Wired Network

**Necessary equipment
(Not included) :**

- RJ45*1
  (machine ∼ router)
- RJ45*2 + router*1
  (machine ∼ router / computer ∼ router)
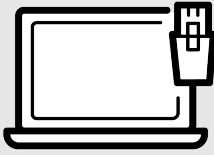
3

USB Connection

**Necessary equipment
(Included in the accessory box) :**

- USB cable (USB-B to USB-A)

(Not included) :

- USB-A to USB-C adapter

4

Direct Connection

**Preparation Items
(Not included) :**

- RJ45*1
  (machine ∼ computer)
- Plugable USB/USB-C to Ethernet adapter

1 Wi-Fi

a. Set up the machine network [you must use the same Wi-Fi (2.4GHz) as your computer network] :
Select "NETWORK" > "Connect to Wi-Fi" and select the Wi-Fi you want to use. Then enter the Wi-Fi password and press "Confirm" > "NETWORK". Confirm the "Wireless IP" of the machine.
*If it didn't show your Wi-Fi name :
- Make sure your WiFi is Public. If not, please select "NETWORK" > "Connect to Other WiFi" > Enter the network name > Choose a security level > Enter the Wi-Fi password and press "Confirm"
- Insert the Wi-Fi dongle and set antenna at 90 degrees to side USB port on the side of the machine to improve signal reception.

b. Select the software interface display language :
Use the drop-down list to select the language and then click "Next".

c. Log in to your member account :
Log in to benefit from added functionality and improvements of software updates.

d. Select the connection method :
Select "Wi-Fi".

e. Enter the IP address of the machine to complete the setting :
Enter the IP address of the machine to complete the setup process.

2 Wired Network

a. Connect the Ethernet cable :
Connect the Ethernet cable to the Ethernet port on the rear of the machine and to the router. The machine will automatically connect to the network once the installation is complete.

b. Confirm the machine network :
Confirm the value of Wired Network "MAC Address" of the machine on "NETWORK" page.

c. Select the software interface display language :
Use the drop-down list to select the language and then click "Next".

d. Log in to your member account :
Log in to benefit from added functionality and improvements of software updates.

e. Select the connection method :
Select "Wired Network".

f. Enter the IP address of the machine to complete the setting :
Enter the IP address of the machine to complete the setup process.

3 USB Connection

You can also connect to the machine directly via an USB cable.

1. Windows :

a. Connect the USB cable :
Connect the USB cable to the USB-B port on the rear of the machine and then connect the USB-A side to the computer. The machine will automatically connect to the network once the installation is complete.

b. Confirm the machine network :
Confirm the value of Wired Network "MAC Address" of the machine on "NETWORK" page. Click "Settings" > "Network & Internet" > Ethernet – "Properties". Verify that the IPv4 DNS servers is set to 10.55.0.17.

c. Select the software interface display language :
Use the drop-down list to select the language and then click "Next".

d. Log in to your member account :
Log in to benefit from added functionality and improvements of software updates.

e. Select the connection method：
Select "USB Connection".

f. Enter the IP address of the machine to complete the setting：
Enter the IP address of the machine, 10.55.0.17, to complete the setup process.

2. masOS :

a. Connect the USB cable：
Connect the USB cable to the USB-B port on the rear of the machine and then connect the USB-A side to the computer. The machine will automatically connect to the network once the installation is complete.

b. Confirm the machine network：
Click "System Preferences" > "Network" > Status of USB HEXA 2 LAN: Connected.

c. Set the software interface display language：
Use the drop-down list to select the language and then click "Next".

d. Log in to your member account：
Log in to benefit from added functionality and improvements of software updates.

e. Select the connection method：
Select "USB Connection".

f. Enter the IP address of the machine to complete the setting：
Enter the IP address of the machine, 10.55.0.1, to complete the setup process.
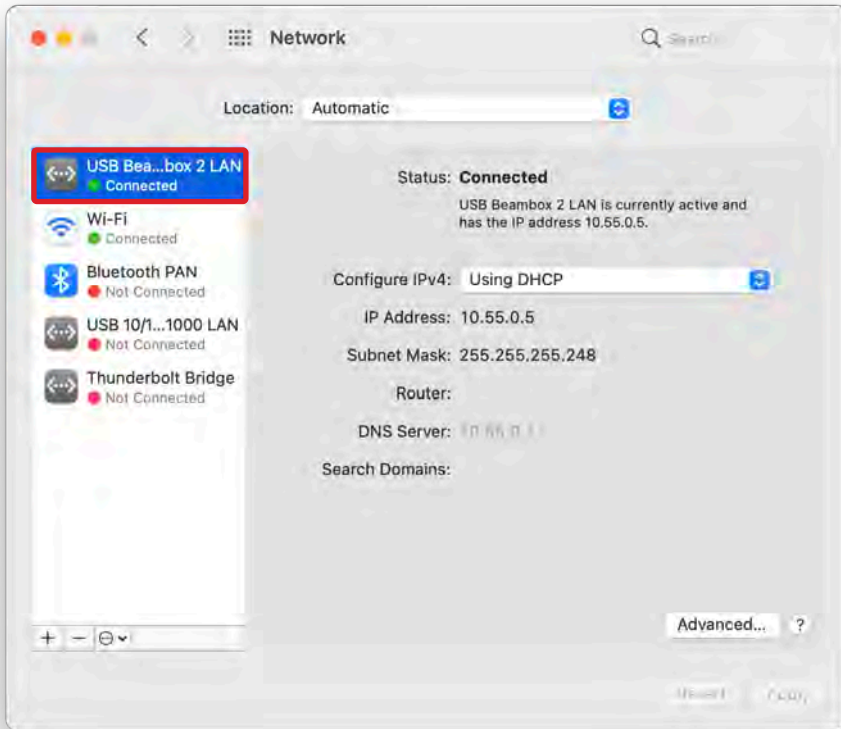
4 Direct Connection

You can also connect directly to your computer via an Ethernet cable.

1. Windows : **(This method applies to Windows 10)**

a. Connect the Ethernet cable :
   Connect the Ethernet cable to the Ethernet port on the rear of the machine and the computer.

b. Confirm the machine network :
   Confirm the value of Wired Network "MAC Address" of the machine on "NETWORK" page.

c. Enable Internet connection sharing :
   Click "Settings" > "Network & Internet" > "Change adapter options".
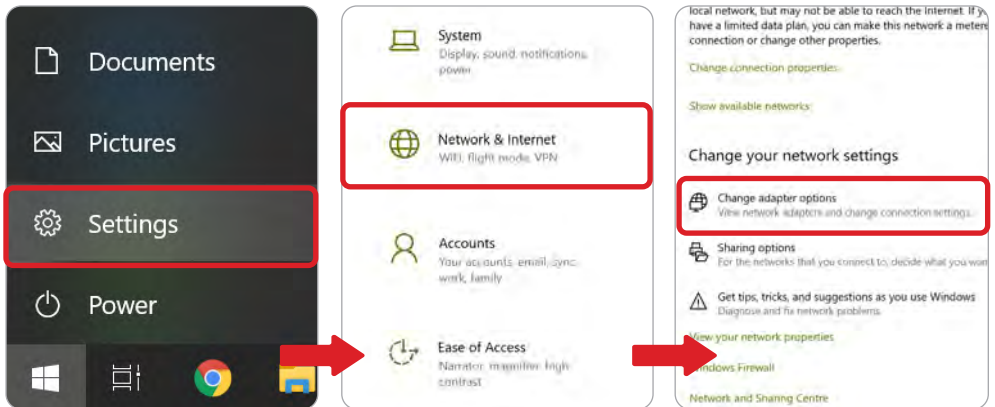
Right-click on the network you are using (Wi-Fi or Ethernet) then click "Properties" > "Sharing". Check the boxes next to "Allow other network users to connect through this computer's Internet connection" and "Allow other network users to control or disable the shared Internet connection".
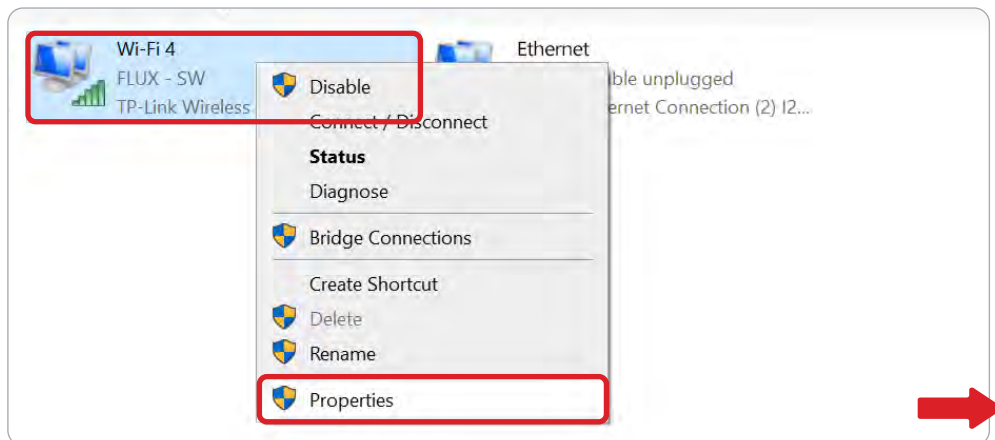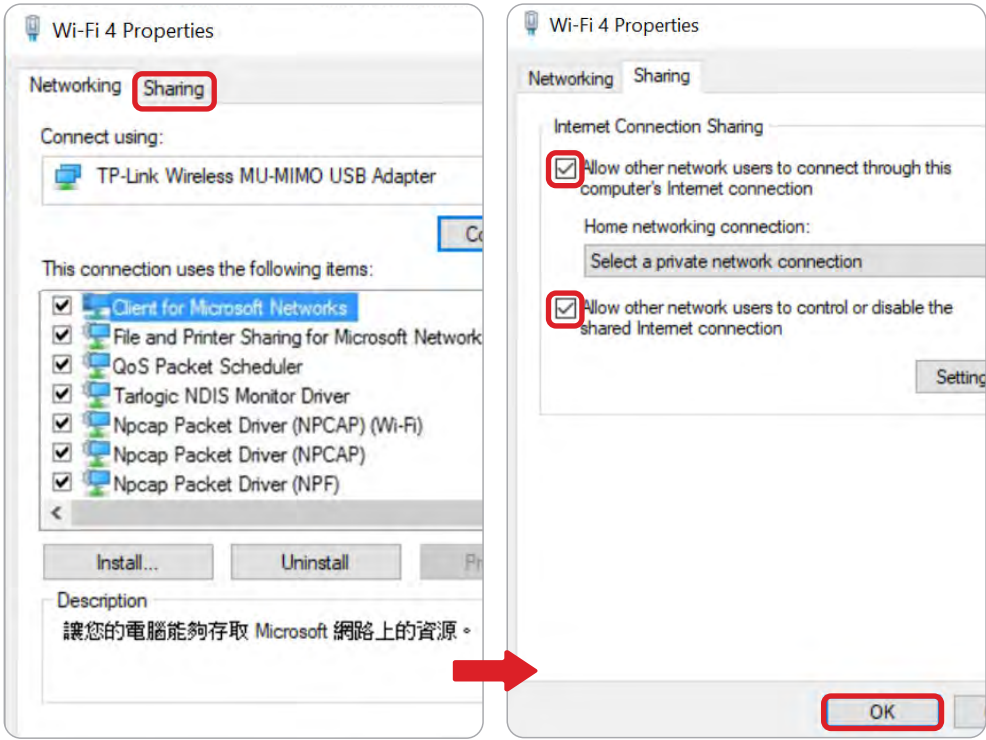
After confirmation, the word "Shared" will be displayed under that network.
In the "Network Connections" window, you will see an "Unidentified network", which is the network to which the machine is connected.
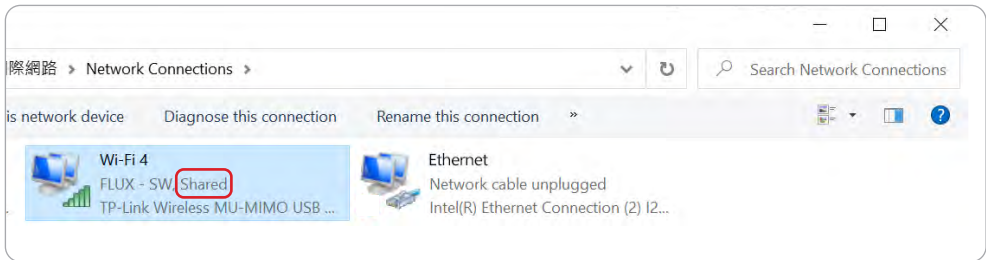
d. Select the software interface display language :
   Use the drop-down list to select the language and then click "Next".

e. Log in to your member account :
   Log in to benefit from added functionality and improvements of software updates.

f. Select the connection method :
   Select "Direct Connection".

g. Enter the IP address: :

Confirm the "Wired IP" address of the machine from the panel. Enter the wired IP address of the machine into the computer to complete the setup process. It usually starts with 192.168.(If it starts with 169.254, it means the computer may be set up incorrectly or the network cable).

2. macOS: The method is applicable to macOS environment. If you are using macOS Catalina, please update to at least 10.15.4.

a. Connect the Ethernet cable :

Connect the Ethernet cable to the Ethernet port on the rear of the machine and the computer.

b. Verify the machine network :

Verify that the machine has a value for Wired Network "MAC Address" on the "NETWORK" page.

c. Turn off the computer firewall:

Click "System Preferences" > "Security & Privacy" > "Firewall" > "Turn Off Firewall".
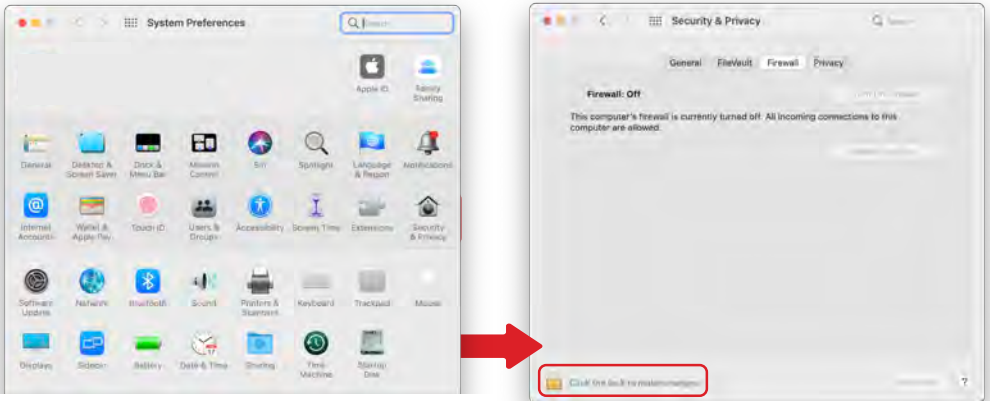
d. Enable Internet connection sharing :

Click "System Preferences" > "Sharing". Set the "Share Your Connection From" to the network you are using (Wi-Fi or Ethernet) then select the port to use. Click "Start" on the pop-up message to enable sharing.
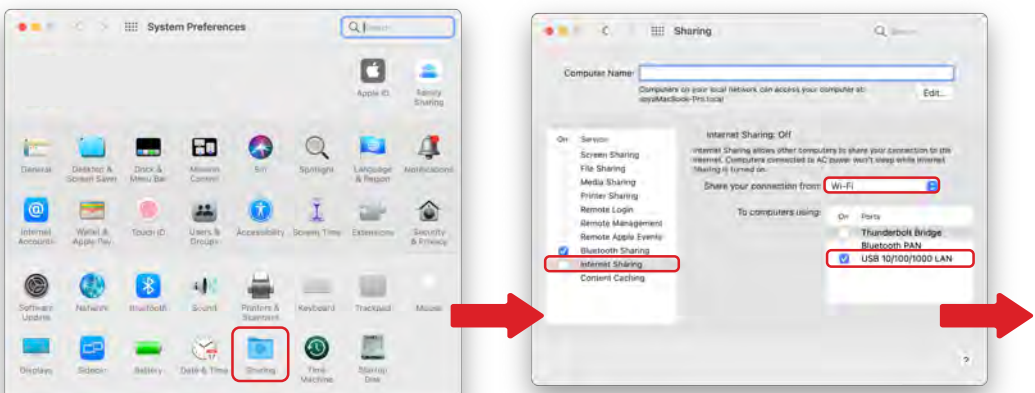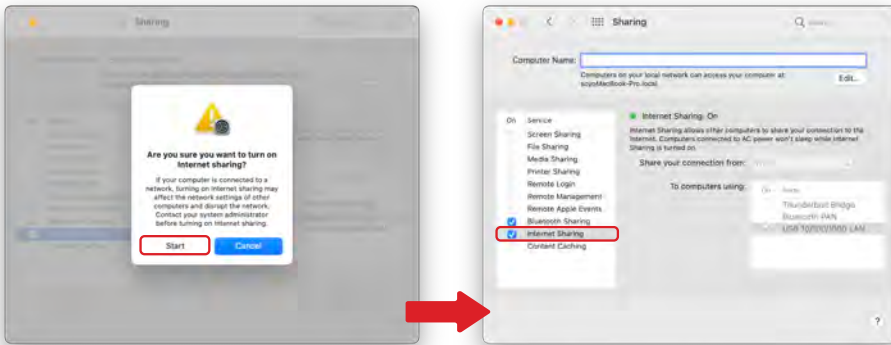
e. Set the IP address of your computer to 192.168.2.1 :

Click the network icon in the upper right corner and select "Network Preferences". Select the right interface (RJ45 adapter). For "Configure IPv4", select "Using DHCP with manual address" from the drop-down list and set the "IPv4 address" to 192.168.2.1.
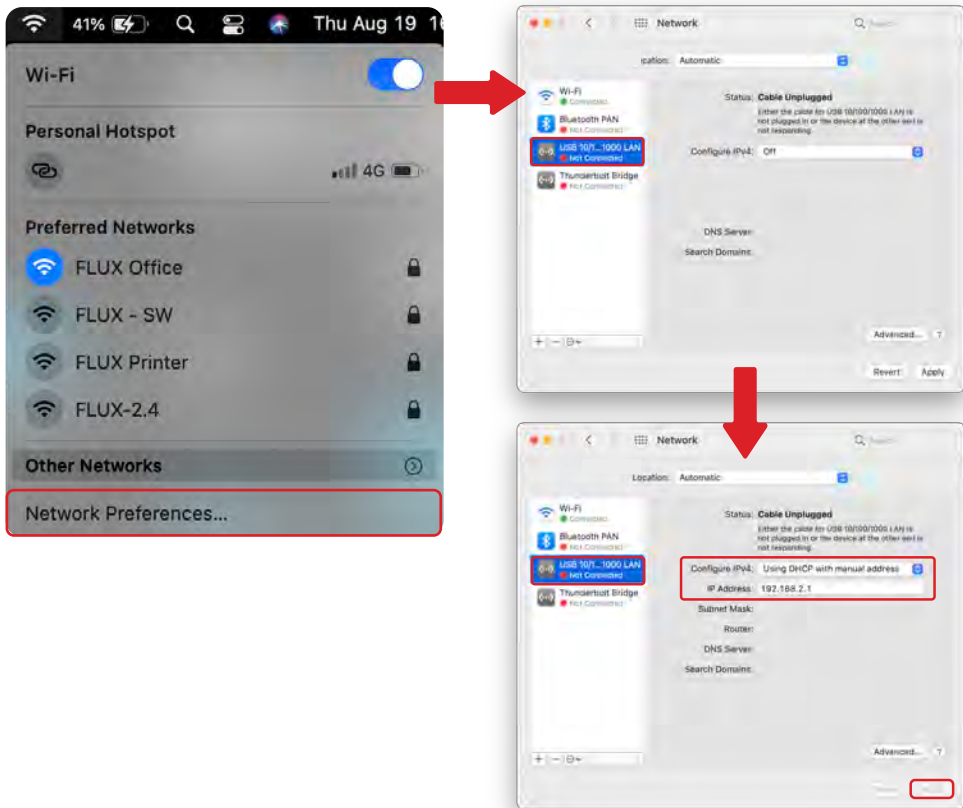
f. Select the software interface display language :

Use the drop-down list to select the language and then click "Next".

g. Log in to your member account :

Log in to benefit from added functionality and improvements of software updates.

h. Select the connection method :
Select "Direct Connection".

i. Enter the IP address :
Enter the IP address of the machine to complete the setup process. The IP address usually starts with 192.168. (If it starts with 169.254, it means the computer may be set up incorrectly or the network cable needs to unplugged and plugged in again).

> **Return to the setup connection method screen at any time via "Machines" > "Machine Setup" in the menu.**

【Troubleshooting】 Connection Issue（p.211）

Once the Connection is Complete, You Can Start Your First Engraving!

CH 2-6
Beam Studio Tutorial

Including Camera Calibration, Engraving Material Focusing, and Common Software Functions.

1. Automated Error Reporting :

If you encounter an error alert window, click "Yes" to agree to automatically upload the information to the development team. This will help the team identify potential software problems.

Note: Customer support may still request you send the relevant bug report.
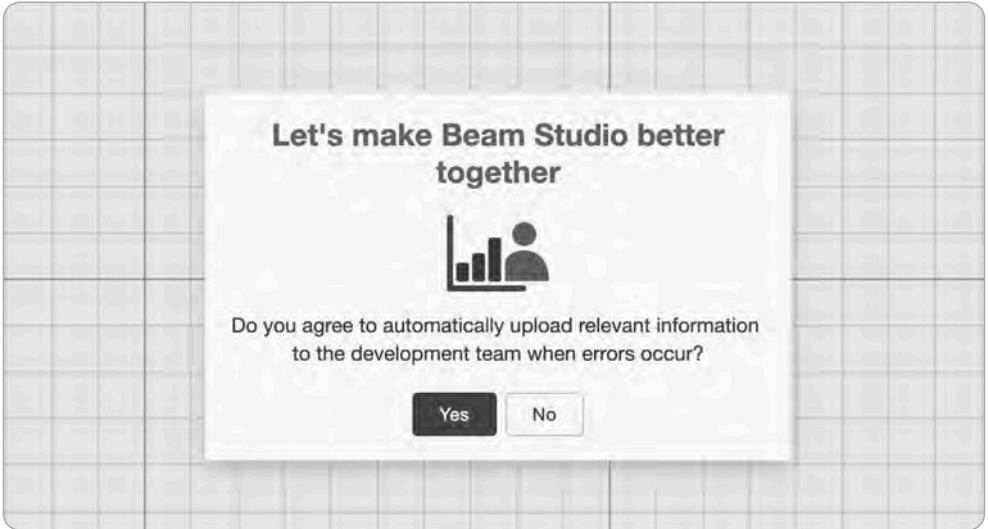
2. Camera Calibration :

To ensure accurate engraving, calibrate the camera and engraving position.

Required Items : A4 (Letter size) white paper

Note : 1. Camera calibration is required before using the camera preview function for the first time. 2. Refocus the platform each time to get the best results.
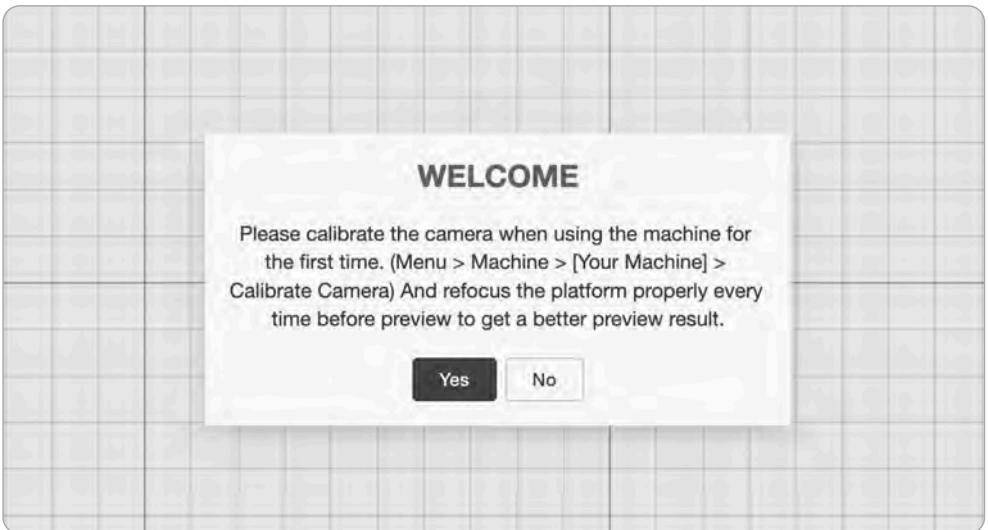
a. Select Device : Select the name of the machine in use. The machine name can be verified on the machine page interface.

b. Place paper : Place a clean sheet of A4 (Letter size) white paper at the top-left corner of the working area.

c. Focusing：Double click the height adjustment button to raise the honeycomb table up until the probe touches the paper.
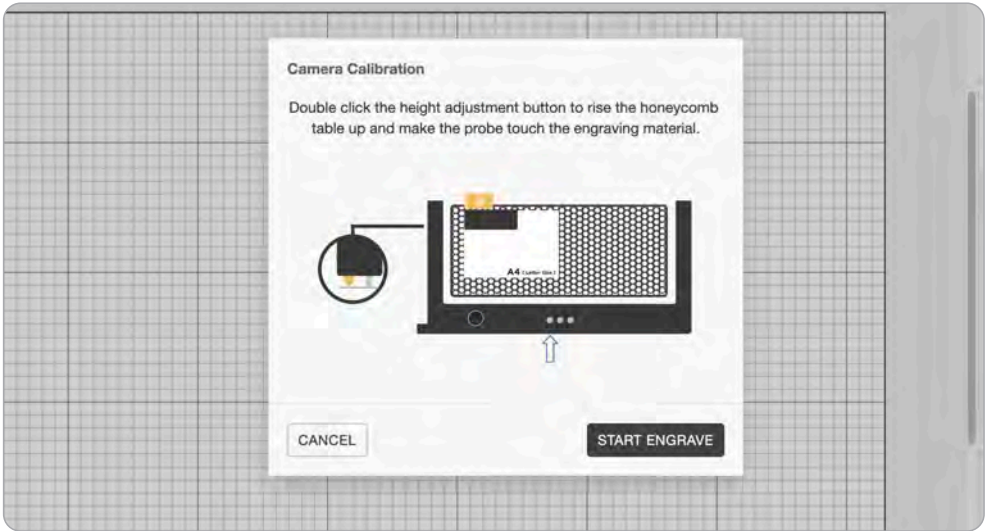
d. Draw calibration image : The machine will cut out grid lines on the paper.
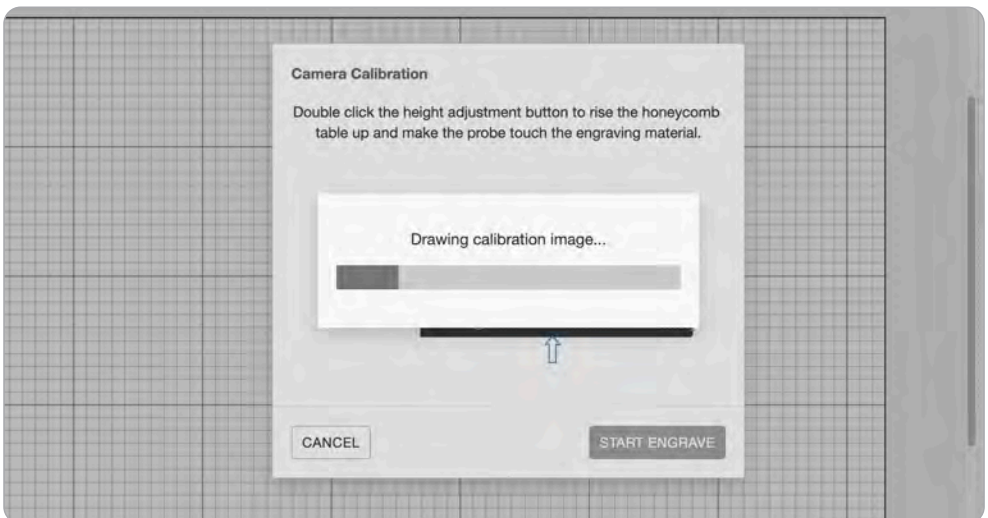
e . Place the red square : Click anywhere to cancel the prompt and move the grid lines to the center. Align the outside of the red square with the center square by adjusting the horizontal and vertical translation, rotation angle, and size ratio (you can use the arrow keys to adjust the values).
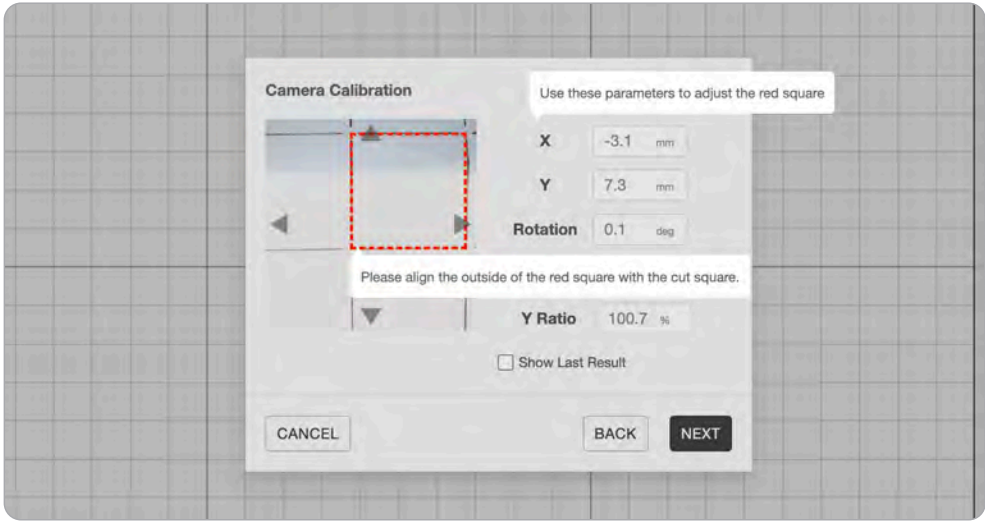
e-1. Red square adjustment completion position.
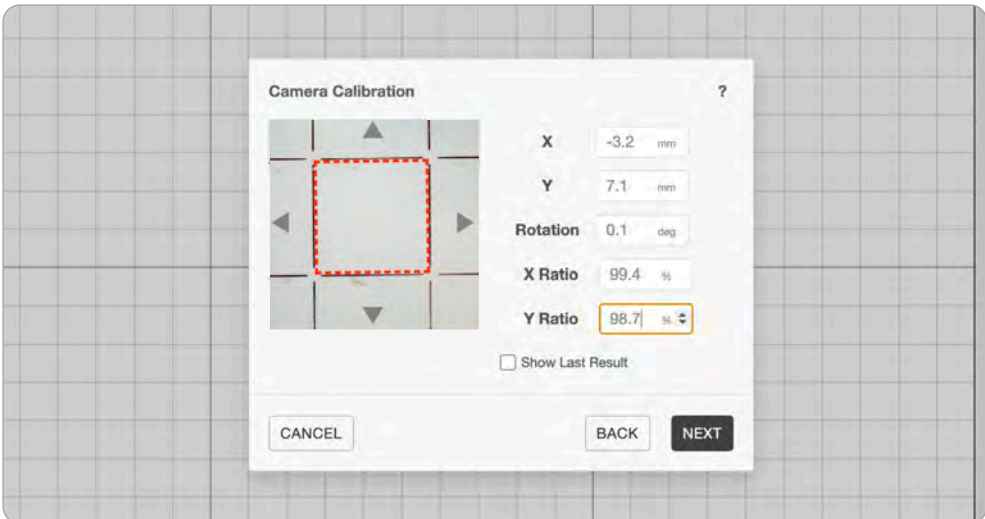
f. **Camera Calibration completed** : Once the camera calibration is completed, you can begin engraving.

Camera Calibration

Calibration done. Better camera accurency is given when focus precisely.

DONE
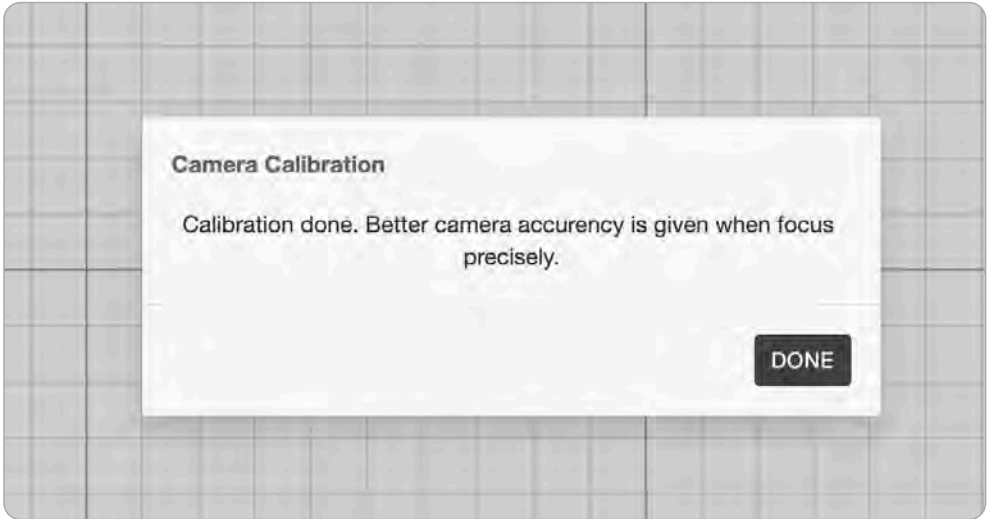
3. Beam Studio Tutorial : After completing the Beam Studio tutorial, you will know how to carve round and square shapes out of wood.

Required Items : Engraving Material: 3mm wood piece (included in the accessory box).
Note - To ensure the best engraving results, make sure to follow these steps:
1. Engrave before cutting : work from the top to the bottom of the layer. Make sure the engraving layer is on top and the cutting layer is on the bottom. Doing so avoids collapse of the object after cutting.
2. Cut inner objects before outer ones : If there are multiple cutting objects in the same layer, cut the inner objects first, and then the outer objects. For e.g., if object a is in object b, then cut object a before cutting object b.
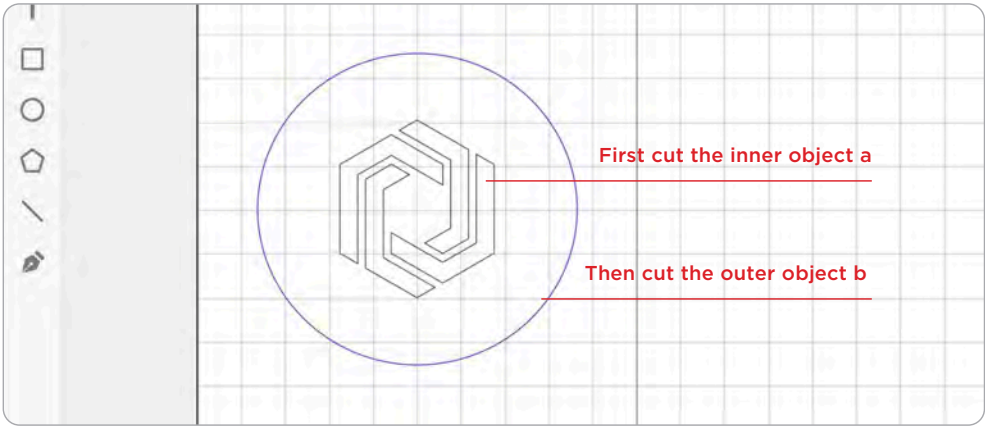
Steps :

0. Select "Yes" if you would like to start the Beam Studio tutorial.

1. Switch to Preview Mode : Tap the Camera Preview icon on the left then select the machine in use.

2. Preview the Platform :
   a. Place the wood piece on the platform
   b. Adjust the focus
   c. Close the cover
   d. Preview the range of engraving material by clicking on the working interface or selecting a preview range

3. End Preview Mode : Select "End Preview"   。

4. Draw a Rectangle : Select a "Rectangle (M) " ☐ to draw a square in Layer 1. Press Shift to to make a square.

5. Drag to Draw : Drag to draw a square on the working interface.

6. **Switch to Layer Panel :** Switch to the layer 🗇 panel to set the parameters.

7. **Set Preset :** Wood - Cutting : "Wood - 3mm Cutting".

8. **Add a New Layer :** Name the new layer Layer 2.

9. **Draw a Circle :** Select "Oval (L)" ◯ to draw a circle in layer 2 . Press Shift to make a circle.

10. **Drag to Draw :** Drag to draw a circle in the working interface.

11. **Turn on Infill :** Turn on the infill function. `Infill 🔵`

12. **Switch to Layer Panel :** Switch to the layer 🗇 panel to set the parameters.

13. **Set Preset :** Wood - Engraving : "Wood - Engraving".

14. **Send the File** ▶ :

    a. Confirm the parameters and layer settings.
    b. Select the name of the machine in use.
    c. Click "Start" to start the engraving and cutting process.

【Troubleshooting】 "Cooler Off" (p.185), "Door Opened" (p.187), "Homing Failed"(p.191), etc.

- **- *Return to the Beam Studio tutorial at any time by selecting "Help" > "Show Start Tutorial".**
- **- If the engraving is blurred or the color is light, please check the focus first. If that does not fix the issue, inspect or adjust the optical path. See 【**Maintenance**】 "Optical Path Inspection" (p.144), "Optical Path Alignment" (p.146).**

⚠️

CH 3
Software Operation

CH 3-1
Software Interface

This chapter introduces the software features and demonstrates the 4 creation techniques, including Beam Studio creation, importing work files, Trace Image, as well as mass production, and concludes with formatting instructions. Available for Beam Studio 1.9.X.

The software interface can be divided into 5 sections

A : Toolbar

B : Layer and object management

C : Parameter Settings

D : Working Interface

E : Menu

Beam Studio   File   Edit   View   Machines   Window   Help

A

D

— 40% +

E

A * 🛜 68% 🔋 Q 🖥 Fri Sep 24 17:07:40

◼️ ▶

☰ Layers

| ◻ | Layer 1 | 👁 |

B

+

Parameter Settings (Layer 1)

🗀 🗋   ⚙

Custom   ▼   +

Power   15

Speed   20

C

Execute   1
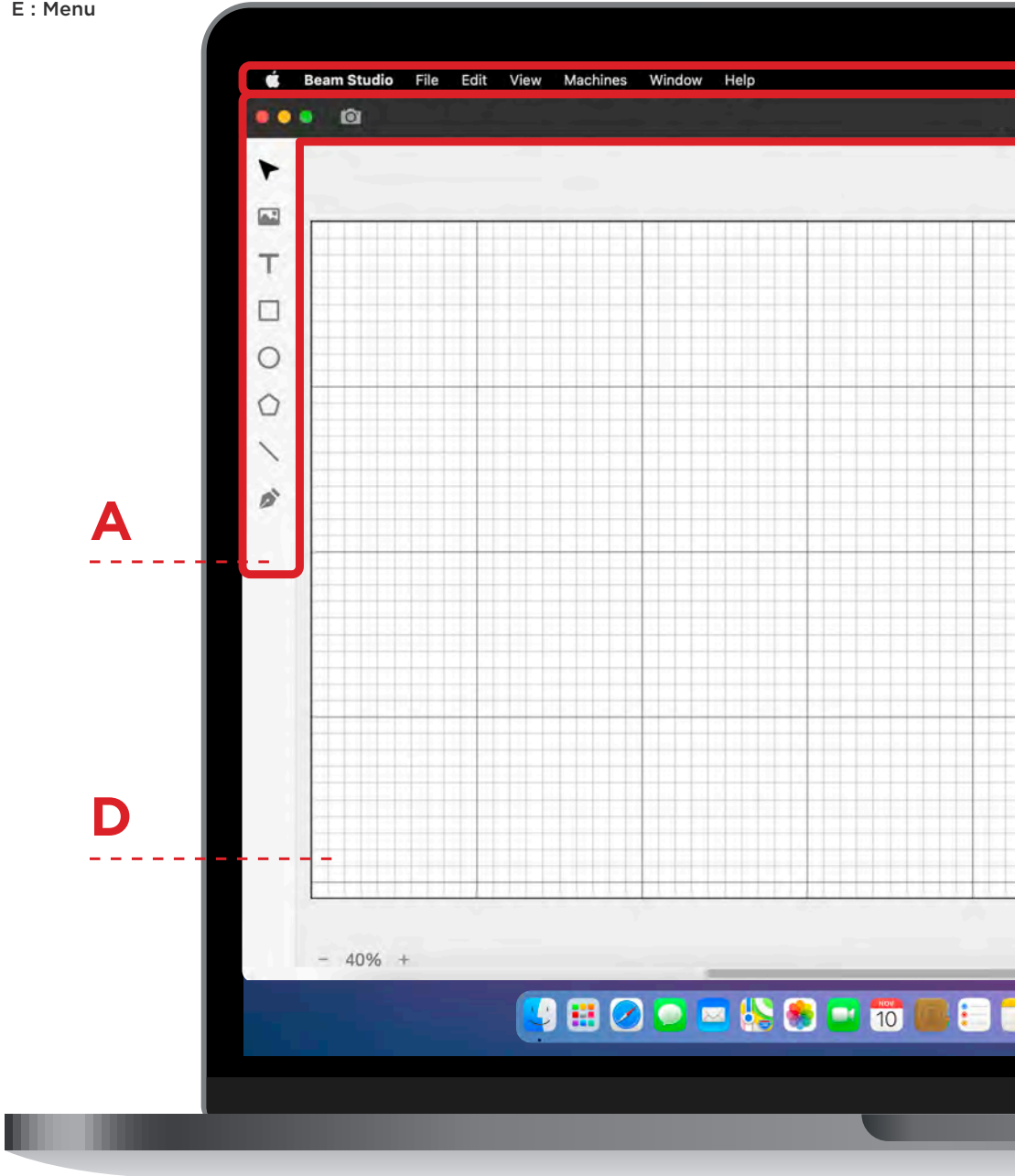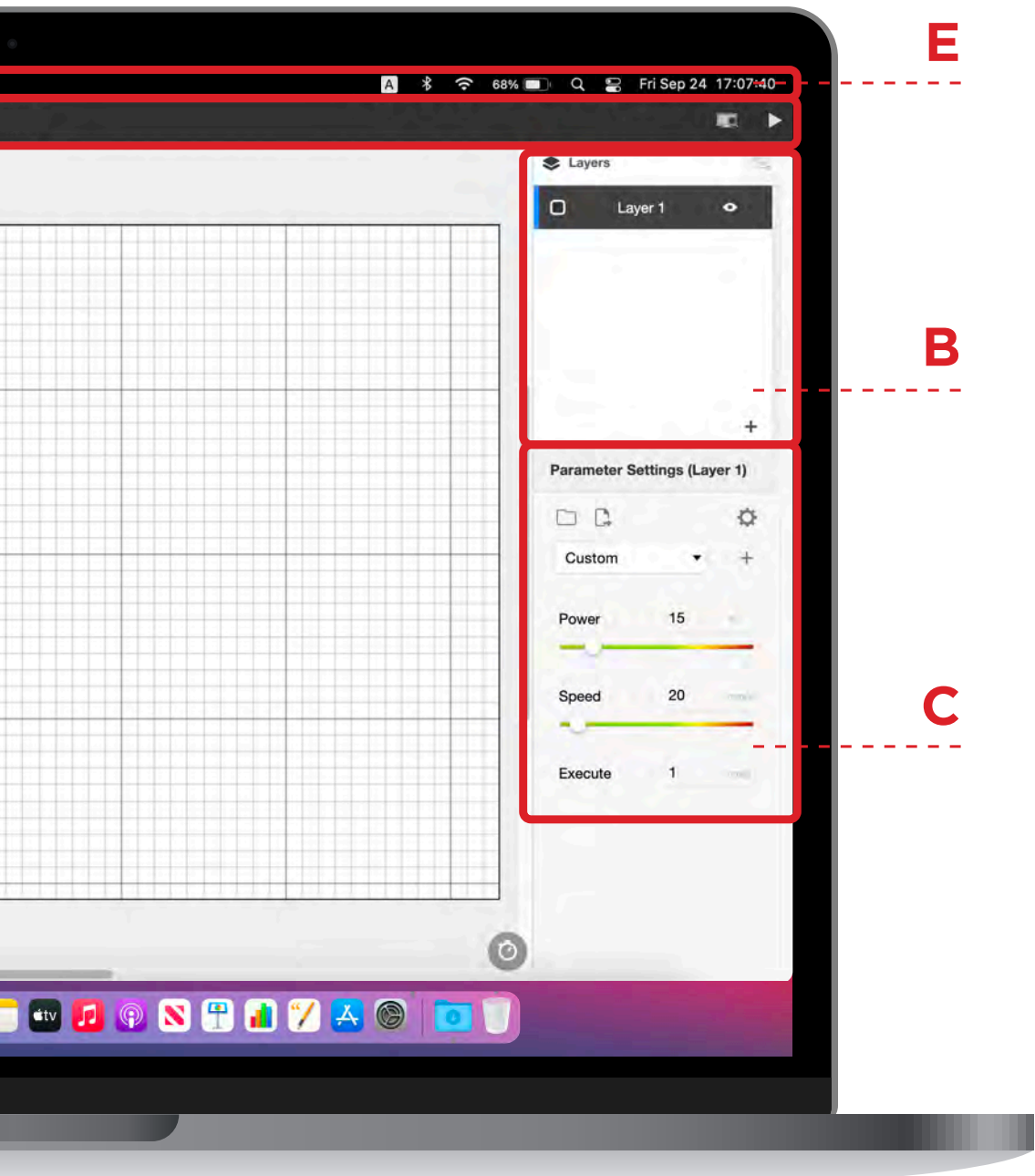
A : Toolbar

▶ Select (V)

Select specific objects.

▣ Image (I)

Import JPG / PNG / SVG / DXF / AI / PDF files and drag and drop them directly into the software or paste them directly from the browser after "Copy image".

T Text (T)

Add new texts. When the Infill is not on, there is only a text stroke, once it is on, text will be solid.

▢ Rectangle (M)

Draw rectangles. Able to adjustable rounded corners radius.

⬠ Polygon

Draw polygons. The number of polygon vertices can be increased or decreased by using the "+" and "−" keys of the keyboard while drawing.

◯ Oval (L)

Draw ellipses.

Press and hold the keyboard Shift :
Able to draw squares and circles from Rectangle (M) and Oval (L).
Able to rotate drawing objects and texts (except importing files) 45 degrees, and scale one drawing object or text at a time. Adjust import files freely (scale by default).

╱ Line (\)

Draw line paths.

Work Preview : Preview the simulation working path before sending the task.

▲ Select the name of the machine in use and deliver the task.

Pen (P)

Outline the lines and curves of the vector and adjust the shape with the anchor point after you finish drawing.

Press and hold the left mouse button while drawing : Able to draw curves.
Double click the end point or use the keyboard esc to end the pen path. Double click the pen drawing path to edit the path.

There are 3 modes according to the node type :

tCorner :
When adjusting the length of one side of the handle, only the path on that side will change.

tSmooth :
When adjusting the length of one side of the handle, the path will change on both sides of the selection point, but the path will change more on the controlling side.

tSymmetry :
When adjusting the length of one side of the handle, the path on both sides of the selection point will change, and the change is symmetrical.

Camera Preview Function

Camera Preview :
Preview the range of engraving materials. Click or select a range to preview the location of the materials to be engraved.

Trace Image :
Scan and convert a pattern to vector grahpics for software editing via camera preview.

Clear Preview :
You can delete the images previewed by the camera, but the objects of the Trace Image will not be deleted.

B : Layer and object management

Layer management and object management. Object management not only covers the functions shared by picture, text, and drawing objects, but also have their own adjustable OPTIONS and ACTIONS. The introductions are as below.

Layer management :

Add Layer

Create and name a new layer.

Move elements to

Move elements to:

Layer 1

When there are multiple layers, you can transfer the selected object to a certain layer in the drop down list.

Layer Color

After changing the color, open "View" > "Use Layer Color" to distinguish the color of objects between different layers. When displaying layer colors, the software performance and editing speed may be affected if the shapes are complicated or numerous.

Show Layer

Click to turn off the layer.

Right-click on the layer column is able to do the following :
Duplicate Layer : Duplicate the objects and parameters of the layer and add a new layer on the list top.
Lock Layer : You cannot edit the layer objects after locking it, but you can rename, delete, move, and merge the layer.
Delete Layer : Delete the layer.
Merge Down : After merging, the layer name will be the name of the next layer.
Merge All : After merging, the layer name will be the name of the bottom layer.
Merge Selected Layers : After merging, the layer name will be the name of the last selected layer (labeled by a blue mark in front).
Delete multiple layers at the same time : Press the keyboard Shift and select the layer you want to delete, then use the right-click delete or keyboard delete key to delete the selected layers.
Drag and drop the layer to adjust the layer order.

Object management : shared functions for picture, text, and drawing objects.

Horizontal Distribute

Distribute the selected objects evenly by the center of the graphs in the horizontal direction.

Top Align

Align all the selected objects to the top bounding of the objects.

Middle Align

Align all the selected objects to the middle vertically.

Bottom Align

Align all the selected objects to the bottom bounding of the objects.

Vertical Distribute

Distribute the selected objects evenly by the center of the graphs in the vertical direction.

Left Align

Align all the selected objects towards the leftmost bounding of the objects.

Right Align

Align all the selected objects towards the rightmost bounding of the objects.

Center Align

Align all the selected objects to the center horizontally.

Group

Group multiple objects together.

Ungroup

Cancel the grouped objects.

Union

Combine multiple closed vector graphics into one.

Subtract

Delete the overlapping parts of the two closed vector graphics. If two vector graphics are on the same layer, the pattern will be subtracted to keep the last drawn part; if two vector shapes are on two different color layers, the pattern will be subtracted to keep the upper layer and the color will be the selected (blue marked) layer color.

Difference

When Infill is on, only the un-overlapped parts of multiple closed vector graphics are kept. If two vector shapes are on two different color layers, the color of the pattern kept will be the selected (blue marked) layer color.

Intersect

Keep only the part of multiple closed vector graphics that overlap. If two vector shapes are on two different color layers, the color of the pattern kept will be the selected (blue marked) layer color.

Coordinate

X 0 mm Y 0 mm

Object coordinate on the working interface.
Center point : Oval. **Two endpoints :** Line. **Top left point of the bounding box :** Image, Rectangle, Polygon. **Top left point of the highlight range :** Text

Rotation Angle

↻ 0 deg

Adjust the angle of the selected objects.

Object Size

W 10 mm H 10.00 mm

Adjust the size of an object, W is its width and H is its height.

Lock

Click to open or close the lock.
Lock opened : press and hold the keyboard Shift to scale the selected objects.
Lock closed : press and hold the keyboard Shift to enlarge or reduce the sizes of selected objects freely.

Horizontal Flip

Flip the selected object(s) according to the horizontal line through its (their) object center.

Vertical Flip

Flip the selected object(s) according to the vertical line through its (their) object center.

OPTIONS :

OPTIONS

選項   **Gradient**

When importing bitmap graphics, images are converted to grayscale and gradients are turned on by default.

▶ If the Gradient is turned off, the Threshold brightness can be used to adjust the binarization threshold.

Threshold brightness

This function defines the RGB color components on a scale from 1 to 255, with 1 being black and 255 being white. If the threshold is set to 125, all colors above 125 will be converted to white and below to black. Move the slider to clear the noise and enhance the contour.
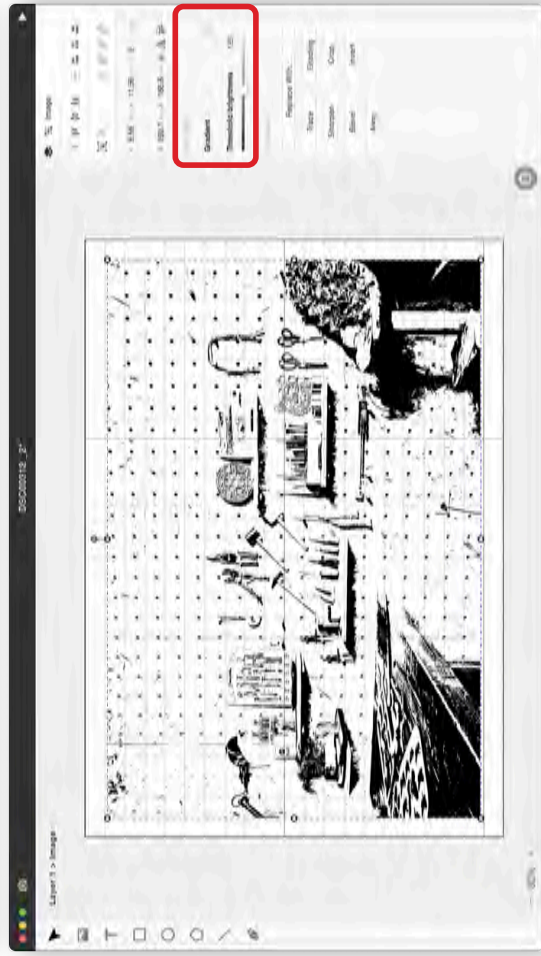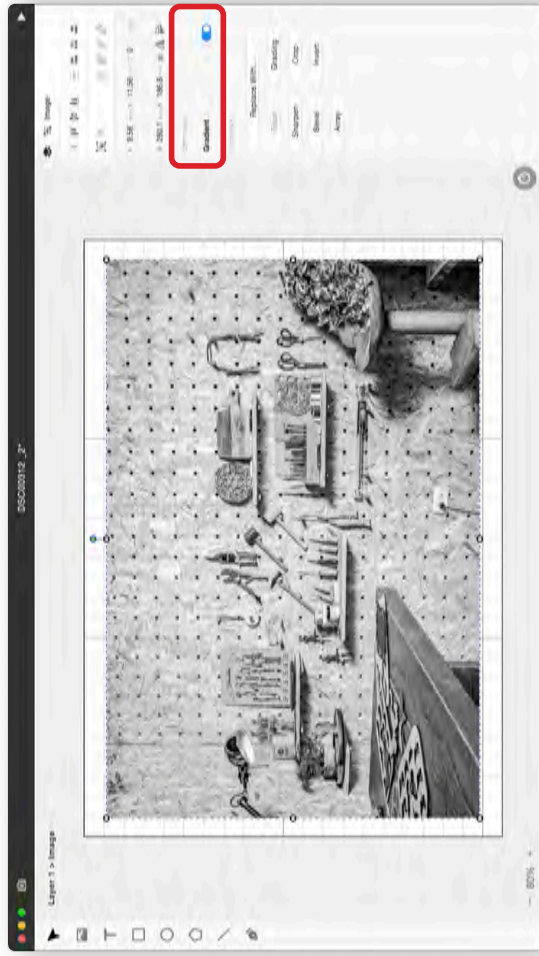
Font Arial Narrow ▼   **Font**

Apply any fonts installed in the operating system to a Text.

Style Regular ▼   **Style**

Different font-styles are available with different font installed in the operating system, as bold, Italics, etc.

Size 100 px   **Size**

Set the Text size.

Letter spacing 100 px   **Letter spacing**

Set the space between letters.

Line spacing 0 em   **Line spacing**

Set the space between adjacent lines of type.

Vertical text 🔵   **Vertical text**

Create vertical scripts.
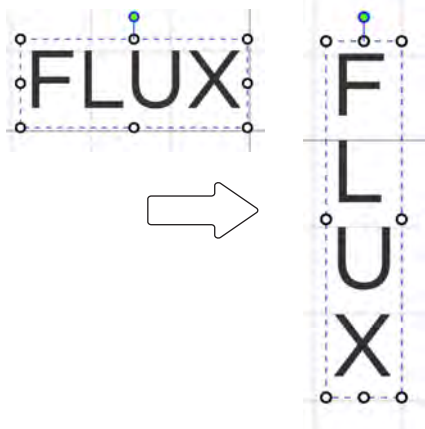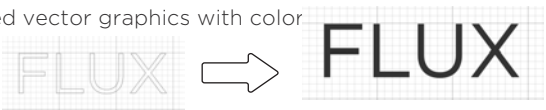
Rounded corner 0 mm   **Rounded corner**

Round the corners of a Rectangle.
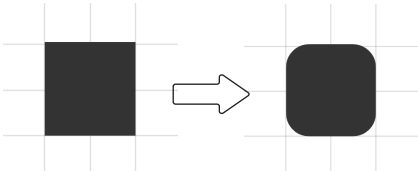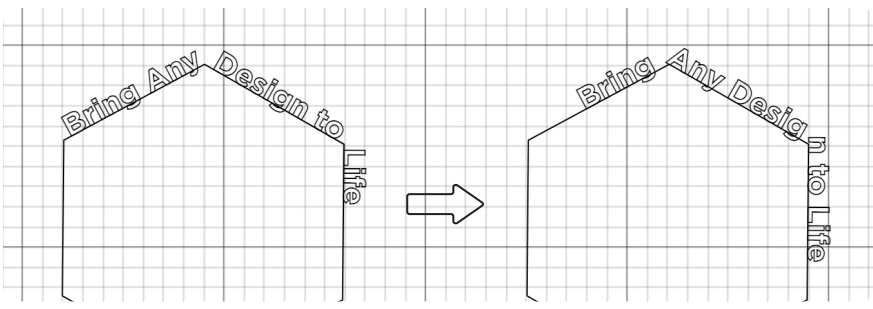
Infill 🔵   **Infill**

Fill the blank areas of texts or closed vector graphics with color, often used for engraving.

FLUX ⇒ **FLUX**
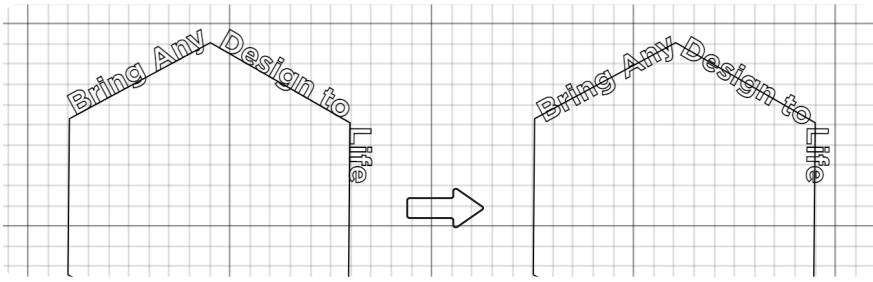
Text Offset   5   **Text Offset**

Set the start point of the text on the path of "Text on Path".

Bring Any Design to Life ⇒ *Bring Any Design to Life*

Alignment Middle Align   ▼   **Alignment**

Decide the alignment of the text bounding and the path in the vertical direction of "Text on Path".

Bring Any Design to Life ⇒ *Bring Any Design to Life*

Text Infill ⬤ **Text Infill**

Fill the blank areas of texts of "Text on Path" with color.
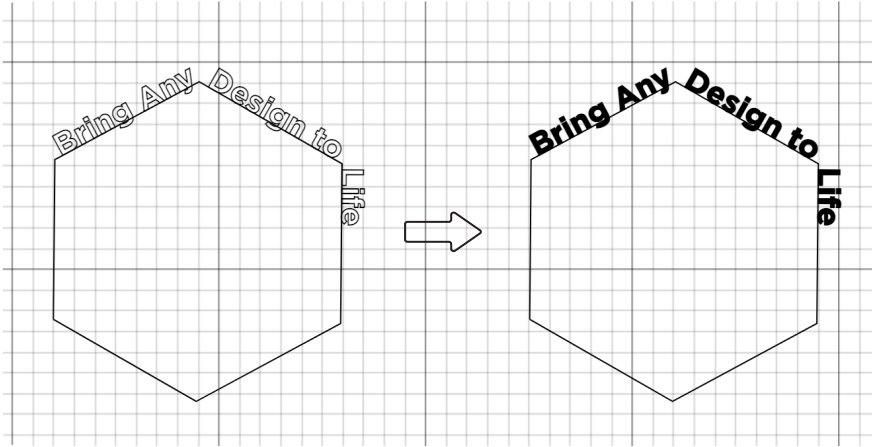
Path Infill ⬤ **Path Infill**

Fill the blank areas of paths of "Text on Path" with color.

OPTIONS					
Tool / Funtction	Image	Text	Rectangle	Oval	Polygon
Gradient	◯	✕	✕	✕	✕
Threshold brightness	◯	✕	✕	✕	✕
Rounded corner	✕	✕	◯	✕	✕
Font	✕	◯	✕	✕	✕
Style	✕	◯	✕	✕	✕
Size	✕	◯	✕	✕	✕
Letter spacing	✕	◯	✕	✕	✕
Line spacing	✕	◯	✕	✕	✕
Vertical text	✕	◯	✕	✕	✕
Infill	✕	◯	◯	◯	◯
Text Offset	✕	✕	✕	✕	✕
Alignment	✕	✕	✕	✕	✕
Text Infill	✕	✕	✕	✕	✕
Path Infill	✕	✕	✕	✕	✕

OPTIONS				
Tool Funtction	**Line**	**Pen (Path)**	**Multiple Objects**	**Text on Path**
Gradient	✕	✕	✕	✕
Threshold brightness	✕	✕	✕	✕
Rounded corner	✕	✕	✕	✕
Font	✕	✕	✕	◯
Style	✕	✕	✕	◯
Size	✕	✕	✕	◯ *
Letter spacing	✕	✕	✕	◯
Line spacing	✕	✕	✕	✕
Vertical text	✕	✕	✕	✕
Infill	✕	△	△	✕
Text Offset	✕	✕	✕	◯
Alignment	✕	✕	✕	◯
Text Infill	✕	✕	✕	◯
Path Infill	✕	✕	✕	△

△ : **Infill of Pen :** When the pen path is a closed vector graphics, Infill function can be performed.
Infill of Multiple Objects : When the selected objects do not contain an image and there are more than 2 drawn closed vector graphics, you can select multiple objects at the same time and perform the Infill function.
Delete Multiple Objects at the same time : Delete after selecting multiple objects.
Path Infill of Text on Path : When the path of Text on Path is a closed vector graphics, Path Infill can be performed.

* : **Size of Text on Path :** The size of text of Text on Path can only adjusted by setting a size value but not dragging the control points on corners of the text bounding.

ACTIONS：

Replace With...

Change an image to a new selected image from the computer file.
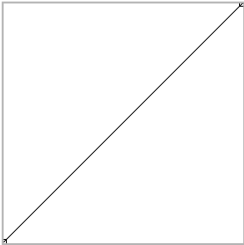
Trace

Convert a binary image to a vector path. The more complex the pattern, the longer the conversion time.

Grading

Adjust image brightness and contrast. Tap the middle of a line segment to create an adjustment point.

Curve

Crop

Remove unwanted content. Drag any edge of the crop box to adjust its size.

Sharpen

Sharpness : Enhance the edge contrast of an image in an attempt to improve its acutance.
Radius : If Sharpness has a value, you can move the slider to remove noises.

Sharpen

Sharpness ●————— 0

Radius ●————— 1

Convert to Path

Convert a Text to paths for editing.

Decompose

Discontinuous paths are "single" paths made up of a Pen, or several closed vector graphics being processed by Union, Subtract, Intersect, or Difference. Decompose is to dissolve a single discontinuous path into multiple paths.

Invert

Reverse the color of an image, such as negative effect. When engraving transparent materials (such as acrylic), Invert is usually needed to be turned on.

Bevel

Create a blurred grayscale gradient for edges of bitmap graphics. Bevel is often used to smooth out engraving depth differences.

Array

Copy a large number of objects. The number of rows (horizontal direction), the number of columns (vertical direction), and the object spacing (The spacing is the distance between centers of two objects.

Create Grid Array

Array Dimension	1 X 1

Cols. 1

Rows 1

Array Interval	0, 0 mm

X 0.00 mm

Y 0.00 mm

Offset

Create concentric objects at a custom distance inward or outward.

Offset

Offset Direction	Outward

Outward ▼

Corner	Sharp

Sharp ▼

Offset Distance	5 mm

5.00 mm

Edit Path

Edit the path or adjust the node type.

Create Text on Path

Put a text design along a path.

Decompose Text on Path

Decompose a Text on Path into a Text and a Path.

ACTIONS					
Tool ／ Funtction	Image	Text	Rectangle	Oval	Polygon
Replace With...	◯	✕	✕	✕	✕
Trace	△	✕	✕	✕	✕
Grading	◯	✕	✕	✕	✕
Sharpen	◯	✕	✕	✕	✕
Crop	◯	✕	✕	✕	✕
Bevel	◯	✕	✕	✕	✕
Invert	◯	✕	✕	✕	✕
Array	◯	◯	◯	◯	◯
Convert to Path	✕	◯	◯	◯	◯
Offset	✕	✕	◯	◯	◯
Decompose	✕	✕	✕	✕	✕
Edit Path	✕	✕	✕	✕	✕
Create Text on Path	✕	✕	✕	✕	✕
Decompose Text on Path	✕	✕	✕	✕	✕

△ **: Trace of Image :** Only binary images can be converted to vector paths (one at a time). Grayscale images are not allowed to do Trace.

ACTIONS

Tool / Funtction	Line	Pen (Path)	Multiple Objects	Text on Path
Replace With...	✕	✕	✕	✕
Trace	✕	✕	✕	✕
Grading	✕	✕	✕	✕
Sharpen	✕	✕	✕	✕
Crop	✕	✕	✕	✕
Bevel	✕	✕	✕	✕
Invert	✕	✕	✕	✕
Array	◯	◯	◯	◯
Convert to Path	◯	✕	✕	◯
Offset	◯	◯	△	✕
Decompose	✕	◯	✕	✕
Edit Path	✕	◯	✕	◯
Create Text on Path	✕	✕	△	✕
Decompose Text on Path	✕	✕	✕	◯

△ : **Offset of Multiple Objects :** When the selected objects do not contain an image or a Text, and there are more than 2 drawn objects, you can select multiple objects at the same time and perform the Offset function.
Text on Path of Multiple Objects : When a text and a path, Image or Text excluded, are selected at the same time, Create Text on Path can be performed.

C：Parameter Settings

Import

Import all engraving parameters stored in a .json file into the parameter list.

Export

Export all parameters as a single .json file.

Custom **Select parameters**

The suggested parameters for common materials can be found in the drop-down list.

Manage

Browse all parameters, and edit or delete customized parameters.
"Z STEP (mm)" : When performing multiple cuts of the same path for a single layer ("EXECUTE" > 1), you can set the descending amount of the laser head for each execution to cut thicker materials. This setting is only available for autofocus add-on.

Add current parameters

Name the current parameter and save it to the parameter list.

Power (%) : the percentage of laser output power.
Speed (mm/s) : the number of millimeters per second the laser head moves.
Execute (times) : the number of times a single layer is executed for the same job.

Since there are various materials, for the first time, you can choose the built-in parameters to observe the engraving results and then fine-tune them to achieve the desired effect.
It is recommended that the power setting be less than 70% to reduce laser tube consumption.
The decline of laser tube caused by usage and time is normal, and the parameters should be adjusted according to the situation.

D：Working Interface

The center of the window is the area for importing images or drawing objects. Note that objects should be placed in the area to proceed the task.

> **— 100% +**   Zoom in or zoom out the working interface

E：Menu

The menu will explain the frequently used functions in each tab.

🍎 Beam Studio   File   Edit   View   Machines   Window   Help

Beam Studio - About Beam Studio, Preferences ...

Preferences : Modify default settings such as language, machine IP address, and add-on.

File - Open, Save, Save As, Examples, Export To ...

Examples : Use examples, including different files and material engraving tests (different power speed combinations to find out the suitable parameters for new materials).
Export : Export files to several formats, including BVG, SVG, PNG, JPG, FLUX task. Detailed information is explained in this chapter on file formats.

Edit - Optimize, Document Settings, Clear Scene ...

Optimize : Optimize the object arrangement, so that the engraving material can be used more effectively.
Document Settings : Adjust the engraving resolution, working area (select the model), and add-on switch.

View - Show Grids, Use Layer Color ...

Show Grids : Display the grids in the working interface.
Use Layer Color : Show the layer color on objects in that layer.

Machines - Test Network Settings, Calibrate Camera for machines connected to this network, Update Firmware ...

Test Network Settings : Check the quality of the network connection between the computer and the target machine.
Update Firmware : Download the firmware from the official website and save it on the computer, then change the machine firmware to the selected version by selecting the firmware file on the computer. Note: It takes a few minutes to upgrade the firmware, so do not turn off the machine in the middle of the process.

Window

This is the default menu for Mac systems; Windows and Linux Ubuntu do not have this option.

Help - Show Start Tutorials, Bug Report, Debug Tool ...

Bug Report : Export a bug report after an error is encountered. Please mind that the software cannot be reorganized or shut down before exporting a bug report. Customer Service guides the export of bug report files to troubleshoot Beam Studio errors.
Debug Tool : An interface for developers to debug software issues.

CH 3-2
Four Creation Techniques

This section contains Beam Studio creation, Import Image, Smart Trace, and mass production operation steps.

Beam Studio is designed for FLUX laser engraving machines, which can effectively interface with other professional design software
(see Appendix II 2-1 Design Software Recommendations) for laser engraving; if there are more complex objects and shapes to be engraved, it is recommended to use the method of Import Image, and after importing the drawings, final layout and parameter settings are made in Beam Studio.

01.
Beam Studio creation

Draw objects

Set layers

02.
First editing of mass production project
(A fixture is needed for fixing the material positon)

Import Image

Adjust parameters (Threshold)

03.
Import Image (as AI or SVG)

First use the camera preview function, and then Trace Image

04.
Smart Trace

Place artworks in the working area
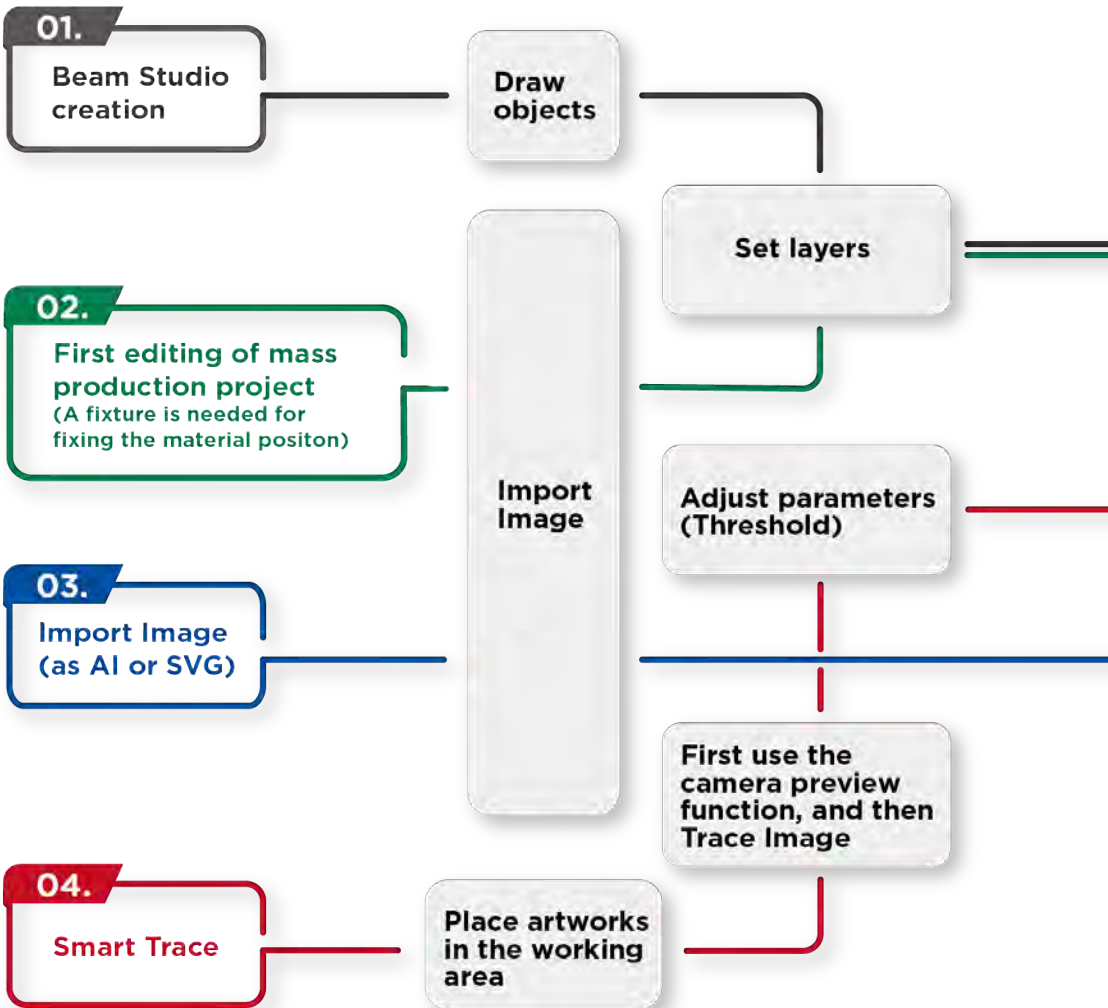
When previewing the Smart Trace image, make sure the least amount of preview is done to avoid the misalignment of the image caused by stitching. If the tracing image is small, you can click the center of the image to place it in one camera preview screen when previewing.

After confirming the position of the fixture and objects in the first editing of mass production project, FLUX task can be exported to the USB flash drive. In the future, you only need to insert the USB flash drive into the machine, focus on the engraving material on the fixture, and then click "START" page to select the file and directly start the engraving job.

Set the parameters	Place the engraving material and adjust the focus	First use the camera preview function, and then Trace Image	Export To FLUX task
			Save the file in a USB flash drive
			Plug the USB flash drive into a USB port in the back of the machine
			Get into the "START" page for the saved file
		Deliver the task	Start to work
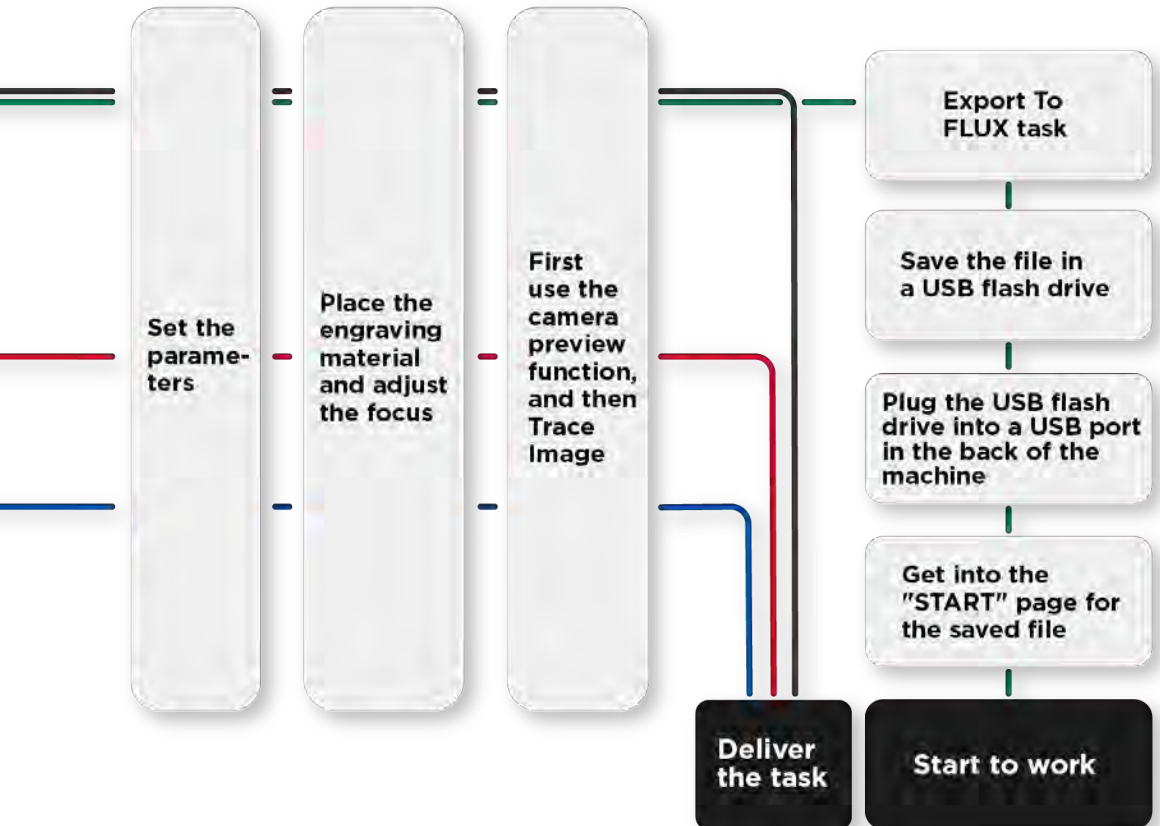
File Formats

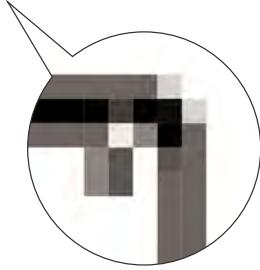There are two main types of digital image files, bitmap files and vector files.

1 Bitmap Graphics

2 Vector Graphics

Bitmap is an image type that consist of numerous square pixels. Bitmap files are rich in details which are mostly suitable for photography or digital applications. However, the quality is related to the resolution so the image can get jagged or blurry when resized.

Vector images are composed of paths defined by multiple points and are especially suitable for logos and font layout. For each path, curve, or shape has its own formula, and can therefore be resized without affecting the graphic quality.

Suitable for infill engraving	Suitable for outline engraving and cutting
Long working time	Short working time
Complete image quality	Clear contour
JPG / PNG are commonly used bitmap format	AI / PDF / SVG are commonly used vector format

It is essential to use the vector format when cutting. The next page will contain a table explaining the file type of import image and the file type of saving, etc. There is also an overview of the layer layering method and the engraving resolution.

File import and export formats :

Content		BVG	SVG	PNG	JPG	DXF	AI	PDF
Layering Style	Layer	○ (as the original file settings)	✗	✗	✗	✗	✗	✗
	Color	○	✗	✗	✗	✗	○	○
	Single Layer	○	✗	✗	✗	○	○	○
Scale Setting		✗	✗	✗	✗	○	✗	✗
Vector — Bitmap		○	○	✗ ○	✗ ○	○ ✗	○	○
Options	Gradient	△	△	○	○	✗	△	△
	Threshold brightness	△	△	○	○	✗	△	△
Saving Condition		as the editing condition	separate vectors and bitmaps into different layers	Bitmap	Bitmap	N/A	N/A	N/A
Export To		BVG / SVG / PNG / JPG / FLUX task *						
Save As		.beam						

.bvg / FLUX file (.fc) / .beam is a special file format saved by Beam Studio. If a file contains a bitmap, the software will export it to the bitmap preview quality in a .bvg file, while saving it as a .beam file will preserve the original image resolution.

*FLUX work : .fc file. .fc file is a machine-readable file that saves the software values as object layout, power, etc. This file format cannot be reimported into Beam Studio for editing and is often used for mass production work using fixture positioning.

File type of reimport file						
Things kept after import	BVG	SVG	PNG	JPG	FLUX task*	.beam
Bitmaps of original resolutions	✕	✕	✕	✕	✕	◯
Object	◯	◯	✕	✕	✕	◯
Object size	◯	◯	◯	◯	✕	◯
Layer Settings	◯	✕	✕	✕	✕	◯
Parameter Settings (Power, Speed)	◯	✕	✕	✕	✕	◯

Layering : You can set the layering style by "Layer", "Color", or "Single Layer" when importing SVG files in Beam Studio.
1. **Layer :** If you have set up layers in external software, you can choose this layering method.
2. **Color :** If there are objects of different colors in the file, you can choose this layering method, and the software will create layers according to different colors.
3. **Single Layer :** If there is no need to set different power and speed, you can choose Single Layer, and the software will merge all layers into a single layer.

Engraving Resolution : In Beam Studio, you can set the engraving resolution, i.e., engraving fineness, from low to high, at 100, 250, 500 and 1000 DPI by menu > Edit > Document Settings. High resolution engraving result can show more details but take longer time, on the contrary, low resolution engraving result is simpler but takes less time to complete. It is recommended to choose the suitable engraving resolution according to the creation needs and time consideration.
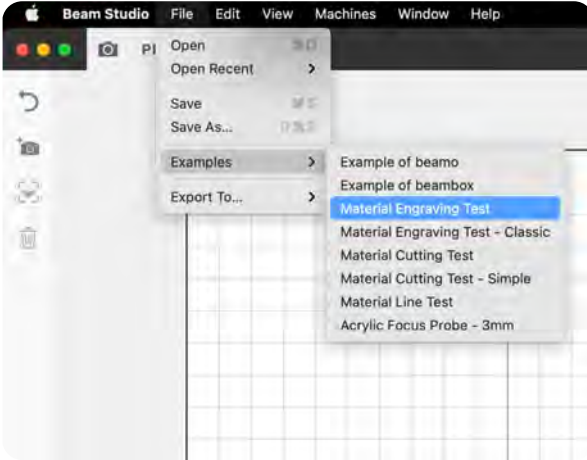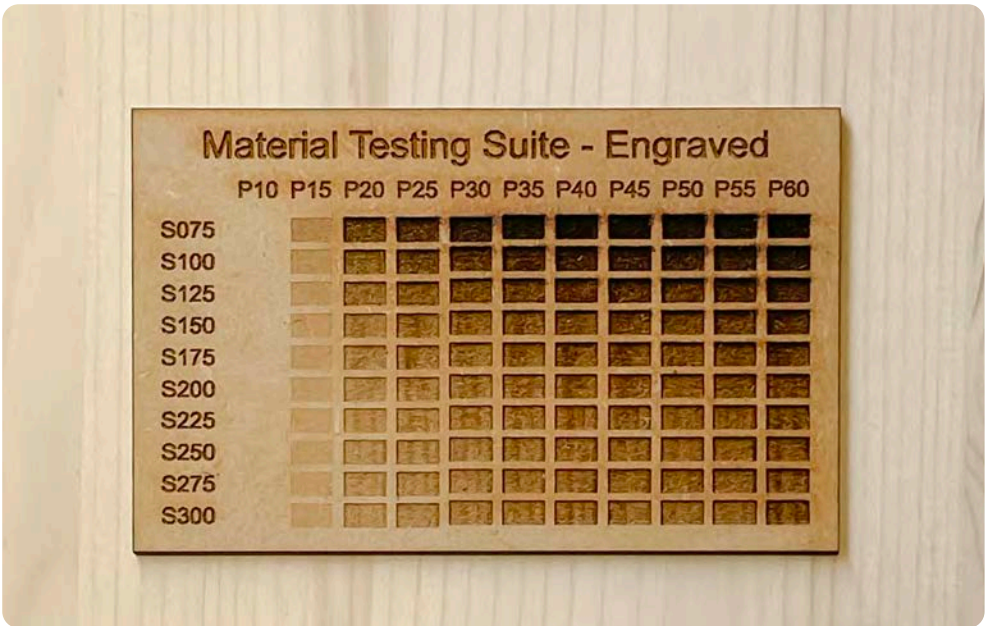
CH 4
Material Tips

CH 4-1
New Materials Testing

Try different combinations of speed (S: Speed) and power (P: Power) to find appropriate parameters for materials you have not worked with before. Sample test files can be imported through "Menu > File > Samples > Material Engraving Test. Test files are available for both engraving and cutting.

Use of the engraving or cutting sample file is not recommended with thin material (thickness less than 0.5 mm) due to the potential for excessive burning resulting in oversized engraving or cutting openings; begin manual testing of such materials with high speed and low power (e.g., P:15, S:300).

CH 4-2
Material Characteristics

In this chapter, we describe the characteristics, advantages, and disadvantages (and corresponding potential workarounds) of 8 types of materials and include a comparison of materials of equal thickness.

1. Wood - Fiberboard, also known as medium density fiberboard (MDF)

Glued and pressed wood fiber

Material	Suitability	Photo
New Zealand MDF	◯	

Advantages	Disadvantages
1. Good material stability, easy to cut 2. Low level of surface embossing impurities	Lower density than Asian dense board

Note
To reduce the risk of health hazards, use low formaldehyde fiberboard

Material	Suitability	Photo
Asia MDF	△	

Advantages	Disadvantages
Low price	1. Suitable only for engraving, not easy to cut 2. Engraving produces a relatively highlevel of black dust

Note
To reduce the risk of health hazards, use low formaldehyde fiberboard.

1. Wood - Plywood

Overall: Exterior : solid wood / Interior: glued and pressed wood fiber.

Material	Suitability	Photo
Teak plywood	⭕	

Advantages	Disadvantages
Beautiful engineered material	Cutting requires higher power

Note
To reduce the risk of health hazards, use low formaldehyde fiberboard

Material	Suitability	Photo
Poplar plywood	⭕	

Advantages	Disadvantages
1. Resistant to cracking and warping, fine grain, easy to work with 2. Light white, straight grain 3. Light-weight material, suitable for crafts and as children's toys 4. Engraves easily with even color after engraving, edges are not easily scorched or broken	Engraving results are slightly blurry due to lower material density

Note
To reduce the risk of health hazards, use low formaldehyde fiberboard.

Material	Suitability	Photo
Basswood plywood	⭕	

Advantages	Disadvantages
1. Resistant to cracking and warping, tough, fine grain, easy to work with 2. Creamy white, fine and straight grain 3. Smooth surface obtainable by sanding, staining, and polishing	Engraving results are slightly blurry due to lower material density

Note
To reduce the risk of health hazards, use low formaldehyde fiberboard

Material	Suitability	Photo
Plain plywood	⭕	

Advantages	Disadvantages
1. More complex material, harder texture, less likely to split when cut 2. Used for building construction or crafts	Texture quality is poor, slightly rough

Note
To reduce the risk of health hazards, use low formaldehyde fiberboard

Material	Suitability	Photo
Walnut plywood	◯	

Advantages	Disadvantages
1. Resistant to cracking and warping, tough, fine grain, easy to work with 2. Coffee color, fine and straight grain of different shades. 3. Smooth surface obtainable by sanding, staining, and polishing	Dark wood color makes engraving effect less apparent

Note
To reduce the risk of health hazards, use low formaldehyde fiberboard

1. Wood - Solid Wood

Natural, healthy, non-toxic, eco-friendly.

Material	Suitability	Photo
Solid wood	◯	

Advantages	Disadvantages
Naturally varying grain characteristics	Depth of engraving may be uneven due to growth rings

Note
Growth rings are naturally uneven in wood density

⚠ **Common Problems with Wood :**

Problem	Solution	Possible Drawback
Uneven	1. To deepen the color: lower the speed 2. To deepen the cutting depth : increase the power	1. Larger burn marks 2. Decreased precision and distorted proportions
Engraving Burn Marks	Before processing 1. Cover the surface of the engraving material with paper tape 2. Slightly moisten the wood After processing 1. Remove the burn marks with sandpaper	Before processing 1. Tape residue 2. Bumps on the surface After processing 1. Scratch marks
Cutting Burn Marks	1. Use lower-density wood 2. Clean with a small amount of alcohol	1. Moisture may warp the wood 2. Excessive alcohol causestar to penetrate into the wood

2. Leather - Synthetic Leather

Base layer: mostly woven fabric; adhesive layer; resin layer : PU and PVC, etc.

Material	Suitability	Photo
Polyurethane (PU)	⚠	
Advantages	**Disadvantages**	
1. Base cloth: PU looks much thicker than PVC from the side 2. Texture: PU feels softer than PVC	–	
Note		
Incomplete burning will produce toxic fumes		

Material	Suitability	Photo
Polyvinyl chloride (PVC)	✕	

Advantages	Disadvantages
–	Engraving produces corrosive gas which causes the screws in the machine to rust

Note
Hazardous materials

2. Leather - Genuine Leather

Supple, soft, malleable

Material	Suitability	Photo
Vegetable tanned leather	◯	

Advantages	Disadvantages
Natural color, absorbs oil, moist, firm	–

Note
–

Material	Suitability	Photo
Chrome tanned leather	✕	

Advantages	Disadvantages
Malleable, water and stain resistant, does not easily fade	–

Note
Burning produces toxic gas, not suitable for laser processing

⚠ **Common Problems with Leather**

Problem	Solution	Possible Drawback
Scorching and curling	Wet the whole piece of leather before processing	Leather wrinkles after drying
Heavy smell from laser	Use air purifier in work space	Air filter foam sheet is consumable

3. Acrylic - Acrylic, also known as polymethyl methacrylate (PMMA), plexiglass

Strong, tough, durable

Material	Suitability	Photo
Acrylic	⬤	
Advantages	**Disadvantages**	
No burn marks	Produces dust during processing	
Note		
Make sure that the material is not plastic (PVC, PC)		

⚠️ **Common Problems with Acrylic**

Problem	Solution	Possible Drawback
Scratches	After processing Use plastic-specific abrasive to remove	May only be able to remove shallow scratches
Cloudyiness	1. Keep the protective film on when not engraving gradient images 2. Clean with a small amount of alcohol	Using too much alcohol with some acrylics may cause surface defects, such as cracks. But gently heating acrylic in an oven may help repair minor cracks.
Explosive sounds when cut	Some acrylics contain high levels of impurities; use better quality acrylics.	Big price difference between highest- and lower-grade acrylics.

4. Paper - White Paper

Widely available

Material	Suitability	Photo
White paper	🟢	
Advantages	**Disadvantages**	
Widely available	Warps when burnt at high temperature; make sure the position of the paper is fixed	
Note		
–		

4. Paper - Corrugated Cardboard

Cheap, structurally strong, suitable for three-dimensional art pieces

Material	Suitability	Photo
Corrugated cardboard	🟢	
Advantages	**Disadvantages**	
Easy to obtain, does not require high power to process, suitable for structural works	Uneven surface, make sure focus is accurate	
Note		
Higher power settings may cause fire hazard		

⚠️ **Common Problems with Paper**

Problem	Solution	Possible Drawback
Yellowish carbonized burn edges	Before processing Paper material impacts the amount and color of the ashes; use paper with PP material. After processing Use low-viscosity material such as multi-purpose putty to remove the residue.	–
corrugated cardboard burns	Before processing Slightly moisten the corrugated	Cardboard deforms more easily (surface is uneven)

5. Glass

Material	Suitability	Photo
Glass	🟢	

Advantages	Disadvantages
Easy to obtain, e.g. beverage bottles	Chips easily during processing, engraving results may vary depending on glass material

Note
1. For your safety, clean engraved glass with a brush instead of with bare hands 2. Leaded glass is not suitable for laser processing because glass may shatter

⚠️ **Common Problems with Glass**
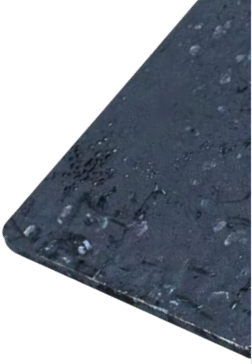
Problem	Solution	Possible Drawback
Crackin	1. Choose thicker glass 2. Reduce power	Laser processing of some glass materials will result in cracking. This is due to material characteristics and cannot be avoided

6. Metal - Anodized Aluminum Alloy Surface

Wear-resistant and textured

Material	Suitability	Photo
Anodized aluminum alloy	◯	
Advantages	**Disadvantages**	
Obvious engraving effect with low power; no loss of color	Using too much power may produce blurry image or brown color	
Note		
–		

6. Metal - Spray - Coated Stainless Steell

Material	Suitability	Photo
Spray-coated stainless steel	◯	

Advantages	Disadvantages
Evenly applied spray-coating makes it easy to engrave stainless steel	The engraving result is not sharp and is only suitable for artwork and experimentation

Caution
1. Oxidize the stainless steel with FLUX Steel Engraving Spray before engraving 2 . Wear gloves when using the spray to avoid staining the skin

7. Other Engravable Materials - Stone

There are differences between artificial materials and natural materials, and textures vary.

Material	Suitability	Photo
Stone	◯	

Advantages	Disadvantages
Suitability for engraving depend on exact stone, shale and marble are more suitable	Engraving effect is usually not apparent on lighter-colored stone

Note
_

7. Other Engravable Materials - Cement

Material	Suitability	Photo
Cement	⭕	

Advantages	Disadvantages
Textures can be easily created on the cement surface	Particle size of cements will affect the overall engraving result

Note
–

7. Other Engravable Materials - EVA Foam

Lightweight and low density, commonly used in molds and cushioning materials

Material	Suitability	Photo
EVA foam	⭕	

Advantages	Disadvantages
Can be cut at extremely low power, low chance of burn marks	Due to flammability and pungent odor, good ventilation is required while engraving

Note
–

7. Other Engravable Materials - Cotton and Linen Fabrics

Material	Suitability	Photo
Cotton and linen fabrics	⭕	
Advantages	**Disadvantages**	
Can be engraved at low power	Due to flammability and pungent odor, good ventilation is required while engraving	
Caution		
—		

7. Other Engravable Materials - Silicone

Material	Suitability	Photo
Silicone	△	
Advantages	**Disadvantages**	
Eco-friendly, non-toxic	Instantly hardens when heated, and therefore not suitable for cutting; cut with scissors or blades	
Note		
Reflective mirrors must be cleaned more frequently to prevent dust from sticking to the mirrors and affecting the laser output		

⚠️ **Common Problems with Silicone**

Problem	Solution	Possible Drawback
Engraving is not visible	Increase power and repeat engraving	Image quality may be poorer
Incomplete cut	Cut with other tools, e.g., scissors, utility knife	Cuts may be uneven
Silicone is dusty after engraving	Clean with a toothbrush	Wear and tear of toothbrush

8. Hazardous Materials - Polyvinyl Chloride (PVC)
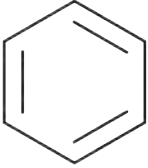
Usually appears as stickers, thin films, or transparent sheets

Material	Suitability	Photo
Polyvinyl chloride (PVC)	✗	
Advantages	**Disadvantages**	
–	Jagged melting marks on edges	
Note		
Burning generates carcinogens and corrosive gases hazardous to health		

PVC/V

8. Hazardous Materials - Acrylonitrile Butadiene Styrene (ABS)

Material		Suitability	Photo
Acrylonitrile butadiene styrene (ABS)		✗	
Advantages	**Disadvantages**		
–	–		7 OTHER
Note			
Carcinogenic substances may be generated when incompletely burned			

8. Hazardous Materials - Plastics with Chlorine, Benzene, Ammonia, Fluorine, Phenol, or Aldehyde in its Scientific Name or with a Hexagonal Benzene Ring in its Molecular Formula

Material		Suitability	Photo
Plastics with chlorine, benzene, ammonia, fluorine, phenol, or aldehyde in its scientific name or with a hexagonal benzene ring in its molecular formula		✗	
Advantages	**Disadvantages**		
–	–		
Note			
Burning will likely generate carcinogenic and toxic substances			
Examples of unsuitable resins :			Hexagonal Benzene Ring
1 PETE 3 PVC/V 6 PS 7 OTHER			

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⚠ **Non-material-specific Problems**

Problem	Solution	Possible Drawback
Laser reflects off material, e.g. glossy metals	Avoid using, except for spray oxidized stainless steel	_
Laser penetrates material and reflects off the honeycomb table	Elevate the material away from the honeycomb table to avoid burn marks on the material from laser reflections	_

Material Comparison Table

Materials are of equal thickness	Wood	Leather	Acrylic	Paper	Glass	Metal
Processing difficulty	Easy	Medium	Easy	Easy	Difficult	Difficult
Strength of smell	Medium	Strong	Strong	Weak	None	*Weak
Dustiness	Medium	Medium	High	High	Low	Low
Amount of tar	High	Medium	Low	Low	None	None
Gradient effect	〇	△	〇	〇	✕	✕

* : metallic dusty smell

⚠ The above comparisons are based on common materials.
Testing on your specific material may yield different results.

CH 5
Maintenance

CH 5-1
Maintenance

To facilitate maintenance and repair instructions, this section divides the machine into three general areas: the panel, the working area, and the back cover.

Maintenance of the machine according to the maintenance frequency can effectively reduce the chance of failure.

【Appendix 3】 Maintenance Checklist (p.245) provides maintenance record sheet for users to use.

Area	Maintenance Content	Maintenance Frequency
Panel	p.125 **MAINTENANCE page***	Once every 1 month
	p.129 **Screen cleaning**	Once every 2 weeks
Working Area	p.131 **Lubricatingt***	
	- Wood, Plywood	Once every 2 weeks
	- Acrylic	Once every 1 week
	- Leather	Once every 2 weeks
	- Paper	Once an operation day
	p.134 **Honeycomb table cleaning***	Once an operation
	p.136 **Chassis cleaning***	Once an operation
	p.138 **Mirrors and lens cleaning***	Once every 1~2 weeks
	p.144 **Optical path inspection***	When first unboxing, after laser tube replacement Once every 1 month
	p.146 **Optical path alignment**	Adjust when the optical path misaligned
	p.159 **Door cover cleaning**	Once every 2 weeks
Back Cover	p.161 **Laser tube replacement**	Depends on power, usage hours, room temperature, water temperature, etc.
	p.171 **Water changing and adding***	Once every 3 months
	p.178 **Ventilation fan cleaning**	Once every 1 month

* : Necessary maintenance

CH 5-2
Panel

The panel contains the machine interface and the components underneath.
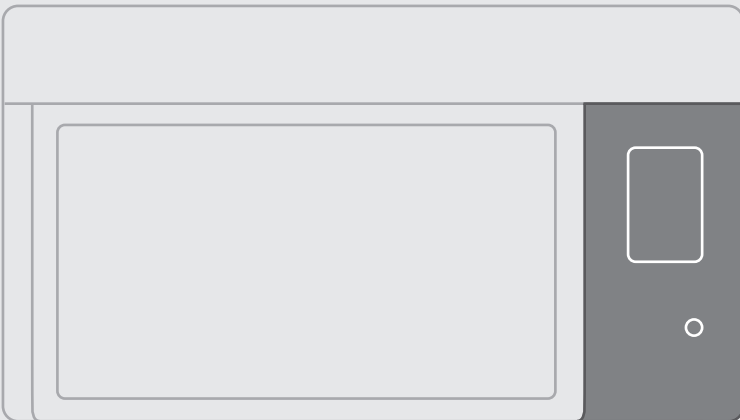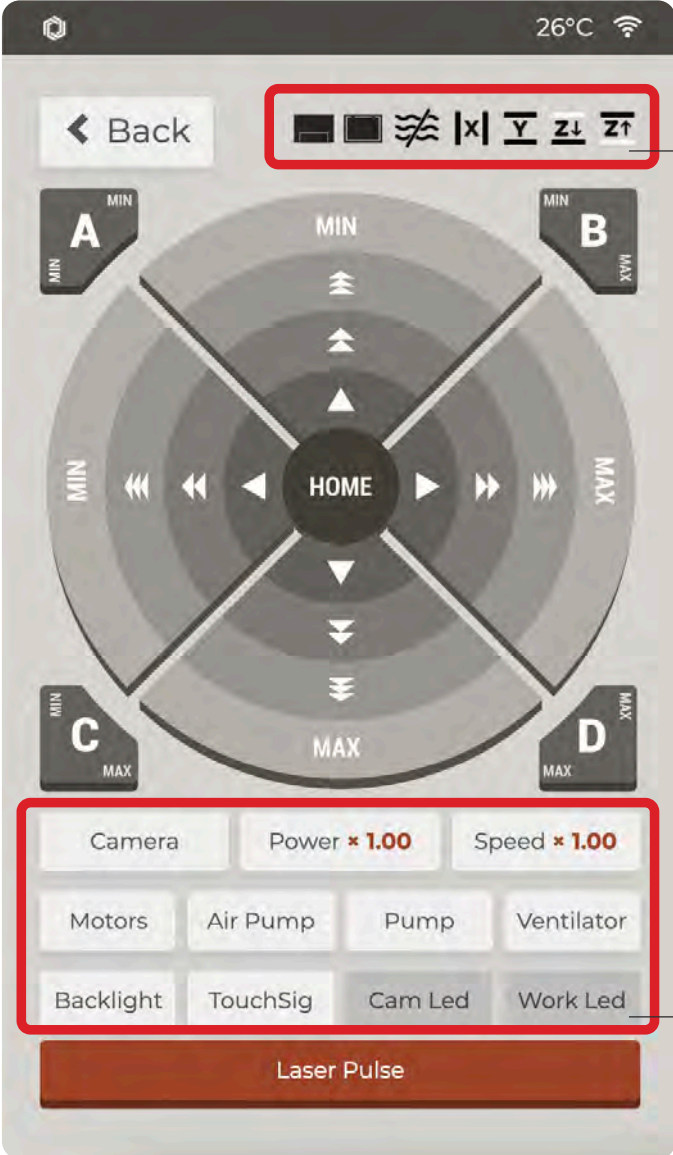
MAINTENANCE Page : **Function Test**	It is recommended to check once every 1 month.

Preparation Items : None

Maintenance Steps : After homing successfully, check the status display and switches except for the "Laser Pulse", and the standards are as follows

Status display

Switches

Status display	Test method	Icon		
Drawer	Open and close the drawer	Opened		Closed
Door cover	Open and close the door cover	Opened		Closed
Water pump	Press the "Pump" switch (start pump)	On		Off
X-axis limit switch	After pressing "Motors" to release the motors, move the laser head to the left-most side of the machine until hearing a clicking sound. (Trigger switch)	Triggered		Not triggered
Y-axis limit switch	After pressing "Motors" to release the motors, move the laser head to the back-most side of the machine until hearing a clicking sound. (Trigger switch)	Triggered		Not triggered
Z-axis bottom limit switch	Manually press the bottom limit switch in the lower right corner until hearing a clicking sound. (Trigger switch)	Triggered		Not triggered
Z-axis top limit switch	Manually press the top limit switch in the lower right corner until hearing a clicking sound. (Trigger switch)	Triggered		Not triggered
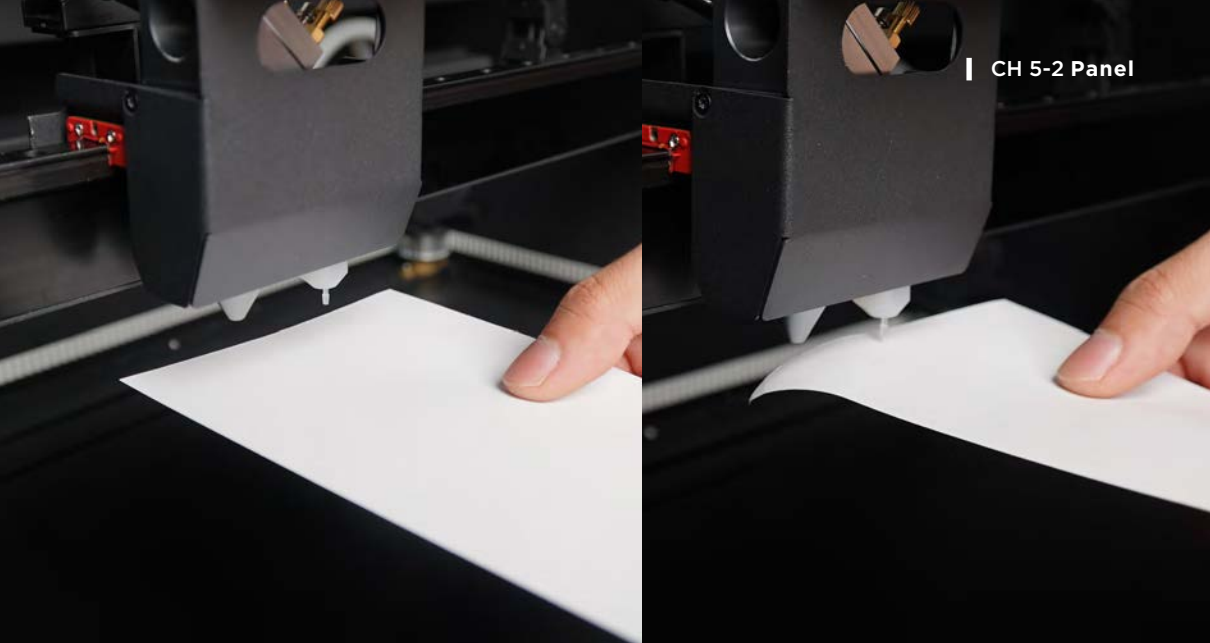
Switches :

- **Camera :** Check whether the camera view appears on the screen and move the laser head to observe whether the screen keeps changing with the camera movement. (Camera view is updated every 3 seconds)
- **Motors :** Check whether the laser head can move normally along the X-axis linear rail and Y-axis guiding rods.
- **Air Pump :** Check whether there is air coming out of the laser outlet with a piece of paper, as shown above.
- **Pump :** Open the door cover to check whether the blue light of the water pump is on (as shown below) and whether the water pump icon on the screen is 〰 .

Cam Led

Work Led

- **Ventilator :** After clicking, there will be a sound of acceleration and rotation, like the sound of aircraft taking off.
- **Backlight :** The screen will turn black and then light up after clicking.
- **TouchSig :** The screen will be untouchable for 3 seconds after clicking.
- **Cam Led :** The light next to the camera, check if it can be normally illuminated, as shown below.
- **Work Led :** At the front side and back side of the chassis, check if the light can be normally illuminated, as shown below.

If there is any abnormality, please go to 【Troubleshooting】(p.183) to find the solution.

Screen Cleaning

It is recommended to check once every 2 weeks.

Maintenance Steps : If the screen is dirty, spray a small amount of alcohol on a cleaning cloth and wipe the screen lightly.

Preparation Items : Self-preparation : 1 | 75%~99% alcohol, 2 | Cleaning cloth

CH 5-3
Working Area

The working area includes the working range and the laser optical path.
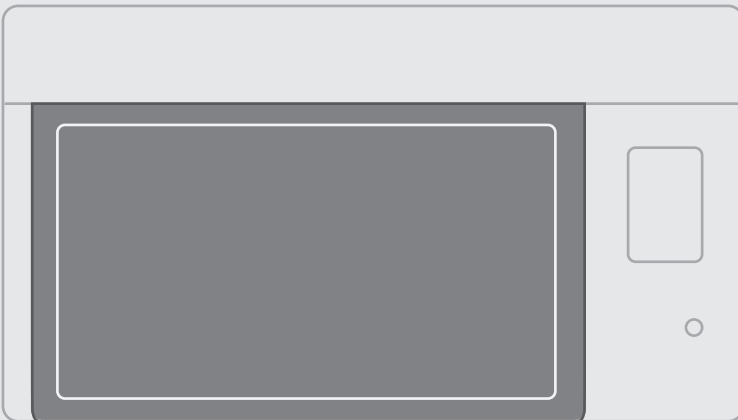
Lubricating

It is recommended to clean and re-lubricate once every 1 - 2 weeks.

Maintenance Steps : Clean the Y-axis guiding rods, X-axis linear rail and 4 lead screws regularly to extend the service life of the parts.

Preparation Items : Self-Preparation : 1 | Paper towel or tissue paper, 2 | Cotton swab or brush Included in the accessory box : 3 | Lubricating oil

1

2

3

1. Cleaning : Use paper towel or tissue paper to wipe the oil and dust on the Y-axis guiding rods, X-axis linear rail and 4 lead screws.

1. Y-axis guiding rods
2. X-axis linear rail
3. 4 lead screws (p.133 bottom)
4. Height adjustment button (p.133 bottom)

Lubricating position

Lubricating position

X-axis linear rail detail
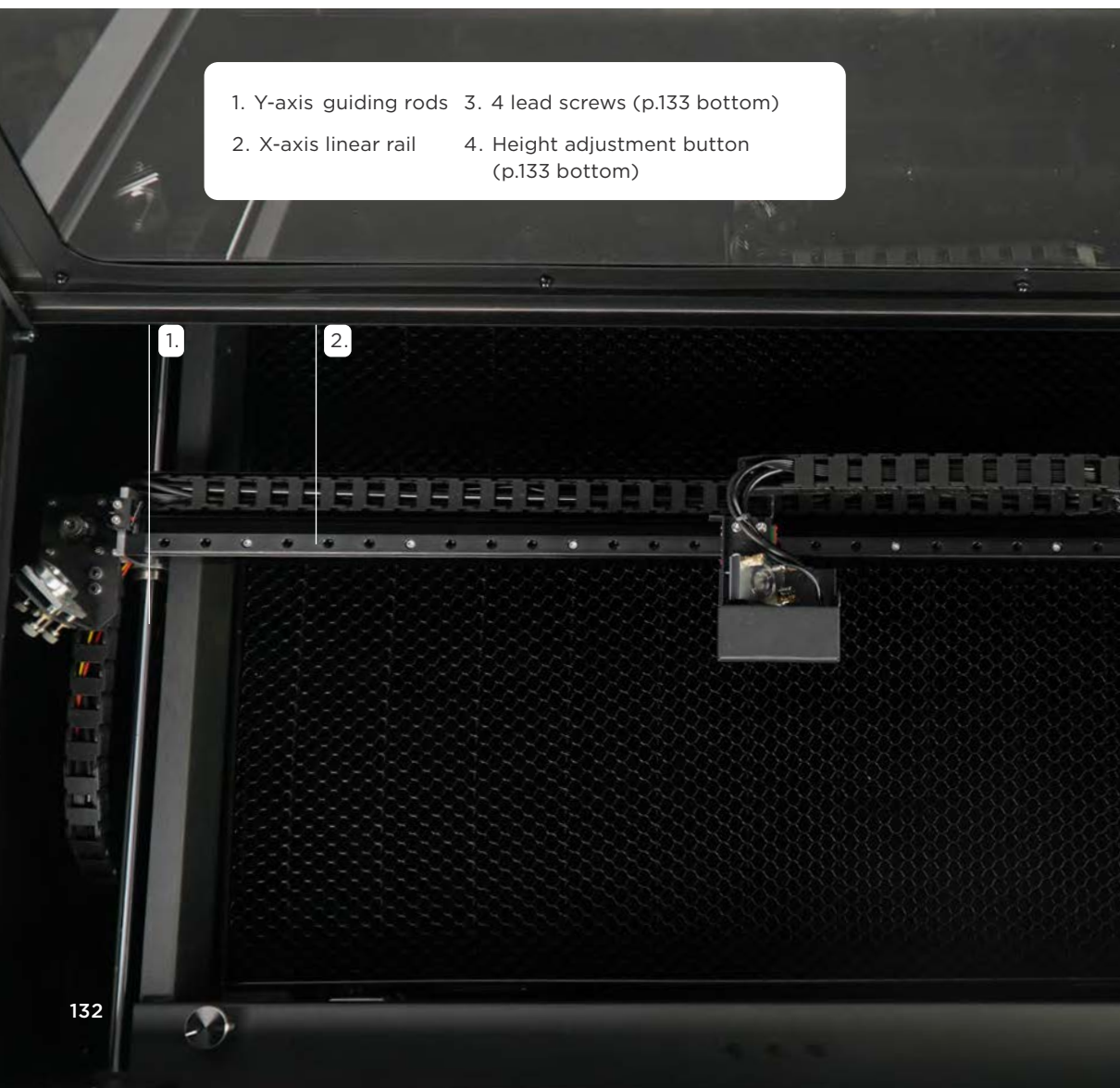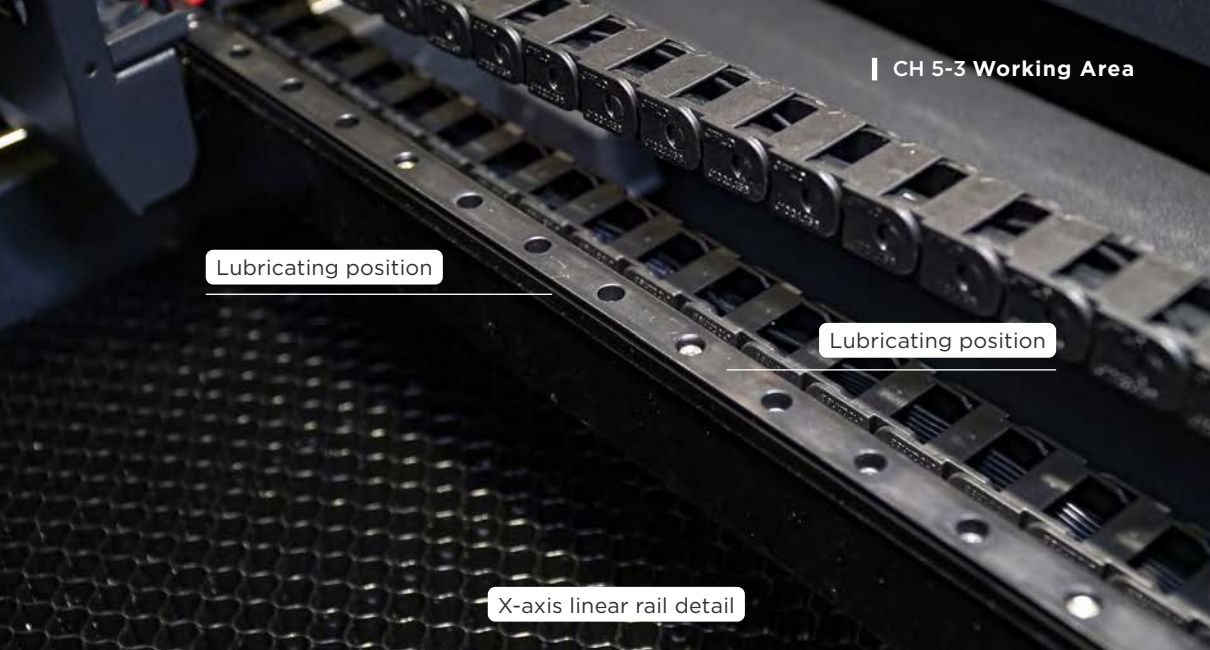
2. Oiling : Dip cotton swab or brush in the lubricating oil >

- **Y-axis guiding rods and X-axis linear rail :** Use at the Y-axis guiding rods on both sides of the working range > Apply evenly above and on both sides of the X-axis linear rail > Manually move the laser head left and right and forwards and backwards 3 - 5 times to distribute the lubricating oil evenly.
- **Lead screws :** Apply at the surface of the lead screws > Press the "Up" button and the "Down" button to elevate and lower the honeycomb table once to distribute the lubri cating oil evenly.

3.

3.

AF

4.

3.

3.

133

	Honeycomb **Table Cleaning**	It is recommended to clean it once an operation.

Notes : To avoid the possible fire hazard due to the left of small pieces of engraving materials on or beneath the honeybomb table, it is recommended to clean the honeycomb table right after use.

Preparation Items : Self-preparation : 1 | Vacuum cleaner or brush, 2 | Paper towel or tissue paper, 3 | Air conditioner coil foaming cleaner

1 _____   2 _____   3 _____

- **The mesh part of the honeycomb table is relatively sharp, so please be careful when holding.**
- **Perform a 2-second press on the "Autofocus" button to do the Z-axis homing to avoid hitting the probe while taking out the honeycomb table.**
- **If the laser head cannot be moved, please click "MAINTENANCE" on the screen > "Motors" to release the motors.**

Maintenance Steps:

1. **Take the honeycomb table out :** Move the laser head to the upper right of the working range > Press on the "Autofocus" button for 2 seconds to do the Z-axis homing > Lift up the honeycomb table handles, hold the two sides of the honeycomb table, and pull it out.
2. **Clean the honeycomb table :** Use a vacuum cleaner or brush to clean the large residue and dust > Spray the honeycomb table with the air conditioner coil foaming cleaner > Wait for the tar oil to soften, then wipe it with paper towel or tissue paper to remove the tar.
3. **Put the honeycomb table back :** Place the honeycomb table at a 45-degree angle into the chassis and lay it flat.
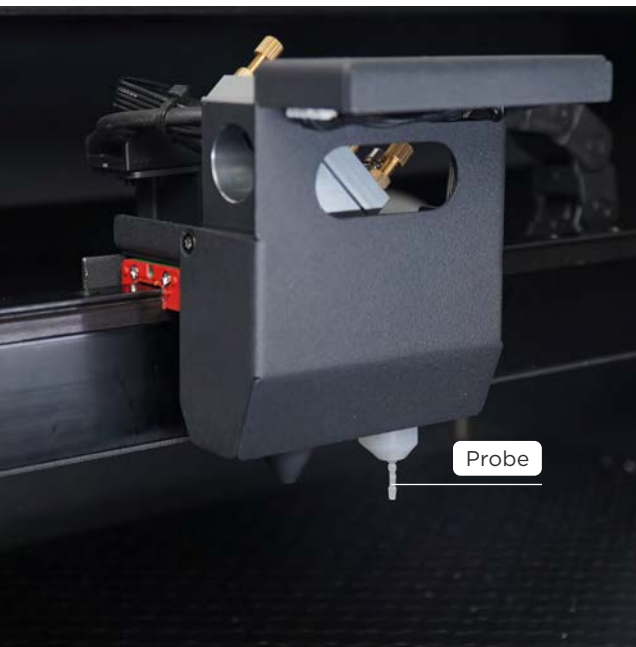
Height adjustment button

Probe
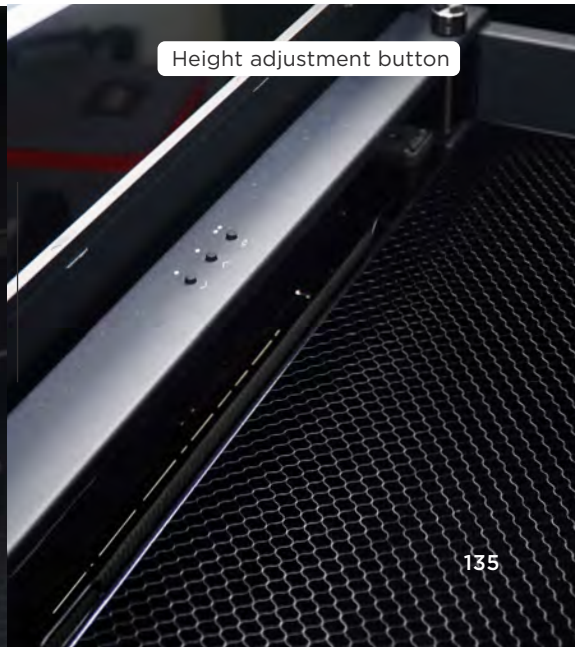
| | **Chassis Cleaning** | It is recommended to clean it once an operation. |

Notes : To avoid the possible fire hazard due to the left of small pieces of engraving materials on or beneath the honeybomb table, it is recommended to clean the chassis right after use.

Preparation Items : Self-preparation : 1 | Vacuum cleaner or brush, 2 | 75%~99% alcohol, 3 | Paper towel or tissue paper.

1 _____   2 _____   3 _____

- **The mesh part of the honeycomb table is relatively sharp, so please be careful when holding.**
- **Perform a 2-second press on the "Autofocus" button to do the Z-axis homing to avoid hitting the probe while taking out the honeycomb table.**
- **If the laser head cannot be moved, please click "MAINTENANCE" on the screen > "Motors" to release the motors.**

Maintenance Steps:

1. **Take the honeycomb table out :** Move the laser head to the upper right of the working range > Press on the "Autofocus" button for 2 seconds to do the Z-axis homing > Lift up the honeycomb table handles, hold the two sides of the honeycomb table, and pull it out.
2. **Clean the chassis :** Use a vacuum cleaner or brush to clean the large residue and dust, or gather them on the drawer, then open the drawer from the outside or push it out from the inside of the chassis for cleaning.
3. **Put the honeycomb table back :** Place the honeycomb table at a 45-degree angle into the chassis and lay it flat.

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Mirrors and Lens Cleaning

Depending on the frequency of usage and material, it is recommended to clean the mirrors and lens once every 1 - 2 weeks.

Maintenance Steps : If the engraving material is paper or wood, it is more likely to cause dust and tar oil to stick on the reflective mirrors. You can use cotton swabs with a small amount of alcohol to clean and wipe until the mirror surface is free of stains.

Preparation Items : 1 | Cotton swab, 2 | 75%~99% alcohol

1 _____

2 _____

First reflective mirror

Second reflective mirror

Third reflective mirror
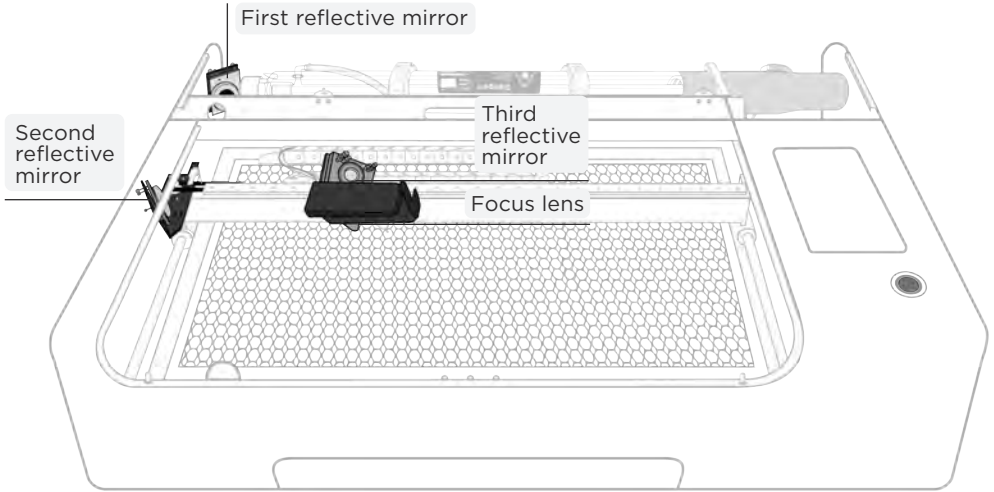
Focus lens

There are 3 reflective mirrors and 1 focus lens that need to be cleaned in HEXA, and their positions are shown in the picture.

> **After cleaning, the mirrors and lens should not be left with water marks to avoid oxidation which may have an effect on the laser power, and should not be wiped excessively as well.**

Maintenance Steps:

1. Clean the first reflective mirror : The first reflective mirror is located at the left side of the laser tube facing the chassis. You can open the back cover or wipe it from the front hole. As shown below.

AVOID EYE OR SKIN EXPOSURE
Invisible Laser Radiation Is Emitted
From This Aperture.
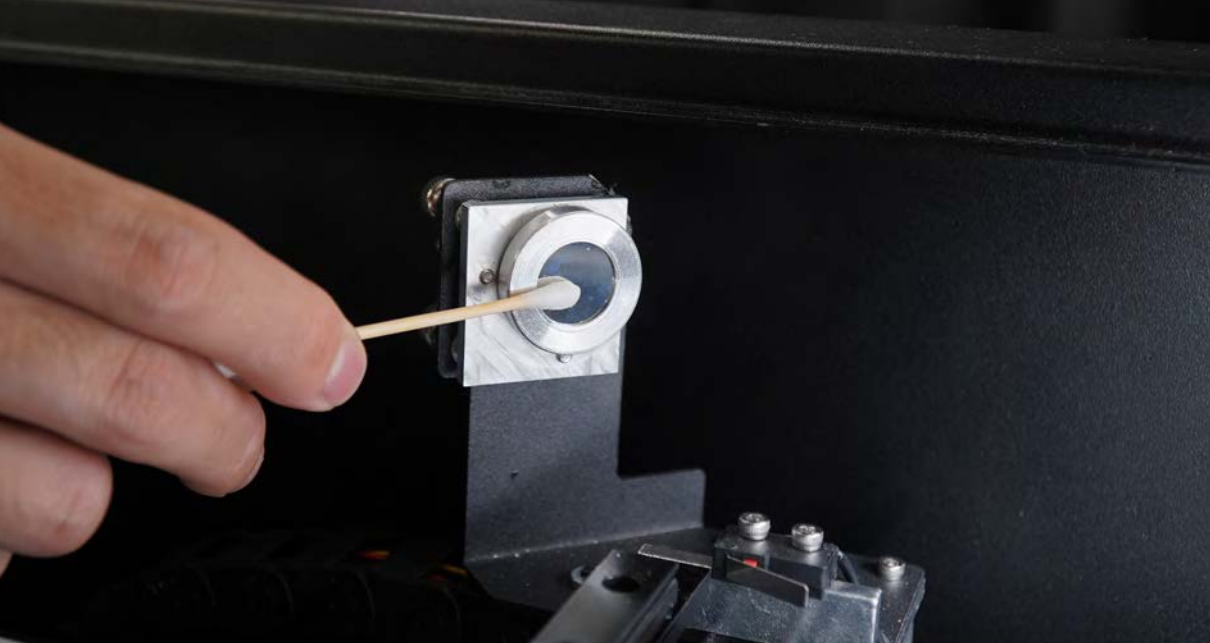
2. Clean the second reflective mirror : The second reflective mirror is located on the left Y-axis guiding rod facing the chassis.

3. Clean the third reflective mirror : The third reflective mirror is in the triangular mirror holder which is on the X-axis linear rail.
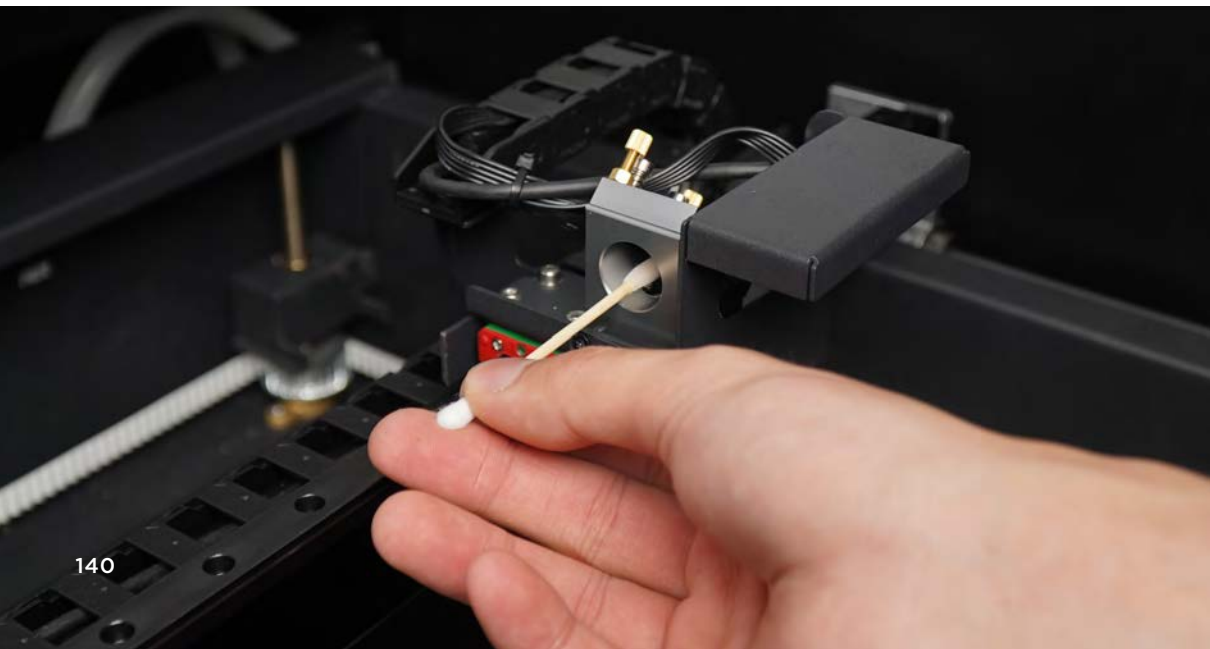
4. Clean the focus lens : The focus lens is located under the third reflective mirror, inside the
   laser head.
   a. Remove the honeycomb table >

   b. Loosen 2 screws on the laser head cover and then move the cover aside >

Laser head cover
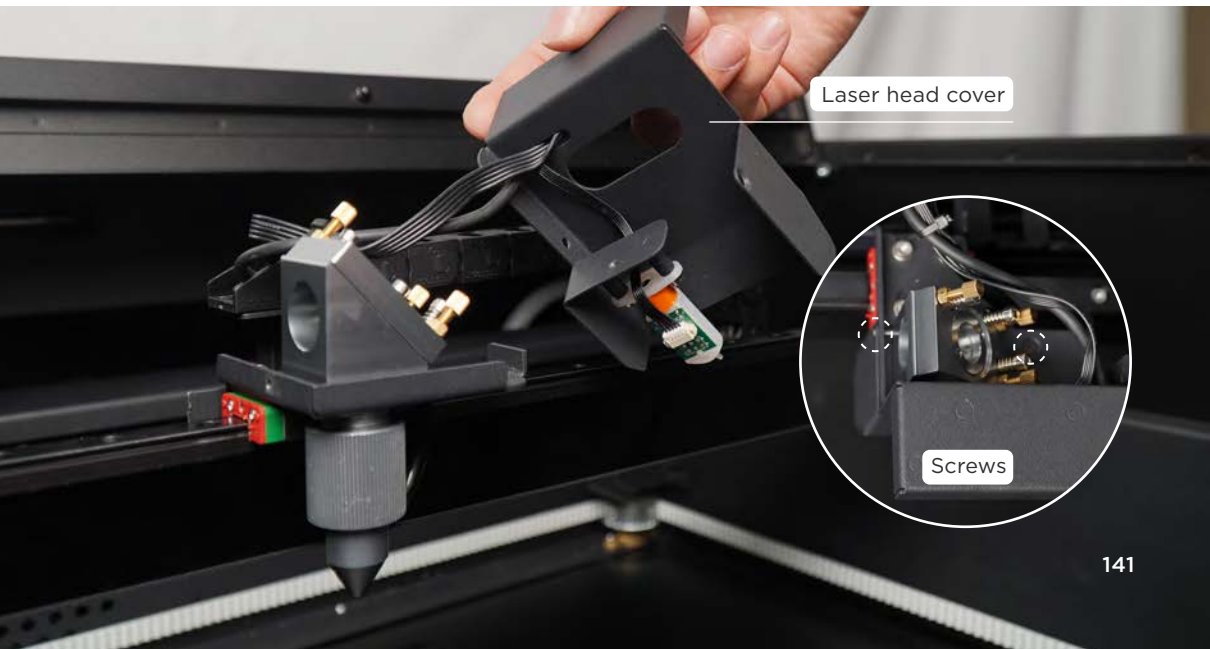
Screws

Nozzle fastening ring

c. Unscrew the nozzle fastening ring clockwise > Remove the laser head, and please avoid the focus lens from being popped out >

d. Take out the focus lens and then clean it.

Convex side   Flat side
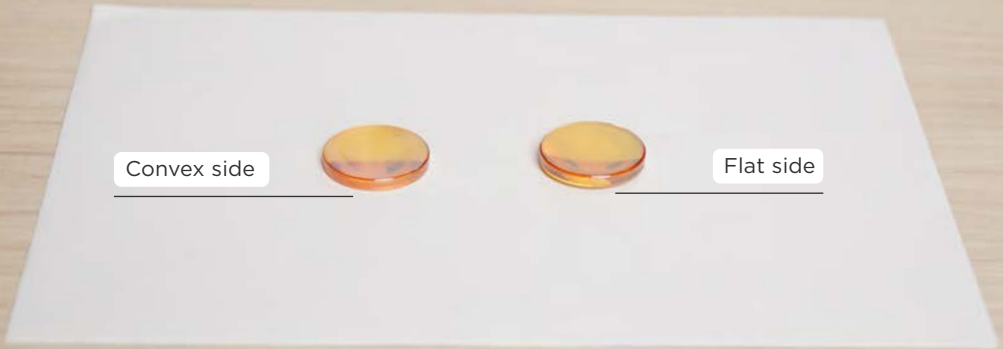
5. Put the focus lens back : The lens has an orientation, the convex side faces up, the flat side faces down.
(Hold the edge of the focus lens on your hand and look towards the focus lens, you can see yourself on the convex side and cannot see yourself on the flat side.)

> **If not installed according to the direction of the instruction, it may cause inaccurate focus, resulting in blurred engraving or inability to cut.**

Optical Path Inspection

When first unboxing, after laser tube replacement, once every 1 month.

Notes : The optical path will be changed due to transportation and vibration of the working, so regular inspection is necessary to ensure the correct laser optical path, so that the machine can engrave evenly and cut normally.

Necessary inspection conditions : 1. The first time unboxing after long distance transportation. 2. After replacement of the laser tube. 3. For regular maintenance, it is recommended to check once a month.

Preparation Items : Included in the accessory box : 1 | Double-sided tape
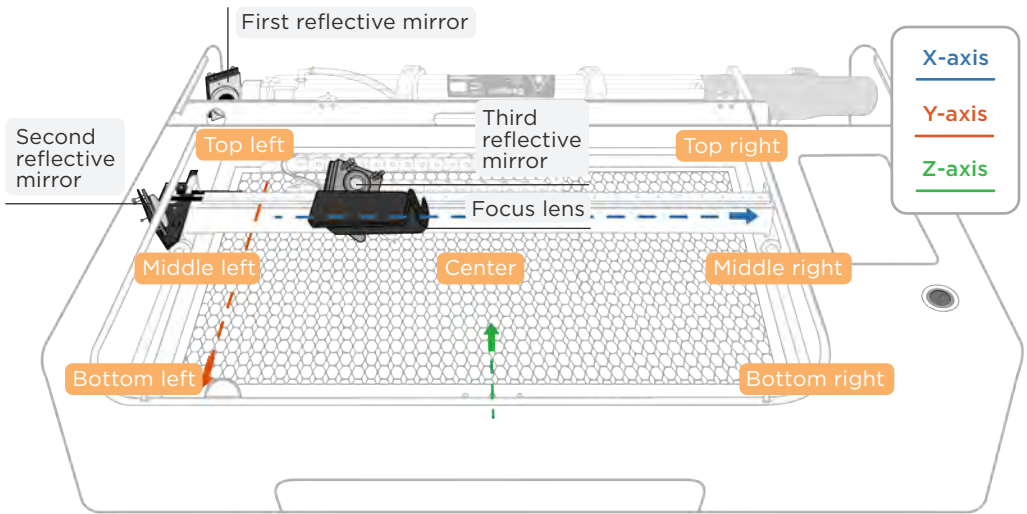
Inspection Steps :

1. Get the laser spots in the two corners : Hit the "MAINTENANCE" of the machine > Select "Motors" > Move the laser head to the top left position > Put the double-sided tape on the laser head outlet > Close the door cover > Make sure the laser "Power" is the default x 1.00 > Click "Laser Pulse" > Open the door cover > Make sure the laser spot is a full circle > Move the laser head to the bottom right > Put the double-sided tape on the laser head outlet > Close the door cover > Click "Laser Pulse" > Open the door cover > Make sure the laser spot is a full circle. Get a total of 2 laser spots on the top left and bottom right.

> **Unable to get a full circle at both corners, you need to go through the** 【Maintenance】 Optical Path Alignment (p.146).
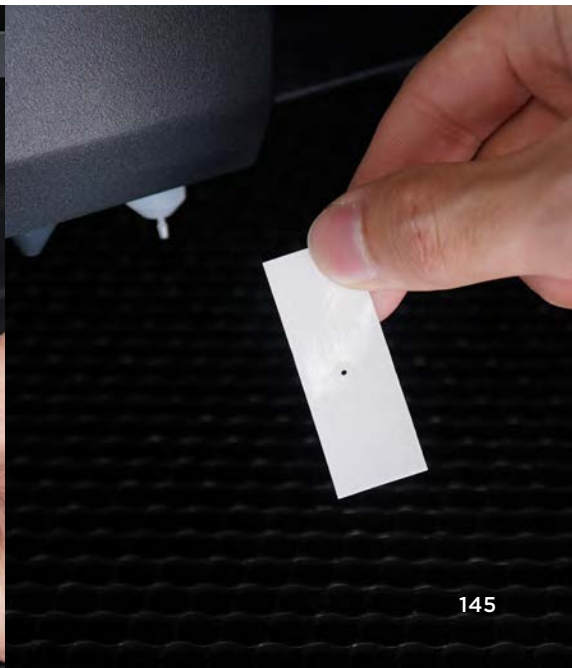
Optical Path Alignment

Once every 1 month

If the optical path is misaligned, the optical path should be realigned.

Signs of misaligned optical path : 1. engraved patterns will be deeper to lighter in a certain direction; 2. the cut section is not vertical after cutting.

Preparation Items : Included in the accessory box: 1 | 2.5mm hexagonal wrench, 2 | Torx screwdriver, 3 | Double head wrench, 4 | Double-sided tape

First reflective mirror

Second reflective mirror

Top left

Third reflective mirror

Top right

Focus lens

Middle left

Center

Middle right

Bottom left

Bottom right

X-axis

Y-axis

Z-axis
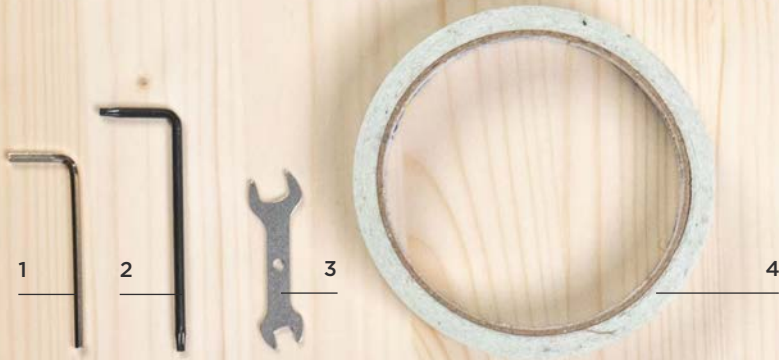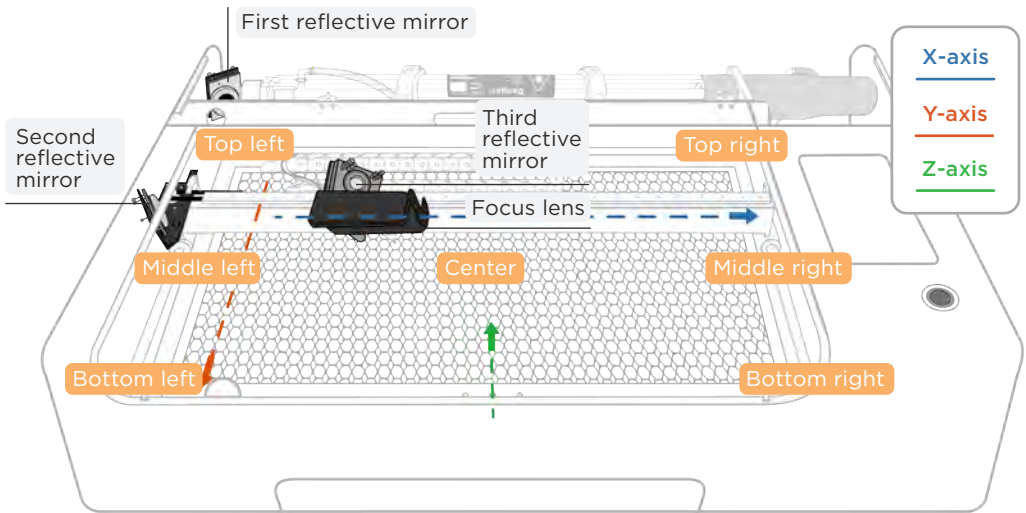
Alignment Instructions :

1. The Y-axis direction is related to the first reflective mirror. After the first reflective mirror is correctly adjusted, the laser spot got at bottom left position should coincide with that got at top left position. When adjusting the first reflective mirror, put the double-sided tape on the second reflective mirror.
2. The X-axis direction is related to the second reflective mirror. After the second reflective mirror is adjusted, laser spot got at middle right position should coincide with that got at middle left position. When adjusting the second reflective mirror, put the double-sided tape on the third reflective mirror.
3. The Z-axis direction is related to the third reflective mirror. After the third reflective mirror is adjusted, the laser spot should be in the center of the laser outlet. When adjusting the third reflective mirror, put the double-sided tape on the laser outlet.

1. Do not open the door cover when laser pulsing is in progress, otherwise the laser will not emit light due to the protection mechanism.
2. When aligning the optical path, the "Power" can be set to x0.50 in the "MAINTENANCE" page to avoid the laser spot being too large to judge the laser spot offset direction precisely. When the alignment is completed, the "Power" needs to be restored tothe original po wer setting of x1.00 to avoid insufficient power during use.
3. If there is an abnormal cracking sound when starting the laser pulse, please disconnect the power and stop using it immediately. 【Troubleshooting】No Laser Beam Output. (p.200)
4. Please use the Torx screwdriver to remove the 2 screws on both sides of the back cover and then lift the cover.
5. Since there are threadlockers on the nuts of the first and second reflective mirrors fixing mirror adjustment screws, dropping a small amount of alcohol on those nuts is suggested to soften the threadlockers before turning the nuts.

2 screws

Alignment Steps:

Laser tube
Target : To confirm the laser spot is on the first reflective mirror.
Method :
1. **Lift the back cover :** Please use the Torx screwdriver to remove the 2 screws on both sides of the back cover and then lift the cover.
2. **Paste the tape :** Take a piece of double-sided tape and paste it on the round metal frame of the first reflective mirror.
3. **Obtain laser spot on the first reflective mirror :** Close the door cover > Click the "MAIN TENANCE" on the screen > Click "Laser Pulse" > Open the door cover > Make sure the laser spot is within the mirror, avoiding the frame of the mirror.

> **If the laser spot is on the frame, it indicates that the optical path is shifted too much, so you need to move the first reflective mirror assembly to make the laser spot fall into the mirror. (Use 2.5mm hexagonal wrench to loosen the 2 screws on the bottom of the first reflective mirror assembly) > Adjust the position of the assembly > Tighten the screws back). If the laser spot is weak (laser pulse at screen power x 1.00, it takes more than 3 shots before the laser spot is visible), then the laser tube should be replaced.** 【Maintenance】Laser Tube Replacement. (p.161)

Mirror frame

Reflective mirror

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Bottom left laser spot
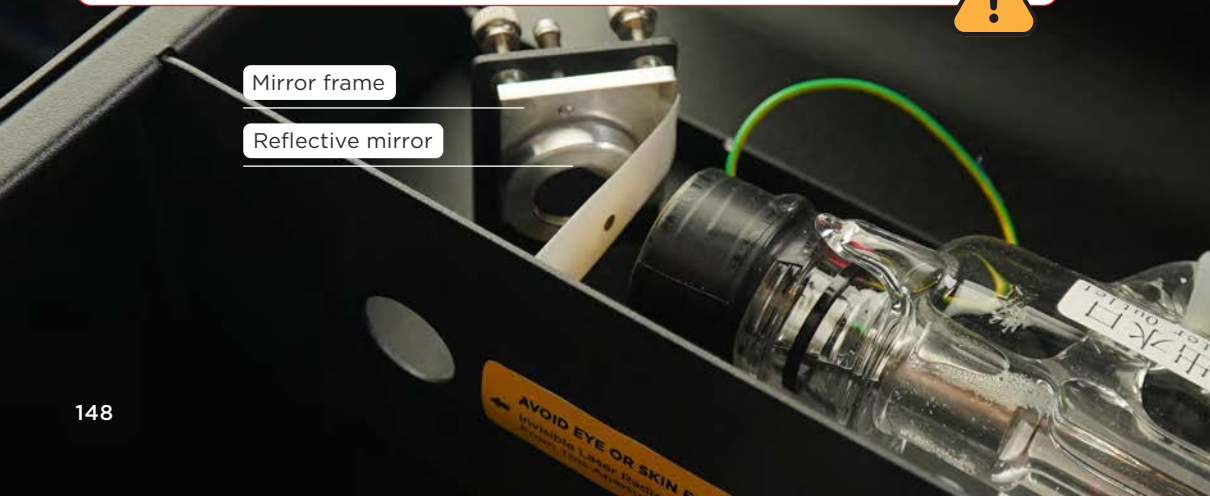
First reflective mirror

Target : To make the bottom left spot coincide with the top left spot.

Method :

1. **Release the motors and paste the tape :** Click the "MAINTENANCE" of the machine to finish the X and Y-axis homing > Click "Motors" > Take a piece of double-sided tape and paste it on the metal frame of the second reflective mirror.

2. **Obtain the top left laser spot :** Move the laser head to the top left manually > Close the door cover > Click "Laser Pulse" > Open the door cover > Confirm the laser spot position. You need to observe how the next (bottom left) laser spot moves.

3. **Obtain the bottom left laser spot:** Move the laser head to the bottom left manually > Close the door cover > Click "Laser Pulse" > Open the door cover > Confirm whether the bottom and top left are overlapped at the same position and avoid the reflective mirror frame. As shown in the picture above. If the laser spots are not completely overlapped, adjust the mirror adjustment screw behind the first reflective mirror according to the direction of laser spot movement, so that the bottom left laser spot position moves to the top left laser spot position.

4. **Adjust the first reflective mirror:** Drop a small amount of alcohol on the nut to soften the threadlocker > Use a double head wrench to loosen the nut without turning the mirror adjustment screw > Tighten or loosen the mirror adjustment screw according to the direction of laser spot movement (control direction explained later) > Repeat steps 2, 3, 4 until the bottom left laser spot overlap with the top left laser spot (if you can no longer determine the direction of laser spot movement, you need to reapply the double-sided tape) > After finishing the adjustment, tighten the nut without turning the mirror adjustment screw.

After confirming that the bottom and top left spots coincide and avoiding the reflective mirror frame, adjust the second reflective mirror.

If there is no laser spot at the bottom left, please move to the middle left for correction first, and then change back to the top left and bottom left for correction after confirming that the middle left and top left points can be overlapped.

Tightening or loosening screw is equivalent to adjusting the angle of the reflective mirror.

- **When turning the yellow screw, the red and green screw link can be considered as the axis of rotation.**
  By tightening the yellow screw (clockwise), you can think of pushing the mirror from the upper left with the red and green as the axis, and the laser spot will move down to the lower right. Loosening the yellow screw (counterclockwise), you can think of the red and green as the axis to move the mirror backward in the upper left, and the laser spot will move up to the upper left.
- **When you turn the green screw, you can think of the yellow and red screw link as the axis of rotation.**
  By tightening the green screw (clockwise), you can think of the yellow and red as the axis to push the mirror from the upper right, and the laser spot will move to the left. Loosening the green screw (counterclockwise), you can think of the yellow and red as the axis to move the mirror backward in the upper right, and the laser spot will move to the right.
- **When turning the red screw, think of the yellow and green screw link as the axis of rotation.**
  By tightening the red screw clockwise, you can think of the yellow and green as the axis to push the mirror from the lower left, and the laser spot will move up. If you loosen the red screw (counterclockwise), you can think of the yellow and green as the axis to move the mirror backward in the lower left, and the laser spot will move downward.
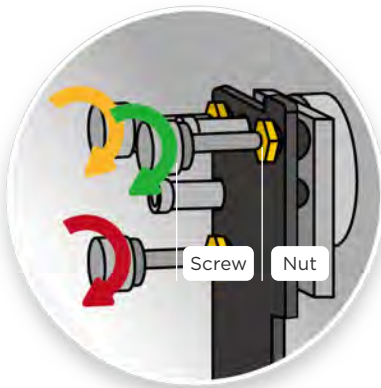
The rotation directions of mirror adjustment screws of the first reflective mirror.
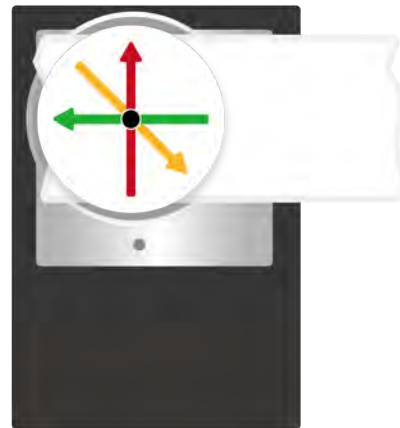
The moving paths of the laser spots on the double-sided tape on the second reflective mirror.

Second reflective mirror
Target: To make the middle right spot coincide with the middle left spot.
Method:
1. **Paste the tape :** Take a piece of double-sided tape and paste it on the round
   metal frame of the third reflective mirror.
2. **Obtain the middle left laser spot :** Move the laser head to the middle left
   manually > Close the door cover > Click "Laser Pulse" > Open the door cover > Confirm the
   laser spot position. You need to observe how the next (center) laser spot moves.
3. **Obtain the center laser spot :** Move the laser head to the center manually >
   Close the door cover > Click "Laser Pulse" > Open the door cover > Confirm whether the
   center and middle left overlap in the same position. You need to observe how the next
   (middle right) laser spot moves.
4. **Obtain the middle right laser spot :** Move the laser head to the middle right
   manually > Close the door cover > Click "Laser Pulse" > Open the door cover > Confirm
   whether the spots overlap in the same position. If they are not completely overlapped,
   adjust the mirror adjustment screw behind the second reflective mirror according to the
   direction of laser spot movement, so that the middle right laser spot position moves to the
   middle left laser spot position.
5. **Adjust the second reflective mirror :** Drop a small amount of alcohol on the nut
   to soften the threadlocker > Use a double head wrench to loosen the nut without turning
   the mirror adjustment screw > Tighten or loosen the mirror adjustment screw according to
   the direction of laser spot movement (control direction is explained later) > Repeat steps
   2, 4 and 5 until the middle right laser spot overlap with the middle left laser spot (if you
   can no longer judge the direction of laser spot movement, you need to reapply the dou-
   ble-sided tape) > After finishing the adjustment, tighten the nut without turning the mirror
   adjustment screw.
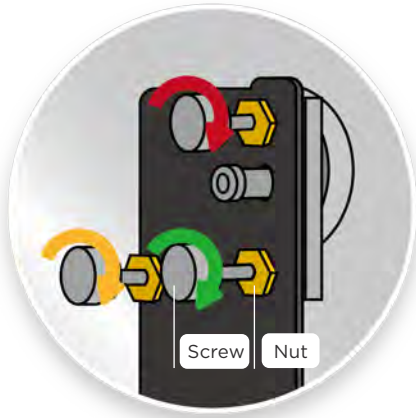
The rotation directions of mirror adjustment screws of the second reflective mirror.
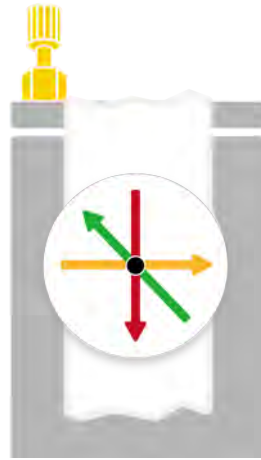
The moving paths of the laser spots on the double-sided tape on the third reflective mirror.

6. **Confirm the spots of the middle right and the middle left overlap :** Take a piece of double-sided tape and put it on the frame of the third reflective mirror > Repeat steps 2 and 4 to confirm the overlap of the middle right and middle left spots and avoid the reflective mirror frame, then fine-tune the laser head assembly position so that the overlapping spot is located on the perpendicular line of the round metal frame (black solid line area in the figure).

4 hexagonal screws

Moving direction
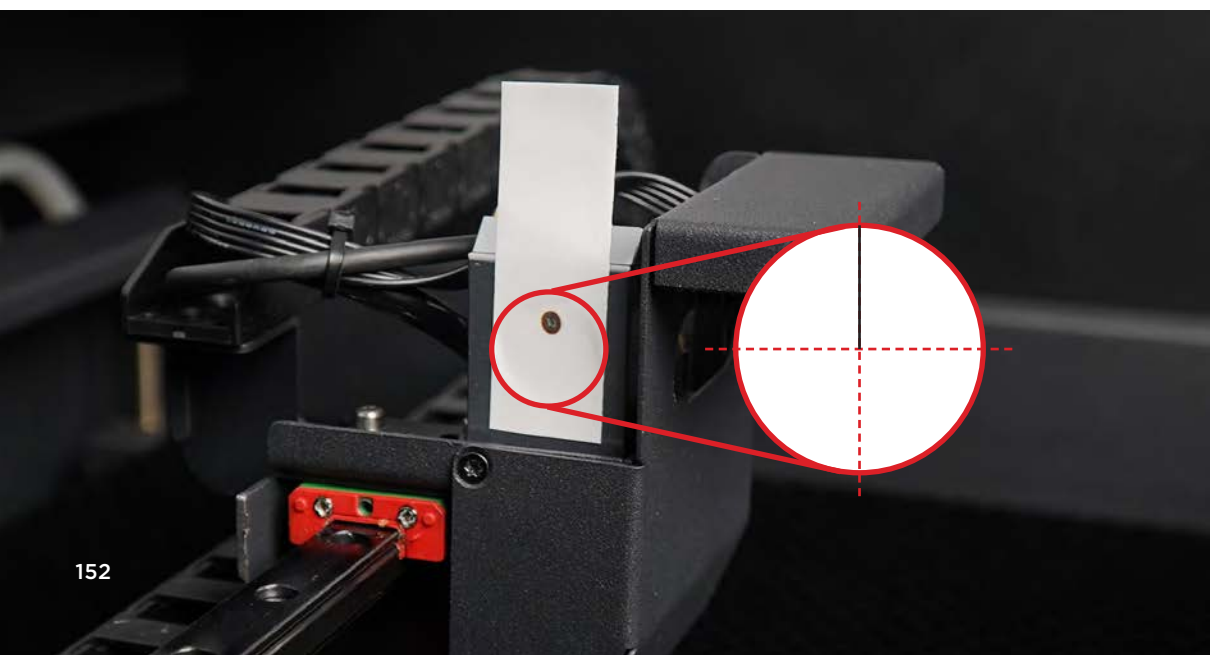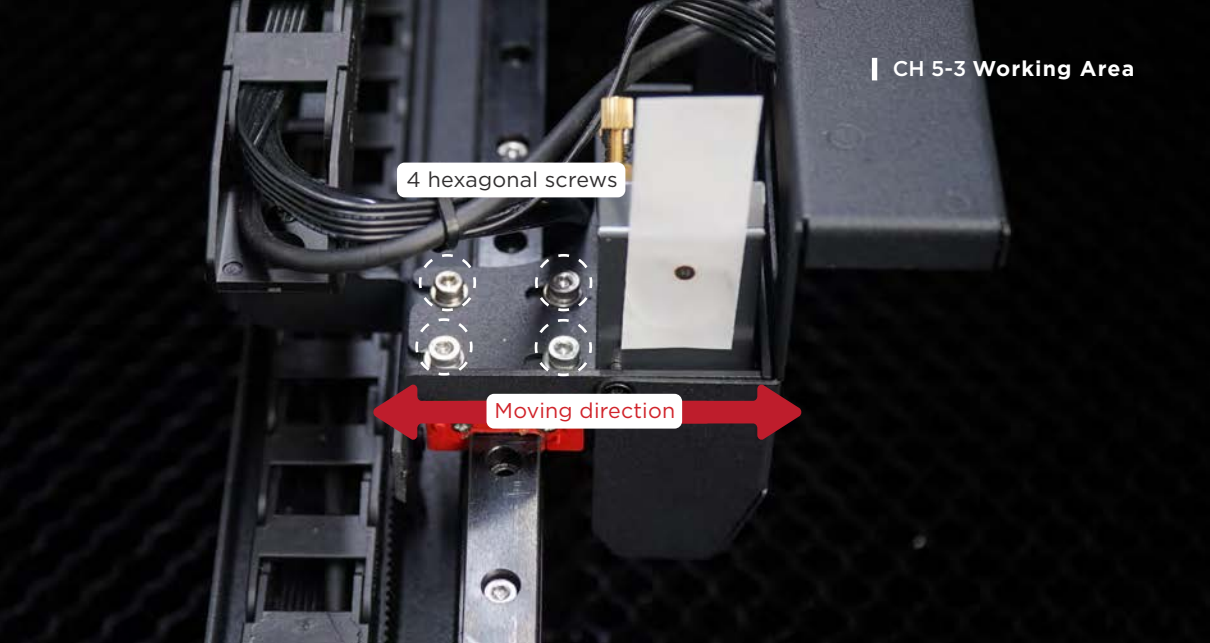
7. Fine-tune the laser head assembly position : Use a 2.5mm hexagonal wrench to loosen the 4 hexagonal screws on the X-axis linear rail that hold the laser head assembly in place > Move the laser head forward or backward depending on the position of the spot > Roughly tighten the 4 screws > Move the laser head to the center manually > Close the door cover > Click "Laser Pulse" > Open the door cover > Confirm that the spot is on the perpendicular line > Move the laser head to the chassis front > Click "Camera" and make sure the upper and lower edges of the camera are parallel to the machine chassis > Fix the 4 hexagonal screws of the laser head assembly. After confirming that the middle right and middle left spots are on the perpendicular line of the round metal frame, you can adjust the third reflective mirror.
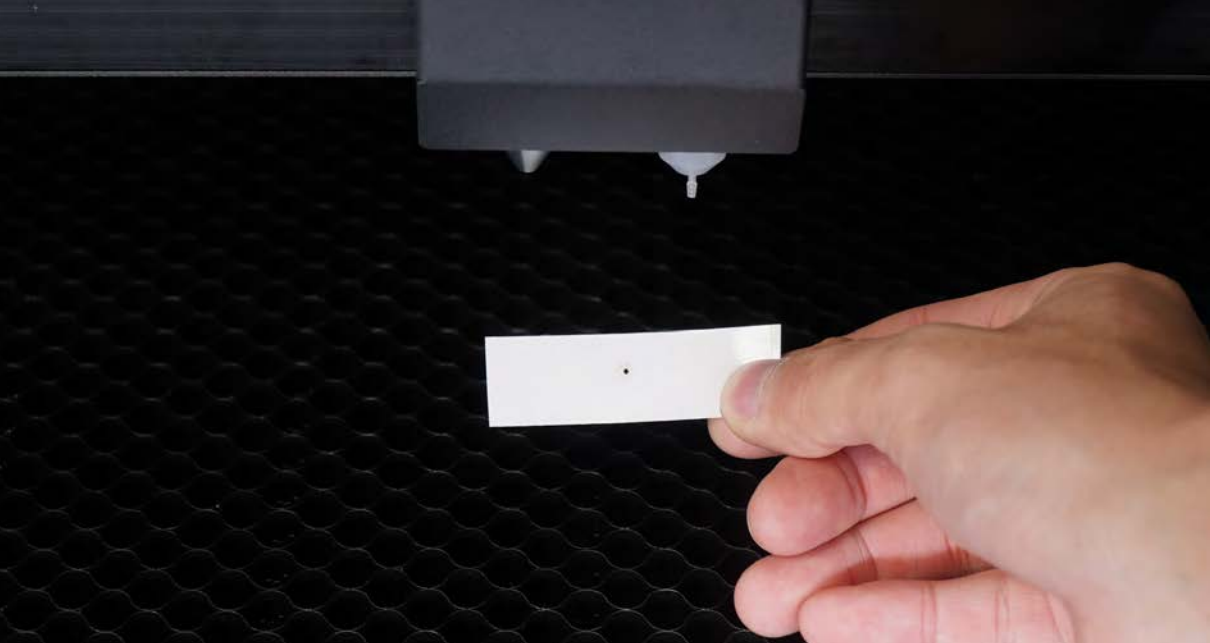
Third reflective mirror

Target: To make the laser spot hit the center of the laser outlet.

Method:

1. **Paste the tape :** Take a piece of double-sided tape and put it on the laser head outlet > Gently press the double-sided tape to make a circle of laser head outlet indentation on the tape's adhesive surface.

2. **Obtain the center laser spot :** Move the laser head to the center manually > Close the door cover > Click "Laser Pulse" > Open the door cover > Make sure the laser spot is in the center of the laser outlet. If it is not in the center of the circle, you need to adjust the mirror adjustment screw behind the third reflective mirror according to the position of the spot.

3. **Adjust the third reflective mirror :** Use a double head wrench to loosen the nut without turning the mirror adjustment screw > Tighten or loosen the mirror adjustment screw according to the direction of the laser spot movement (the control direction is explained later) > Repeat steps 3 and 4 until the laser spot falls in the center of the beam outlet (if you can no longer judge the laser spot movement direction, you need to reapply the double-sided tape) > After finishing the adjustment, tighten the nut without turning the mirror adjustment screw.

The adjustment method is different from the first and second reflective mirror, because the position of the mount under the third reflective mirror is fixed, so when the screw is tightened, the mount will not move, but the reflective mirror will be ejected.

- **When turning the yellow screw, the red and green screw link can be regarded as the axis of rotation.**
Tightening the yellow screw (clockwise), you can think of moving the mirror backward in the upper right with red and green as the axis, and the laser spot will move to the upper right. Loosening the yellow screw (counterclockwise), you can think of the red and green as the axis to push the mirror from the upper right, and the laser spot will move to the lower left.
- **When turning the green screw, the yellow and red screw link can be regarded as the axis of rotation.**
Tightening the green screw (clockwise), you can think of moving the mirror backward in the upper left with the yellow and red as the axis, and the laser spot will move to the left. Loosening the green screw (counterclockwise), you can think of the yellow and red as the axis to push the reflective mirror from the upper left, and the laser spot will move to the right.
- **When turning the red screw, the yellow and green screw link can be regarded as the rotating axis.**
Tightening the red screw (clockwise), you can think of moving the mirror backward in the lower right with the yellow and green as the axis, and the laser spot will move downward. Loosening the red screw (counterclockwise), you can think of the yellow and green as the axis to push the reflective mirror from the lower left, and the laser spot will move upward.
After completing the above adjustments, you can ensure that the laser beam output is uniform at any location in the working area to achieve normal working requirements. Please perform "Calibrate Camera" again before use. 【Beam Studio Tutorial】 Camera Calibration. (p.058)
If the laser beam output verticality is strictly required, you can further adjust the verticality of the optical path.
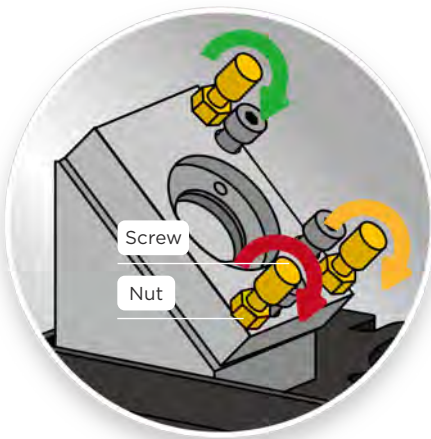

The rotation directions of mirror adjustment screws of the third reflective mirror.

The moving paths of the laser spots on the double-sided tape on the laser head outlet.
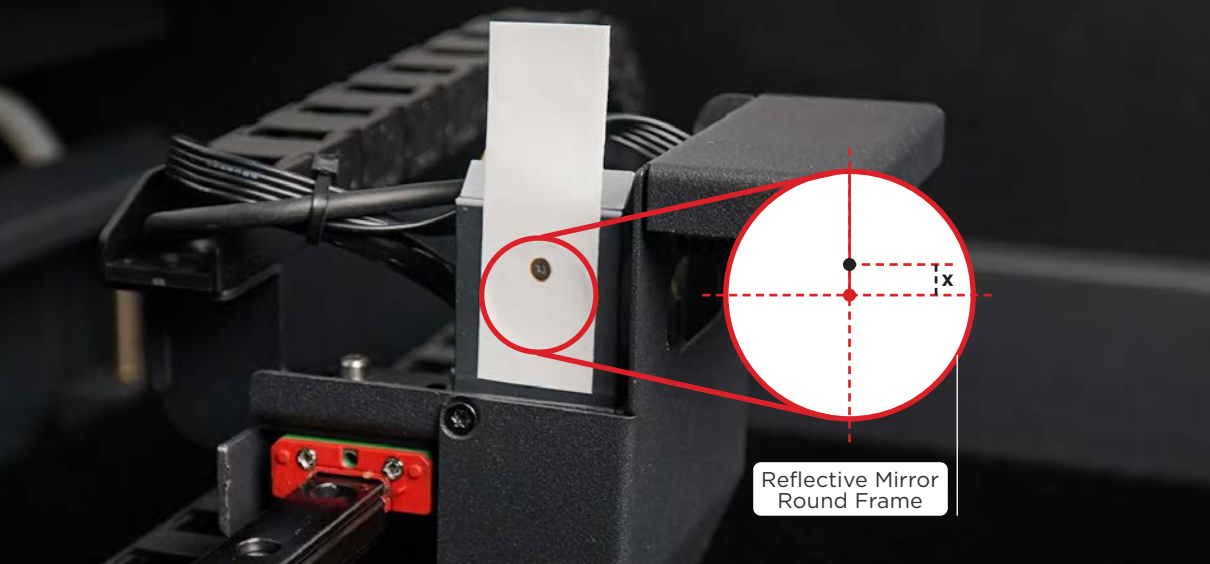
Reflective Mirror
Round Frame

Advanced adjustment : Verticality of the optical path (selective adjustment)
Target:To adjust the laser spots obtained from the laser head socket and from the laser head outlet to the center of the circles.
Method:
1. **Paste the tape :** Take a piece of double-sided tape and paste it flat on the frame of the third reflective mirror.
2. **Get the center laser spot :** Move the laser head to the center manually > Close the door cover > Click "Laser Pulse" > Open the door cover.
3. **Measure the center offset value :** Measure the distance between the center of the spot and the center of the frame, x (mm). The laser spot should be located at the top of the perpendicular line of the metal frame (as shown in the picture above). If the position is incorrect, please contact your reseller.
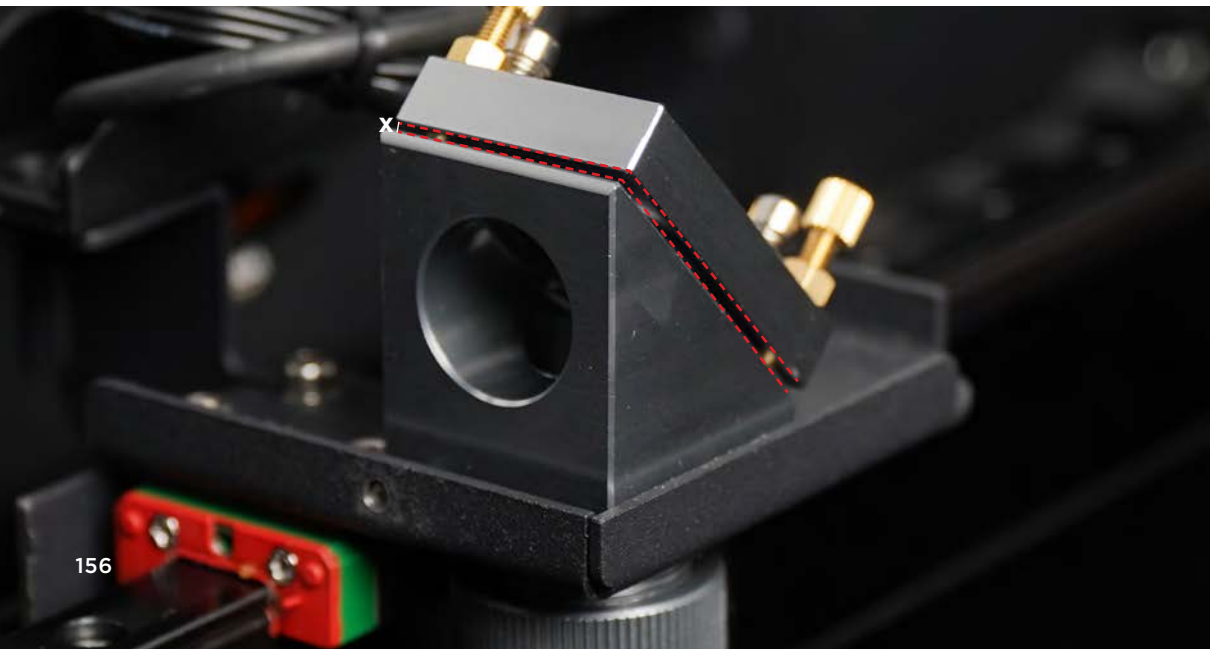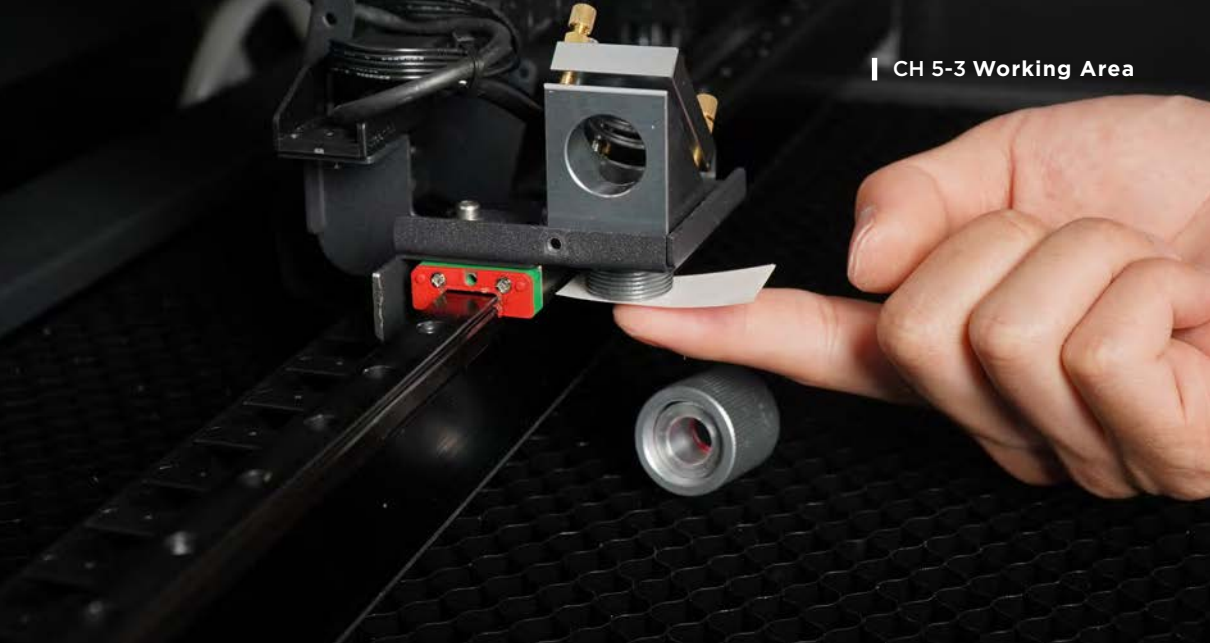
4. **Move the third reflective mirror :** Loosen the nut, use a double head wrench to loosen the nut holding the mirror adjustment screw > Adjust the 3 mirror adjustment screws so that the third reflective mirror and the triangular mirror holder are parallel and have x (mm) spacing (as shown below).

5. **Take the honeycomb table out :** Move the laser head to the upper right of the working range > Press on the "Autofocus" button for 2 seconds to do the Z-axis homing > Lift up the honeycomb table handles, hold the two sides of the honeycomb table, and pull it out. Please avoid hitting the probe while taking the honeycomb table out.

6. **Adjust the third reflective mirror :** Refer to the method of "third reflective mirror" and adjust the laser spot to the center of the laser outlet again.

7. **Move the laser head cover aside :** Loosen 2 screws on the laser head cover and then move the cover aside.

8. **Paste the tape :** Unscrew the nozzle fastening ring and remove the laser head (keep the focus lens aside carefully) > Take a piece of double-sided tape and paste it flat on the laser head socket, gently press the double-sided tape so that there is a socket indentation on the adhesive side of the double-sided tape.

9. **Obtain the center laser spot :** Move the laser head to the center manually > Close the door cover > Click "Laser Pulse" > Open the door cover > Observe the spot position and move the third reflective mirror as appropriate.

10. **Move the third reflective mirror (as shown below) :**
    a. The laser spot is in the center of the laser head socket, which means the optical path is vertical and does not need to be adjusted.
    b. If the spot is to the right, reduce the parallel gap of the reflective mirror and loosen the 3 mirror adjustment screws by half a turn, then repeat steps 6, 8-10 until the spot is in the center of the laser head socket.
    c. If the spot is to the left, increase the parallel gap of the reflective mirror and tighten the 3 mirror adjustment screws by half a turn, then repeat steps 6, 8-10 until the spot is at the center of the laser head socket.

Note that the focus lens, laser head, and the nozzle fastening ring are installed when obtaining the laser spot of the laser head outlet (step 6).

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11. **Check the center laser spot :** After the adjustment, make sure the laser spots got from the laser head socket and from the laser head outlet to the center of the circles.
12. **Install the laser head and its cover back :** Put the laser head and its cover back > Tighten the 2 screws of the laser head cover.
13. **"Calibrate Camera" :** Before using the camera preview function, please first "Calibrate Camera". 【Beam Studio Tutorial】 Camera Calibration. (p.059)
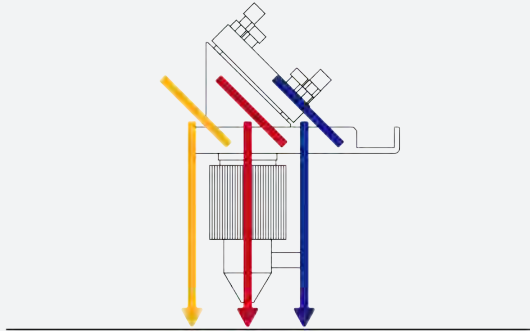
Door Cover Cleaning

It is recommended to clean every 2 weeks.

Maintenance Steps : Spray a small amount of alcohol on the acrylic door and clean with a cleaning cloth. The amount of alcohol should not be too much to avoid cracking the door.

Preparation Items : Self-preparation : 1 | 75%~99% alcohol, 2 | Cleaning cloth

Back Cover

The back cover includes the water pump, laser tube and ventilation fan.

Laser Tube Replacement | Depending on the power, hours of usage, room temperature, water temperature and other conditions.

Replacement Needed : 1. The degradation of the laser tube. 2. The failure of the laser tube which has no laser beam output as well as generates a cracking sound. Laser tube are classed as consumables, the degradation is normal due to the use of power, storage time and other factors. The higher the power setting, the faster the laser tube degradation.

Preparation Items : Self-preparation : 5 | Needle nose pliers, 6 | Paper towel or rag, 7 | 75%~99% alcohol, 17 | Water container, 18 | Scissors, 20 | Vacuum cleaner or high-pressure spray gun *If you have one, it is better.
Included in the accessory box : 1 | Torx screwdriver, 2 | 3mm Allen key, 3 | 2.5mm Allen key, 4 | Double head wrench, 11 | Funnel
Included in the laser tube pack : 8 | Gloves, 9 | Aluminum box, 10 | Conductive fabric tape, 12 | Aluminum box screws*2, 13 | Water pipe, 14 | Pipe clip*2, 15 | Hose connector, 16 | Pipe plug*4, 19 | Laser tube.

High-voltage Side

Low-voltage Side

1. **Please unplug the power cord first, then replace the laser tube.**
2. **Please use the Torx screwdriver to remove 2 screws on both sides of the back cover and lift the cover.**
3. **You can remove the dust from the back chassis first and then replace the laser tube. Use a vacuum cleaner or high-pressure spray gun to remove the dust from the rear chassis, and then use a paper towel or rag with alcohol to wipe the dirty area and wait for the chassis to dry before proceeding with the next operation.**
4. **The laser tube has two ends. The high-voltage side is near the screen and the low-voltage side is near the reflective mirror.**
5. **Please put a rag or paper towel on both sides of the high and low voltage to avoid damage to the machine due to water seepage.**

Replacement Steps :
1. Disconnect the laser tube wires :
   a. Snip & detach: Please wear the provided gloves > Remove the cable wrapper > Snip the copper part with scissors > Detach the white connector on the high-voltage side >
   (If this is not your first time replacing a tube, please skip this step and remove the aluminum directly with a 2.5mm Allen key.)
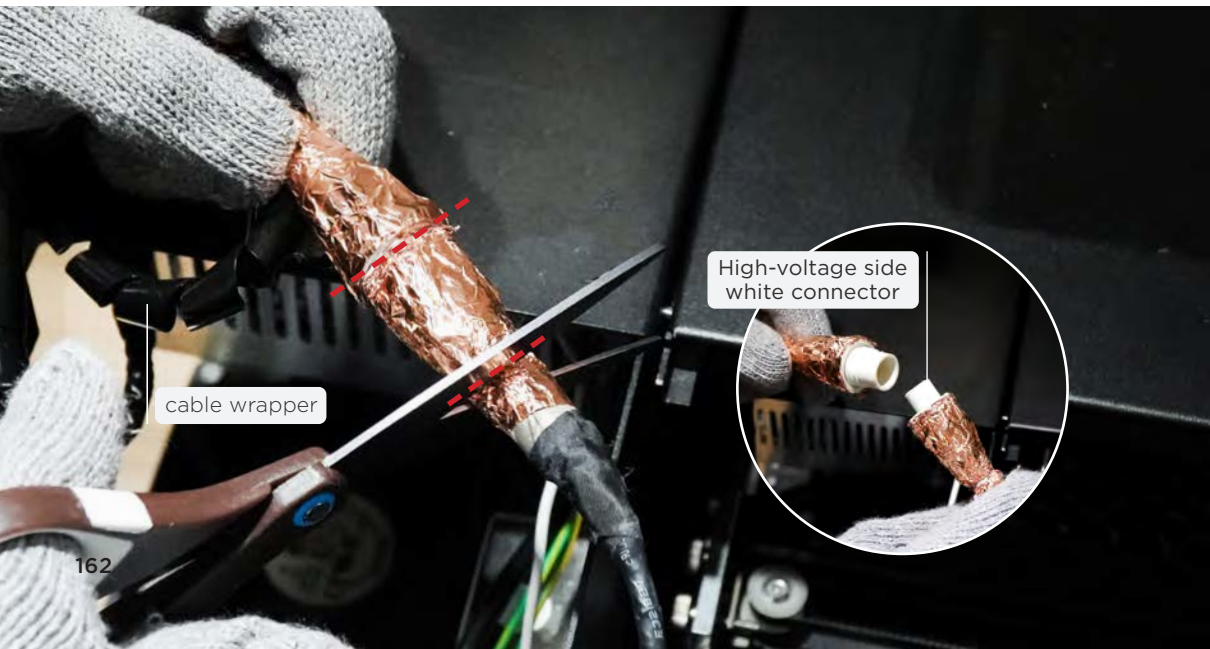
cable wrapper

High-voltage side white connector

White terminal   Ground wire

EMI filter   Screw

Ground wire on the laser tube

出水口
Water Outlet

Low-voltage Side
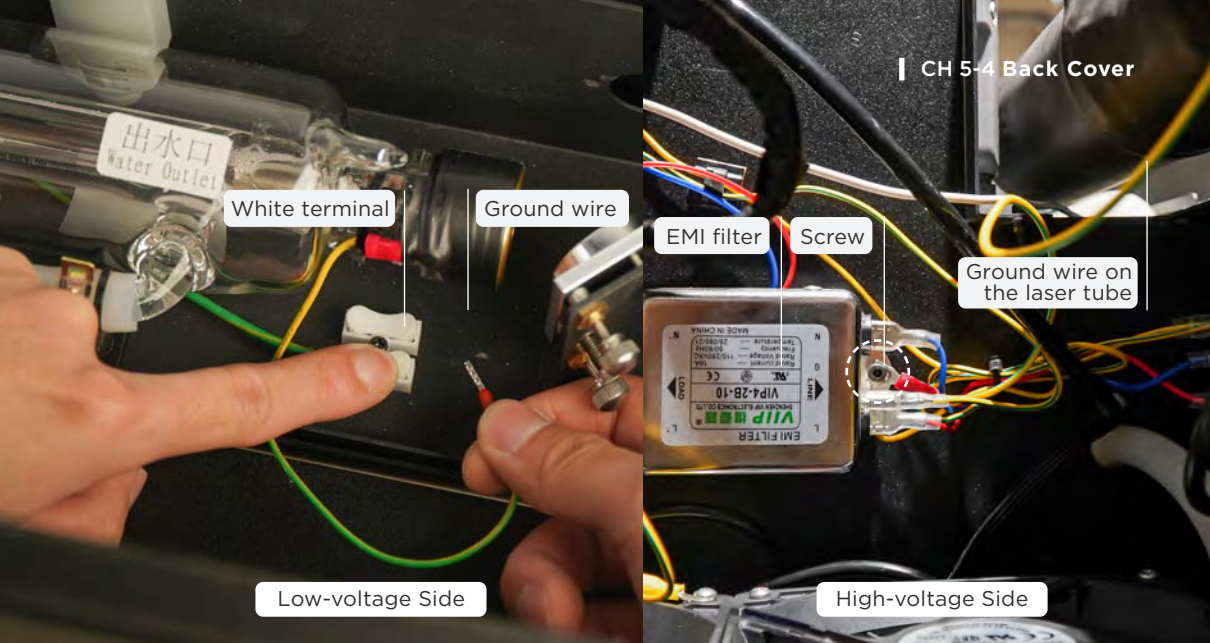
High-voltage Side

b. Disconnect the laser tube wires : Press the white terminal and pull out the ground wire >
c. Remove the ground wire on the high-voltage side : Use the 2.5mm Allen Key to loosen
the screws in the EMI filter. Put out the ground wire connected to the laser tube.

2. Loosen the laser tube holders : Use the 3mm Allen Key to loosen a total of 4 screws on
the laser tube holders.

Water Outlet

Needle nose pliers

Hose connector

pipe plug
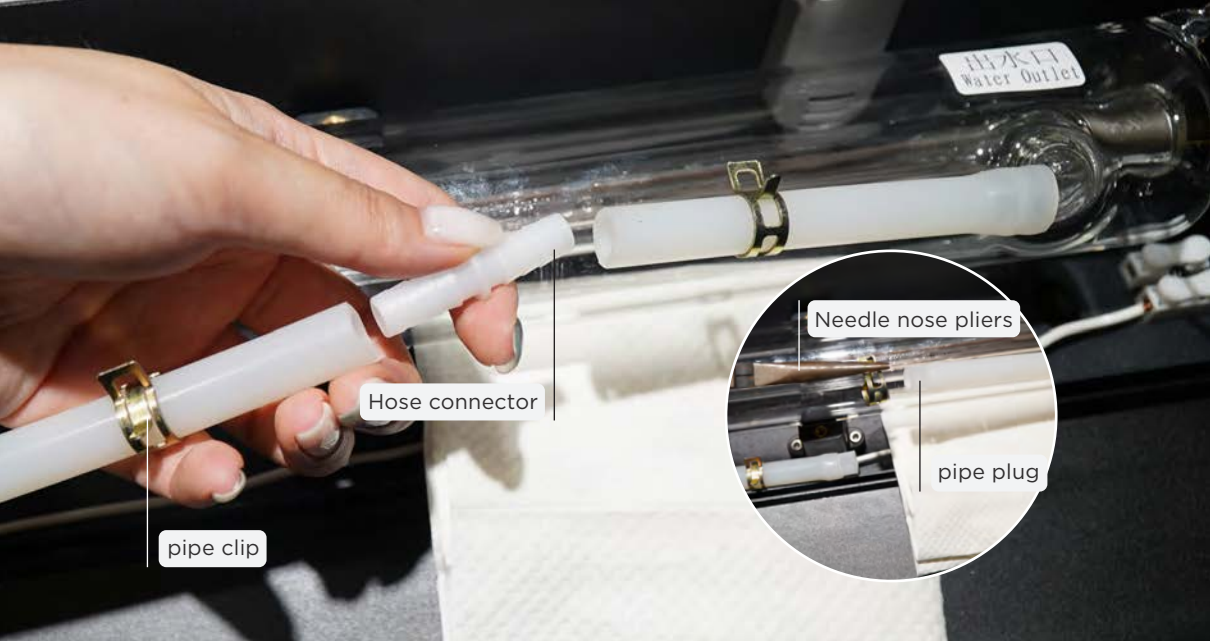
pipe clip

3. Detach the water pipes：

a. Move to the low-voltage side. Push the clamp outward with the Needle nose pliers > Remove the hose connector and put it aside for later use > Remove the pipe clip on the short hose and set it aside for later use > Make sure that the two water pipe openings are inserted into the pipe plug to avoid water leakage.

Be sure to put a towel, rag or paper towel under the high-voltage and the low-voltage side. Water leakage will cause the machine to malfunction.

b. To the high-voltage side, detach the water pipe (the laser tube can move from the tube holder seats to the back cover, it will be easier to pull out the pipe) > Insert the pipe plug after detaching >

pipe plug

pipe plug
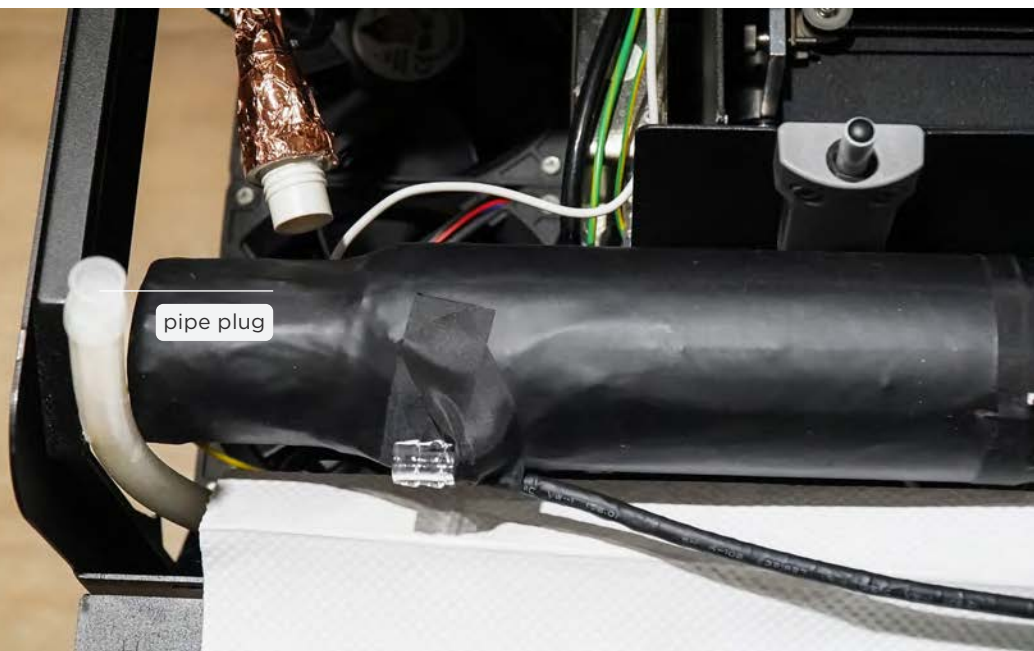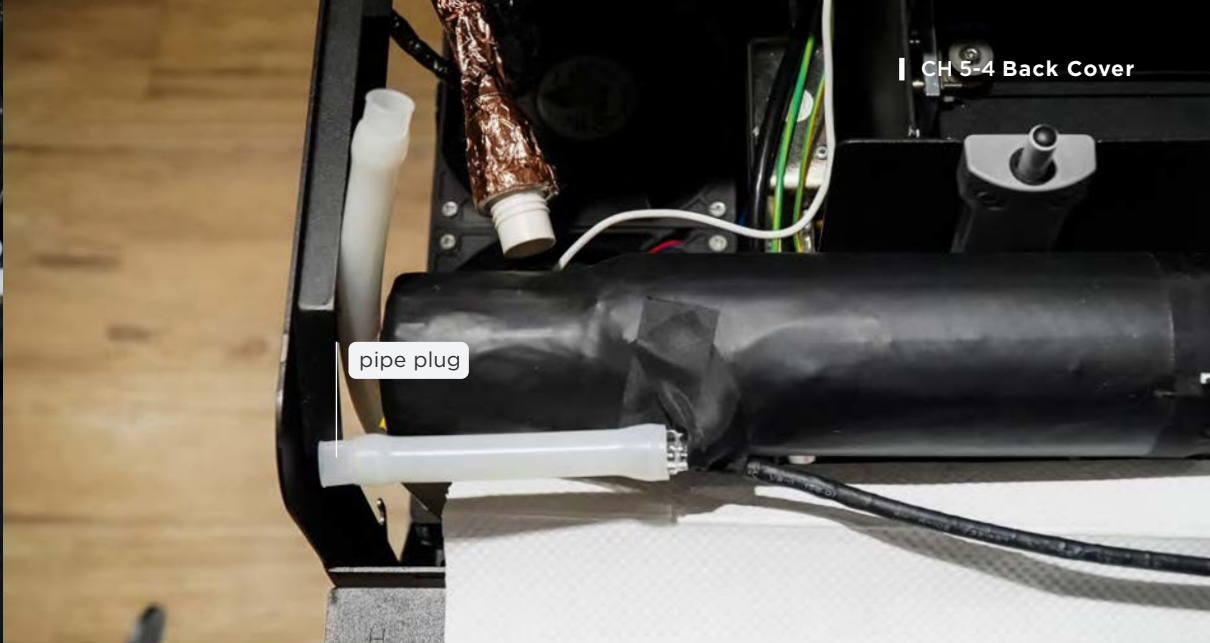
c. Insert the supplied water pipe and plug it into the water inlet of the laser tube to avoid to water leakage >

Avoid contacting the machine parts with water. If water leaks or spreads, let the machine dry completely before starting up.

4. Remove the laser tube completely.

5. Place the new laser tube and water hose in：

a. Place the laser tube according to the picture >

b. Remove the water pipe plug on the high-voltage side and attach the water pipe to the laser tube >

pipe clip

Hose connector

White terminal   Ground wire
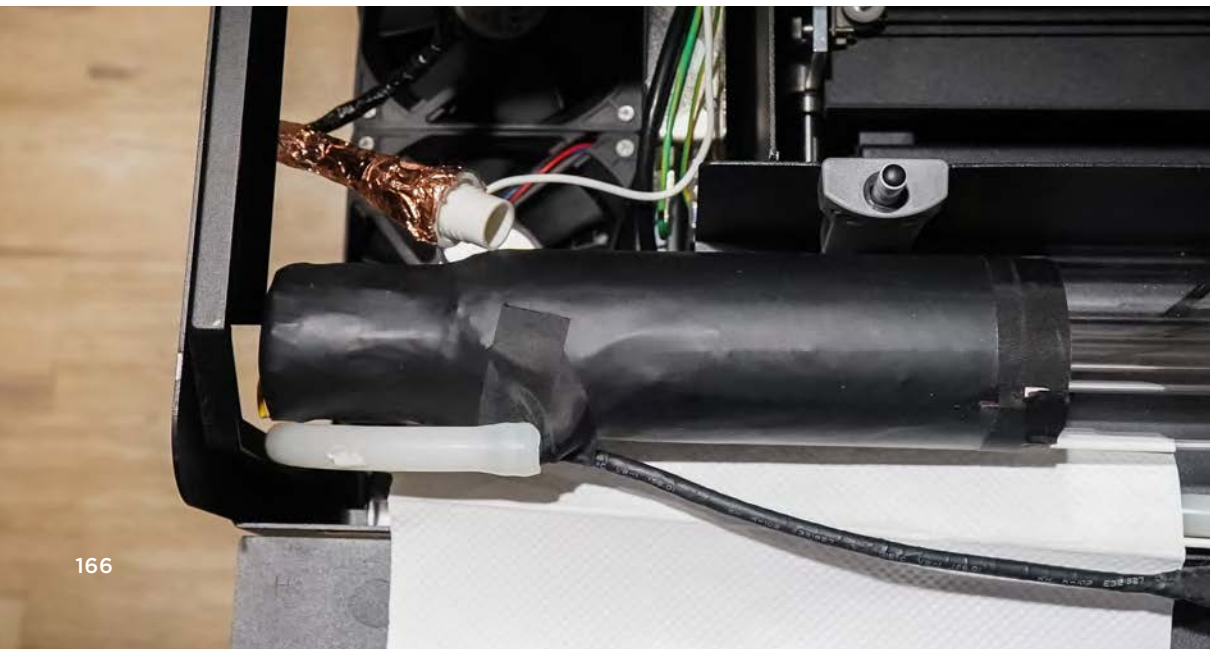
c. Move to the low-voltage side > Remove the pipe plug > Attach the pipe clip to the shorter water pipe > Insert the hose connector > Use the needle nose pliers to move pipe clips towards the connecting side to prevent water leakage.
d. Press down the white terminal and insert the ground wire > Release the white terminal > Gently pull the ground wire to check if it is frimly connected.

6. Apply conductive fabric tape, Install aluminum box and Grounding wire connection：

a. Connect the white connector at the high-voltage side and apply the conductive fabric tape on the laser power supply's connector >
b. Put the white connector into the aluminum box, mount on the cover and tighten the screws with a 2.5mm Allen key. (The box can be put ramdomly in the space as long as the cable and wires are not bent or twisted.)
c. Insert the ground wire on the high-voltage side of the laser tube into the screws position on the EMI filter > Tighten the screw.

Laser power supply's connector

Aluminum box

Conductive fabric tape

EMI filter   Screw

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7. Tighten the laser tube holders back :

a. Place the laser tube in position, leaving a finger distance between the tail end, about 15mm from the laser tube end to the first reflective mirror > Make sure there are no folds or kinks of the water hoses >

b. Use the 3mm Allen Key to tighten a total of 4 screws on the laser tube holders > Gently shake the laser tube to ensure it will not shift.

8. **Plug in the power cord and start the machine :** After confirming the installation is correct, you can plug in the power cord and start the machine.

9. **Take out the water pump :** Use a Torx screwdriver to loosen 4 screws on the water pump cover > Take out the water pump.

10. **Add water :** Use the double head wrench to open the water pump cap > Put in the funnel > Fill the water pump with distilled water > Click "MAINTENANCE" on the screen > Click "Pump" after the laser head has finished the X and Y-axis homing. Then the cooling water will start to enter the laser tube and the water level of the water pump will drop. Keep adding water until the water pump level reaches 80% full and the water level no longer drops due to the adding into the laser tube.

80% full

Water pump cap

11. Tighten the water pump cap and the water pump cover back： Use the double head wrench to tighten the water pump cap back > Place the water pump in its original place > Tighten the 4 screws of water pump cover back with the Torx screwdriver.

1. Make sure there is no folds or kinks of the water hoses to affect the water flow.
2. Please use distilled water to avoid impurities affecting the water-cooling effect.
3. Too many air bubbles inside the laser tube will affect the heat-dissipation efficiency. It is recommended to fill the water to more than 80% full or press the water hose when adding water, so it is less likely to produce air bubbles.
4. Please observe the water level carefully to avoid overflowing.
5. Please do not touch the area near the high-voltage side of the laser tube after plugging the power cord in to avoid electric shock.
6. When using the "MAINTENANCE" page, avoid touching the laser switch or putting your hand at the laser tube tail end.
7. If the water pump cannot be activated, please contact your reseller.
8. After moving the laser tube, 【Maintenance】 Optical Path Alignment (p.146) has to be conducted.

	Water changing and adding	Once every 3 months

Notes : In order to avoid the breakage of the glass laser tube due to the heat generated during laser excitation, it is necessary to maintain the water-cooling effect with sufficient distilled water.

Preparation Items : Self-preparation : 1 │ Needle nose pliers, 2 │ Paper towel or rag, 3 │ Water container
Included in the accessory box : 4 │ Torx screwdriver, 5 │ 3mm Allen key, 6 │ Double head wrench, 7 │ Funnel

White terminal   Ground wire
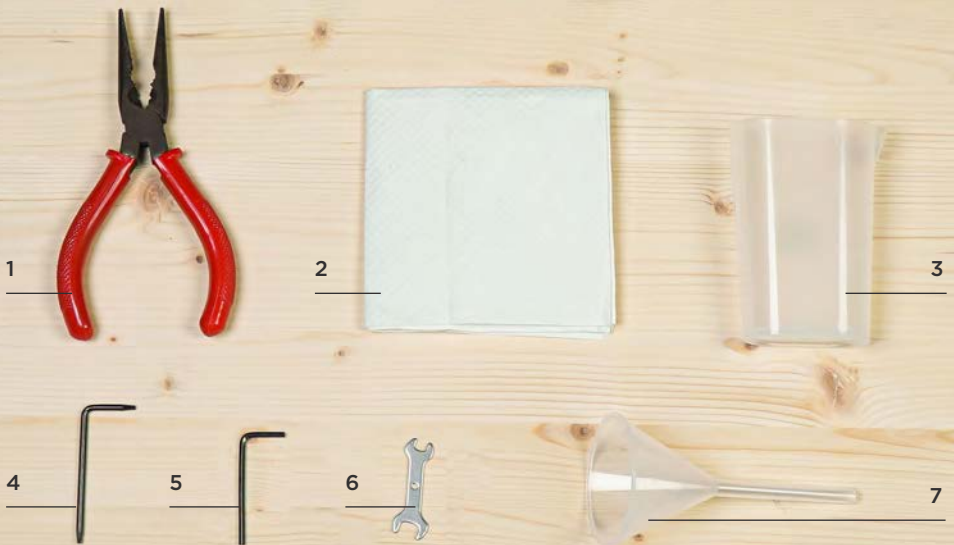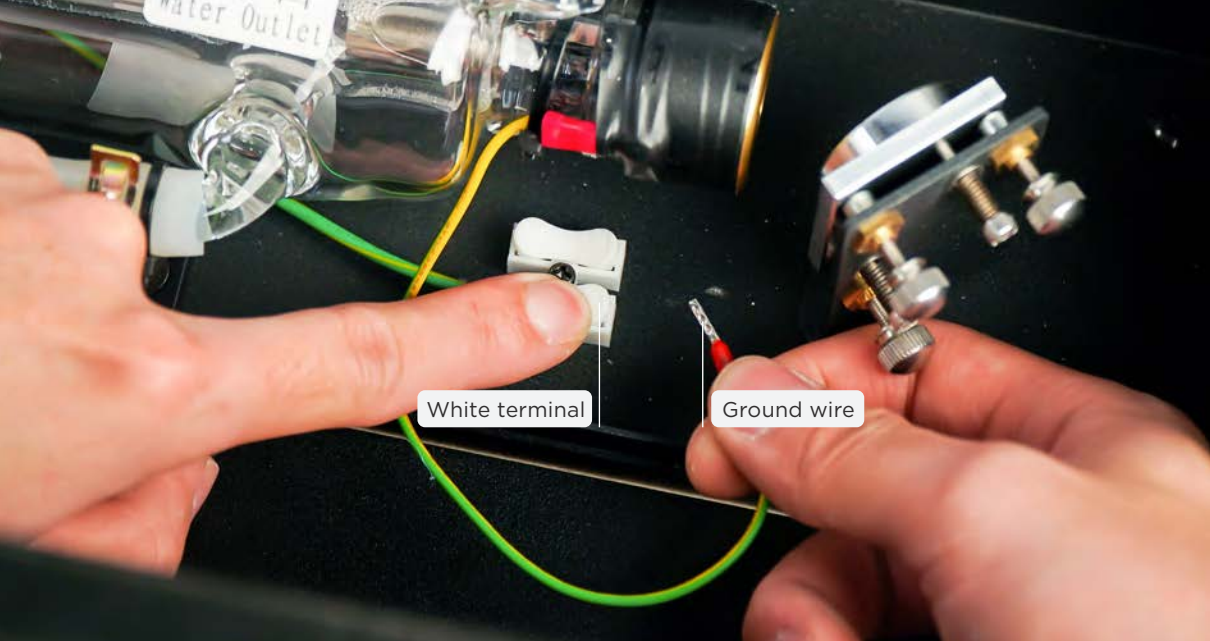
1. Please turn off the machine and unplug the power cord before changing and adding water.
2. Please use the Torx screwdriver to remove the 2 screws on both sides of the back cover and then lift the cover.
3. The laser tube has two ends. The high-voltage side is near the screen and the low-voltage side is near the reflective mirror.
4. If the water is not overly dirty, please skip Step 1 and Step 2 as after moving the laser tube, the optical path must be realigned.

Maintenance Steps:

1. Disconnect the laser tube wires :
    a. Press the white terminal and pull out the ground wire (Photo above) .
2. Remove the laser tube holders : Use a 3mm Allen key to loosen a total of 4 screws on the laser tube holders (Photo below) .

Hose connector

Pipe Plug

Pipe Clip

3. Remove laser tube to drain water out：

a. Place towel or paper towel underneath the laser tube in case leakage (Mind the laser tube's position and angle) > Move both pipe clips away from the hose connector with the needle nose pliers > Remove the joint from one of the hoses and immediately insert the hose plug > Repeat the same for the other hose >

b. Drag the longer hose to the bottom side (High-voltage side) of the machine and put the opening into the water container > Remove the hose plug to drain water (When the water outlet at Low-voltage side is lower than High-voltage side, the water will drain due to the Siphon Phenomenon) >
c. Lift the laser tube to drain the water completely. (Skip this step if choosing not to move the tube.)

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4. Place the laser tube back and put on the hose：

a. Place the laser tube in position as the photo above (Skip this step if choosing not to move the laser tube.) >

Avoid contacting the machine parts with water. If water leaks or spreads, let the machine dry completely before starting up. ⚠️

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b. Remove the plug at the High-voltage side and put on the hose.

pipe clip

Hose connector
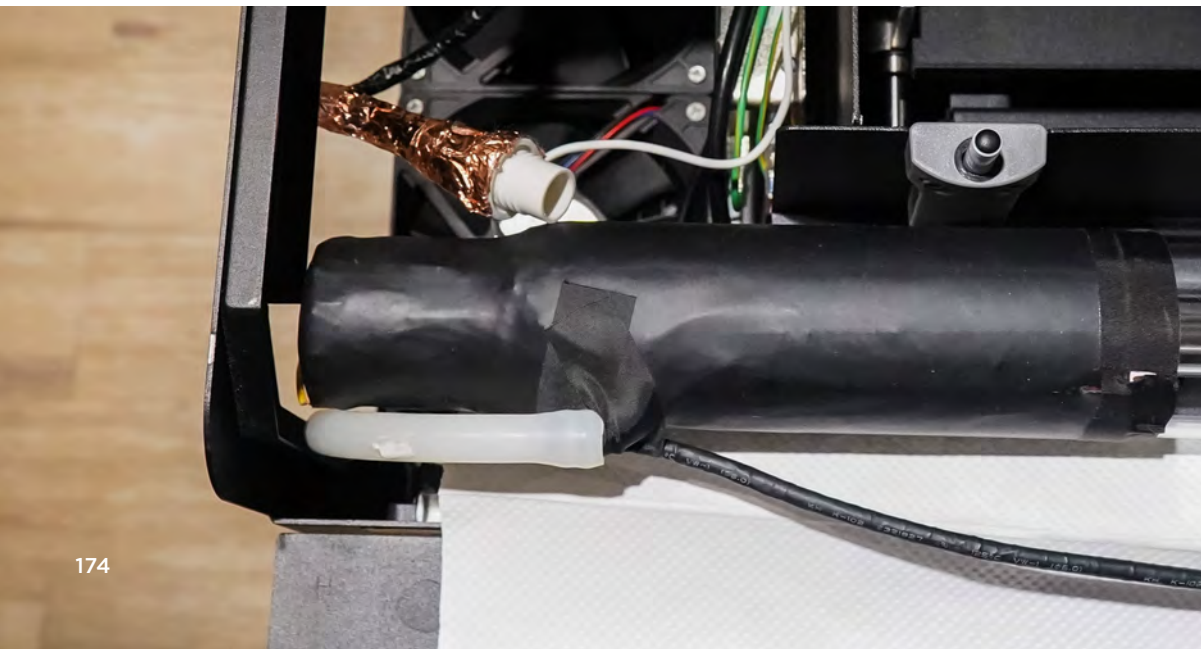
c. At Low-voltage side. put the clip on the shorter hose > Remove the plug > Insert the joint on both hoses > Move both clips closer to each other to prevent leakage.

5. Connect the ground wire of the laser tube：
a. To the Low-voltage side > Press down the white terminal and insert the ground wire > Release the white terminal > Gently pull the ground wire to check if it is firmly connected.

出水口
Water Outlet

White terminal

Ground wire
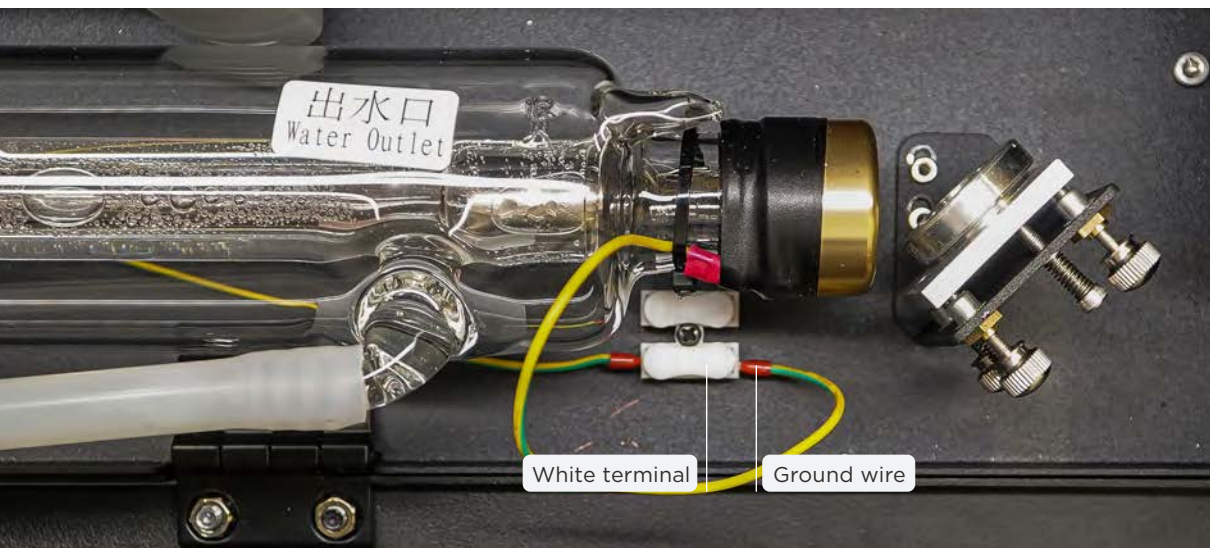
6. Fix the laser tube holders : Make sure the distance between the laser tube and the first reflective mirror is around 15mm (One finger's distance)

7. Power cord and start-up : Plug the power cord and turn on the machine.
8. Water pump take out : Remove the back square plate with the Torx screwdriver > Take the water pump out.

80% Full
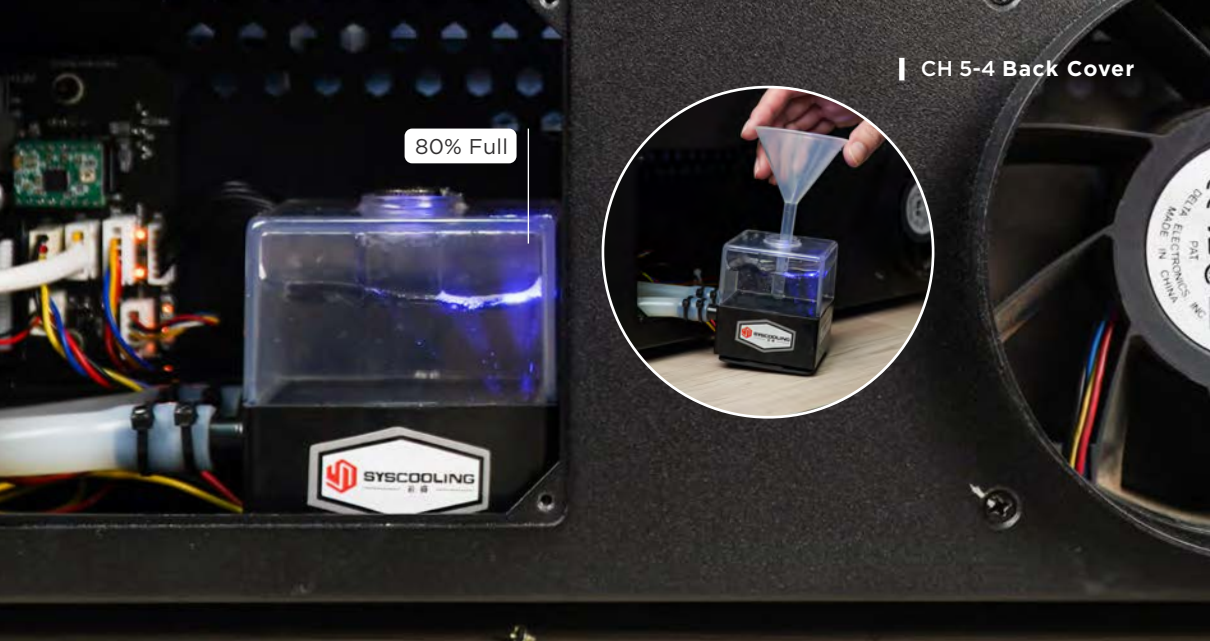
9. Water Filling : Open the cap of the pump with double head wrench > Put in the funnel > Pour the water in > Go to "Maintain Mode" and wait until it finishes homing > Press the "Pump" button to turn the water pump > When water tank's water decreases, pour in more eater until the tank is 80% full.

10. Cap and back plate reassembly : Put back the pump's cap and tighten it firmly with the wrench > Place the water pump back in position > Fix the plate back by tightening these 4 screws with Trox screwdriver.

water pump cap

Ventilation Fan Cleaning

It is recommended to clean once every 1 month.

Maintenance Steps : Remove the dust from the ventilation fan with a brush, then wipe the ventilation fan blades with alcohol.
Please check 【Unboxing】(p.29) for the position of ventilation fan.

Preparation Items : Self-preparation : 1 | Brush, 2 | 75%~99% alcohol.

1

2

CH 6
Trouble-shooting

CH 6-1
Trouble-shooting

This manual classifies the issues into three categories according to their contents, including hardware, software, and comprehensive issues. The test items and solutions for each problem are explained here in order.

FLUX > "Supports" > "Help Center" has more resources to help users with easy troubleshooting. If you cannot follow the guides from this manual or Help Center, you need to collect relevant information (troubleshooting records) and contact your reseller. *Please refer to 6-5 for the troubleshooting records and contact your reseller with all the items in order to solve the problem faster.

Issue Category	Issue Content (Error Code)		Test Items
Hardware	p.185	**#900** Cooler Off	Water hose, water pump, flow sensor
	p.187	**#901** Door Opened	Door cover sensor magnet, magnetic reed switch
	p.189	**#902** Overheated	Room temperature, water temperature, water pump
	p.191	**#904** Homing Failed	Click "MAINTENANCE" on the screen to home the X and Y-axis
	p.192	**#910** Z-axis Homing Failed	Do the homing, height adjustment button, Z-axis bottom limit switch
	p.193	**#911** Drawer Opened	Drawer sensor magnet, magnetic reed switch
	p.194	**#912** Abnormal Fire Detection	-
	p.195	**#913** Abnormal Air Flow Detection	Air flow beneath the laser outlet, air hose, T joint
	p.196	**Abnormal Z-axis top limit switch**	Z-axis top limit switch, probe
	p.197	**Unresponsible motorized work table**	height adjustment button
	p.198	**Material cannot be cut through**	Focusing, power on the screen, reflective mirrors and focus lens, optical path, laser tube
	p.200	**No Laser Beam Output**	Laser tube
	p.201	**Mirrors and lens are oxidized or broken**	Reflective mirrors and focus lens
	p.206	**Minor electric shocks from chassis**	-
Software	p.209	**Unable to Open Software Properly**	Windows : Visual C++ Redistributable / macOS : Version
	p.209	**Other Software Error Codes**	-
Comprehensive	p.211	**Connection Issue**	MAC Address, IP address, "Test Network Settings"
	p.218	**Camera preview screen stitching is inaccurate, Actual engraving position is different from camera preview position**	Focus plane, camera calibration, SVG file
	p.220	**Camera Preview Timeout or Failed to Connect**	"Camera" in the MAINTENANCE page
	p.220	**Camera preview speed is too slow**	Wi-Fi dongle, network environment
	p.221	**Camera preview screen is blurry**	Camera lens
	p.222	**Camera preview screen is overexposed**	Ambient lighting

Hardware Issues

⚙ **#900**
Cooler Off

Lift the cover after removing the 2 screws on both sides of the back cover with a Torx screwdriver.

Preparation Items : Self-preparation : 1 | Distilled water, 2 | Water container, 3 | Cable tie, 4 | Diagonal pliers
Included in the accessory box: 5 | Torx screwdriver, 6 | Double head wrench, 7 | Funnel

Water pump

Air bubble inside the laser tube
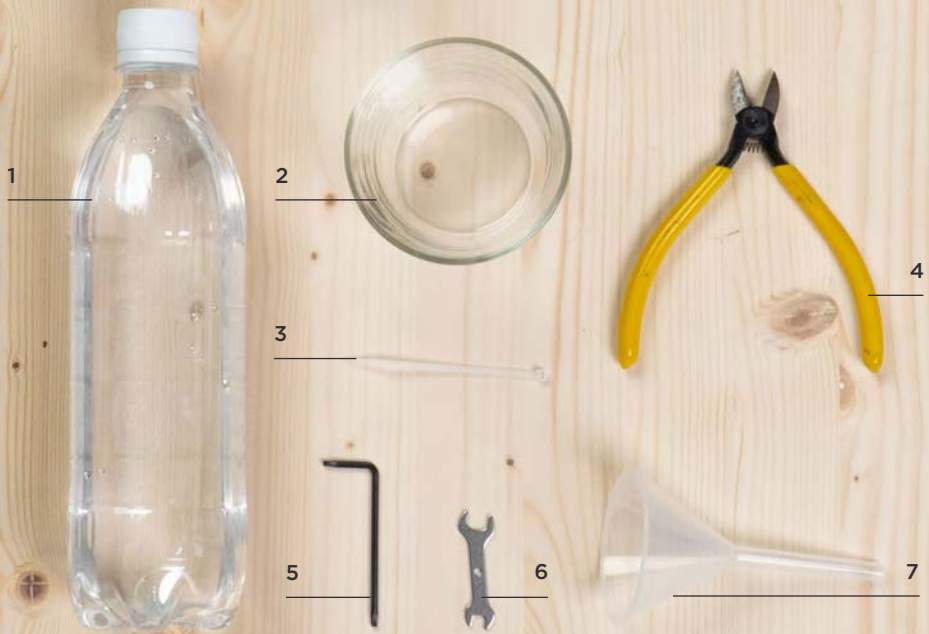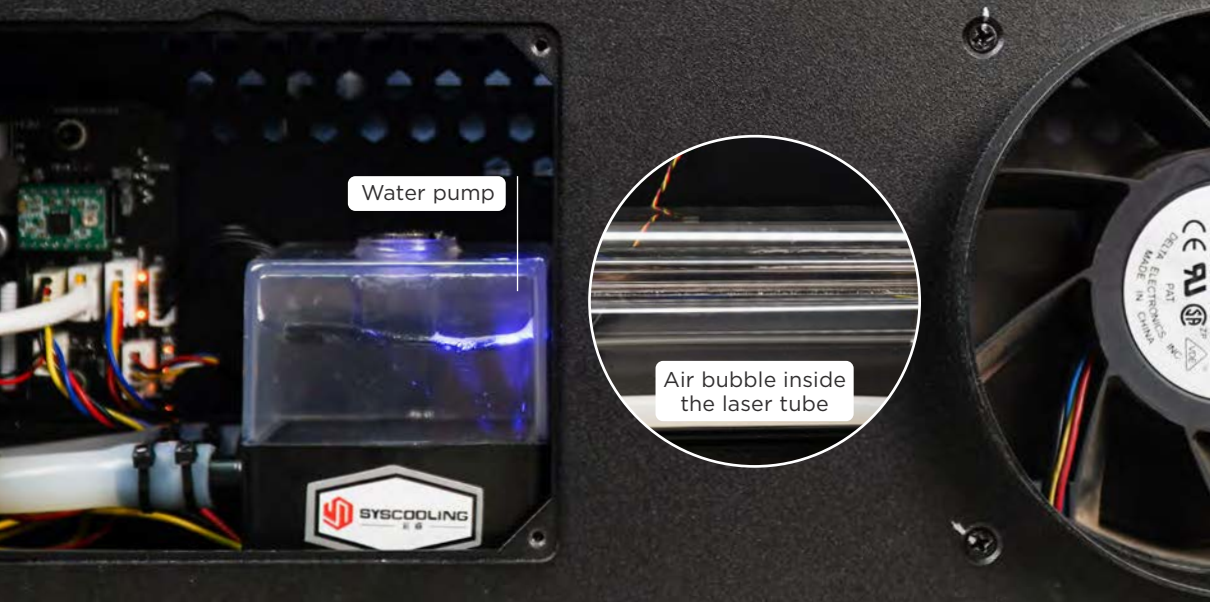
Test Items:

1. **Click "Resume" button :** Try to continue working, if no error message appears again within one minute, then it can be used normally.
2. **No folds or kinks of the water hose :** If the water hose is obviously creased, press the area back to the cylinder shape > Use the cable tie to fix the position.
3. **The water pump should be at least 80% full :** If the water level in the water pump does not reach 80% full, water must be added【Maintenance】 Water changing and adding. (p.171) > Press the water hose to discharge the air bubbles inside the laser tube as many as possible.
4. **Test the flow sensor :** Test the flow speed, which should be above 3.0L/min : Machine screen > "MACHINE" > "Hardware Settings" > "Test Flow Speed".
5. **Replace the cooling water :** If you have tried steps 1 ~ 4 and still have an error, please replace the cooling water【Maintenance】Water changing and adding. (p.171). It would be helpful if you can record a video at the same time.

Troubleshooting Records:

1. **Photo :** Machine screen > "MAINTENANCE" > Turn on the "Pump" and take pictures of :
   a. Water hose (bending at the connection)
   b. Laser tube (the number of bubbles and flowability)
   c. Water pump (water volume, water pump blue light should be constantly on)
   d. Flow sensor (reading), as the right figure.
2. **Video :** The video of cooling water replacement should include the content of photos (water hose, laser tube, water pump, flow sensor) to ensure that the above components are working properly.
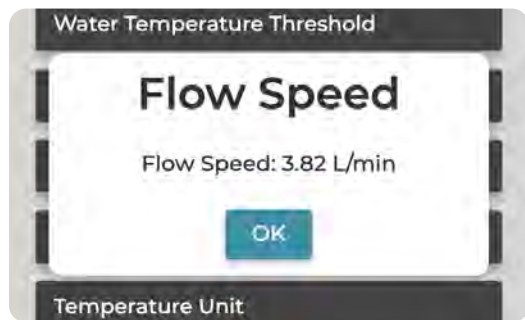
**#901
Door Opened**

Preparation Items : Self-preparation : 1 | Super glue

Magnetic reed switch indicator light

Door cover sensor magnet
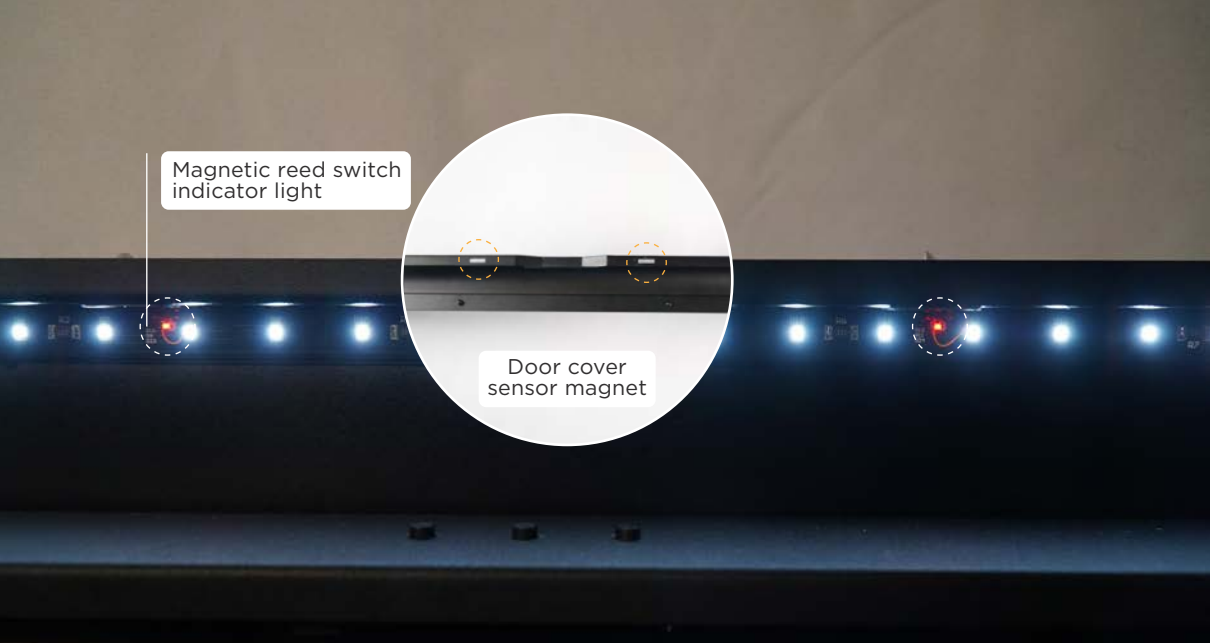
Test Items:

1. **Check the door cover sensor magnet :** If the door cover sensor magnet is off but not lost, you can point super glue at the magnet base to glue the magnet back. If the magnet is lost, please contact your reseller.
2. **Test the magnetic reed switch :** Open and close the door cover continuously, observe whether the 2 indicator lights are obviously on and whether the door cover symbol is displayed normally in the upper right corner.

Door cover opened

Door cover closed

Troubleshooting Records :

1. **Photo :**
   a. Magnet (whether it is off)
   b. Magnetic reed switch indicator lights (whether they are obviously on)
2. **Video :** Need to include the action of opening and closing the door cover and the change of the door cover symbol.

**#902
Overheated**

Overheated warning temperature can be adjusted in "MACHINE" > "Hardware Settings" > "Water Temperature Threshold".
High water temperature will degrade the laser tube faster, so it is recommended to prevent the overheated warning by decreasing the room temperature instead of increasing the water temperature threshold.

Preparation Items : Self-preparation : 1 | Distilled water
Included in the accessory box: 2 | Funnel, 3 | Double head wrench, 4 | Torx screwdriver

Screw hole

Water cooling fan
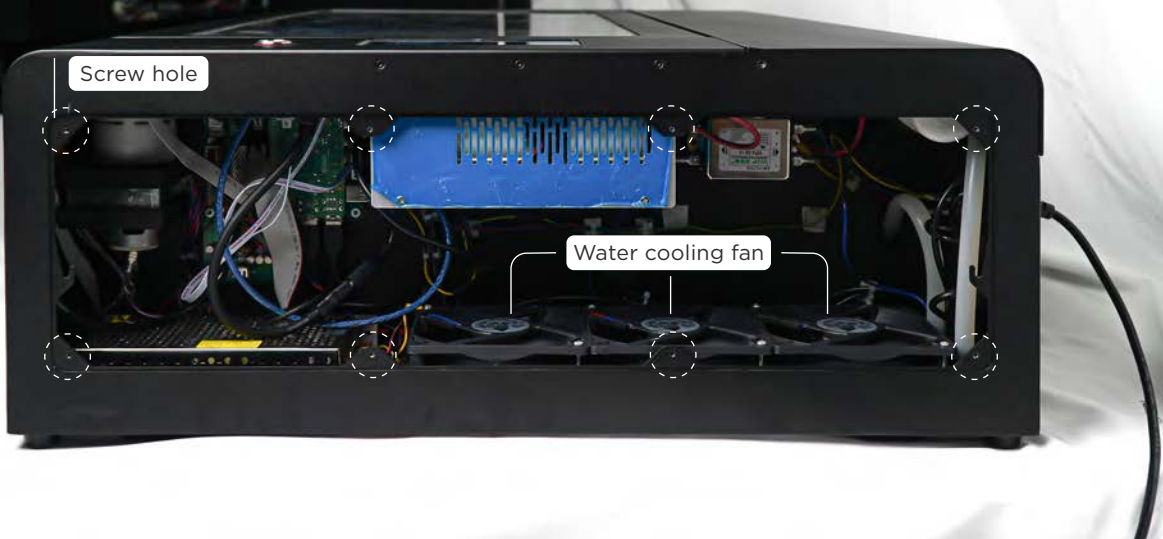
Test Items:

1. **Room temperature should not be too high :**
   a. Keep the right side of the machine heat vent open and should not shade the bottom air intake.
   b. Room temperature above 30°C is not suitable for the use of CO_2 laser.
2. **Water temperature should not be too high :** The water temperature should be between 5°C-30°C.
   The starting temperature of water is low, or the machine has good heat dissipation ability, the continuous cutting time can be longer.
3. **Reduce the high-power operation time :**
   a. If the water temperature is too high due to continuous cutting, you should wait for the machine to dissipate heat and the water temperature to decrease before clicking "Resume" for operation. This will not affect the engraving result. A suitable pause in cutting will help to improve the heat dissipation and can effectively increase the continuous cutting time.
   b. Arrange engraving works between the cutting jobs so that the laser tube can have enough time to dissipate heat.
4. **The water pump should be at least 80% full :** More water will make the water temperature rise more slowly. If the water level in the water pump is less than 80% full, water should be added 【Maintenance】 Water changing and adding. (p.171) > Press the water hose to discharge the air bubbles inside the laser tube as many as possible. The water-cooling system of this model is a closed water circuit, if the water pump cap is covered, general use will not cause water evaporation, the water level of the water pump drops, if the water level decreases significantly within a week, please contact your reseller.
5. **Water cooling fans work normally :** Loosen the 8 screws on the side cover with a Torx screwdriver and move the cover aside > Press the "MAINTENANCE" on the machine screen > Click "Pump". After the water pump is turned on, you can check whether the 3 water cooling fans are working.

Troubleshooting Records :

1. **Photo :** Flow speed reading (should be greater than 3.0 L/min) ("MACHINE" > "Hardware Settings" > "Test Flow Speed")

Water Temperature Threshold
Flow Speed
Flow Speed: 3.82 L/min
OK
Temperature Unit
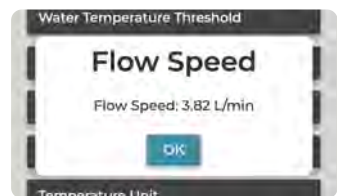
| #904 Homing Failed | Since the reason for "#904 Homing Error" is rather complicated, please provide the trouble-shooting video to your reseller directly. |

Troubleshooting Records :

1. **Video :** The complete X and Y-axis homing process should be recorded. The screen should cover the whole machine. When the X and Y-axis homing process starts, focus on recording the screen and sound at the top left of the machine. Manually pull the laser head to the center of the working range > click "MAINTENANCE" on the screen, then the laser head will move up to the top and then move left to the far left to complete the X and Y-axis homing. As shown in the picture.

<table>
<tr><td>⚙</td><td>**#910**
Z-axis Homing
Failed</td><td>Since the reason for "#910 Z-axis Homing Error" is rather complicated, please provide the troubleshooting video to your reseller directly.</td></tr>
</table>

Test Items :

1. **Test the height adjustment buttons :** Press 3 buttons in turn to make sure the motion along Z-axis is normal.
2. **Test the Z-axis bottom limit switch :** Take the honeycomb table out 【Maintenance】 Honeycomb Table Cleaning, step 1 (p.135) > Click "MAINTENANCE" on the screen > Press the Z-axis bottom limit switch, and observe the change of its symbol from the screen.

<table>
<tr><td>**Z-axis bottom limit switch: triggered**</td><td>**Z↓**</td><td>**Z-axis bottom limit switch: not triggered**</td><td>**Z↓**</td></tr>
</table>

Troubleshooting Records :

a. The complete homing process should be recorded. (Press on the "Autofocus" button for 2 seconds to do the Z-axis homing.) Focus on recording the motion of Z-axis motor and its sound.
b. Height adjustment buttons (whether they are functional)
c. Z-axis bottom limit switch (whether the symbol is shown correctly)

Height adjustment buttons

Z-axis motor

Z-axis bottom limit switch

#911
Drawer Opened

Preparation Items : Self-prepartion : 1 | Super glue, 2 | Magnet

1 ———

2 ———

Magnetic reed switch

Drawer sensor magnet
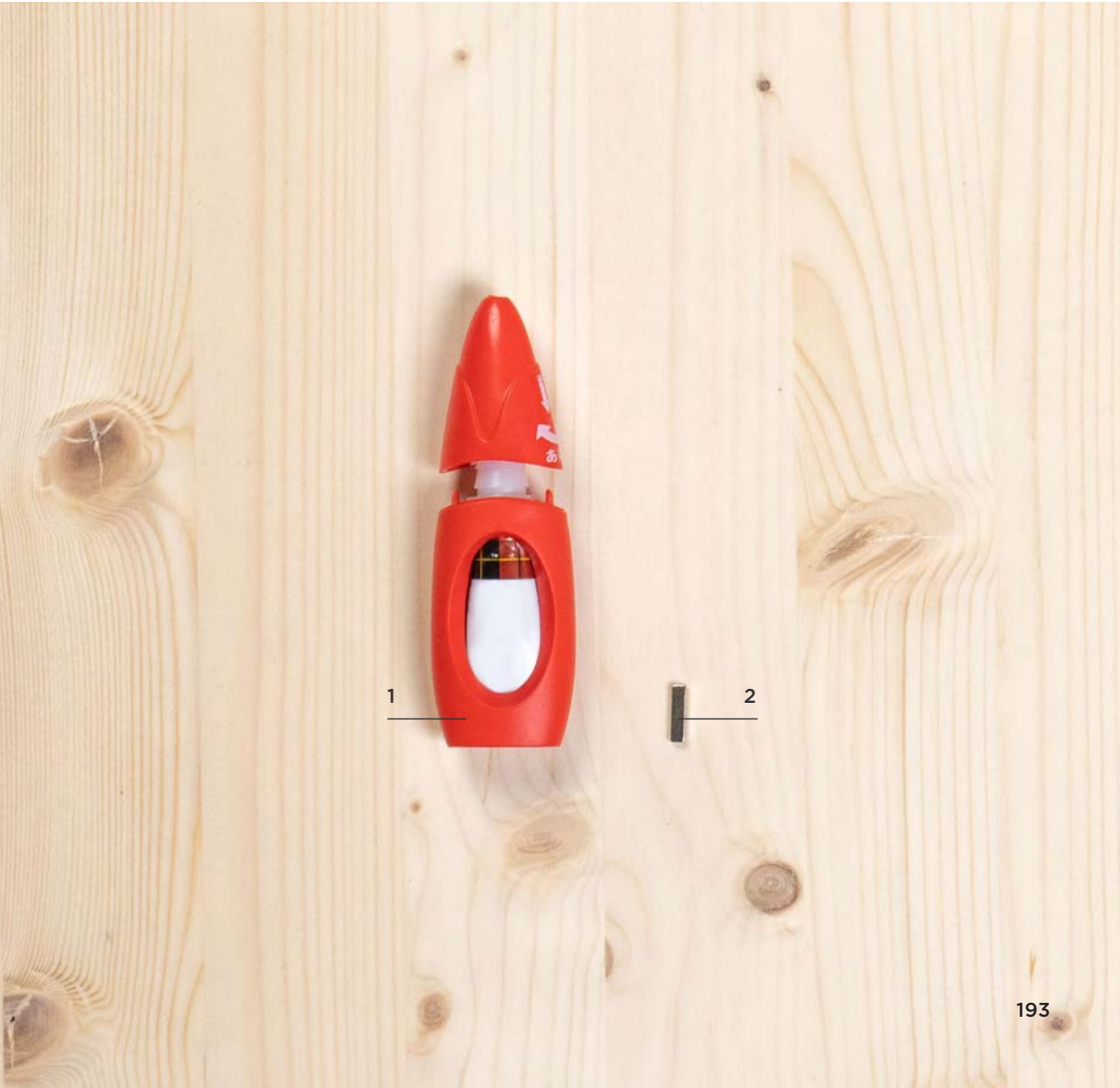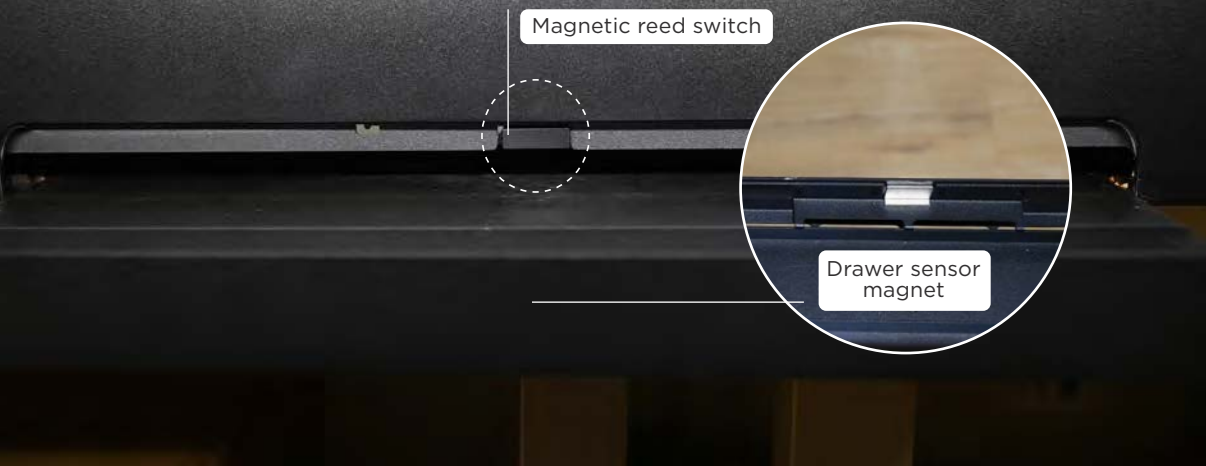
Test Items：

1. **Check the drawer sensor magnet：** After opening the drawer, check if the drawer sensor magnet on the front of the drawer is over there. If the magnet on the drawer is off but not lost, you can glue the magnet back. If the magnet is lost, please contact your reseller. Remove the honeycomb table【Maintenance】Honeycomb Table Cleaning, step 1. (p.135) first, and push the drawer out from the inside of the chassis will be easier to open the drawer.
2. **Test the magnetic reed switch：** Open the drawer > Click "MAINTENANCE" on the screen > Take another magnet to cover the magnetic reed switch > Observe the change of the drawer symbol.

Drawer opened		**Drawer closed**	

Troubleshooting Records：

1. **Photo：** Drawer sensor magnet (whether it is off)
2. **Video：** Test the magnetic reed switch, including the use of external magnet, and the change of the drawer symbol.

⚙️ **#912**
Abnormal Fire Detection

The machine is in use, and (1) there is no flame generated, but the buzzer is making a buzzing sound, or (2) there is a fire, but the buzzer is malfunctioning. Both situations indicate that parts could be problematic. Please stop using the machine and contact your reseller. Repair parts as soon as possible to keep the warning function works.

#913
Abnormal Air Flow Detection

Preparation Items： Self-prepartion：1│Paper

Test Items：

1. **Check the air flow at the laser outlet (air pump)：** Click "Air pump" on the screen > Place a piece of paper at the laser outlet and test whether the laser head is blowing air normally.【Maintenance】MAINTENANCE Page：Function Test, Switches – Air Pump. (p.127)
2. **No folds or damages of the air hose：** If the air hose is obviously creased, press the area back to the cylinder shape. If the air hose is worn to cause a leak, please contact your reseller.
3. **Check the T joint：** Loosen the 8 screws on the side cover with a Torx screwdriver and move the cover aside > Make sure the air hoses on the T joint are installed firmly.

Troubleshooting Records：

1. **Photo：**
   a. Air hose (bending at the connection)
   b. T joint (connections)
2. **Video：** Record the air flow change at the laser outlet before and after turning on the air pump.

T joint
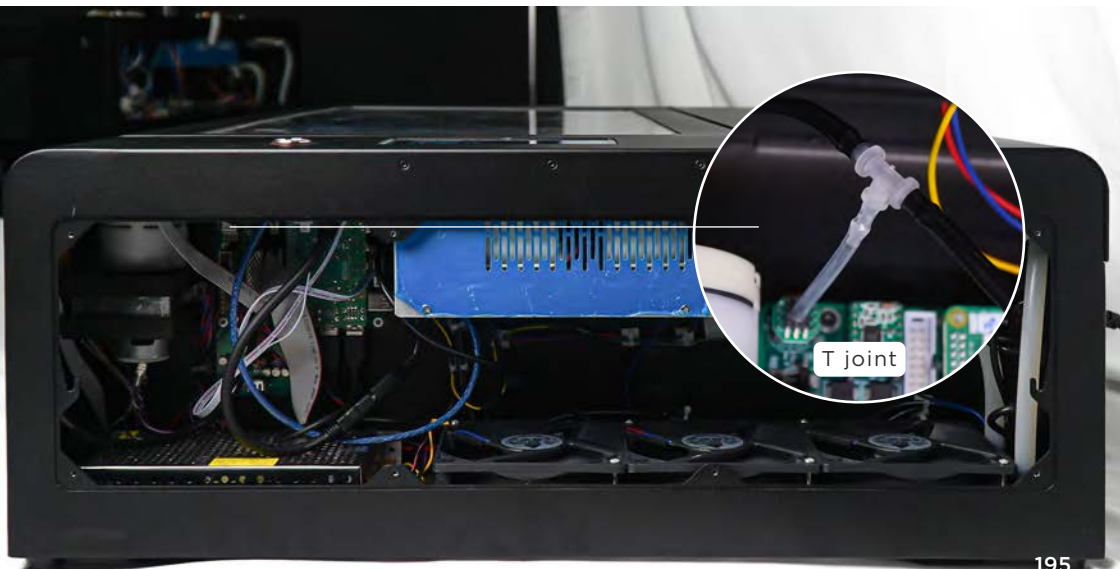
Abnormal Z-axis top limit switch

Test Items：

1. Test the Z-axis top limit switch： Take the honeycomb table out 【Maintenance】Honeycomb Table Cleaning, step 1 (p.135) > Click "MAINTENANCE" on the screen > Use a long tool such as a pen to press the Z-axis top limit switch, and observe the change of its symbol from the screen.

Z-axis top limit switch: triggered		Z-axis top limit switch: not triggered	

2. Check the probe： Double click the "Autofocus" button to do the focusing. When the motorized work table is rising, kindly tap the probe. Then, check if the probe retracts and the table stops moving.

Troubleshooting Records：

1. Video：
a. Z-axis top limit switch (whether the symbol is shown correctly)
b. Probe (whether it is functional)

Height adjustment buttons

Z-axis top limit switch

⚙ **Unresponsible motorized work table**

Troubleshooting Records：

1. Video： Press 3 height adjustment buttons in turn.

<table>
<tr><td>⚙️</td><td>**Material cannot be cut through**</td><td>Self-Preparation Items: As described in the Test Items.</td></tr>
</table>

Test Items :

1. Make sure the focus is correct : Double click the "Autofocus" button to allow the motorized work table to rise and let the probe automatically touch the surface of the engraving material. The distance between the laser head and the surface of the engraving material should be 12mm±1mm.

2. Check the screen power setting : The power on screen is preset to x1.00. If the software power and the screen power are multiplied by less than 15%, it is possible that there is no laser beam output.

3. Make sure the mirrors and lens are clean and undamaged : Clean the reflective mirrors and focus lens, please refer to 【Maintenance】Mirrors and Lens Cleaning (p.138).

4. Make sure the optical path is not misaligned :
a. Put the double-sided tape on the first reflective mirror > Make sure the laser spot is on the first reflective mirror.
b. Apply the double-sided tape to the second reflective mirror > Make sure the bottom left and top left laser spots overlap.
c. Apply the double-sided tape to the third reflective mirror > Make sure the middle right and middle left laser spots coincide.
d. Apply the double-sided tape to the laser outlet > make sure the laser spot is in the center.
If the above conditions cannot be met, it means the optical path is misaligned and needs to be aligned 【Maintenance】Optical Path Alignment (p.146).

5. Confirm that the laser tube is not degrading : If you have confirmed 1~4 items but still cannot cut the engraving material, please contact your reseller.
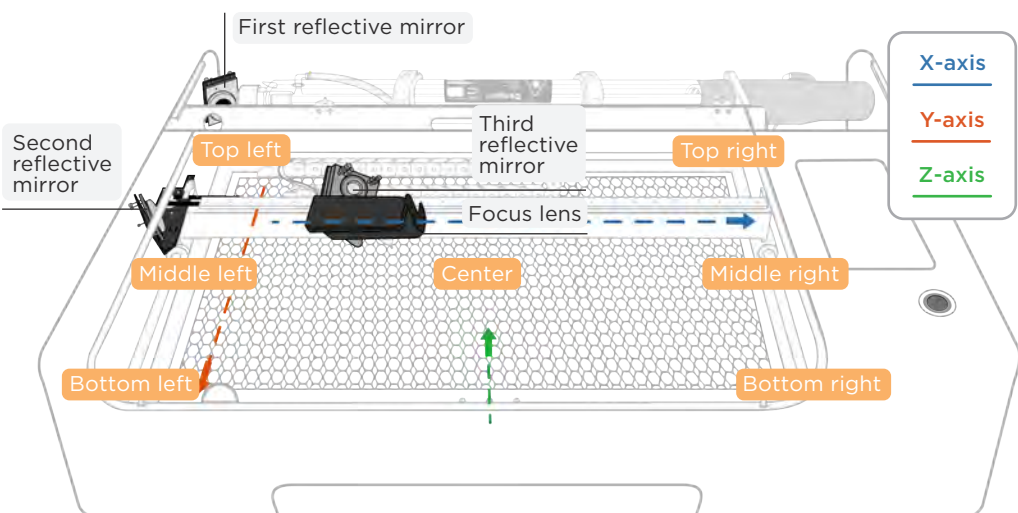
Reflective mirror

Focus lens

Troubleshooting Records :

1. Photo : Take pictures of
    a. 3 reflective mirrors (whether there are stains)
    b. Focus lens (whether there are stains)

    c. Double-sided tapes on 3 reflective mirrors after optical path alignment (shapes and colors of laser spots) Please stick the tapes as below, and press the "Laser Pulse" twice.
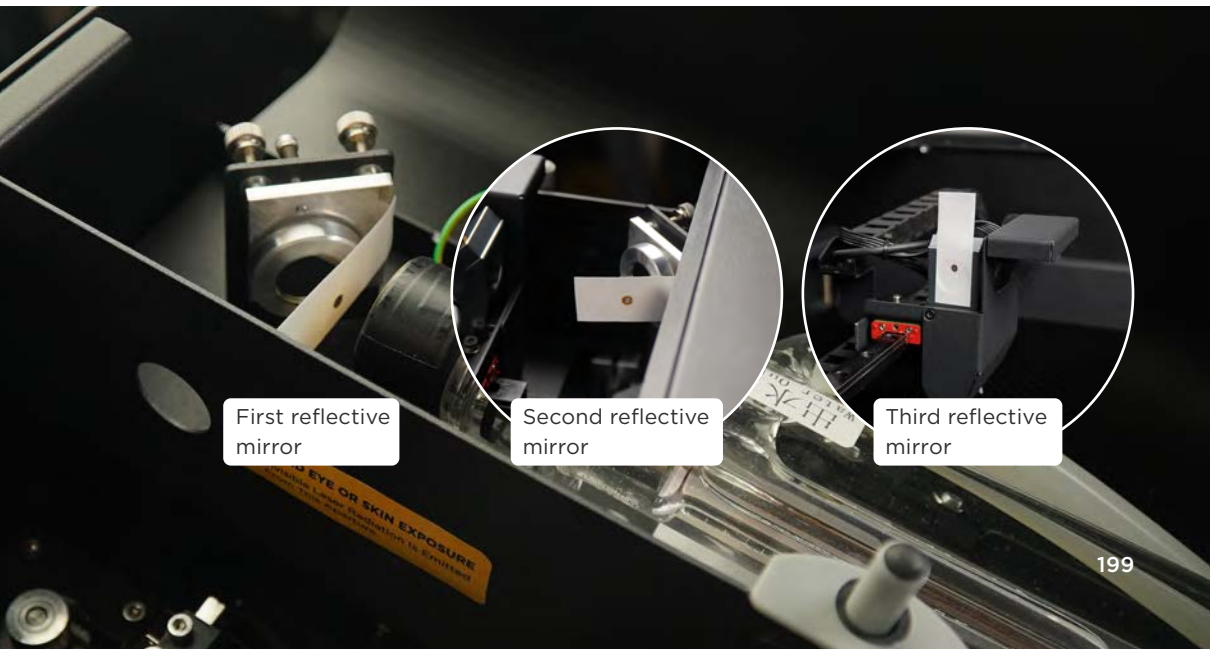
First reflective mirror

Second reflective mirror

Third reflective mirror

⚙️ No Laser Beam Output

Test Items :

1. **Stop using the machine when there is an abnormal sound :** If the laser outlet does not show light and the laser tube makes a "cracking" sound during the use of the machine, it means that the laser tube is malfunctioning, please stop using it immediately to avoid overloading the power supply and causing damage to other parts.

2. **Observe whether there is light in the laser tube :** If there is no obvious noise but still no laser beam comes out, please observe whether there is a light from the laser tube. Go to the "MAINTENANCE" page > Make sure the power setting is x 1.00 > Close the door cover > Click on "Laser Pulse" > At the moment of clicking, you should see a pinkish fluorescent light instantly from the laser tube observation hole. If there is fluorescence, it means the laser is operating normally, please refer to 【Maintenance】 Optical Path Alignment (p.146). If there is no fluorescence, please contact your reseller.

Troubleshooting Records :

1. **Video :** Record the laser tube observation hole status at the moment of pressing "Laser Pulse" (whether there is pinkish fluorescence).

2. **Photo :** If there is pink fluorescence, please provide double-sided tapes on 3 reflective mirrors after optical path alignment (shapes and colors of laser spots).
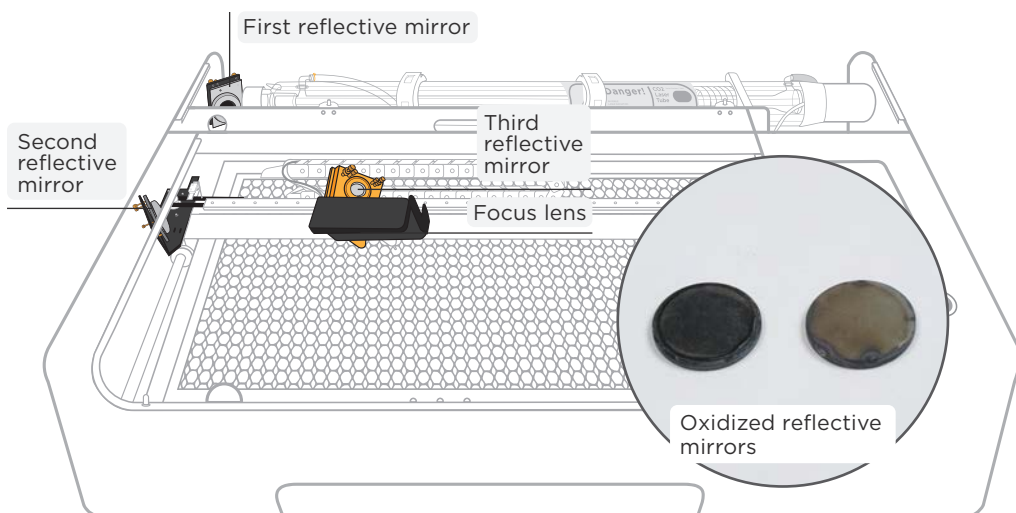
Laser tube shows a pinkish fluorescent light

⚙️ **Mirrors and lens are oxidized or broken**

Preparation Items : Self-Preparation : 1 | Needle nose pliers
Included in the accessory box : 2 | Torx screwdriver

1 _____

2 _____

First reflective mirror

Second reflective mirror

Third reflective mirror

Focus lens

Oxidized reflective mirrors

Test Items :

1. **Check if mirrors and lens are oxidized or broken :** If there are black spots, white spots, etc. on the surface of the first, second, and third reflective mirror, or if there are serious scratches, and the stains cannot be removed by 【Maintenance】Mirrors and Lens Cleaning (p.138), or if the focus lens is deformed or broken due to external force, the mirrors and lens should be replaced.

Replacement Steps :

First reflective mirror :
a. Lift the back cover: Please use a Torx screwdriver to remove the 2 screws on both sides of the back cover and then lift the cover.
b. Loosen the aluminum cover: Loosen the aluminum cover that fixes the mirror (face the mirror and turn counterclockwise), if it cannot be turned, use needle nose pliers to clamp the aluminum frame and turn again >
c. Replace the mirror: Take out the old mirror > Put the new mirror with the matte side facing the mirror holder (laser beam will hit the shiny side) >
d. Tighten the aluminum cover: Tighten the aluminum cover back to the mirror holder.

Aluminum cover

Shiny side

Matte side

Second reflective mirror : After opening the door cover, follow the first reflective mirror steps b~d (the position of the second reflective mirror is indicated in the picture in p.202).

Third reflective mirror :
a. Loosen the fixing cap: Use the needle nose pliers to hold the two round points of the fixing cap of the mirror, and unscrew the fixing cap counterclockwise >
b. Replace the mirror: Take out the old mirror, you can pull out the mirror from the laser inlet area > Place the new mirror with the shiny side facing the mirror holder >
c. Tighten the fixed cap: Use needle nose pliers to hold the two round points of the fixing cap of the mirror, and tighten the fixing cap clockwise.
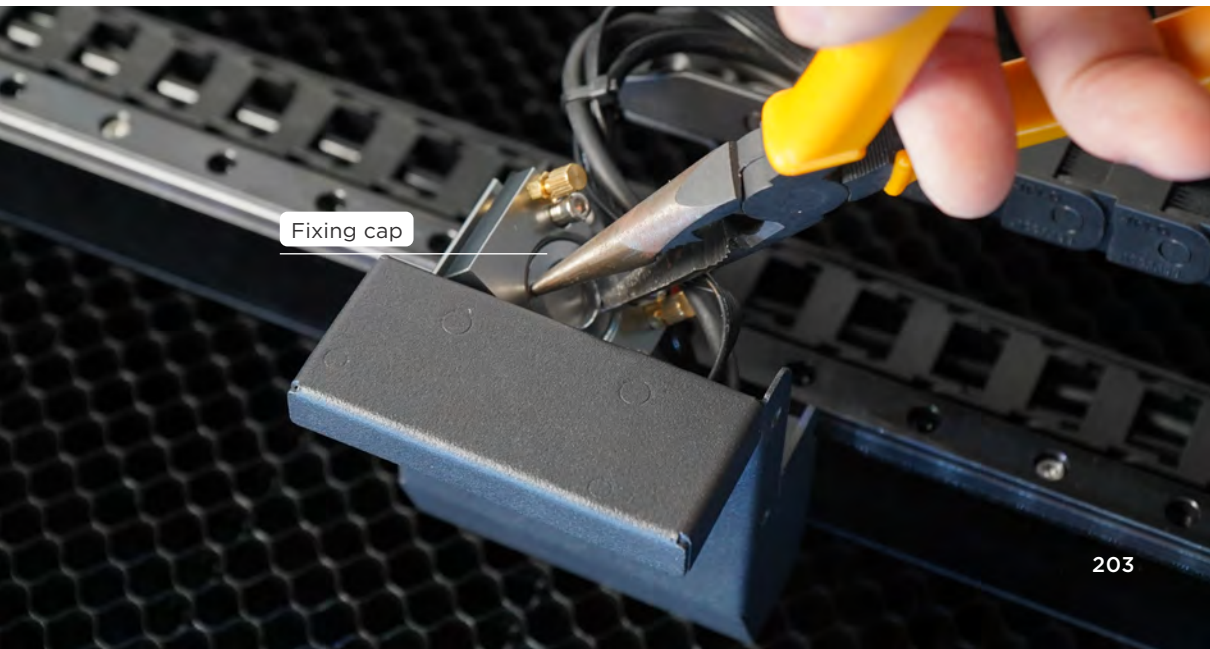
Fixing cap

Focus lens:

a. Remove the honeycomb table 【Maintenance】Honeycomb Table Cleaning, step 1 (p.135). >

b. Move the laser head cover aside : Loosen 2 screws on the laser head cover with a Torx screwdriver and then move the cover aside >

c. Remove the laser head : Unscrew the nozzle fastening ring clockwise. If it cannot be unscrewed, use needle nose pliers to assist > Remove the laser head, and please avoid the focus lens from being popped out >

Laser head cover

Screw
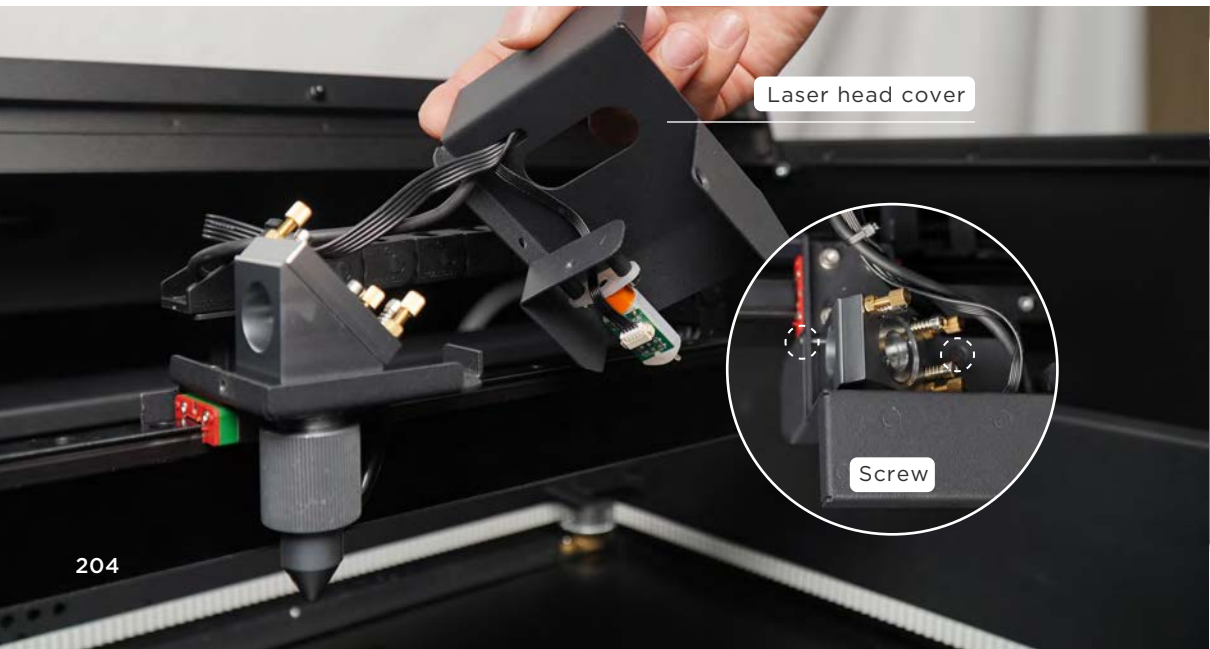
d. Replace the lens : Remove the old lens > Put the new lens into the laser head with the flat side downward (hold the edge of the lens and look into the lens, you can see yourself on the convex side, but you cannot see yourself on the flat side) >

e. Put the laser head back : Put the laser head back > Tighten the nozzle fastening ring counterclockwise >

f. Tighten the laser head cover : Tighten 2 screws on the laser head cover >

g. Put the honeycomb table back 【Maintenance】 Honeycomb Table Cleaning, step 3 (p.135).

Troubleshooting Records :

1. Photo : Take pictures of
    a. 3 reflective mirrors (whether oxidized)
    b. Focus lens (whether oxidized or broken)

Reflective mirror

Focus lens

Convex side

Flat side
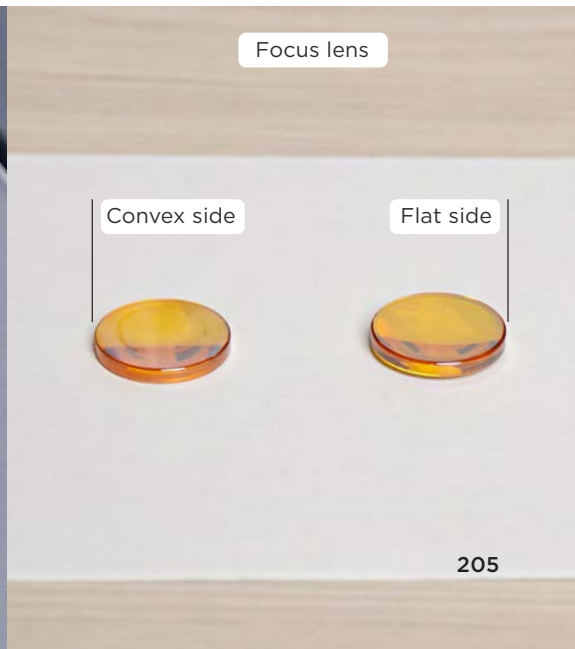
⚙️ Minor electric shocks from chassis

Everyone's sensitivity to electric current is different, that is, everyone will have different degrees of feelings about leakage. Due to the design mechanism of the laser tube, there will be a slight controlled leakage current for the tube to function properly, which is a normal phenomenon, do not worry too much. The laser cutting machine must be properly grounded while using. If it is properly grounded, there will be no leakage. If you touch the machine when it is operating, and you may feel a minor electric shock, it maybe the 3-prong outlet is not properly grounded, or the third prong is not fully grounded.

Preparation Items : Self-preparation : 1 | Phillips screwdriver, 2 | Ground wire, 3 | 3-prong adapter

Solution :

1. DIY grounding : Connect the machine's power cord to a 3-prong adapter > Connect the adapter's ground terminal to the building's metal piping to achieve an approximate grounding effect.

2. Wear shoes to use the machine : Avoid using the machine with bare feet, wearing shoes can reduce the risk of electric shock.

3. Plug the adapter into the outlet reversely : If you are unable to DIY, connect the power cord to the 3-prong adapter and plug it into the outlet in the opposite direction (rotate 180 degrees).

1

2

3

CH 6-3
Software Issues

⚙️ **Unable to Open Software Properly**

Windows
If your computer pops up a not responding window when you open the software, please make sure you have installed Visual C++ Redistributable on your computer.
Please install Visual C++ redistributable packages for Visual Studio 2015, 2017 and 2019.

macOS
Please update your system to macOS 10.14 (Mojave) or above. Some older versions of macOS may have support issues.

⚙️ **Other Software Error Codes**

When the software is abnormal, error messages will pop up in your computer window. If you are unable to follow the steps below to resolve the software issues, please contact your reseller.

Steps to Follow :

1. Record :
   a. Record the current software and firmware versions.
   b. Explain the operation behavior (or recording) and take screenshots.
2. Export a bug report : Export a bug report when an error message pops up.
   (Menu > "Help" > "Bug Report")
3. Retry: Reopen the software > Retry the behavior.
4. Check the Help Center : Go to official website "Supports" > "Help Center" to
   search for solutions. (https://support.flux3dp.com/hc/en-us)
5. Update software and firmware : Update software and firmware to the latest beta
   version > Retry the behavior.
6. Record again : As in step 1.
7. Export another bug report : As in step 2.

Troubleshooting Records :

1. The information collected in steps 1, 2, 6, and 7.
2. .beam files and image files, etc.

CH 6-4
Comprehensive Issues

Connection Issue

Make sure that the MAC Address in the "NETWORK" of the machine screen has a value, IP address starts with 192.168 and the network quality is good so that you can have a stable connection.

Preparation Items : Self-preparation : 1 | Ethernet cable (Wired Network*1 or 2, Direct Connection*1)
Included in the accessory box: 2 | USB cable, 3 | Wi-Fi dongle

Test Items :

1-1. There is a value for MAC Address in the "NETWORK" page :

a. Wi-Fi :

- Built In Wi-Fi:

Click "NETWORK" on the machine screen > Check whether MAC Address under Embedded Wireless Network has a value, as shown below. If there is a value, then please go directly to the 2nd test item. If there is no value, please insert the Wi-Fi dongle and look the Extender Wi-Fi below.

- Extender Wi-Fi:

Screw the Wi-Fi dongle firmly > Fold the dongle antenna up 90 degrees and insert it into any USB socket on the side of the machine > Click "NETWORK" on the machine screen > Check whether MAC Address under Extender Wireless Network has a value, as shown below. If there is a value, then please go directly to the 2nd test item. If there is no value, please insert the Wi-Fi dongle into another USB socket for use. If neither socket shows the MAC address, please contact your reseller.

b. Wired Network : (machine - router – computer, take 2 ethernet cables as an example):

One RJ45 ethernet cable connects the machine to the router and the other RJ45 ethernet cable connects the router to the computer > Click "NETWORK" on the machine screen > Verify that MAC Address under Wired Network has a value, as shown below. If there is a value, please go directly to the 3rd test item. If there is no value, please try to replace the network cable or contact your reseller.
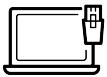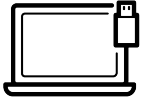
c. Direct Connection (machine-computer) :

A RJ45 ethernet cable is connected to the machine and the computer on both ends > Enable Internet connection sharing 【Connection Settings】2-5.4 Direct Connection (p.053), Windows setting as 1, c, macOS setting as 2, c~e > Click "NETWORK" on the machine screen > Check if the MAC Address under Wired Network has a value, as shown below. If there is a value, then you can go directly to the 3rd test item. If there is no value, please try to change the network cable or contact your reseller.
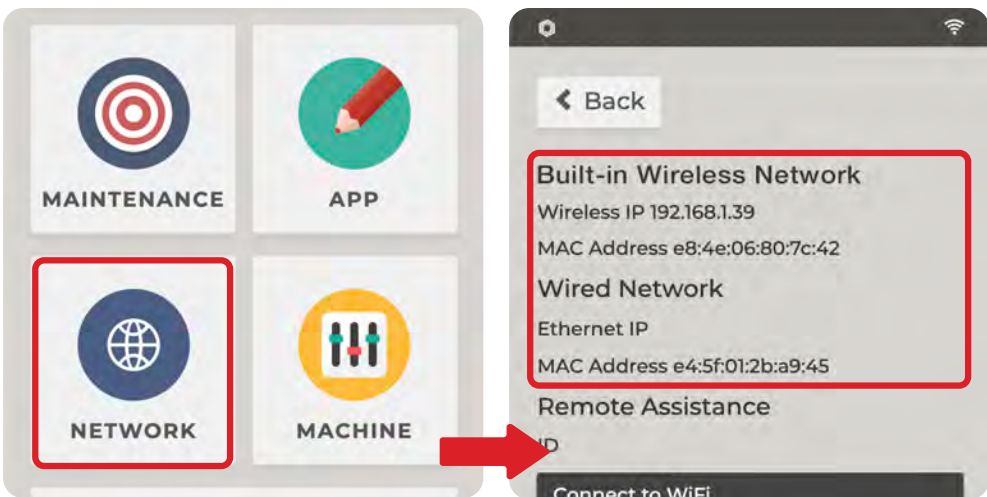
1.2. Network status is "Connected"：

USB Connection (machine~computer)：
A USB cable is connected to the machine USB-B slot and the USB adapter on both ends. Install the USB-C of the adapter to the computer. > Verify that the network status is "Connected." 【Connection Settings】CH2-5, 3. USB Connection (p.051)，Windows setting as 1-b., macOS setting as 2-b., as below. If it shows "Connected", please go directly to the 5th test item. If it does not show "Connected", please try to replace the USB cable or contact your reseller.
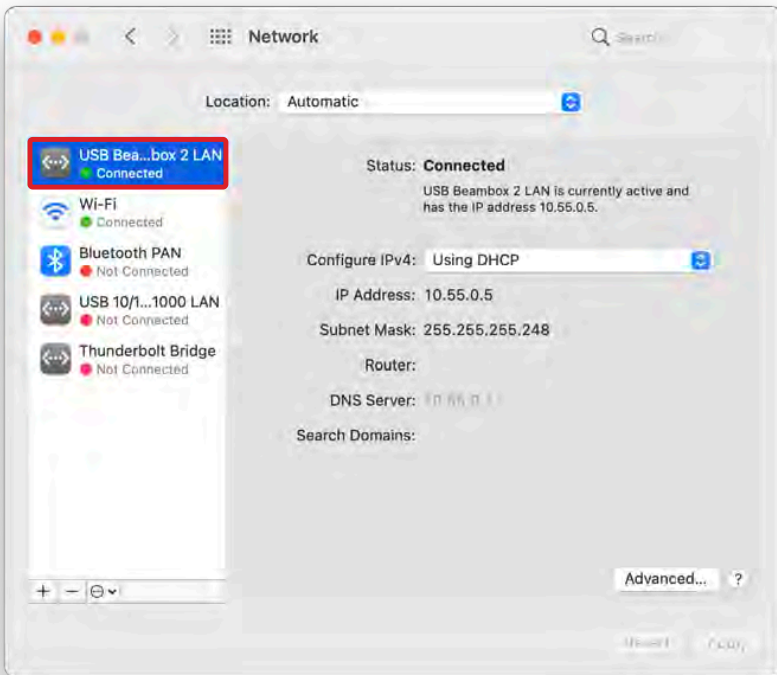
2. "Connect to WiFi": "Connect to WiFi" > Select the Wi-Fi you want to use > Enter the Wi-Fi password and press "Confirm".
a. If the Wi-Fi name is not displayed :
Make sure the Wi-Fi channel is 2.4Ghz, the machine does not support 5Ghz.
b. If Wi-Fi name is displayed, but you cannot connect to it :
Check the Wi-Fi encryption type, it should be WPA2 or None (no password). The encryption type can be set by your computer, but be aware that not all routers support WPA2.
c. Unable to connect to iPhone hotspot :
Make sure the phone hotspot name should not have special characters or non-English characters. If the phone system is iOS 13, keep the hotspot page open when the machine connects to the hotspot; if the connection fails, turn off the hotspot for about 10 seconds, then reopen the hotspot and try to connect again.

3. Confirm the beginning of IP address :

a. Wi-Fi :
Make sure the "Wireless IP" of the machine starts with 192.168.
b. Wired Network :
Verify that the "Ethernet IP" of the machine starts with 192.168.
c. Direct Connection :
Verify that the "Ethernet IP" of the machine starts with 192.168.
d. If the IP address starts with 169.254 :
If the IP address starts with 169.254, it means that the network interface card did not obtain the IP address automatically. And usually this is because the router does not have DHCP service enabled or the DHCP service is malfunctioning. Please contact your internet service provider to turn the DHCP function on.

4. Fill the IP address of machine in Beam Studio: Fill the IP address starting with 192.168 in the software.
a. Windows :
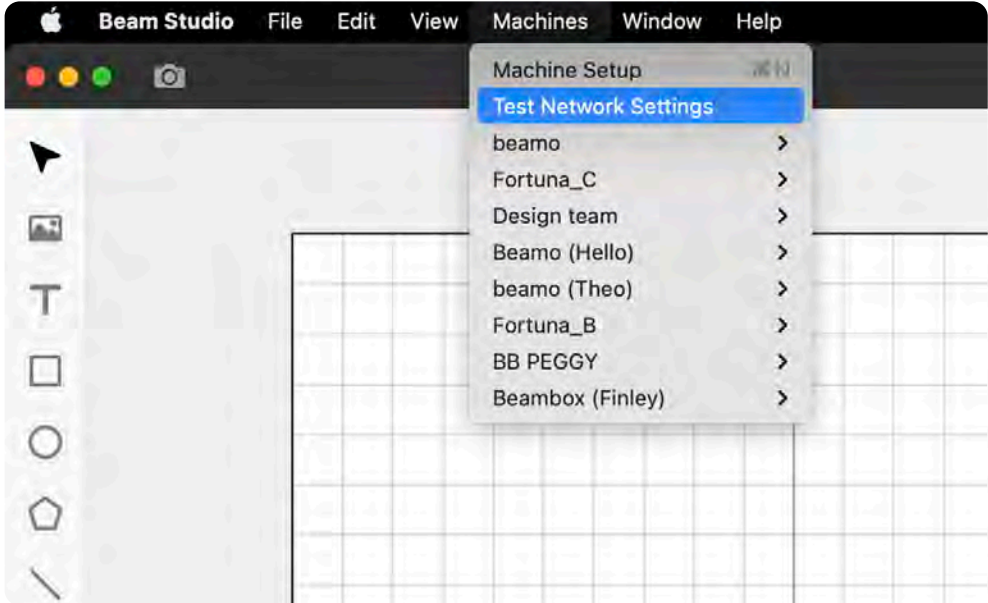Menu > "File" > "Preferences" > Machine IP Address > Apply.
b. macOS :
"Beam Studio" > "Preferences" > Machine IP Address > Apply.
c. Linux :
"Beam Studio" > "Preferences" > Machine IP Address > Apply.

5. Test the connection stability : If the software still cannot find the machine after filling the IP into the software, please confirm the connection stability.
a. Menu > "Machines" > "Test Network Settings" >

> If you have other connection problems, please refer to "FLUX > Supports > Help Center > Beam Studio > Connection" for other instructions.

b. Fill in the IP of the machine you want to use in "Target device IP address" > "Start" > (If USB Connection is used, and the operating system is Windows, machine IP or so-called Target device IP address should be 10.55.0.17. If the system is macOS, Target device IP address should be 10.55.0.1.)
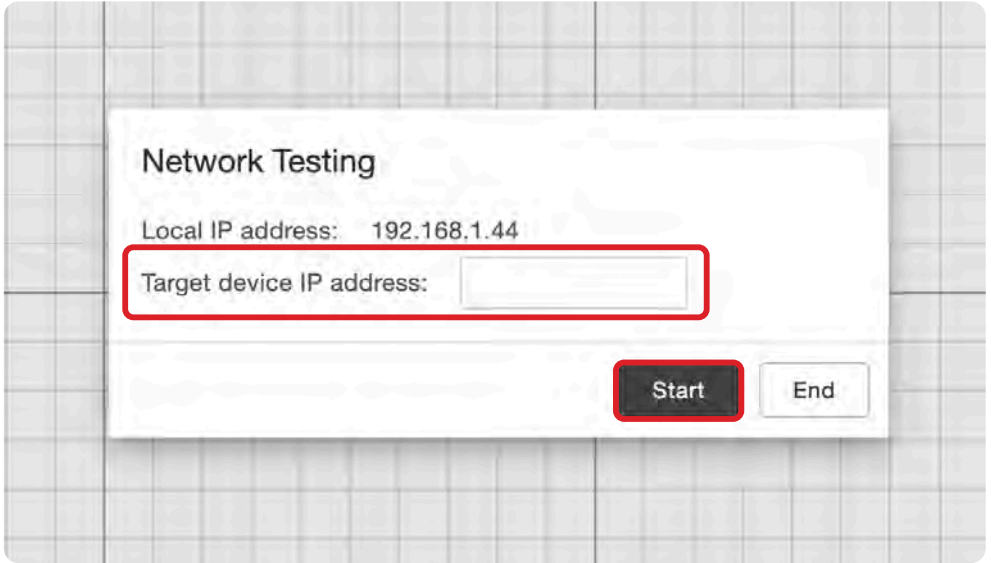
c. The test data includes Connection Quality and Average Response Time >
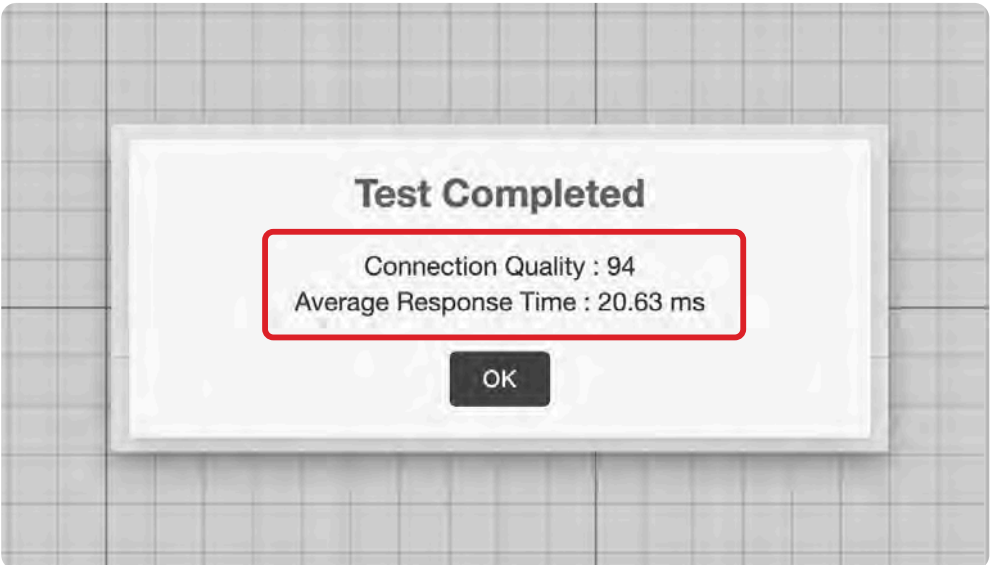
After Beam Studio version 1.4.2, Connection Quality > 70 and Average Response Time < 100ms means the connection is stable. If the connection is stable but the software cannot find the machine, please update the software and fill in the IP in "Preferences" > Machine IP Address. If the connection is not stable, please check the Wi-Fi signal strength and whether the computer and the machine are using the same network.

Dongle antenna

Antenna connector

Ethernet port

Troubleshooting Records :

**1. Photo :**

(1) If any of Wi-Fi, Wired Network, or Direct Connection is used, connect the Built In Wi-Fi, Wi-Fi dongle or ethernet cable > Turn on the machine > Click "NETWORK" and take pictures of :

a. Antenna (connector, angle) or etherne port
b. Wireless Network MAC Address, Wired Network MAC Address
c. Wireless IP, Ethernet IP
d. Screenshot of the result of "Test Network Settings"
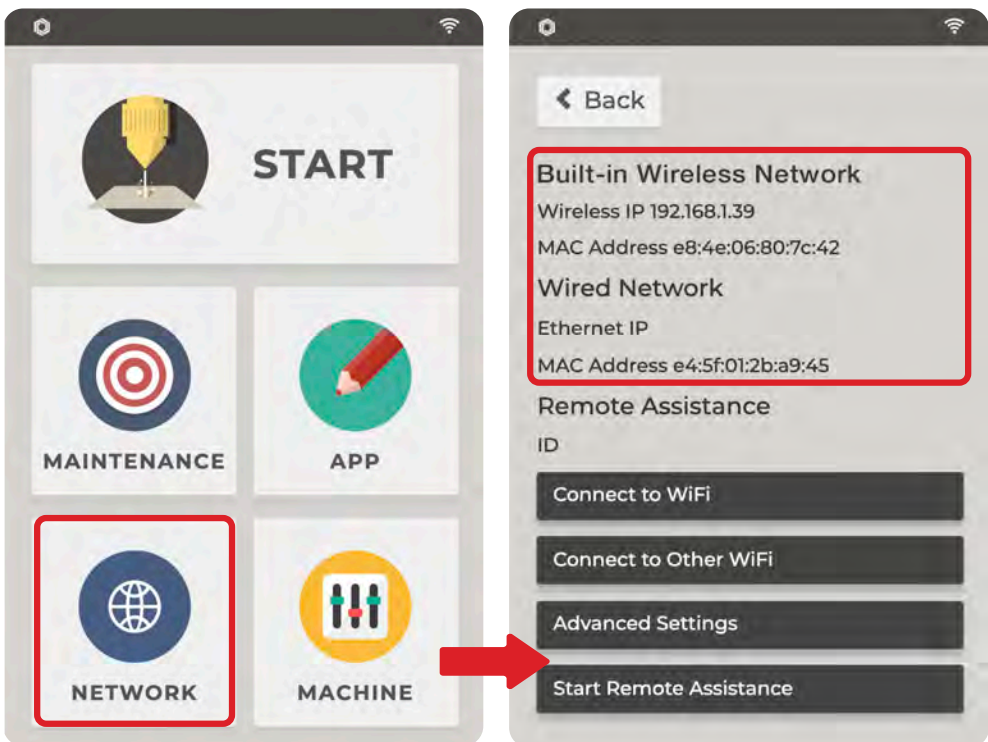
(2) If USB Connection is used, connect the USB cable > Turn on the machine and take pictures of :
    a. Network status (whether it is connected)
    b. Screenshot of the result of "Test Network Setting"
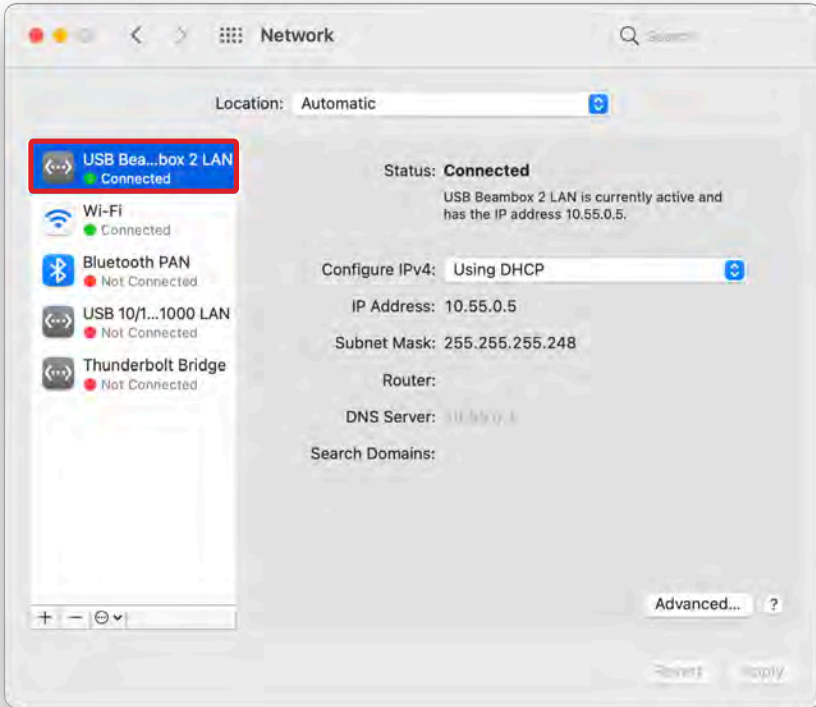
Camera preview screen stitching is inaccurate, Actual engraing position is different from camera preview position

Accurate focus and calibration can make the preview picture stitching more accurate and make the engraving position consistent with the preview position.

Test Items :

1. Confirm the correct plane of focus :
Double click the "Autofocus" button to allow the motorized work table to rise and let the probe automatically touch the surface of the engraving material. Every time you change the material of different thickness, you need to lower down the work table and do the autofocus again to ensure the correct focus. When engraving, if the focus is not correct, the laser beam will be thicker than the laser beam with correct focus.

Result of wrong focus

Result of correct focus

Thicker object : When the object is thicker or when the rotary add-on is used, the side of the object may be captured by the camera, and only the objects on the plane of focus can be stitched together, and the picture out of focus and inaccurate stitching caused by the height difference is normal. Be sure to focus on the surface of the engraving material and the highest point of the engraving material when using the rotary add-on.

2. **Complete camera calibration (left of below pictures) :**
   After exposing to shock and vibration of transportation, optical path alignment, and Reset to Factory, etc., all need to be recalibrated. The calibration steps are as described in 【Beam Studio Tutorial】Step 2 (p.057).
   There are two calibration objectives:
   a. The red square must be located in the center of the calibration window.
   b. The outside of the red square must be aligned with the center square of the grid lines.

3. **Confirm the calibration result (right of below pictures) :** Draw a square at (X,Y) = (77.5mm, 77.5mm) with a width W and height H of 25mm and make sure the square overlaps with the center square of the grid lines. If it does not fit, refocus the paper and recalibrate the camera.
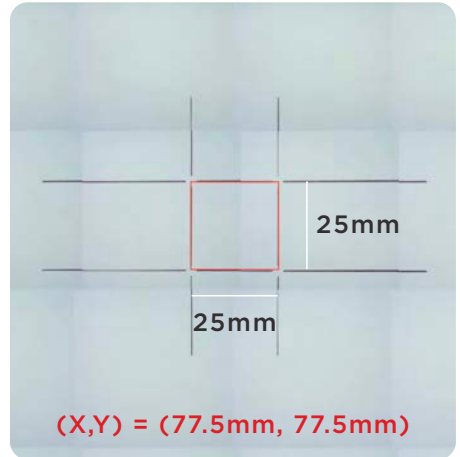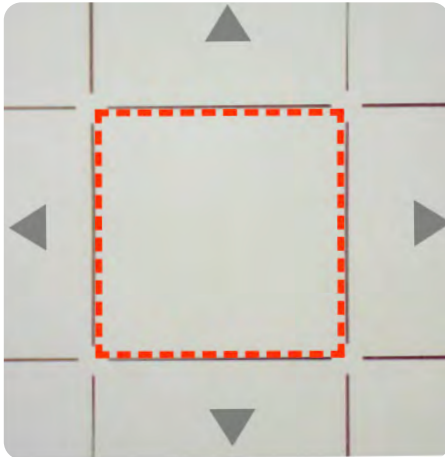

Troubleshooting Records :

1. **Image file :** If there is still a discrepancy between the result and the preview position after using SVG file and confirming the correct plane of focus and accurate camera calibration, please provide the SVG file to the your reseller and let the engineering team assist.

⚙️ Camera Preview Timeout or Failed to Connect

Troubleshooting Records : The reason for not being able to use the camera may be related to hardware or software, so please directly provide the troubleshooting video to your reseller for evaluation.

1. **Video :** The screen should cover the whole machine, focusing on recording the machine screen. Click "MAINTENANCE" > "Motors" > "Camera" > Open the door cover > Slowly move the laser head around the working range for 3 rounds and observe whether there is a picture on the screen, as shown in the picture, if the picture is white, please contact your reseller. (Note that the camera updates the screen every 3 seconds.)
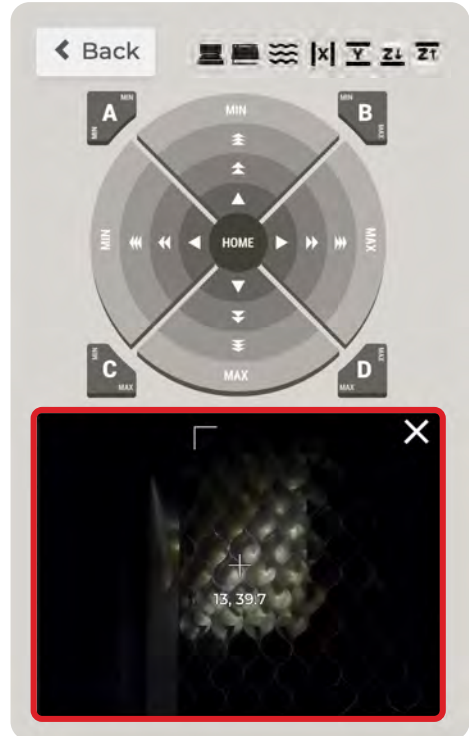
⚙️ Camera preview speed is too slow

Test Items :

1. **Wi-Fi dongle is not loose :** Make sure the Wi-Fi dongle at the back of the machine is not loose, and the antenna connector has been tightened.
2. **Shorten the distance between the machine and the hotspot :** Shorten the distance between the machine and the wireless network source (router or hotspot), or try to use wired connection. If the above items do not solve the problem of slow camera preview speed, please refer to "Camera Preview Timeout or Failed to Connect" or contact your reseller.

Camera preview screen is blurry

Test Items :

1. Check the cleanliness of the camera lens : Click "MAINTENANCE" on the screen > "Camera" > check the cleanliness of the lens from the screen panel.

Preparation Items : Self-preparation : 1 | Cotton swab, 2 | 75%~99% alcohol

Camera lens

Operation Steps :

1. **Clean the camera lens :** Use a cotton swab with a small amount of alcohol to clean the camera lens > Then use a dry cotton swab to dry the lens.
2. **Confirm the camera screen :**
    a. Click "MAINTENANCE" > "Camera" > confirm the lens is clean from the screen panel.
    b. Use the software Beam Studio camera preview function to confirm that the camera preview screen is clean.

⚙️ **Camera preview screen is overexposed**

Test Items :

1. Confirm that the environment is free of strong light interference :
    a. Check that there is no strong light above the machine, such as track lights, flurescent lamps, etc.
    b. Make sure the machine is not placed in a place in harsh sunlight.

Preparation Items : Self-preparation : 1. dark fabric or cardboard.

Operation Steps :

1. Remove or shield the strong light source :
    a. Cover the acrylic door cover above the engraving material with a dark fabric or cardboard.
    b. Turn off the indoor light source above the machine.
2. Retry the camera preview : Make sure that the camera preview screen is back to normal.

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CH 6-5

Contact Customer Service

The contents of this chapter are subject to actual use.

FLUX > "Supports" > "Help Center" has more resources to help users with easy troubleshooting. If you are unable to troubleshoot a problem according to this manual or Help Center, please provide the following items to your reseller.

The following information is subject to actual use :

Name :
Telephone :
email :
Address :
Purchasing platform : For non-FLUX official website purchasers, please provide a photo of the order details.
Operating system : Windows / macOS / Linux
Software version : Windows: Menu > "Help" > "About Beam Studio".
macOS: Menu > "Beam Studio" > "About Beam Studio".
Browser: Chrome / Safari.
(Supported devices for browser version are those with either viewport width or height is over 1024 pixels.)
Firmware version : Machine screen, "MACHINE" > Firmware Version.
Laser tube usage hours : Machine screen, "MACHINE" > Laser Tube Usage.
Machine serial number : Please provide a photo of the sticker on the back of the machine.
Troubleshooting Records : Please provide photos or videos according to the Troubleshooting Records in this chapter.

Contact your reseller to get a prompt support!

Contact FLUX :
Private message to Facebook fan page : https://www.facebook.com/flux3dp/
email : support@flux3dp.com

Help Center

CH 7
Warranty

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As a FLUX consumer, you benefit under certain conditions from additional warranties. FLUX offers specific consumer warranty benefits which are in addition to, and not instead of, any legal warranties provided by your national consumer law. The duration and conditions related to the legal warranties are provided by respective local laws.

Hardware Warranty

1. FLUX Inc. warrants only the hardware (excluding accessories and consumable parts*) against defects in materials and workmanship when used as instructed in the manual for the warranty period.
    *Consumable parts include reflective mirrors, focus lenses, and vent hoses.
2. The limited warranty covers products purchased from authorized FLUX retailers against defects in materials or workmanship.
3. Customers must provide the machine serial number and related information as proof of purchase.
    *Prior to returning any products, customers must receive an approval of shipping from our authorized reseller via email or phone. We will not accept any unapproved re- turned goods
4. During the product's warranty period, FLUX may, at its discretion, take one or more of the following actions: (1) send parts to customer along with tutorials for repair, (2) approved return of the product to an authorized local reseller for (i) repair with new or refurbished parts or (ii) replacement with a new or refurbished product provided that:
    - The product was properly used according to the manufacturer's intended purposes and instructions.
    - The product was not damaged due to acts of nature such as lightning, flood, or fire.
    - The product's casing was never disassembled without permission.
    *Note : Particles, scratches, unevenness, or other appearance issues which do not affect the function of the machine are not covered under the warranty.
5. Under the specified warranty period, our authorized local reseller may recall and repair your products and absorb the local shipping fee (international shipping is not included) without charging you.

Warranty Period

Warranty period starts at the time of customer receives the product. Please see the chart below for the warranty periods.

Product	Warranty Period
HEXA (Laser Tubes excluded)	12 months
60W Laser Tube	12 months
Rotary / Beam Air	12 months

Post Warranty Support and Repair

1. FLUX will continue to provide tech support via phone, email, and other online methods even after the product warranty period.
2. After the warranty period, all costs—including but not limited to replacement parts, shipping charges, and testing fees—are the sole responsibility of the customer.
3. Our authorized reseller may provide a quote for repairs.

CH 8
Disclaimer

Disclaimer

1. FLUX Inc. does not warrant against normal wear and tear, items consumed or expended by normal use, product misuse, or accidental damage.

2. FLUX is not liable under this warranty for any damages or defects caused by :
    (1) Improper (contrary to the stated purpose and scope of use described in relevant documentation) use of Products or Add-ons;
    (2) External force;
    (3) External or internal inside;
    (4) Lightning strike, overvoltage, power surge, or electromagnetic field.
    (5) Unauthorized change, correction, or modification. Modification of the hardware or accessories, including but not limited to replacing parts, making permanent cosmetic changes to the machine, replacing the software or firmware, or other unauthorized changes voids this warranty policy.
    (6) Natural or human-caused calamities such as earthquake, war, fire, and flood.
    (7) Improper storage, operation, application, or transportation.
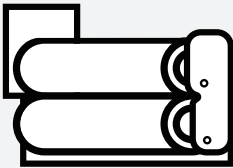
Appendix 1

Appendix 1-1
Add-on Introduction

With the use of different Add-on combination, the engraving materials can be diversified.

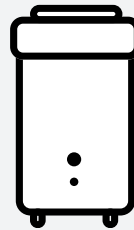Note: Add-ons may not be available for specific regions / countries.

HEXA 1.5 inch Focus Lens

Finer laser spots

Rotary

Cylindrical object engraving

Beam Air

Dust, tar and odor filtering

Appendix 2

Appendix 2-1
Design Software Recommendations

Adobe Illustrator

Vector graphics editor by Adobe Inc.

Adobe Photoshop

Raster graphics editor by Adobe Inc.

Affinity Design

Vector graphics editor for Windows and macOS by Serif Ltd

Autodesk AutoCAD

Computer-aided design (CAD) and drafting software application by Autodesk, Inc.

Sketch

Vector graphics editor for macOS by Sketch B.V.

SketchUp

3D modeling program for architects, urban planners, filmmakers, game developers, and related professionals

SolidWorks

Solid modeling CAD for Windows by SolidWorks

Corel Draw

Vector graphics editor by Corel Corporation

Rhinoceros

3D computer graphics and CAD application, abbreviated Rhino3D

Beam Studio supports the following file formats :
SVG / PNG / JPG / DXF / PDF / AI
Version Support :
Beam Studio supported operating system versions

Exporting Adobe Illustrator SVG files :

If you are used to designing graphics in Adobe Illustrator and would like to export SVG files for use in Beam Studio, please refer to the following steps to export files to avoid incompatibility or non-support issues when importing into Beam Studio :
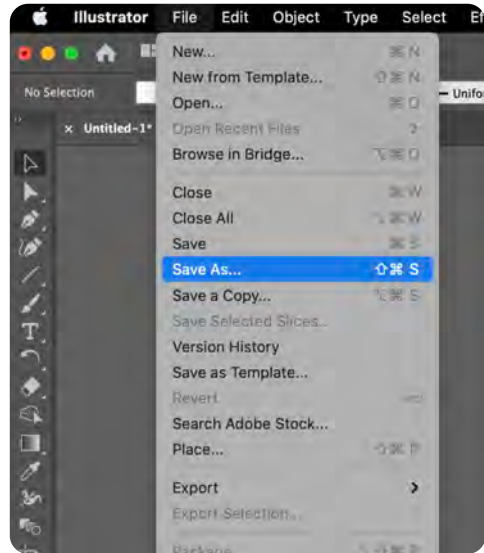
I. Make sure the strokes are center-aligned before drawing :
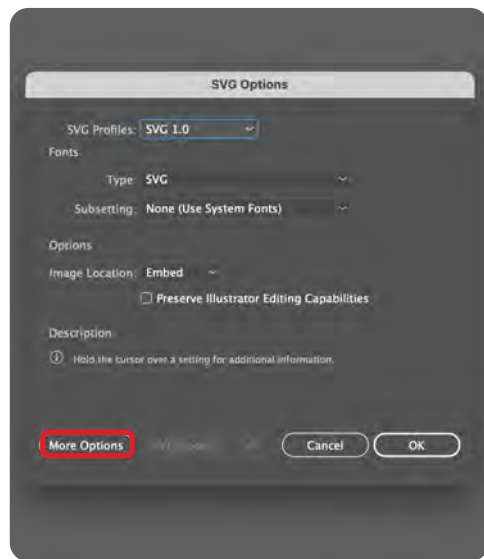Window - Stroke, set "Stroke" as "Align Stroke to Center".
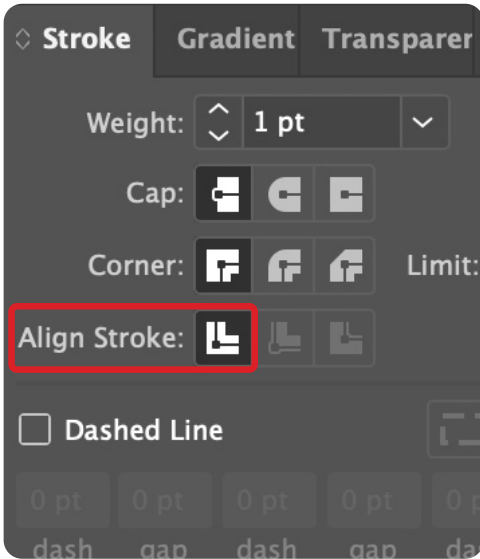
II. Save the file:
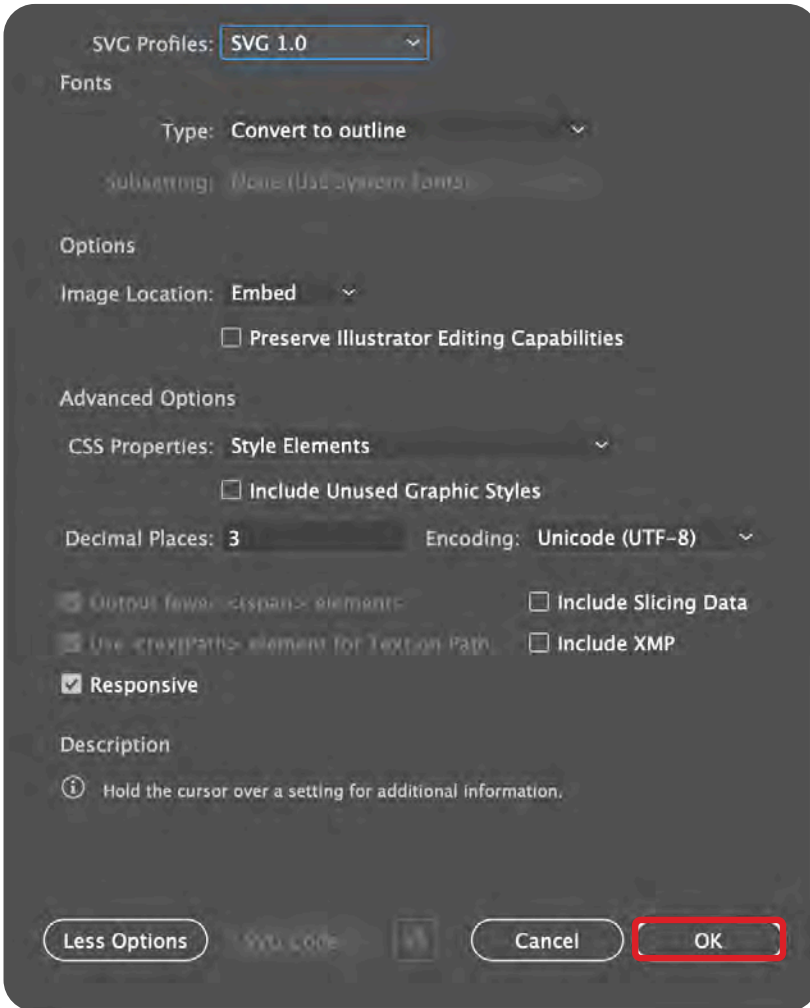1. Click "File" > Click "Save As…".

2. Select "SVG (svg)" > Click "Save".

3. When the "SVG Options" window pops up, click "More Options" in the lower left corner.

4. Please follow the screen below to set the SVG Options > Click "OK" to finish saving the file.
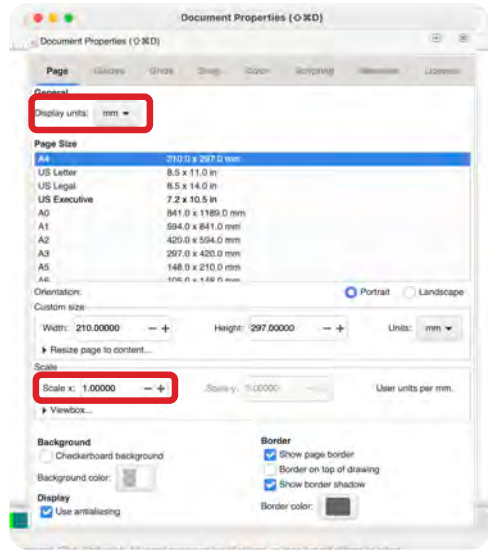

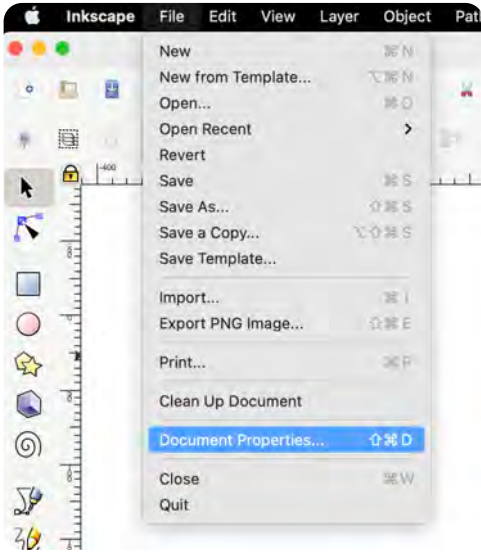**III. Importing files into the software :**

Import SVG files by dragging and dropping them into the Beam Studio window, or by clicking the "Picture"　　　　button on the left side of the Beam Studio toolbar.

Exporting Inkscape SVG files :

If you are used to using Inkscape to design graphics and willing to export SVG files for use in Beam Studio, please refer to the following steps to export files to avoid incompatibility or unsupported problems when importing into Beam Studio :

**I. Check the version of Inkscape :** "Inkscape" > "About Inkscape", it should be version 1.0 or above.

II. Set the document properties before sketching : "File" > "Document Properties", set the Scale to 1.0 and the Units to mm.

III. Save the file : Click "File" > "Save As..." > Select "Plain SVG (*.svg)" > Check the box to export as SVG 1.1 > "Save".
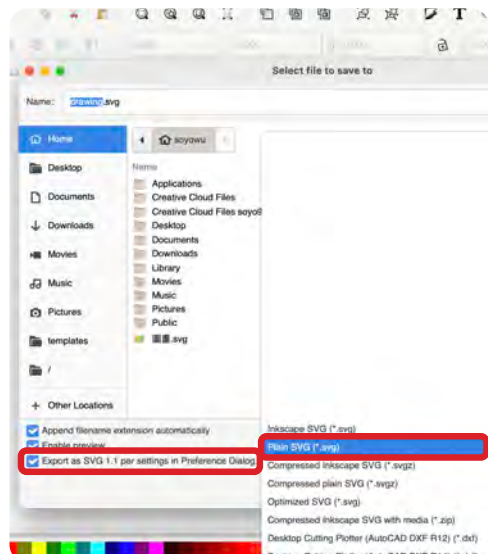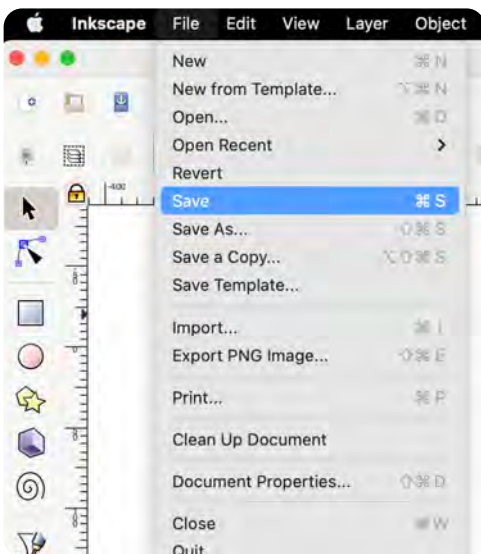
IV. Importing files into the software : Drag and drop files into the Beam Studio window or click the "Image" button on the left side of the Beam Studio toolbar to import SVG files. If you import SVG 1.1, a reminder window will pop up, click "OK" to continue using the software.
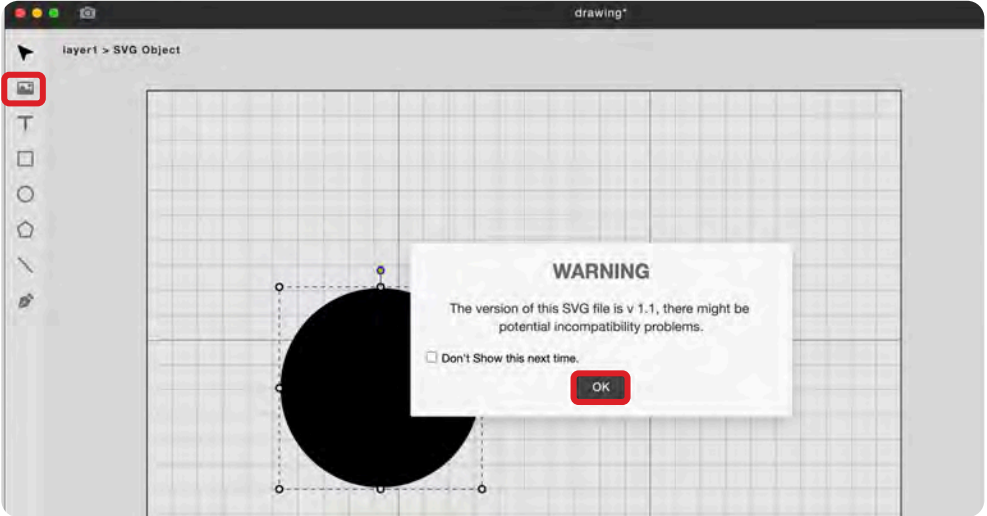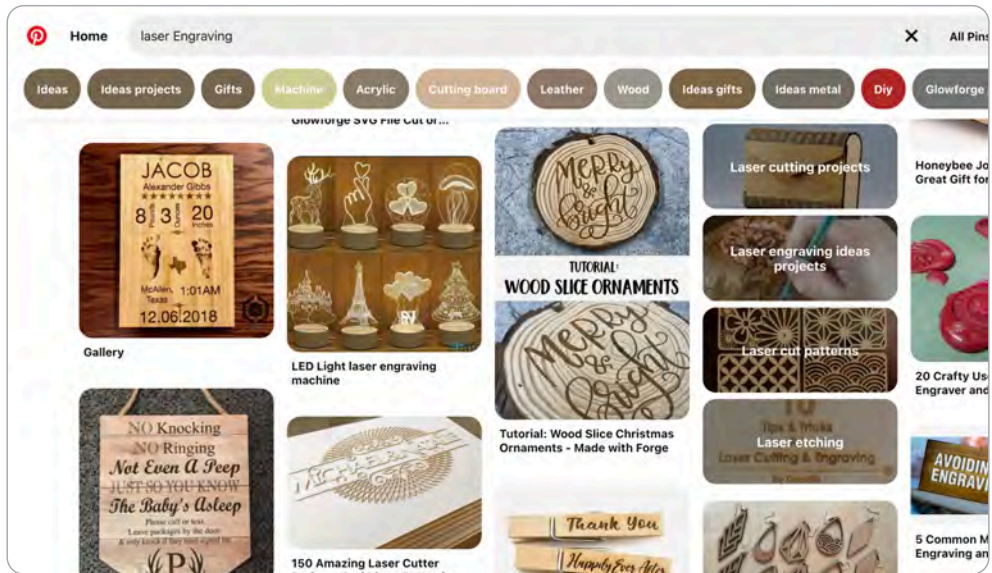
Appendix 2-2
Design Inspiration

Inspirations :

Pinterest Idea Board : https://pse.is/JXRR5
Ponoko 150 Laser Engraving Ideas : https://pse.is/HQARL

Search for "laser engraving" on Pinterest.com for more ideas

Graphic Resources :

The Noun Projects (free vector graphics) : https://thenounproject.com/
Freepik (free vector graphics) : http://freepik.com/

Wood Crafts & Paper Crafts :

DXF Projects (wood crafts) : https://dxfprojects.com/
Canon Creative Park (paper crafts) : http://cp.c-ij.com/sc/index.html
Paper-replika (paper crafts) : http://paper-replika.com/

Free Fonts :

Font-Bear (Japanese and Chinese characters) : https://fontbear.net/
Dafont (English characters) : https://www.dafont.com/
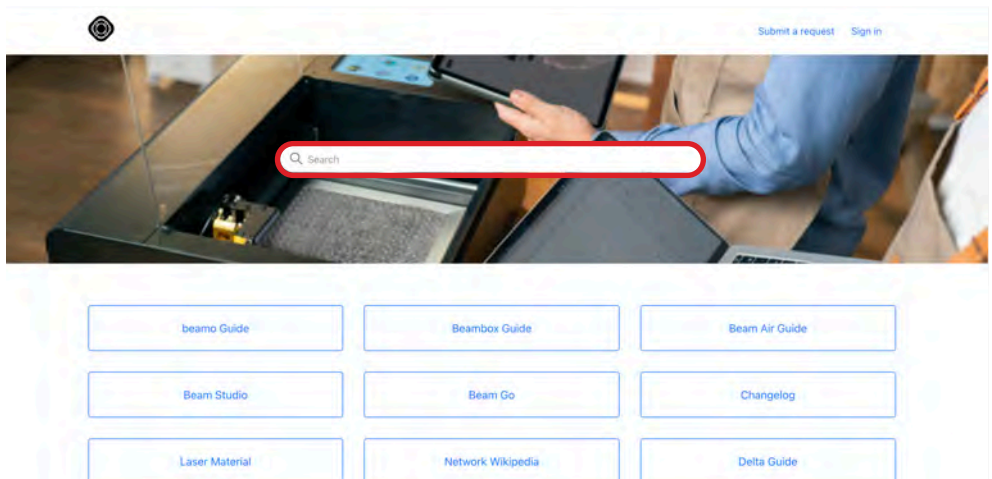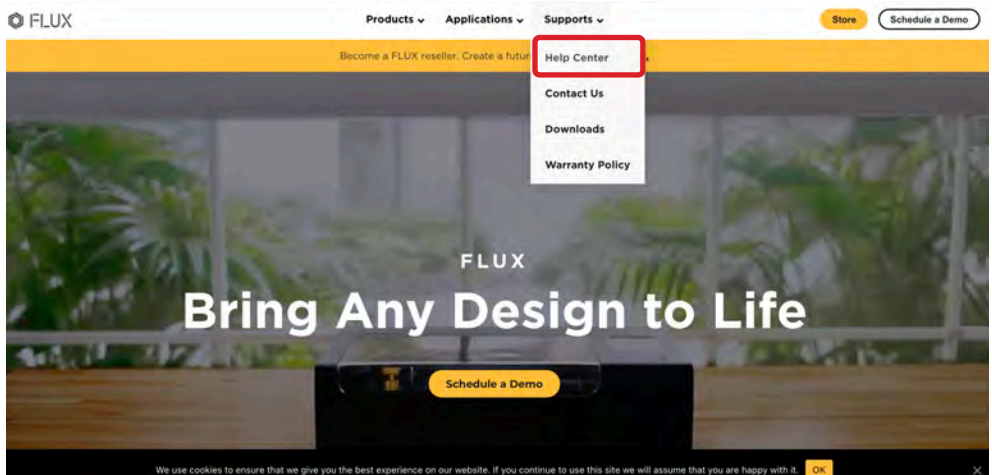
Appendix 3

Appendix 3-1
Maintenance Checklist

To download the form, please go to "FLUX > Supports > Help Center" > Search : Maintenance Checklist, download and print the checklist.

Maintenance Checklist provides the key points to be checked by users at different times, please follow the instructions of 【Maintenance】(p.121) for maintenance procedures.

> Even if the machine is used sparingly, necessary maintenance items should still be maintained on time to ensure the machine health. Leaving the machine unused for a long time may accelerate the aging, regular use and proper maintenance is the way to avoid the machine from being out of action.

Maintenance Checklist (HEXA)

Area	Maintenance Content	Key Points to be Checked
Panel	Screen cleaning	Clean the dust and grease off the panel.
Working Area	Honeycomb table cleaning*	Remove the residue and tar oil from the mesh of honycomb table.
Working Area	Chassis cleaning*	Remove the residue and tar oil from the chassis and bottom cover.
Back Cover	Water changing and adding*	Add water and fill the water pump to more than 80% full without a large amount of air bubbles.
Back Cover	Ventilation fan cleaning	Remove the dust from the ventilation fan blades.
Working Area	Lubricating*	Cleaning the Y-axis guiding rods, X-axis linear rail and 4 lead screws, and relubricate them.
Working Area	Door cover cleaning	Clean the grease off the door cover.
Working Area	Mirrors and lens cleaning*	Clean the 4 mirrors and lens. Make sure they are not oxidized or left with water marks.
Working Area	MAINTENANCE page*	Check the status display and switches except for the "Laser Pulse".
Working Area	Optical path inspection*	Make sure the laser spots got at two corners (top left and bottom right) are full circles, otherwise Optical Path Alignment has to be conducted.

* : Necessary maintenance

				Date							
1st month				2nd month				3rd month			
W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12
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