

user manual

beambox



PREFACE

We started with a passion for digital creation and a goal to make tools for makers and designers that are easy-to-use and affordable. After almost 2,500 backers helped us successfully raised \$1.6M on Kickstarter, it took us a year to take FLUX Delta from prototype to a product embraced by users around the world. Our users loved the laser cutter on the FLUX Delta, since it enabled them to cut and engrave materials beyond plastic, and wanted more. In fact, one of the most frequent requests we received from our supporters was to make the laser engraving module more powerful. Our team plunged deeper into the world of laser technology and decided to take on this challenge. We gained substantial experience in manufacturing when we made a 3D printer from scratch. Now, in pursuit of the same goal we've had since day one, we're leveraging our experience from FLUX Delta to make something just as fantastic. Beambox is the laser cutter and engraver that you've been waiting for, it is intuitive, intelligent, and accessible.

FLUX Team

September, 2019

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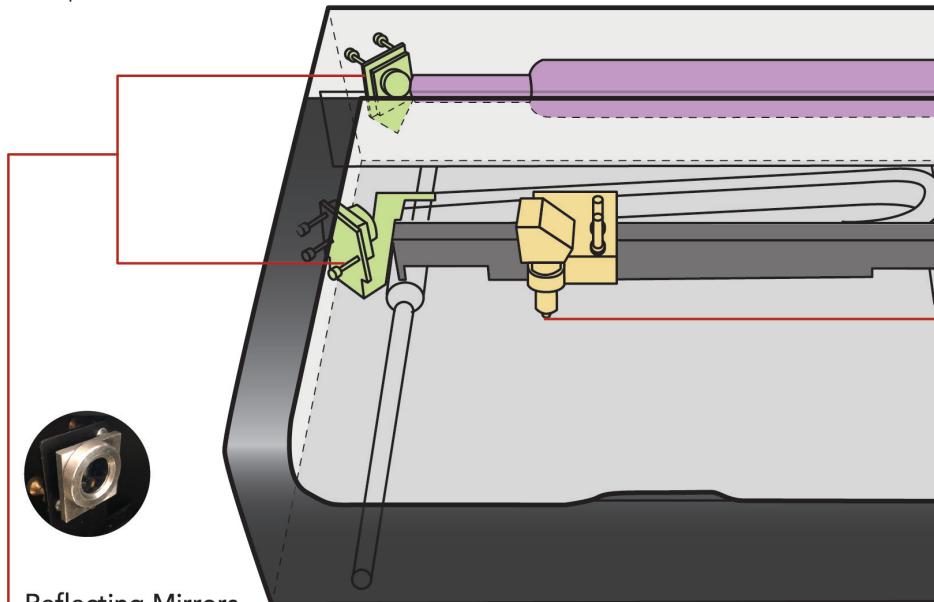
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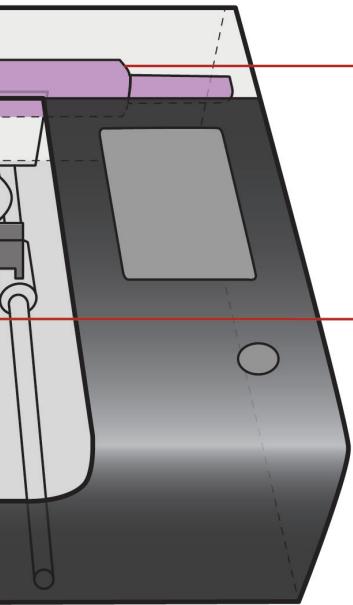
CO₂ LASER BASICS

The principle of a laser cutter is to focus high-power laser beam on the surface of the workpiece. The part of the workpiece which absorbs the high energy from laser beam will burn or vaporize instantly so engrave or cut can be done along the work path of the laser beam.



Reflecting Mirrors

There are three reflective mirrors inside the machine, in which the first mirror is in a fixed position, and the second mirror and the third mirror are driven by motors to translate the laser light to appointed position in the work area. The second mirror moves back and forth to control the position of the Y axis; the third mirror moves left and right to control the X axis.



Laser Tube

Beambox is equipped with a 40W/50W CO₂ laser tube. The CO₂ gas is encapsulated in the glass tube. When a high voltage is applied across the laser tube, the gas will be energized and produce invisible laser beam of 10.6 μm wavelength. The parallel beam with diameter of about 5 mm will be emitted from the end of the laser tube. Due to low divergence, the parallel beam can be transmitted inside the machine with little loss of energy.



Focus Lens

After the third reflection, the laser beam will directly hit the surface of the workpiece. In order to achieve a higher energy density, the focus lens focuses a parallel beam of about 5mm diameter to a diameter of about 0.2mm. If the beam is properly focused, its energy is enough to burn through non-metallic materials such as wood and acrylic.

UNBOXING

2.1 Before You Start

Read the following safety precautions carefully before operating Beambox. Beambox produces high-powered laser beam. Improper handling can result in fire, visual impairment, skin burns, or inhalation of toxic substances and other personal safety hazards.



Important Precautions

- 1** Never leave the machine unattended while operating.
- 2** Be sure to prepare a fire extinguisher in the work area.
- 3** Do not try to service, repair, or modify the machine without authorization from FLUX Support.
- 4** Do not stare at the flame generated by the laser.
- 5** Please make sure that the processed material does not pose a hazard when burned at high temperatures.

User Safety

- [1] All personnel who will operate the machine shoud read the safety precautions and follow the instructions. Confirm with FLUX Support if you have any questions regarding use and safety. support@flux3dp.com
- [2] Children require the supervision and assistance of an adult at all times.

Operating Environment

- [1] Place the machine in a well-ventilated area.
- [2] Avoid rain, moisture, liquids or direct sunlight.
- [3] The ambient temperature and humidity should be within 5°C - 35°C (41°F - 95°F), 10% - 75%.
- [4] If venting outdoors, ensure that changing conditions do not cause extreme temperatures or humidity to enter the machine through the vent hose. Disconnect the hose from the outside air when the machine is not in use.
- [5] Place the machine on a stable surface to prevent overturning.

Electrical Safety

- [1]** The machine comes in 2 models, 110V and 220V. Do not use a power source other than the AC rated voltage. If in doubt, contact FLUX Support. (110V: 100 - 127V / 220V: 200 - 240V)
- [2]** Make sure that the grounding pin is properly plugged-in. If not grounded properly, static electricity might be generated to affect the performance and even increase the risk of electric shock.
- [3]** Do not continue to use the power cord if it is found to be damaged.
- [4]** When maintaining or disassembling the machine with the consent of FLUX Support, be sure to turn off the power and unplug the unit.

Fire Safety

- [1]** Do not put anything inside the machine that is not laser-compatible. Learn more about laser-compatible materials (p.41).
- [2]** Do not stack materials; for example attempting to cut two or more sheets of material at a time.

- [3]** Clean out leftover bits inside the unit when it builds up.
- [4]** Never leave the unit unattended while operating always stay within sight. Look inside frequently.
- [5]** If there is a lasting flame inside the unit that does not extinguish when the laser has moved past. Turn off the machine and pull the plug on the back of the unit.
- [6]** If it is safe to do so, extinguish the fire with a wet towel. Note that water may damage the machine.
- [7]** Extinguish the fire with a fire extinguisher. Note that fire extinguishers may cause damage to the machine.
- [8]** If the fire cannot be extinguished or if it spreads outside the machine, call your local emergency number

Smoke and Fume Safety

- [1]** When exhausting outdoors, be sure that the exhaust location won't be bothersome to neighbors or passers-by, and don't forget to check local air quality regulations that may apply.
- [2]** If a strong, sharp smell that also causes eyes, nose, or throat irritation, is detected, or visible smoke escaping while the lid is closed, stop immediately and re-check your exhaust setup.

Operation Safety

- [1]** Do not stare at the flame generated by the laser.
- [2]** Stabilize the unit to prevent performance failure.
- [3]** In case of burn injury, seek medical advice.
- [4]** Wear gloves when cleaning leftover bits.
- [5]** Have two people lift the unit when moving the machine.

Safety Switch

- [1]** The safety interlock switch on the front door turn off the laser immediately if they are opened. Do not try to defeat the switches.
- [2]** Keep body parts out of the workarea to prevent injuries.
- [3]** Make sure the front door is closed when adjusting the optical path.



Stop Using Your Beambox If...

- 1** There is a fire in the unit which persists after the laser turns off.
- 2** The head stops moving but the laser is on.
- 3** An unusual sound or unusual light coming from the unit that was not occurring previously.
- 4** You see any damage to the interior components of the unit.

Now, let's get started!

2.2 What's In The Box

- 1 Place the box on the floor and unseal the box.



- 2 Remove the cushions on the four corners and take out the machine. Have two people lift the unit out of the box. Keep the packaging in case of transportation in the future.

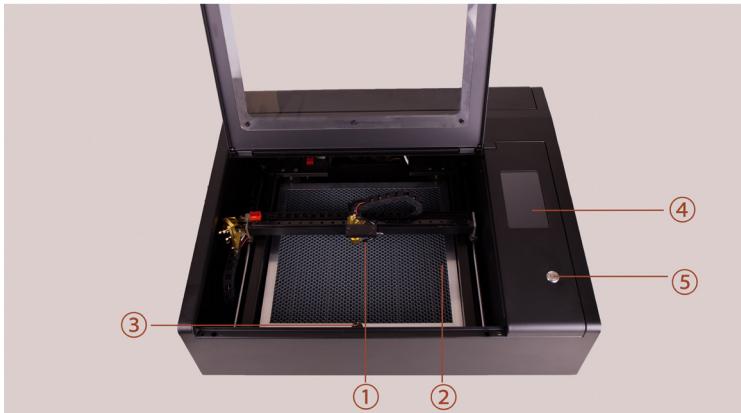


- 3** Open the front door and take out the duct.
Remove the foam on the air pump then take out
the accessory box.



- 4** In the accessory box are ① Wi-Fi dongle
② lubricant ③ duct clamp ④ double-sided tape
⑤ power cord ⑥ small wrench ⑦ magnets
⑧ dampers ⑨ washers ⑩ nuts

- [5] Front view:** ① focus probe ② honeycomb platform ③ level adjustment knob ④ touch panel ⑤ power button



- [6] Rear view:** ① main switch ② power inlet ③ Ethernet port ④ USB port ⑤ grounding cable ⑥ exhaust fan

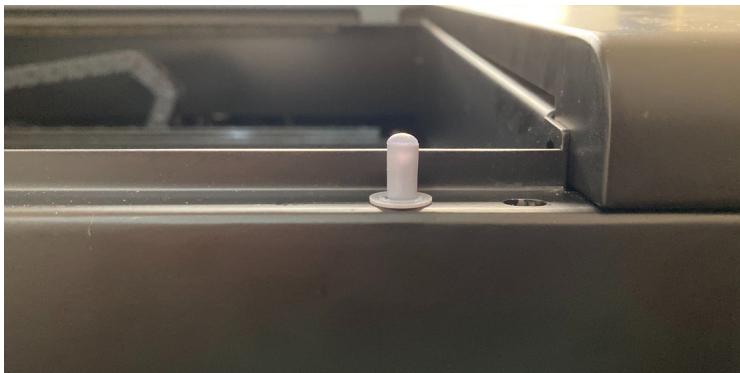


2.3 Assembly

- 1** Remove the release paper of the magnet and stick the two magnets on the edge of the door.
- 2** Peel off the cover paper on both side of the acrylic window and install the window with one washer and one nut on each bolt.



- 3** Install the two dampers to the holes on the edge of the machine.



- 4** Plug in the power cord to the power inlet of the machine and the wall socket as well. Plug in the Wi-Fi dongle to the USB port on the back. Bend the antenna upward for better signal.



- 5** Match the duct clamp to the bigger end of the duct then connect it to the exhaust fan outlet. Tighten the clamp using the little wrench by screwing clockwise.



2.4 Network Setup

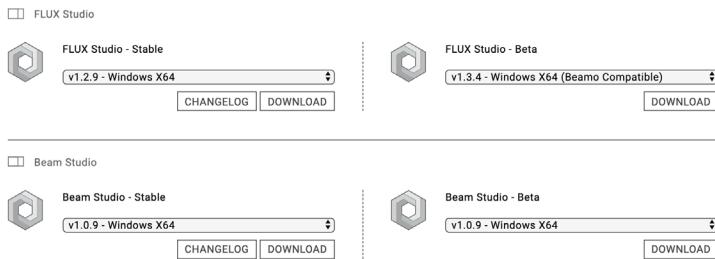
- 1 Toggle the main switch on the back and press the power button to turn the machine on. It takes about 1 minute to start up.
- 2 Touch panel: **Settings > Internet > Settings > Select Wi-fi name > Enter password**
- 3 The wireless IP address indicates the Internet setting is done.



2.5 Software Download

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

<https://flux3dp.com/downloads/>



Windows : Download the suitable version for your system type. To check the system type, right click on the **This PC** icon > **Properties** > and find **System type**. Download the x86 version for 32-bit system and x64 version for 64-bit system.

MacOS : Open the download file and drag the Beam Studio icon into the folder beside. Find and execute the Beam Studio in the Application folder.

Troubleshooting: Software Unexpectedly Quits (p.100)

2.6 Software Setup

- 1** The language setting will pop up on the first run.
Select English > FLUX Beambox / Beambox Pro.
- 2** Fill in the machine IP address in the textbox.



- 3** Go to **Menu > Machine** or click on the camera icon at the bottom left corner to check if the machine name can be found.

 If the popup window was skipped previously, click **Menu > Machine > Machine Setup**

Troubleshooting: Cannot Connect to the Machine (p.96)

Now, let's start your first engraving!

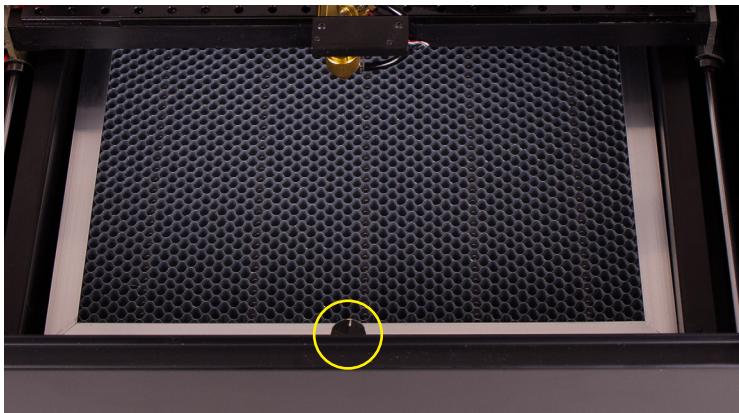
FIRST ENGRAVING

3.1 Adjusting Focus

Engage the focus probe downward. Rotate the level adjustment knob to move the platform up and down. Make the surface of the workpiece slightly touches the end of the probe so the height is on the right focus. Retract the focus when the adjustment is done.



Check the focus before each task.



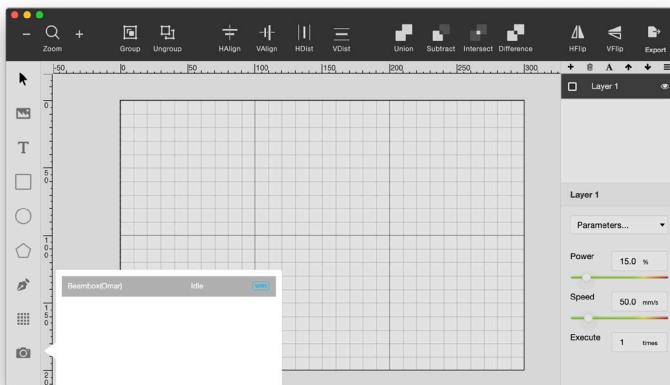
▲ Rotate the level adjustment knob



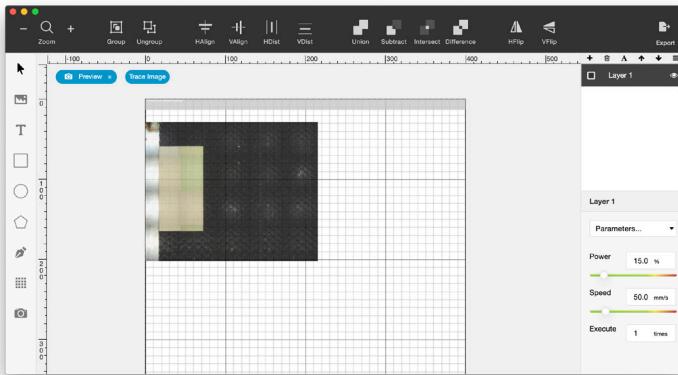
▲ The probe should precisely touches the surface of the material

3.2 Camera Preview

Click on and select your machine. Start previewing when the cursor becomes . Single click on a specific location or drag an area to preview the workarea. Click on again or press ESC to leave preview mode.



▲ Click on and select your machine.



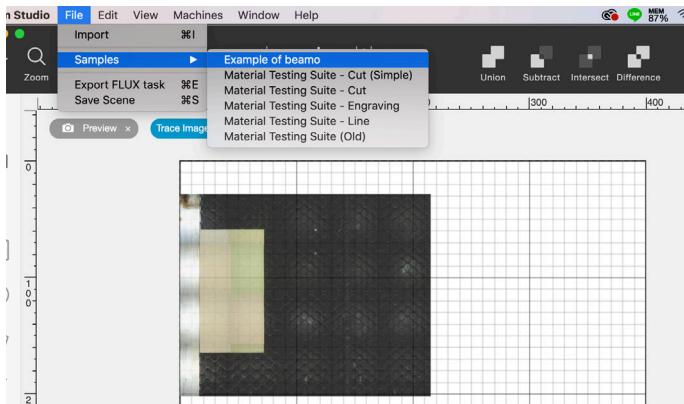
▲ Single click or drag an area



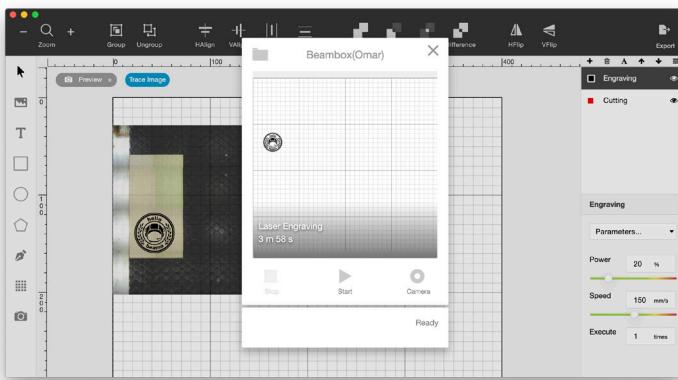
If the machine menu is blank when clicking on the camera button, it means the connection between the computer and the machine was not set up properly. Check "Cannot Connect to the Machine" (p.101).

3.3 Importing the Test File

Click on **Menu > File > Samples > First Engraving**. Click on Export, select your machine and click Start to start the task.



▲ Import the test file



▲ Click on Start to start the task

Troubleshooting: Check the troubleshooting section if you see error messages (p.90)

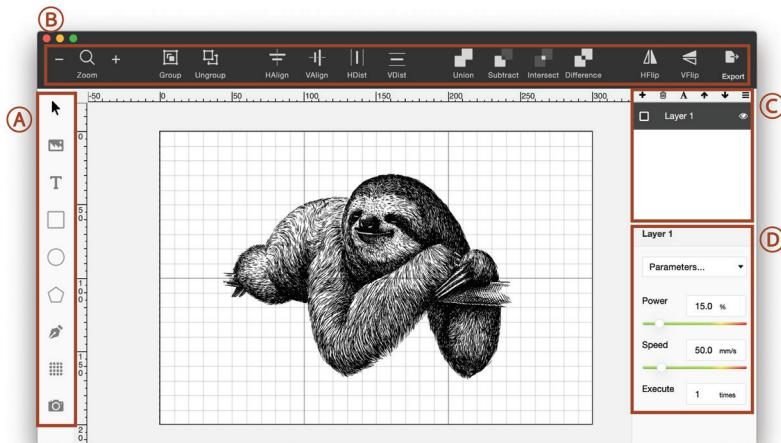
3.4 Engraving Result



If the result is too light or blurry, please check if the focus is just right. If the focus is right but the result is poor, please recheck the optical path. See "Optical Path Adjustment" (p.60). If the position of the result varies with the camera preview, please recheck the focus or see "Camera Alignment Issue" (p.95).

SOFTWARE

4.1 User Interface



A. Object Editing

- : Select or move a specific object
- : Import JPG/PNG/SVG/DXF file. You can also drag the file into the software
- : Font, size and spacing can be set when a text object is created. Enable Infill or "Outline"
- : Set dimensions for a round object

-  : Set dimensions for an oval object
-  : Set dimensions for a polygon object
-  : Create a vector curve
-  : Copy selected objects into a rectangular array
-  : Enable / disable camera preview

A. Object Placement

-  : Zoom in and zoom out
-  : Group multiple items together
-  : Ungroup items
-  : Align multiple items horizontally
-  : Align multiple items vertically
-  : Distribute selected items horizontally between the left and right borders
-  : Distribute all selected items vertically between the top and bottom borders
-  : Merge and unite multiple items into one
-  : Subtract the overlapping area of two items
-  : Keep the overlapping area of multiple items

C. Layer Management

+ : Create and name a new layer

⌫ : Delete selected layer

A : Rename selected layer

↑ ↓ : Sequence arrangement.

Working sequence will be top to bottom.

D. Power and Speed Setting

Parameters for commonly used material can be found in the "Parameters..." drop down menu. Customized parameters can be set using "Save". Use "Manage" to edit or remove saved parameters. Power is set by percentage which means a 40W machine can output 40W if the power setting is 100%. Speed is set by mm per second. Execution count can be set to repeat the same action on a single layer.



Parameters may vary with different materials. Try built-in parameters on first run and then fine tune the parameters for better results.



Power setting is recommended to not exceed 70% to avoid drastic consumption of laser tube.

4.2 Bitmap Engraving

Bitmap and vector are two different types of digital image files. 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. JPG and PNG are two commonly used bitmap format which are both compatible with Beam Studio.

4.2.1 Engraving Resolution

Engraving resolution can be set in Beam Studio by menu > "Edit" > "Document Setting". Engraving resolution stands for the fineness and quality of the final result. Get more detailed results when the resolution is set to "High", but it takes longer to engrave the same file. On the contrary, setting the resolution to "Low" gets rough quality but takes shorter time. The quality stands for the spacing of each line scanned by the laser which correspond to 0.2mm / 125 dpi, 0.1mm / 250 dpi and 0.05mm / 500 dpi. Select the right resolution to fit the need of the quality and time.

4.2.2 Threshold

The exposure threshold value can be set when a bitmap image file is imported to Beam Studio. Find "Shading" and "Threshold" option in the "Laser Config" label. When "Shading" is disabled, images will be transformed into monochromic, which is optimized for built-in "Monochromatic Engraving" parameters. When "Shading" is enabled, images will be transformed into greyscale, which is optimized for built-in "Shading Engraving" parameters.

The "Threshold" value can be adjusted when "Shading" is disabled. This function is based on the RGB color model which defines colors from 1 to 255. 1 stands for black and 255 stands for white. For example, setting the threshold value to 125 will turn all colors above 125 into white.

4.3 Vector Engraving

A vector image is composed of paths defined by multiple points. Each path, curve or polygon is constructed with its own formula which means the quality will not be affected when resizing the image.

Vector images are especially suitable for logos and typesetting materials. Beam studio is compatible with SVG and DXF vector formats.

Layers can be set to manage a complex artwork when creating a vector image. Take Adobe Illustrator for example, the design can be organized by either different color groups or different layers. Beam Studio can import the layer setting so different engraving parameters can be set to each layer. Cutting and engraving can be processed in the same time by this manner.

4.4 Bitmap and Vector Comparison

	Bitmap	Vector
Format	JPG / PNG	SVG / DXF
Usage	infill engraving (monochrome/shading)	outline engraving/ cutting



Be sure to select vector files for cutting.

4.5 Layer Setting

Layering style can be selected when importing a SVG file by "Layer", "Color" and "Single Layer".

Layer: For artwork previously organized by layers in design software

Color: For artwork organized by colors, the layers will be categorized according to its color

Single Layer: All artwork in the file will merge into one single layer

4.6 Save Scene

The "Save Scene" function can save all the items on the scene and keep them editable. This is useful when the design needs some editing but most of the scene should remain the same. Find this function in **Menu > File > Save Scene.**

4.7 Recommended Design Software

AutoCAD is a CAD software specialized in accurate dimensions, solids and more. Suitable for architecture and engineering applications. AutoCAD can export DXF format which is compatible with Beam Studio. If the dimensions do not match with the original design when imported, draw a 100mm square in Autocad then import it into Beam Studio to calculate the correct DPI.

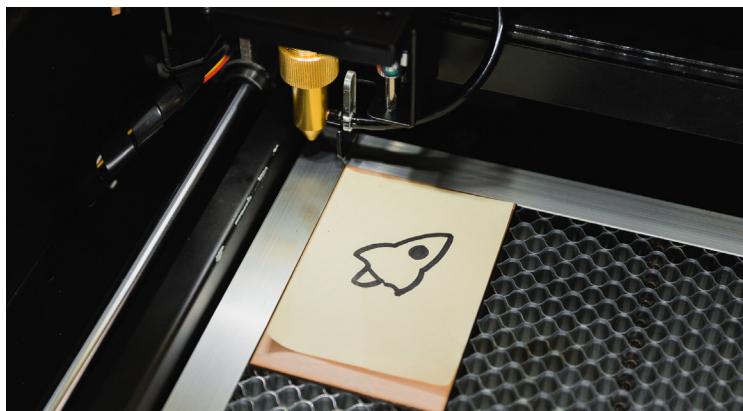
Adobe Illustrator is a vector graphic design software which is suitable for publishing, website and other applications. Illustrator can export SVG format which is compatible with Beam Studio. Please select the SVG 1.0 format when exporting SVG files. Choose "Outline" for texts, "embed" for images.

Inkscape is a free and open source vector graphic design software. Its functions are similar to Illustrator. Inkscape can export SVG, JPG and PNG format which is compatible to Beam Studio. Please select "plain SVG" format when exporting SVG format.

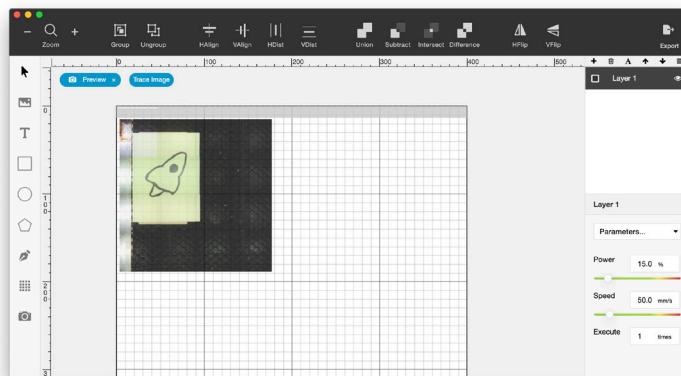
4.8 Smart Trace

The Smart Trace can scan and trace the outline of simple patterns. The feature can also be found on our app.

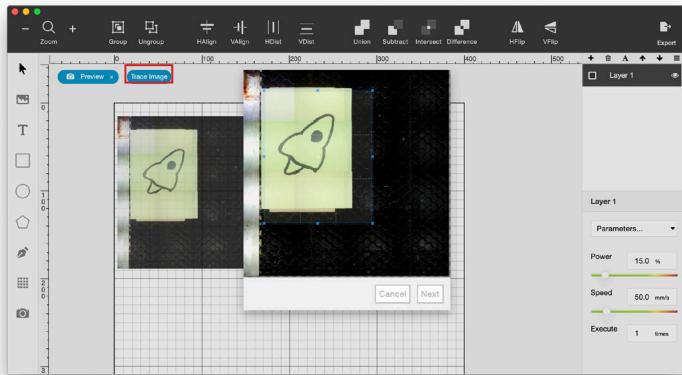
- 1 Prepare the file and the material.



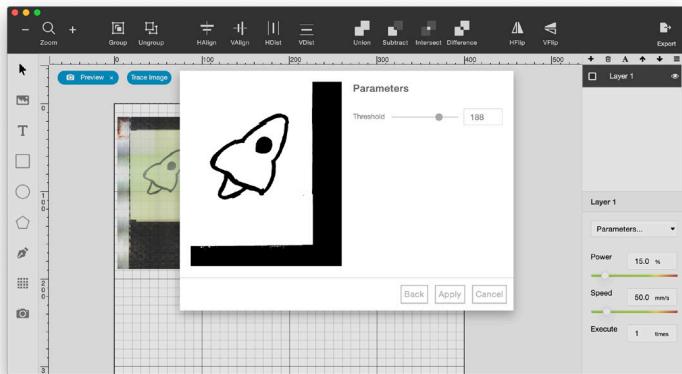
- 2 Start camera preview and capture the workarea.



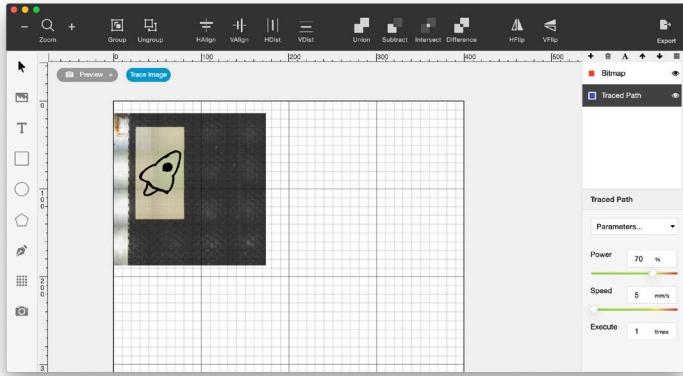
- 3 Press "Trace Image" and crop the area to be scanned.



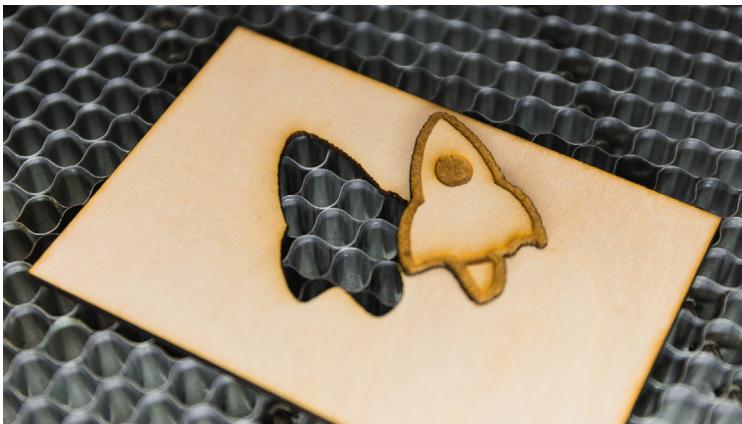
- 4 Adjust the exposure threshold value.



5 Press "Preview" and "Apply"



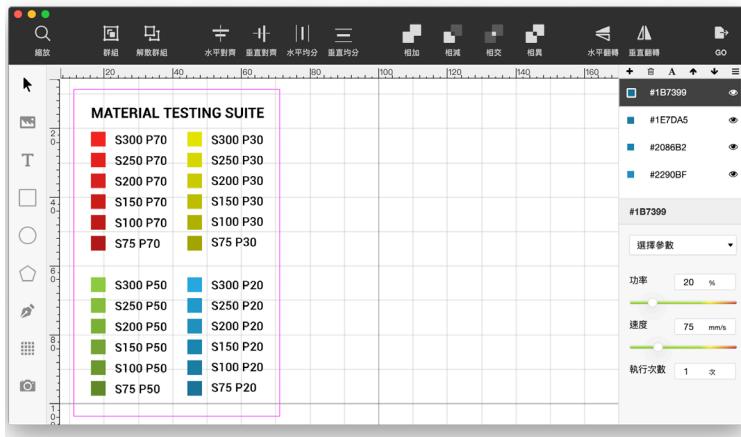
6 Set the power and speed parameters and start engraving.



MATERIAL TECHNIQUE

5.1 Testing New Materials

To test different speed and power combinations on a new material, import the "Material Testing Suite" from Menu > File > Samples.



5.2 Wood

- **Types of wood**



- Medium-density Fiberboard (MDF)

MDF is a wood product made by wood fibers and resin binder formed under high temperature and pressure. The resin binder has a significant effect on the fume generated during laser process. Low formaldehyde MDF is recommended to reduce harmful fumes.



- Plywood

Plywood is made by layers of wood veneer or wood fiber glued together. Low formaldehyde plywood is recommended to reduce harmful fumes.



- Solid Wood

Solid wood might have uneven grain when engraved due to growth rings. The uneven density of wood can cause such result which is very usual.

- **Engraving results on wood**

The slower the speed, the darker the engraved result. The higher the power, the deeper the cutting depth. To achieve a darker effect, slowing down the speed is usually more useful than raising the power.

- **How To Prevent Burn Marks On Wood**

Cover the surface with masking tape prior to printing, or remove the marks with sandpaper. The alternative is to slightly wet the wood, but it might cause bumps on the surface.

- **How To Reduce Burn Edge On Wood**

Clean the edges with alcohol or soapy water, or choose wood with lower density, so the cutting speed can be faster, leaving lighter edge marks.

5.3 Leather

- **Types Of Leather**

Synthetic Leather

The surface of the synthetic leather is mainly divided into two kinds of materials: PU (polyurethane) or PVC

(polyvinyl chloride). If the leather is PVC based, it is strongly not recommended for laser processing (see 5.9 Dangerous Materials). When PU is not completely burned, hydrogen cyanide might be produced.

Genuine Leather

In general, in order to increase the thickness and increase the durability, the leather will be processed by tanning, that is, the part of the leather which is similar to the non-woven material. The tanned layer will require a slower speed when cutting.

• How To Prevent Burn Marks On Leather

Leather gets burnt and curled easily when processed by laser. Soaking the entire piece of leather in water before processing should help.

• Ventilation Requirements for Leather

Since there are many amino groups and benzene rings in the leather protein composition, nitrogen oxides or aromatic compounds may be produced during combustion. If the leather object is engraved or cut for a long time, the ventilation requirements should

be much higher than wood or acrylic. It is recommended to use an air filter and discharge the air to a safer place.

5.4 Acrylic

- **Identifying Acrylic**

Acrylic is also known as PMMA or plexiglass, the scientific name is polymethyl methacrylate. It is one of the few plastics that can be processed by laser. Before processing, it is important to distinguish whether it is acrylic or other transparent plastic materials (PVC, PC), which are not suitable for laser processing. When processed on, the edges of the acrylic are sharp and clear. If you see yellowish burn marks, the material is not acrylic. However, if no burn marks are seen, it doesn't prove that the material is acrylic.

- **Scratches On Acrylic**

Scratches can be removed with plastic polish.

- **How To Clean Cloudy Acrylic**

It is recommended that the film should remain on the acrylic when processing, unless engraving greyscale images. Use an alcohol swab to clean the acrylic, please note that too much may cause other surface defects.

5.5 Paper

- **How To Reduce Burn Edge On Paper**

When cutting white paper, it is easy to produce a yellowish carbonized burn edge. The use of universal clay or other low-viscosity substances can effectively remove the toner to a certain extent without damaging the surface of the paper.

- **Corrugated Cardboard**

When cutting corrugated paper, the cardboard might catch on fire due to the misfocus on the downward layer. Spray the board with water to reduce the chance of burning.

5.6 Glass

Glass cracks easily, so the laser power should not be too powerful. Choose thick glass materials for better flexibility.

5.7 Metal

- Anodized Aluminum

Anodic treatment is a surface treatment that forms an oxide layer on the aluminum alloy. Through laser engraving, the surface oxide layer will be decomposed.

- Stainless Steel (with coating)

Due to the wavelength of CO₂ lasers, stainless steel reflects most of the energy, so special oxidants are needed to allow the stainless steel to oxidize and darken at relatively low temperatures and darken the color. Wear work gloves when applying the coating.

5.8 Other Safe Materials

Stone, cement, EVA foam, cotton, linen material, etc.

5.9 Dangerous Materials

- **PVC**

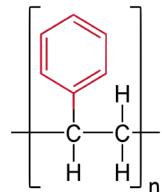
PVC is a common material that cannot be laser processed. When burned, PVC produces HCl (hydrochloric acid gas) that will harm the lungs and corrode machine parts. When PVC is burned, it also produces highly carcinogens such as dioxin or polychlorinated biphenyls. PVC is often presented in the forms of sticker, film or transparent sheet.

- **ABS**

ABS is a common material that cannot be laser processed. ABS tends to burn “dirty”, producing A (acrylonitrile), B (butadiene), and S (styrene), which are carcinogens category 2B, 1 and 2B.

- Plastics With Chlorine, Benzene, Ammonia, Fluorine, Phenol, Aldehyde In Its Scientific Name Or With A Hexagonal Benzene Ring In Its Molecular Formula When burning plastic molecules with these elements or organic structures, the chances of producing carcinogens and toxic substances are extremely high.

Laser processing is not recommended.



There should be no benzene ring in the molecule for the material to be laser-safe.



PROJECT IDEAS

(<https://pse.is/KFDPQ>)

Inspiration

Pinterest Idea Board

<https://pse.is/JXRR5>



Use "laser engraving" as keyword on Pinterest for more ideas!



Ponoko 150 Laser Engraving Ideas

<https://pse.is/HQARL>

Vector Files

The Noun Projects

<https://thenounproject.com/>

Freepik

<http://freepik.com/>

Cutting Files

DXF Projects

<https://dxfprojects.com/>

Canon Creative Park

<http://cp.c-ij.com/sc/index.html>

Paper-replika

<http://paper-replika.com/>

Free Fonts

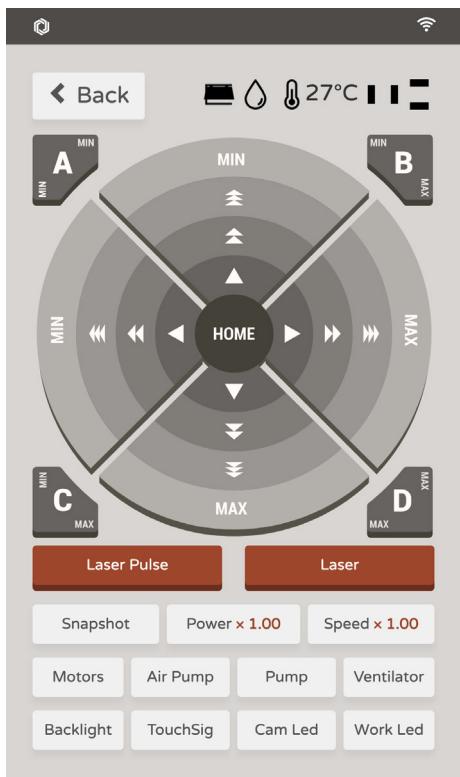
Dafont

<https://www.dafont.com/>

Notes: To find conjoined words, check the category of calligraphy.

MAINTENANCE

7.1 Touch Panel – Maintenance Mode

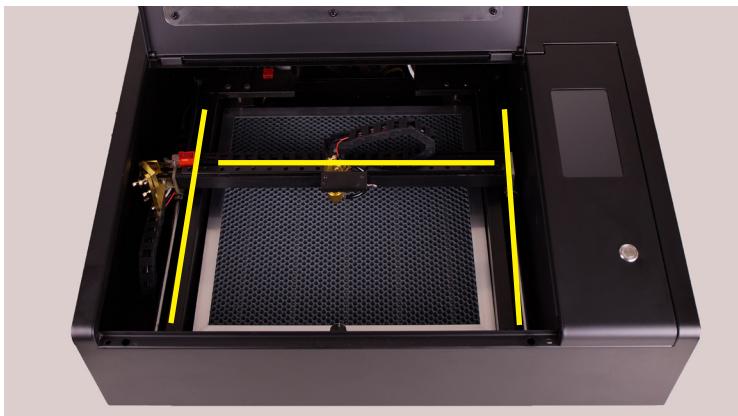


- : Front door opened
- : Front door closed
- : Water not flowing
- : Water flowing
- : Water temperature
- : X-axis limit triggered
- : X-axis limit switch
not triggered
- : Y-axis limit triggered
- : Y-axis limit switch
not triggered

7.2 Keep Everything Lubricated

Cleaning and lubricating the guiding rods and rail periodically can extend the lifetime of the moving parts. The frequency recommended is once every 1 - 2 weeks.

- [1] Wipe away the oil grease on the guiding rods and rail using a paper towel.
- [2] Apply lubricant on the guiding rods of the Y-axis.
- [3] Apply lubricant on the top and the side of the linear rail of the X axis.
- [4] Move the laser head up-and-down, left-and-right several times to evenly distribute the lubricant.



7.3 Cleaning the Work Area

- [1]** Move the laser head to the top-left corner. Lift the honeycomb tray by the handles on both sides then take it out.



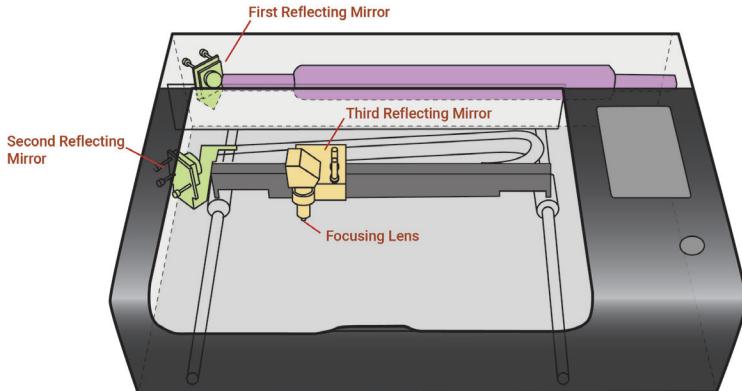
Mind the sharpness of the honeycomb surface to avoid cutting injury when taking it out.

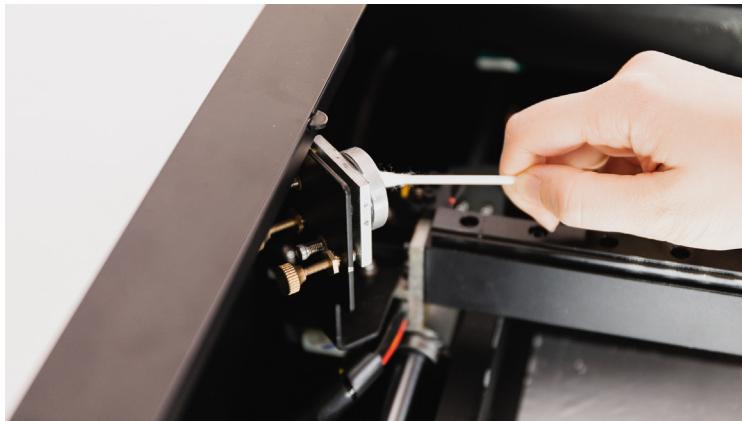


- [2]** Use vacuum cleaner or brush to clear the left-overs bits under the tray. Detergent can be applied to remove the stains.
- [3]** Return the tray to the original location, sliding it in horizontally. Be careful not to contact the laser head or the rails.

7.4 Wiping the Lens

If wood and paper are used frequently, the lens and mirrors can get dirty in a short period of time. Clean them with a wet Q-tip. Alcohol can be applied if the stain is tough. Do not rub the mirrors too fiercely to prevent damaging the coating on the mirrors. The cleaning frequency recommended is once every 1 – 2 weeks.





The focus lens is inside the lens holder which are located under the third reflecting mirror. Lower down the platform or remove it out of the machine to make room for later procedure. Rotate the lens holder ring clockwise to release and remove the lens holder.



▲ Release and remove the lens holder.

Rotate the silver ring on the lens holder counter-clockwise to take out the focus lens. Use pliers if the ring is too tight to rotate.



When putting back the lens, the curved side should face up and the flat side should face down.

7.5 Water Cooler Maintenance

It is recommended that the water should be changed once every 3 months.

- [1] Remove the screw on the handle of the back lid and open the lid. If you're only adding water, skip to step [4] after opening the lid.



- [2] Remove the hose clamp with pliers and pull apart the hose from the white connector of the flow sensor. Place the two ends of the hose into a container to prevent water from spilling out.



▲ Remove the hose clamp with pliers and pull apart the hose

3 Blow air into one end of the water pipe so the water will come out of the other end.

4 Open the water tank and fill in cooling water using a funnel. Seal the tank when finished.



▲ Open the water tank by the small wrench



▲ Fill up the tank using a funnel. Watch the water level carefully to prevent from spilling over



Watch the water level carefully to prevent from spilling over. Distilled water is strongly recommended.

[5] Restart the machine. Touch Panel > Maintenance > Pump. The water in the tank will be pushed into the cooling system. Repeat step **[4]** and **[5]** until the water level of the tank no longer goes down.



Too many bubbles sticking in the laser tube may decrease the cooling efficiency. It is recommended to fill the water tank more than 80% to decrease bubble generation.

7.6 Optical Path Adjustment

If the workpiece cannot be cut through by the preset parameters or the power output seems to vary a lot on each corner of the working area, the optical path might have got misaligned and need readjustment. Please try the steps below.

Tools



Accessory Box: ② little wrench ③ double-sided tape

Prepare On Your Own: ① 2.5mm Allen key

[1] When pressing "Laser Pulse", please keep the door shut so the laser will not be disabled by the door interlock protection.

[2] If you hear a loud cracking sound, stop operating and shut down the power immediately. Contact FLUX Support.

- [3]** Remove the screw on the handle of the back lid and open the lid to access the laser tube.

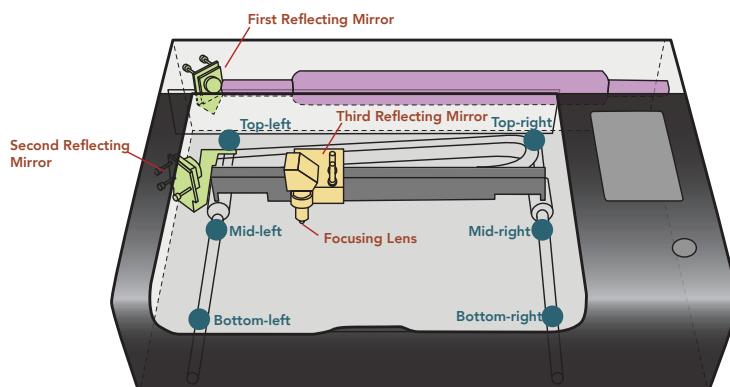
There are three sets of reflecting mirrors and one set of focusing lens in Beambox.

The first reflecting mirror is located on the left side of the laser tube when facing the front of the machine.

The second reflecting mirror is located on the carriage of the guiding rod on the left side when facing the front of the machine.

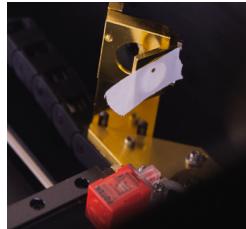
The third reflecting mirror is located on the rail of the X-axis.

The focusing lens are located inside the lens holder beneath the third mirror.



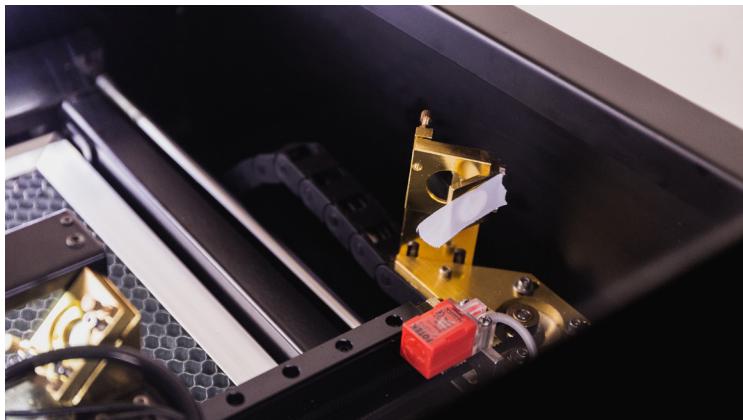
7.6.1 First Reflecting Mirror

Goal: Make the 2 dots shot from the top-left and the bottom-left corner overlap.



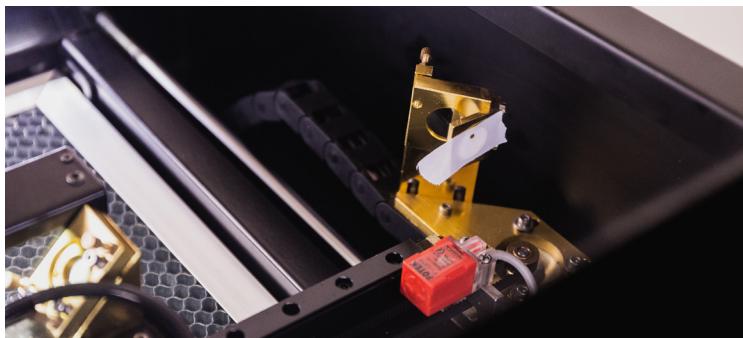
Directions:

- [1]** Go to Touch Panel > Maintenance and wait for the laser head to go back to home position. Then press "Release Motors".
- [2]** Put a piece of double-sided tape over the second reflecting mirror.



- [3]** Move the laser head to the top-left corner manually. Close the door and press "Laser Pulse".

4 Open the door and check the location of the dot. This dot shot from the top-left corner is the reference point when adjusting the mirror. The shot made from other locations should be adjusted to move toward the reference point.



- 5** Move the laser head to the bottom-left corner.
6 Close the door and press "Laser Pulse".
7 Open the door and check if the second beam is overlapping with the first one. If not, adjust the screws behind the first mirror.



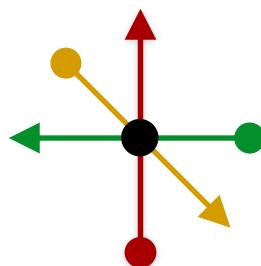
⚠ If the dot shot from the bottom left corner is not found on the tape, it means the optical path is very much misaligned. Please try the mid-left spot instead of the bottom-left corner. Make sure the dots of the top-left and the middle-left overlaps, then go back to the original top-left and bottom-left adjustment.

[8] The screws behind the first mirror control the mirror angle which is shown in the picture below. Release the nut on the screw, rotate the screw for the desired direction and test the dot location until the two dots overlaps. Tighten the nut slightly back to its position after the adjustment is done.



First Mirror

Dot Direction

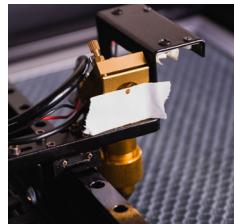


Adjustment guide for the screws of the mirror:

Shots made on the reference point (top-left in this case) rarely moves when adjusting the screws. So we try to adjust the shot on the adjustable point (bottom-left in this case) by the screws and move the point toward the reference point until they overlap.

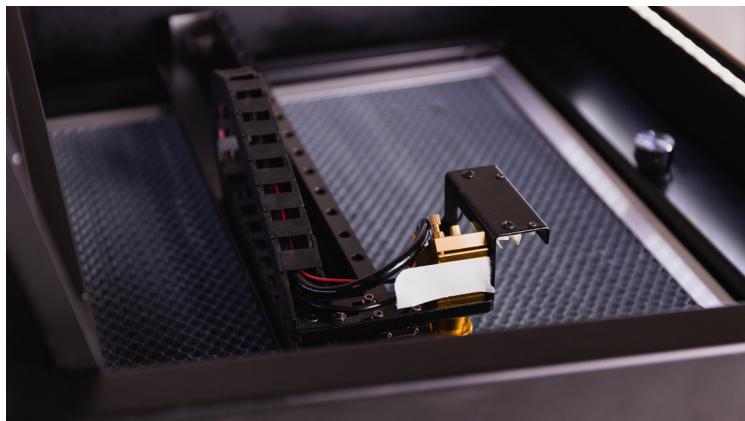
7.6.2 Second Reflecting Mirror

Goal: Make the 2 dots shot from the middle-left and the middle-right overlap.

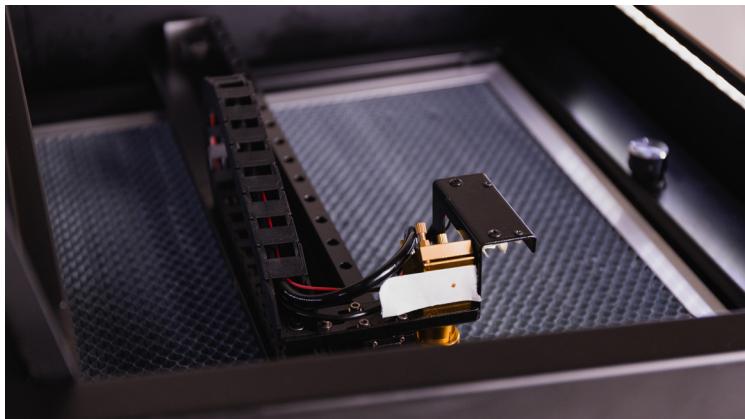


Directions:

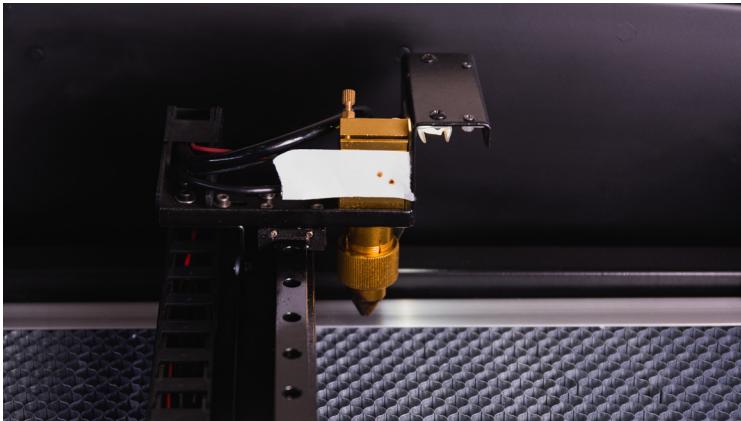
- 1 Take a piece of tape and put it on the metal ring in front of the third mirror.



- [2]** Move the laser head to the mid-left spot manually. Close the door and press "Laser Pulse".
- [3]** Open the door and check the location of the dot. This dot shot from the middle-left corner is the reference point when adjusting the mirror. The shot made on other locations should be adjusted to move toward the reference point.

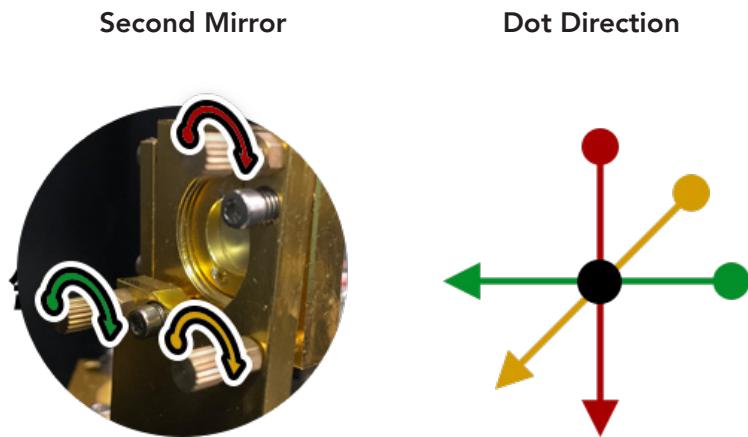


- [4]** Move the laser head to the middle-right spot manually. Close the door and press "Laser Pulse".
- [5]** Open the door and check if the second dot is overlapping with the first one on the same position. If not, adjust the screws behind the second mirror.



If the dot shot from the middle-right corner is not found on the tape, it means the optical path is very much misaligned. Please try the middle-middle spot instead of the middle-right spot. Make sure the shots of the middle-left and the middle-middle can overlap and then go back to the original middle-left and middle-right adjustment.

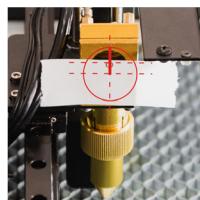
[6] The screws behind the second mirror control the mirror angle which is shown in the picture below. Release the nut on the screw, rotate the screw for the desired direction and test the shot position until the two shots can overlap. Tighten the nut slightly back to its position when the adjustment is done.



[7] Put on a new tape and run the test again.

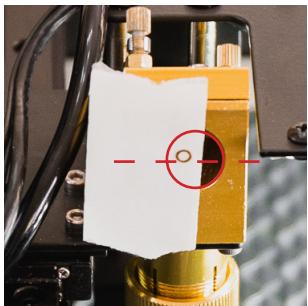
7.6.3 Laser Head Displacement Adjustment

Goal: The dot on the metal ring be on the vertical center line of the ring.
The dot must be above the center point of the ring.

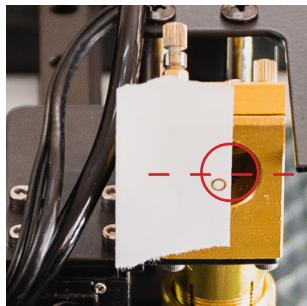


Directions:

- [1] Move the laser head to the center of the working area manually. Close the door and press "Laser Pulse".
- [2] Check if the dot landed on the vertical center line of the ring. If yes, skip to step [6].
- [3] Release the 4 hex socket head screws by a 2.5 mm Allen key.
- [4] Move the laser head forward or backward related to the rail. Then tighten the 4 screws back.
- [5] Press "Laser Pulse" and check if the dot landed on the vertical center line of the ring. If not, please repeat the adjustment of step [3] and [4].
- [6] Check if the dot overlaps or is above the horizontal center line of the ring. If yes, move on to "Third Mirror Adjustment".



▲ above horizontal center



▲ below horizontal center

- 7 If the height is below the center line, adjust the screws of the laser tube holder. Release the holder on the laser beam outlet side and tighten the other side.



▲ Tighten

▲ Loosen

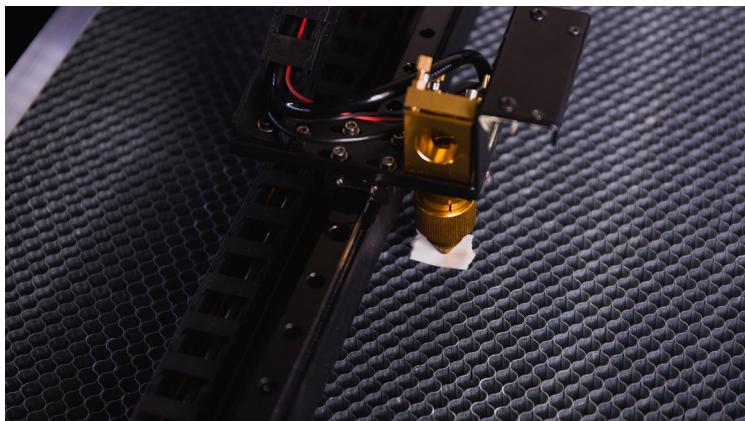
- 8 Check if the dot overlaps or lands above the center line. The first and second mirrors might require readjustments if the position of the laser tube holder is adjusted a lot.

7.6.4 Third Reflecting Mirror

Goal: Dot be made on the center of the laser beam outlet.

Directions:

- [1]** Lower down the working platform to make room for adjustments.
- [2]** Place a piece of tape on the laser head outlet. Apply pressure on the tape by hand so a circular mark can be seen.



- [3]** Move the laser head to the center of the working area manually. Close the door and press "Laser Pulse".

- 4** Open the door and check if the dot is located near the center of the circle. If not, the screws behind the third mirror need to be adjusted.

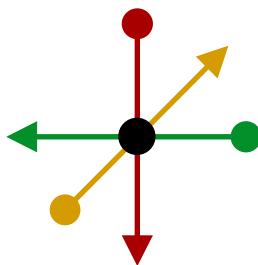


- 5** The screws behind the third mirror control the mirror angle which is shown in the picture below. Release the nut on the screws, rotate the screws for the desired direction until the two dots overlap. Tighten the nut slightly back to its position when the adjustment is done.

Third Mirror



Dot Direction



The power of the laser can be distributed evenly to any location on the working area after the adjustments above. The performance should meet the needs of regular operation. Please run "Camera Calibration" again after the optical adjustment. If the verticality of the optical path is required in specific applications, the steps below can be carried out for advanced adjustments.

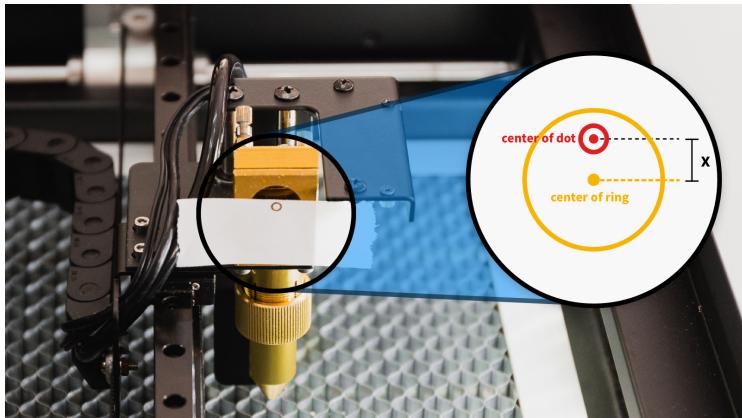
7.6.5 Verticality of the Optical Path (Advanced Adjustment)

Goal: Both dots on the lens holder and the laser beam outlet be on the center of the circle.

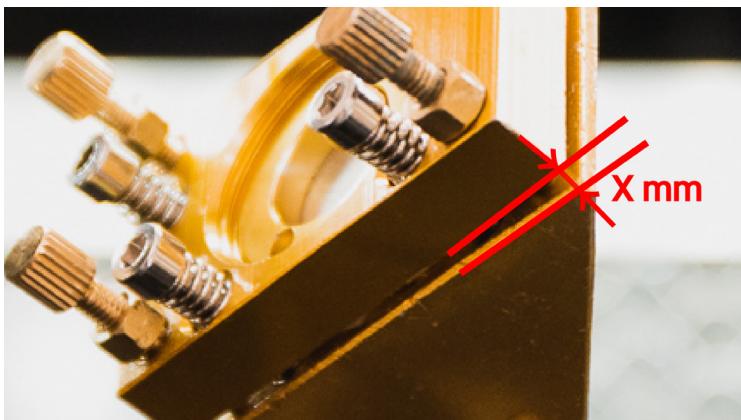
Directions:

- [1]** Move the laser head to the center of working area manually. Place a piece of tape on the metal ring in front of the third reflecting mirror.
- [2]** Close the door and press "Laser Pulse".

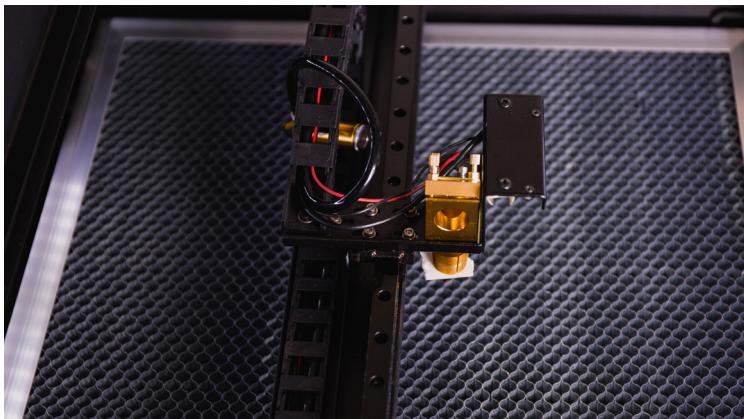
- [3]** Open the door and measure the distance between the center of the dot and the center of the ring. Let the distance be X .



- [4]** Release three nuts behind the third mirror. Rotate the three screw equally so the mirror can move forward or backward in a paralleled direction. The gap between the metal pieces should be X mm.



- [5]** Release the lens holder ring by rotating clockwise and lower the lens holder midway. Fasten the holder at the position by rotating the ring counter-clockwise.
- [6]** Place a piece of tape on the beam outlet.
- [7]** Refer to the steps of "Third Reflecting Mirror" and readjust the screws behind the third mirror so the dot is located at the center of the circle.
- [8]** Release and remove the whole lens holder. Place a piece of tape on the location shown in the picture below. Apply pressure to make a circular mark on the tape.



[9] Close the door and press "Laser Pulse". Open the door and check the dot on the tape. There are three possibilities for the location of the shot:

a The shot is in the center of the circle.
Indicating the optical path is already vertical and the adjustment is done.

b The dot is on the right side of the circle.
Indicating the optical path has an angle which comes from the top-right and exit to the bottom-left. Release all three screws counter-clockwise half a turn to decrease the gap distance between the metal pieces. Redo step **[5] - [9]**.

c The dot is on the left side of the circle.
Indicating the optical path has an angle which comes from the top-left and exit to the bottom-right. Tighten all three screws clockwise half a turn to increase the gap distance between the metal pieces. Redo step **[5] - [9]**.

Please run the "Camera Calibration" again after the adjustment is done.

7.7 Laser Tube Replacement

Tools



Accessory Box: ② little wrench ⑧ funnel

Laser Tube Box: ⑥ laser tube plug ⑦ cable ties

Prepare On Your Own: ① water container ③ Philips
screw driver ④ needle-nose pliers ⑤ diagonal pliers
⑨ towel



Please unplug power before operation.

- [1]** Remove the screw inside the handle of the back lid then open the lid.



There are two ends on a laser tube. The one with the red wire which is closer to the touch screen is called the high-voltage side. The other next to the first mirror is called the low voltage side.



▲ High-voltage

Low-Voltage ▲

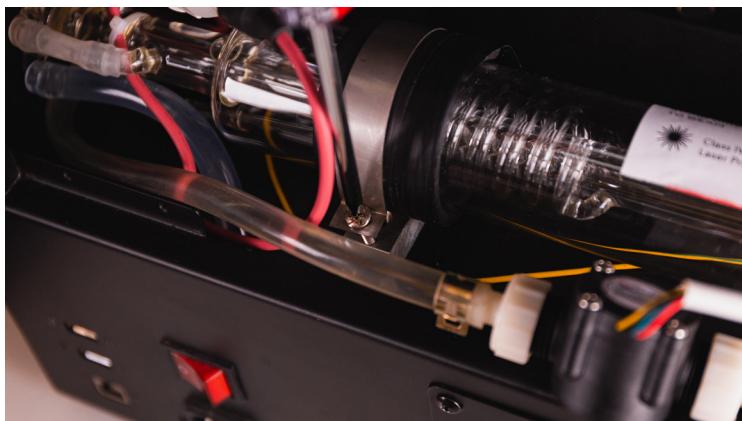
- [2]** Find the white connector on the high-voltage side.
Twist open the connector and disconnect it.



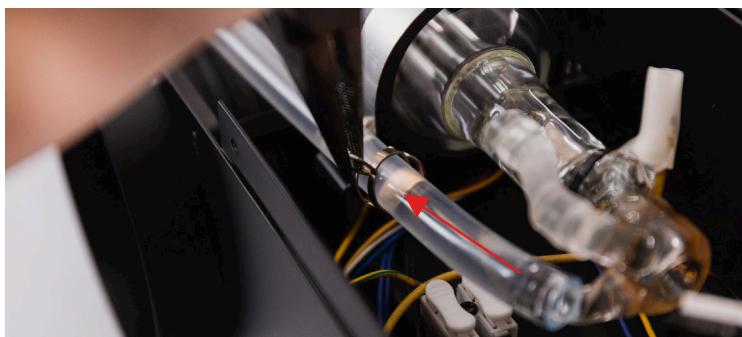
- [3]** Find the white terminal near the low-voltage side.
Press the button on the white terminal to release and
remove the cable connected to the low voltage side.



- 4** Remove the screws of the laser tube holder on both sides.



- 5** Move the hose clamp away from the laser tube by pliers. Take the laser tube out of the chassis and place the low-voltage side above a container. Disconnect the hose from the tube and drain the water. Clog the hose by a plug when done.





▲ Place the low-voltage end above a container.

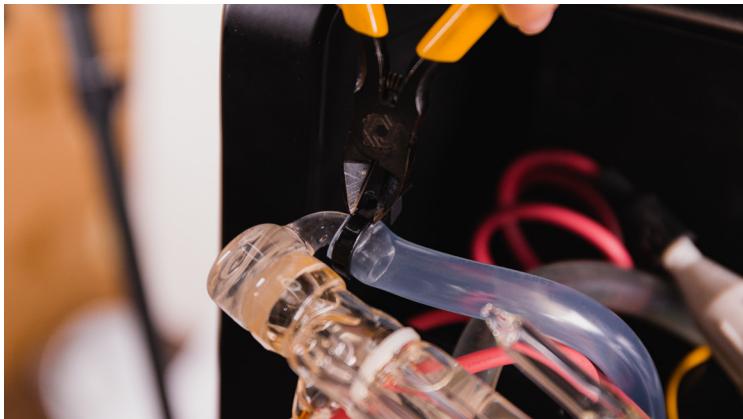


▲ Pull off the hose and drain the tube

- [6] Place a towel under the high-voltage side. Cut the cable tie on the end of the hose with diagonal pliers or scissors. Pull off the hose so the tube is fully disconnected and can be entirely removed.



▲ Place a towel under the high voltage side.



▲ Cut the cable tie on the end of the hose.



▲ Pull off the hose and clog the end



Avoid spilling water into the machine. If it happens, wipe away the moisture and wait till the machine entirely dries up.



▲ The laser tube can be entirely removed

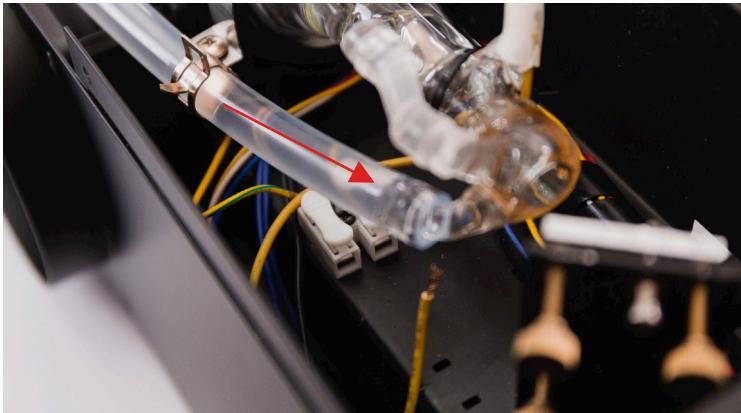
7 Place the new laser tube and connect the hoses on both ends. Zip the high-voltage end by a cable tie and clamp the other end using the original metal hose clamp.



▲ Place the new laser tube and connect the hoses



▲ Zip the high-voltage end by a cable tie



▲ Use the original metal hose clamp to secure the low-voltage end

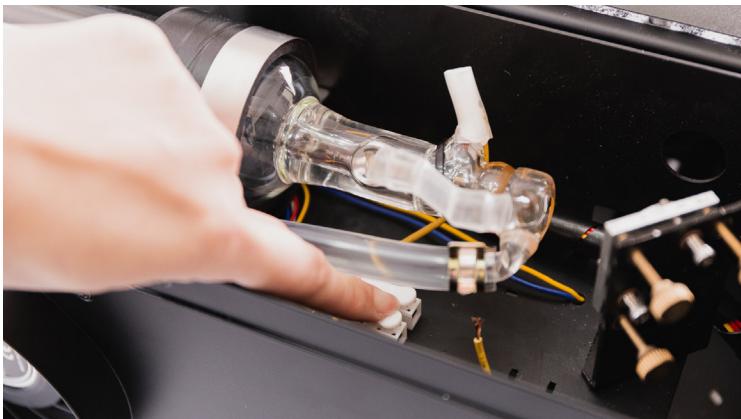


Release the metal clamp slowly to prevent damaging the tube by the force bounced back.

[8] Reconnect the white connector on the high-voltage side. Plug the wire into the terminal on the low-voltage side and make sure the wire is clamped firmly and does not fall out.



▲ Reconnect the connector on the high-voltage side

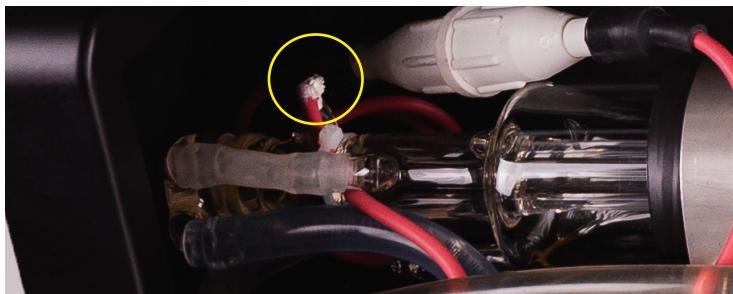


▲ Check if the wire is firmly clamped by the terminal

[9] Place the laser tube into the chassis. Make sure the gap is wider than a finger on both ends of the tube. The terminal on the laser tube which connected to the thick red wire should point upward. Install the screws of the tube holder clip and make sure the tube is fastened firmly.



Make sure the terminal of the red cable points upward instead of other angles. Do not let the end of the tube touch or near the side of the chassis. Wrong placement for the tube may cause voltage leak.



[10] Check all the installation and the machine is ready to start up.



Do not touch the area near the high voltage side on the tube to prevent electric shock.

[11] Press "Maintenance" and the laser head will go to home position. Press "Pump" and the cooling water will be pumped into the laser tube.



Beware not to press "Laser". Do not put your fingers near the laser beam outlet.

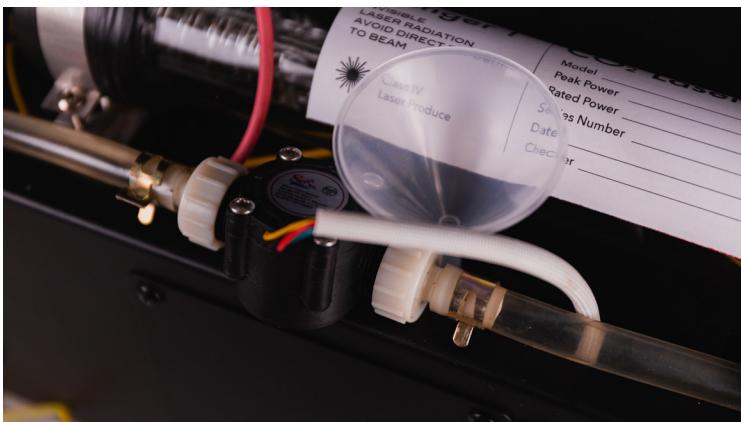
[12] Unplug power and open the cap of the water tank. Fill the tank with a funnel and seal it back.



Watch the water level carefully to prevent from spilling over. Distilled water is best recommended.



▲ Use a coin or the little wrench to open the tank.



▲ Pour the water into the funnel

- [13] Repeat step [11] and [12] until the level of the tank no longer goes down. Then the replacement is complete.

TROUBLESHOOTING

8.1 No Laser Beam Output

If there is no laser output when Beambox is running and the machine is making a loud cracking sound, it indicates the tube is broken. Please stop operating the machine to prevent further hardware failure.

If you do not hear the cracking sound, please check the following:

- [1]** Open the back lid, refer to 7.7 Laser Tube Replacement (p.77) for instructions.
- [2]** Go to touch panel > Maintenance, make sure power is set to "x1.0" then close the front door. Press "Laser Pulse" and observe if a pinkish fluorescent light is emitted through the laser tube. If yes, it means the laser tube is functioning, please check the optical path. If no pinkish fluorescent light is observed, please contact FLUX Support.

8.2 Cut Didn't Go Through Material

- [1]** Go to touch panel > Maintenance, make sure power is set to "x1.0".
- [2]** Check if the focus is adjusted at the right height.
- [3]** Check if the lens or mirrors are dirty or damaged.
- [4]** Check if the optical path is aligned.
- [5]** If the solutions above didn't work, please contact FLUX Support.

8.3 #900 Cooler Off

- [1]** Press "Continue", if the error message does not pop up again within one minute, the machine should operate normally.
- [2]** Please check if the water level of the cooling tank is at least half full.



- 3 If the error message pops up again, please refer to **Water Cooler Maintenance (p.57)**, change the water and try again.
- 4 If the solution didn't work, contact FLUX Support.

8.4 #901 Door Opened

- 1 Go to touch panel > **Maintenance**, make sure if the door icon is changed to "closed" when the door is closed. If the icon is changed from "open" to "close", the machine should operate normally.



Door open



Door close

- 2 If the icon didn't change, please check if the door magnet fell off.
- 3 If the magnet is in place, please place a new magnet over the front door sensor, and check if the icon changed.
- 4 If the solution didn't work, contact FLUX Support.

8.5 #902 Overheated

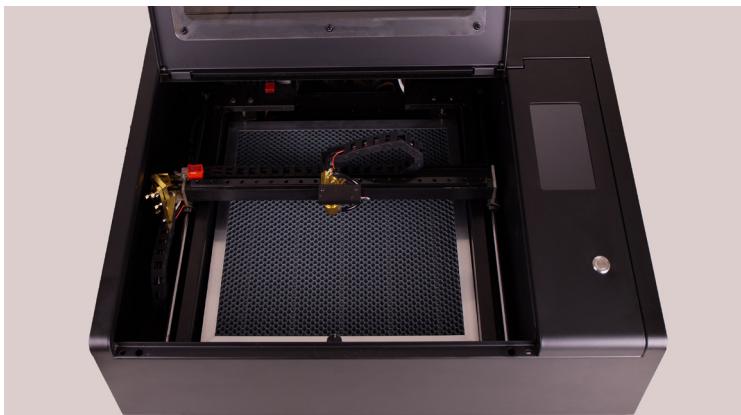
- [1] Please check if the room temperature is 5°C - 35°C (41°F - 95°F).
- [2] Go to touch panel > Maintenance and check if the temperature is 5°C - 35°C (41°F - 95°F).



- [3] If there is a huge difference between the room temperature and the temperature shown on the touch panel, please contact FLUX Support.

8.6 The Laser Head Doesn't Return To Rear Left Corner

- [1]** Gently move the laser head to the center of the bed.



- [2]** Go to touch panel > Action, the laser head should firstly move to the top and then move to the rear left.
- [3]** If the laser head doesn't return to the rear left corner, please use your phone or camera to make a video including the whole work area.
- [4]** Start filming and repeat step **[1]** and **[2]** and send the video to FLUX Support.

8.7 Camera Alignment Issue

- [1]** Run camera calibration in software: Beam Studio > Menu > Machines > Choose Machine > Calibrate Camera. Make sure the height of the laser head is adjusted to the right focus.
- [2]** Compare the red-dotted-line square with the actual square engraved, manually adjust values to make the 2 squares overlapping.

8.8 Camera Preview Speed Too Slow

The preview results are formed by multiple snapshots put together, if the loading speed is too slow, improving the internet connection might help.

- [1]** Go to software: Menu > Machines > Test Network Settings.
- [2]** Fill in the Target device IP Address column with the machine IP address.
- [3]** Press Start and the test will start running.
- [4]** If the average response time is over 100ms, try reducing the distance between the machine and the router or mobile hotspot, or change to a wired connection.

8.9 Camera Preview Doesn't Work

If camera preview can't be activated, please try the following:

- [1]** Restart the machine and press Action and wait for the laser head to go to home position.
- [2]** Use the arrow keys or manually move the laser head to the center of the bed.
- [3]** Press Snapshot, if the image is shown, it means the camera is functioning. Please refer to **9.8 Camera Preview Speed Is Too Slow (p.95)**.
- [4]** If you see a question mark icon, it means the camera is not functioning. Please contact FLUX Support.

8.10 Connection Issue

8.10.1 No Wi-Fi Found

- [1]** Make sure the Wi-Fi dongle is fully plugged in.
- [2]** If you don't see the MAC Address of wireless network on the touch panel, please contact FLUX Support.
- [3]** The Wi-Fi channel should be 2.4Ghz (5Ghz is not supported).

8.10.2 Unable to Connect When Selecting Wi-Fi

- [1]** The Wi-Fi encryption mode should be WPA2 or no password.
- [2]** The encryption mode can be set in the Wi-Fi router administration interface. If the router doesn't support WPA2 and you need help picking out the right router, please contact FLUX Support.

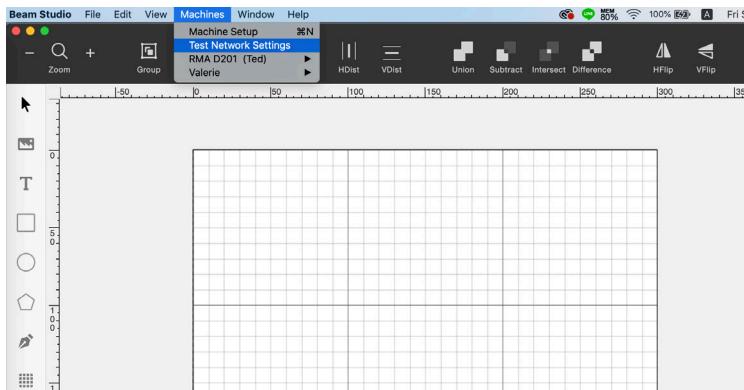
8.10.3 Machine Doesn't Appear In The Software

- [1]** Go to touch panel: **Settings > Internet** and confirm the machine IP address. If the IP address starts with 169.154, please see **IP Address Starts With 169.154** (p.100).
- [2]** Go to software: **Menu > Beam Studio > Preferences**, and fill out the Machine IP Address column.
- [3]** If the machine doesn't appear, please see **Confirm Connection** (p.98).

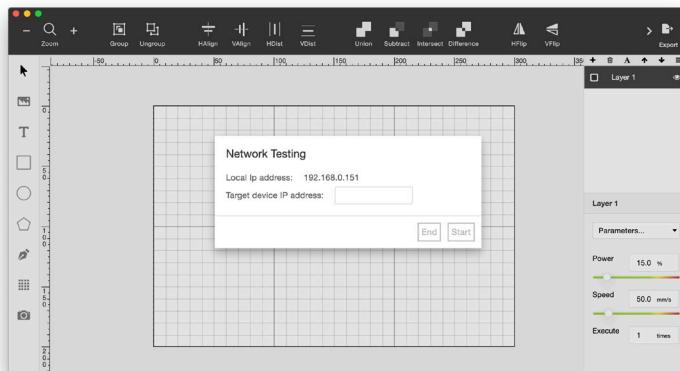
8.10.4 Confirm Connection

Make sure the machine IP address is shown and doesn't start with 169.154.

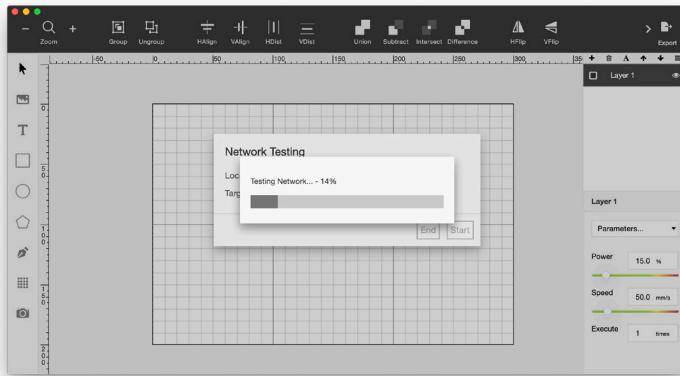
- 1 Go to software: Menu > Machines > Test Network Settings.



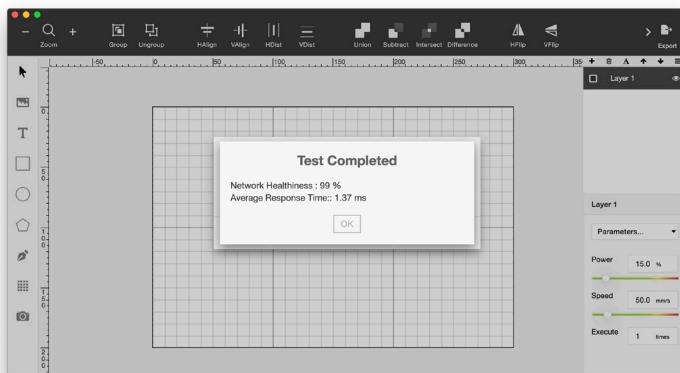
- 2 Fill in the Target device IP Address column with the machine IP address.



3 Press Start and the test will start running.



4 The statistics include Network Healthiness and Average Response Time. The values should be Network Healthiness > 95%, Average Response Time < 100ms. If the machine IP address is keyed in, but the machine is still not found, please update the software to the latest version. If the connection issue persists, please contact FLUX Support.



IP Address Starts With 169.154

- [1]** If the IP address starts with 169.154, it should be a DHCP setting issue, please contact your ISP (internet service provider) for further assistance.
- [2]** If your computer connects to the internet directly using PPPoE, please change to using the router to connect using PPPoE, and enable DHCP feature in the router.

8.11 Software Quits Unexpectedly

Windows

Please install Visual C++ Redistributable 2015, if the latest version is installed, please download the latest Visual C++ Redistributable 2015 - 2019. If you are using Windows 7, please update to Windows 7 SP1, install the latest graphics driver and Windows Update KB2670838.

MacOS

Please update your OS to macOS 10.14 (Mojave) or above. Previous OS versions might have compatibility issues.

Linux

Due to numerous types of systems, please provide the software log to FLUX Support.

TERMS OF USE

Please read the instructions carefully before you use Beambox. Improper use is not cover by the insurance.

- Do not leave the machine running unattended. If you would like to leave temporarily, please press pause on the panel.
- Always operate this product from a power source of the same voltage. Do not operate the product with a damaged plug or cord.
- Be sure to disconnect the power and remove the power cord from the electrical supply when cleaning, maintaining, and servicing the laser equipment.
- Beambox is not intended for use by persons (including children) with reduced physical, sensory, mental capabilities or lack of experience and knowledge, unless they have been given supervision or instructions concerning use of the appliance by a person responsible for their safety.
- Children should be supervised to ensure that they

do not play with the appliance.

- Please place Beambox on an even surface.
- Please use Beambox in a well ventilated place. Fumes and smoke generated during the engraving process should be extracted from the room.
- This product should not be used in the immediate vicinity of water, such as bathtubs, washbowls, swimming pools etc. where the likelihood of immersion or splashing could occur.
- Do not stare at the bright and intense light appearing during the engraving process. Also we recommend not to stare at the light even through optical instruments. Doing so can cause serious eye damage, even permanent blindness.
- Operators should keep a fire extinguisher at the facility since laser may lead to an unexpected fire outbreak.
- Do not move or lift the system alone. Always seek assistance of one or two other people, in case you need to change the system's position. The weight of the system may lead to injury.