



# OPERATIONS MANUAL

VERSION 2.0



Full Spectrum  
LASER

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# Introduction

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Thank you for purchasing your new Muse Core. Our high quality products will provide years of service simply by following proper usage and upkeep. With proper usage and upkeep your machine will be a key part in any design work.

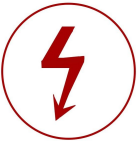
This user manual will guide you through the safety guidelines and operation of your machine. We recommend that you familiarize yourself with this manual before using your laser engraver. Remember to be safe and have fun!

For more information and product selection, please visit [www.fslaser.com](http://www.fslaser.com)

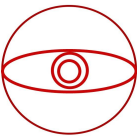
## Safety Symbols & Meanings



This icon warns of potential fire hazards and fire risks.



Warning about power surges and electrical risks.



This icon indicates potential eye damage.



Warning about glass or cutting hazards.



This icon warns of potential risks of chemical inhalation.



Important information to keep in mind when running you laser.



# Section I. Safety

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## Fire Safety



Laser cutting and engraving systems can present a significant fire hazard due to the extremely high temperatures generated when the laser beam is in use.

Some materials are extremely flammable, catching fire quite easily and damaging the machine and its surroundings.

Vector cutting has been shown to have the most potential for igniting material due to its direct and steady output of current. However any function can cause fires due to negligence.

Please read the following warnings and recommendations before using your machine. These instructions should be followed closely at all times.

- **Always** keep a properly maintained and inspected 5lbs. or larger fire extinguisher on hand. We recommend a Halogen or multipurpose dry chemical fire extinguisher.
- **Always** keep the area around the machine clean and free of clutter. **Never** stack materials near or in your work area. Clean the surrounding area regularly to avoid dust getting into the machine.
- **Never** store any flammable materials in or near the machine.
- **Never** operate your machine unattended.
- **Always** use the air assist, especially while vector cutting.
- **Never** attempt to run a laser with the lid open.

## Setup Precautions



Follow all safety protocols and procedures before operating any machinery. It is the responsibility of the operator to ensure all safety precautions are correctly followed, and that the machine is properly assembled and in working order.

- **Always** inspect your machine for damage or breakage before each use. **Do not** operate machinery that is damaged or defective in any way.
- **Always** have a clean, level, and open work space to unbox and place your laser system. **Never** leave the laser system unattended during operation.
- **Never** modify, disassemble, or in any way alter the construction of the laser and never start up a system that has been modified or disassembled.
- **Never** operate the machine with any of the panels removed.
- **Always** have a first-aid kit designed for the initial treatment of burns and smoke inhalation.
- **Never** place hands or fingers into moving parts such as cooling fans.

# Section I. Safety

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## Operation Safety

The output of the CO2 laser is fully contained in a Class 1 enclosure during normal operation. However, the output beam of the Alignment Laser (visible red diode laser) is accessible to the operator during normal operation, giving the total system an overall rating of Class 3R. Class 3R lasers have minimal safety concerns when used properly and handled with care. No special precautions are necessary to operate the high power laser safely. However we recommend following these Safety Guidelines:

- **Never engrave or cut any unknown material. Never run a laser with the lid open.**
- **Never operate the machine without a properly operating ventilation system.**
- **Never look or stare into the visible red diode laser.**

## Electrical Safety



The power supply is capable of releasing a current up to 20mA. This power is sent to the discharge terminals on the laser tube itself. In order to prevent access to bare wiring your laser shipped with silicone terminal covers. Please notify Full Spectrum Laser support and immediately cease operations if the covers ever slips and exposes the bare wires.

**Note: When performing any replacement procedures, make sure the machine is off for at least an hour.**

- **Do not open any of the machine's access panels while the unit is plugged in.**
- **Never make or break any electrical connections to the system while the unit is turned on. Never access any electrical areas with hands or tools. The unit should be disconnected from the power for at least one hour.**
- **POWER ON/OFF is controlled by the switch at the back of the machine, with (-) being ON and (o) being OFF.**
- **Never replace the installed 20 amp fuse with one of a higher rating.**
- **In case of a blown fuse always contact Technical Support before replacing anything.**

## Compliance Statement:

The standard for laser safety is the American Standard for the Safe Use of Lasers, Z136.12000. Developed by the American National Standards Institute (ANSI) it is the basis for many federal regulations and Occupational Safety and Health Administration (OSHA) guidelines for laser and laser system manufacturers. It contains detailed information concerning the proper installation and use of laser systems. While the ANSI standard is not a law, its recommendations, including warning signage, training, and the designation of a laser safety officer, may be mandatory under local regulations. It is the operator's responsibility to ensure that the installation and operation of the Full Spectrum Desktop Laser System are performed following applicable laws. Copies of ANSI Standard Z136.12000 are available from:

**LASER INSTITUTE OF AMERICA 12424 RESEARCH PARKWAY, SUITE 125 ORLANDO, FL 32826 (407) 3801553.**

# Section I. Safety

## HARMFUL MATERIALS:

**WARNING!! TRYING TO CUT THESE ITEMS WILL VOID WARRANTY!!**

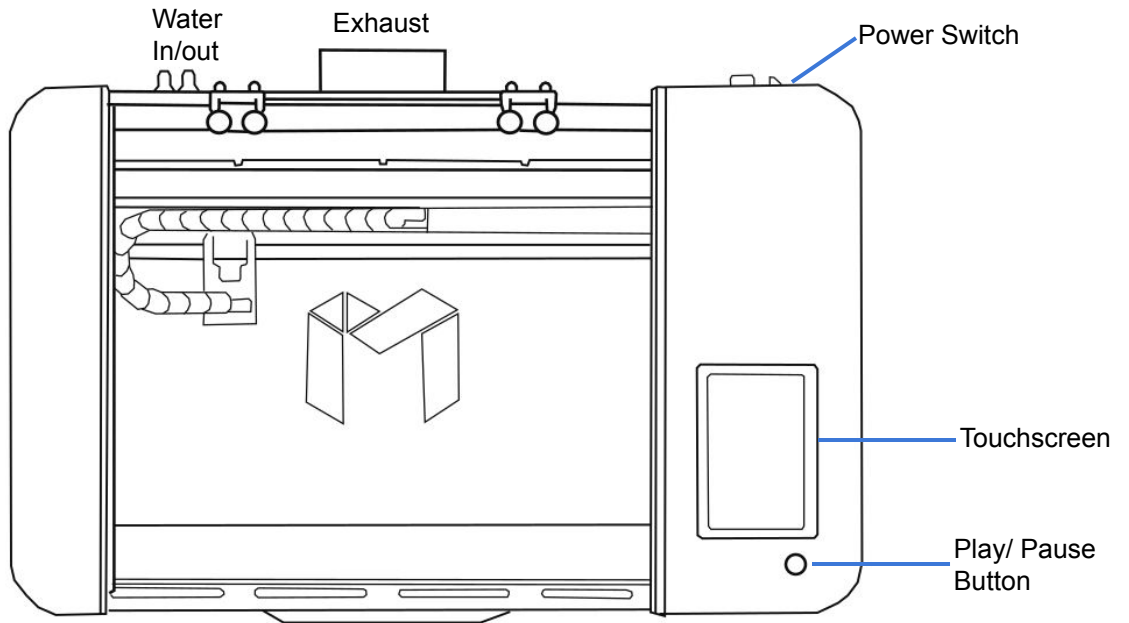
**CUT AT YOUR OWN RISK!**

Material	DANGER!	Issues
PVC (Poly Vinyl Chloride)/Vinyl/ Pleather/Most Artificial Leather	Emits Chlorine gas fumes	This material can ruin the optics as well as cause the metal of the machine to corrode. PVC can also ruin the motor system.
Thick ( >1mm ) Polycarbonate/Lexan	Catches fire	Polycarbonate is used in the window of varies laser cutters because it absorbs infrared radiation. Therefore, it cannot be cut with laser engravers. Trying to do so will create soot that can ruin the optics and mess up the machine.
ABS plastic	Melts, Emits Cyanide fumes	ABS tends to melt creating melted deposits in the workspace and is subsequently a high fire risk. It can also release lethal amounts of hydrogen cyanide.
HDPE/Milk Bottle Plastic	Catches fire and melts	HDPE can melt creating melted deposits in the workspace and is subsequently a high fire risk.
PolyStyrene Foam	Catches fire	Foam can ignite quickly and spread flames rapidly.
PolyPropylene Foam	Catches fire	Foam can ignite quickly and spread flames rapidly.
Epoxy	Emits fumes	Epoxy is a resin made out of carbon. Therefore, a CO2 laser can't cut it. Attempting to do so will result in toxic fumes.
Fiberglass	Emits fumes	It is made of glass and epoxy. Do not attempt.(Refer to epoxy)
Coated Carbon Fiber	Emits fumes	Cannot be cut and will emit toxic fumes.(Refer epoxy)
Any food	Toxicity	Our machines are not designed to be used with food as they possess no safe food contact surfaces. There are also risks involved with debris in the workspace polluting any food placed in the interior. Do not put food in or around the machine.
Material with Sticky Glue or Adhesive Backing	Coats lens or cracks lens	Items that can normally be cut become uncuttable when the manufacturer adds a layer of peel-off glue on the bottom to attach them to surfaces. The glue will vaporize forming a coating on the lens that will coat, cloud, heat, and potentially crack the lens. It can't be removed without damaging to the lens, requiring a lens replacement. <b><u>DO NOT CUT MATERIALS THAT HAVE THIS BACKING!</u></b>

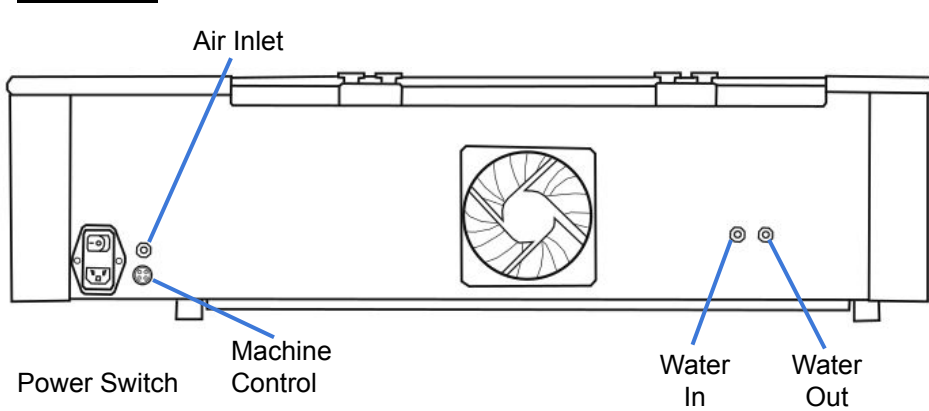
# Section I. Safety

The following diagrams will help you locate all of the machines components.

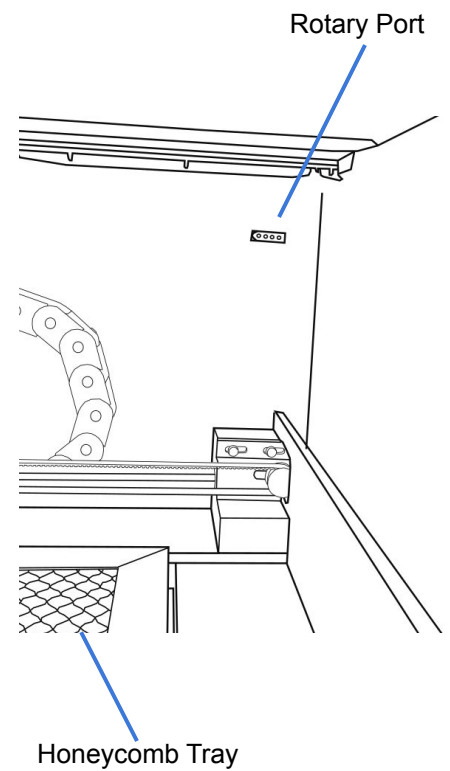
**Top View:**



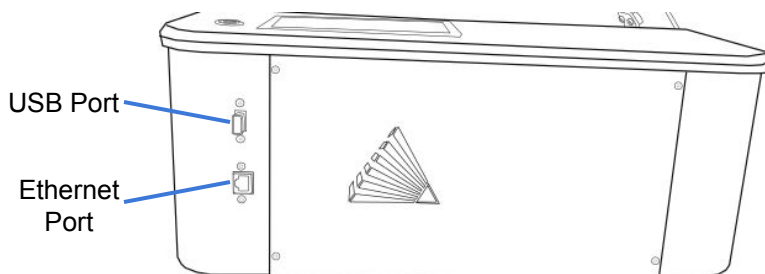
**Back View:**



**Side View:**



**Side View:**





# Section I. Safety

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## Section Review:

### Do's:

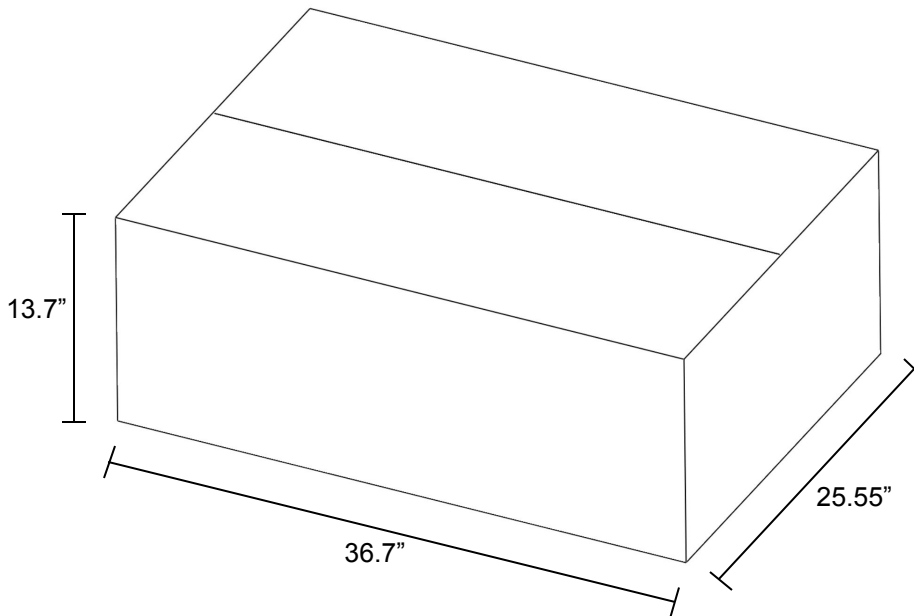
- Remember to make sure your work area is nice and clean. Keep your laser system clean.
- Always keep an eye on your machine.
- Always inspect your machine for damage or breakage before each use.
- Always keep a fire extinguisher and a first-aid kit (preferably one designed for the initial treatment of burns and smoke inhalation) on hand.

### Don'ts:

- Do Not stack items on or near your work area.
- Do Not leave your machine unattended.
- Never operate the machine with any of the panels removed or without a properly operating ventilation system.
- Never access any electrical areas with hands or tools unless the unit is disconnected from the power for at least one hour.
- Never place hands or fingers into moving parts such as cooling fans.

# Section II. Unboxing

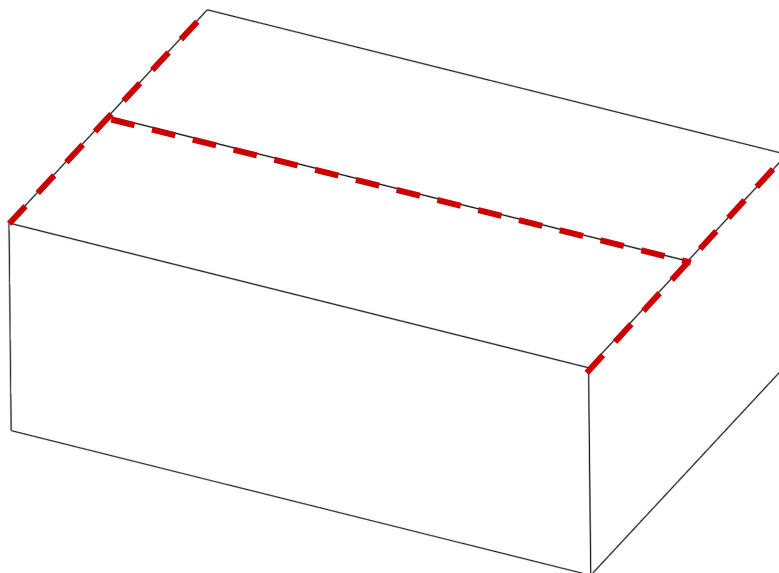
The Muse Core has a weight of 54 lbs. To avoid the potential of injury, two people are needed to lift and unbox the machine. **Lift At Your Own Risk.**



## Unboxing Steps

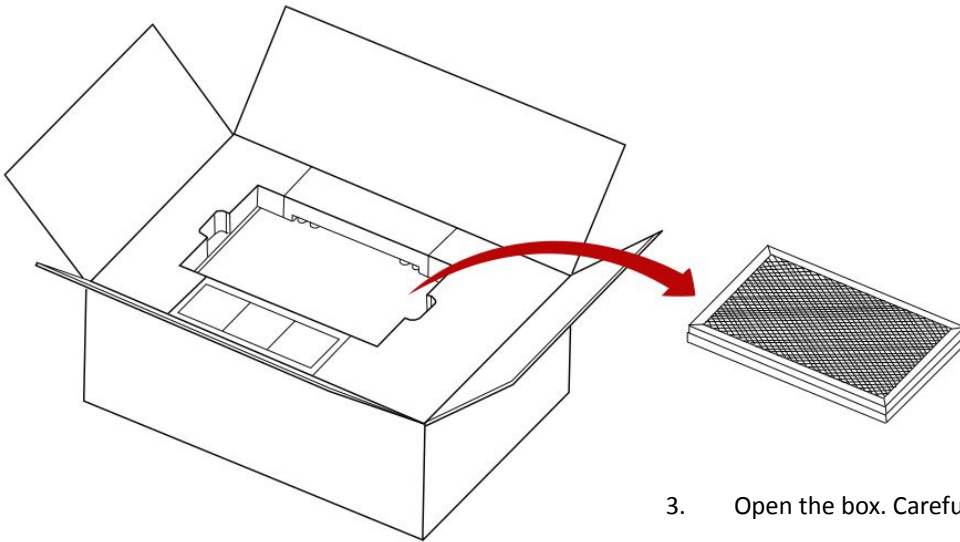
Follow these instructions for best results:

1. **Prepare Work Space:** You will need an open, level work space to place your laser cutter. A sturdy table with room for the machine ( 32.5"x 20.3"x 8.5" for the workspace) is recommended. Be sure the table is free of clutter and can support a minimum of 200lbs (the machine itself weighs 54 lbs).
2. **Place Box:** Place your box on or near your table before opening it, using either a pair of scissors or a box cutter.

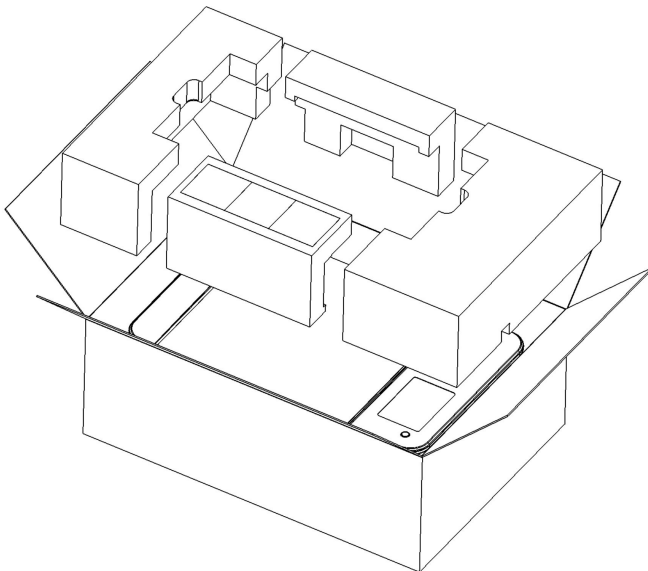


# Section II. Unboxing

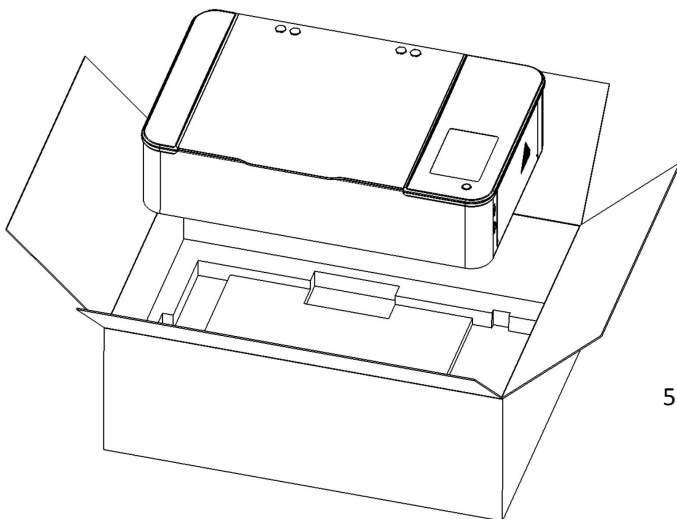
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3. Open the box. Carefully remove the Honeycomb tray.



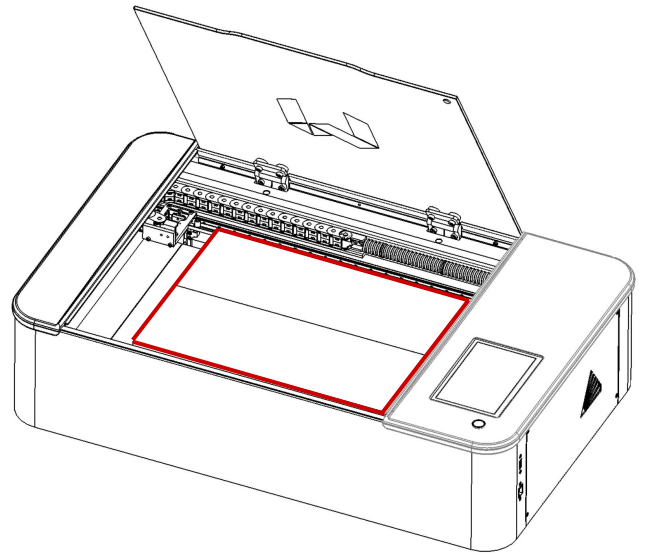
4. Remove the foam layer to access the machine.



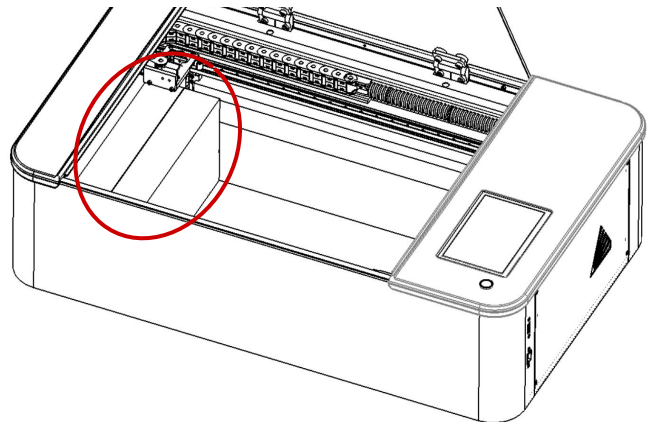
5. Two people should carefully remove the Muse Core from the box.

# Section II. Unboxing

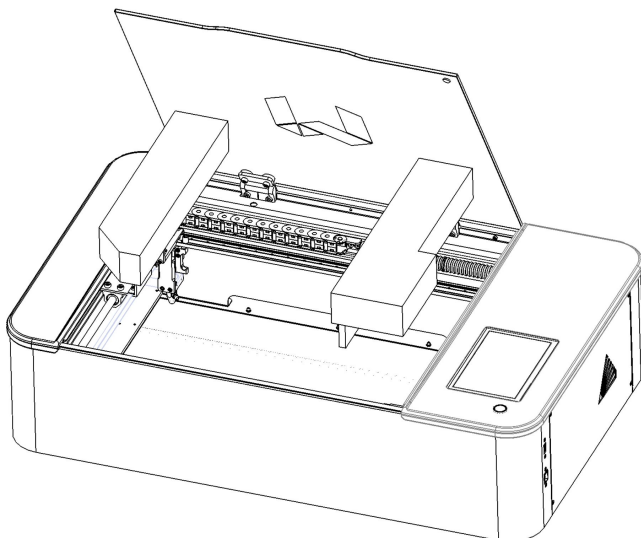
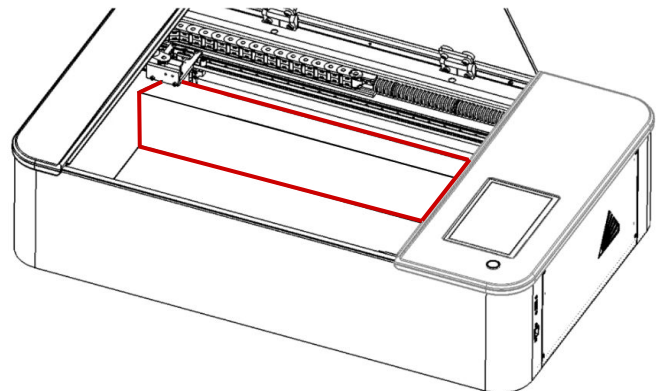
6. Inspect the outside of your machine.
7. Open the Muse and remove the Coolbox package.



8. Remove the Accessory box.



9. Remove the Foam from under the Gantry.



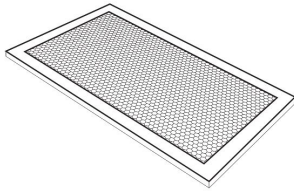
10. Remove the Foam from under the side panels.



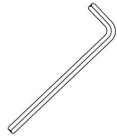
# Section II. Unboxing

## Checklist

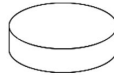
Your laser should come with the following included parts and accessories:



Honeycomb Tray



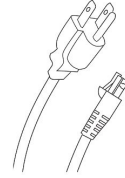
2.5mm Hex Key



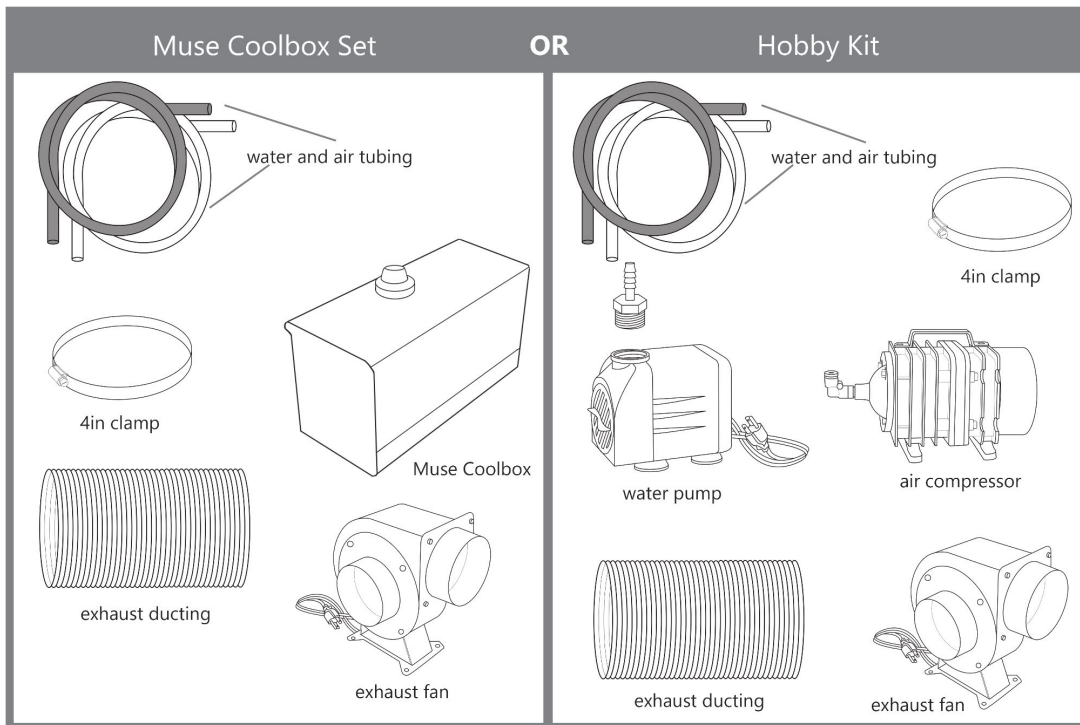
Focus Billet



Thermal Paper



Ethernet and Power Cables

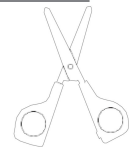


## Additional Items

You will also need the following tools(not included in your purchase):



1 gallon of distilled water



Small Scissors



- **Never use unapproved ducting in the exhaust system as it is potentially flammable.**



- **Never operate your laser without a working exhaust.** Full Spectrum Laser recommends exhaust systems capable of AT LEAST 500CFM. Keep in mind that exhaust systems with high flow rates may require a particle filter for materials with significant particulates such as wood.

# Section II. Unboxing

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## Section Review:

### Do's:

- Remember to Lift Your Box with a partner. Remember to lift with your knees.
- Check your 3D for any damage prior to use.
- Make sure to check that your machine came with all the items on the checklist.

### Don'ts:

- Do Not lift the box alone. Do Not lift using your waist, back or arms as it can lead to injury.
- Do Not use your machine if you see any damage. Contact Support immediately.

# Section III. Setting Up Your Muse

This assembly is a simple process that should take less than half an hour to complete. For simplicity we divided the assembly into five easy steps.

1. Locate & Remove Zip Ties
2. Connect the Exhaust System
3. Assemble the Water System(Hobby Kit)
4. Assemble the Air Compressor(Hobby Kit)
5. Connect Electrical Power

## 1. Locating & Removing Zip Ties

The machine was secured during shipping with zip ties to hold the laser head assembly and the x-gantry. Remove zip ties before operating your laser cutter for the first time.

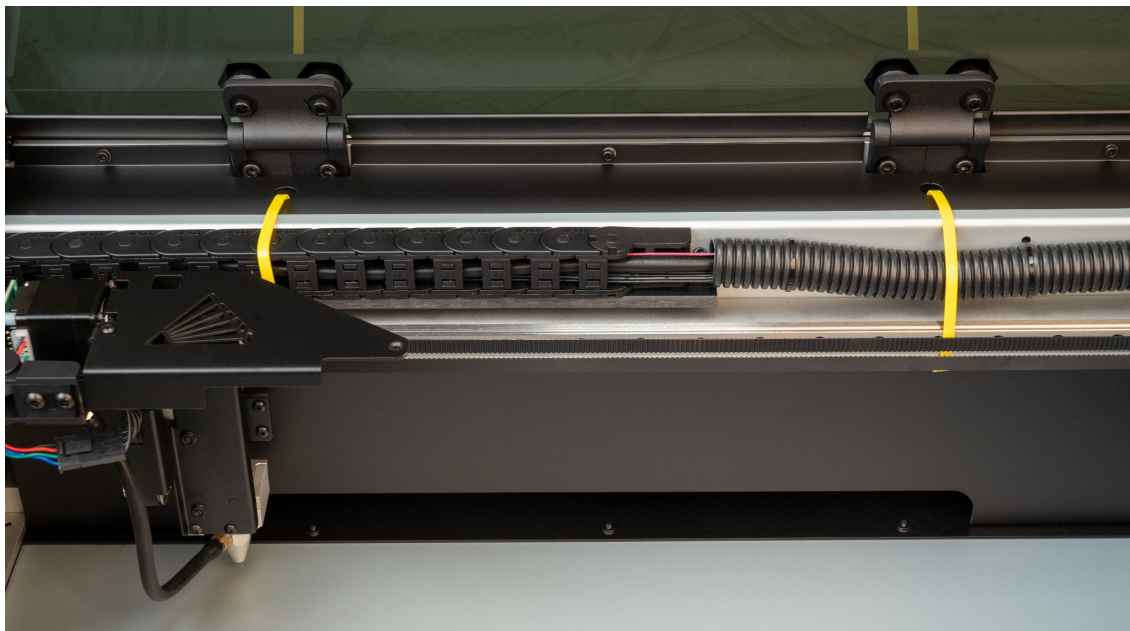


Fig. 1

**Please note: Zip Ties may vary in color. Refer to the provided pictures on which zip ties are cuttable.**

**WARNING!! Do not cut zip ties holding other wires unless instructed to do so by support. Do not cut belts by accident.**

# Section III. Setting Up Your Muse

## 2. Connecting the Exhaust System

An exhaust fan is required to be connected and on whenever a job is run on your laser. A properly installed exhaust fan removes smoke and fumes from the case and exhausts them to the outside of the building or a fume extractor.

1. **Install Exhaust Flange:** Use the provided flange bolts to install the ducting collar on the rear of the machine as shown in Fig. 3.

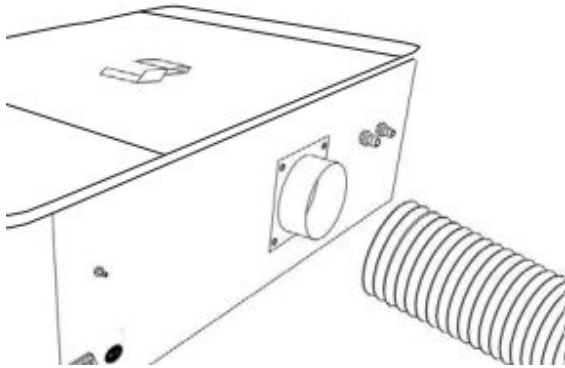


Fig. 2

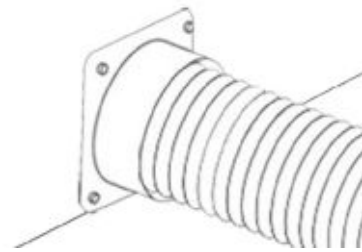


Fig. 3

2. **Position Ducting:** Place your 4" ducting over the Exhaust Port located at the back of the machine and hold. Secure with 4" ducting clamp. (See Fig. 3)

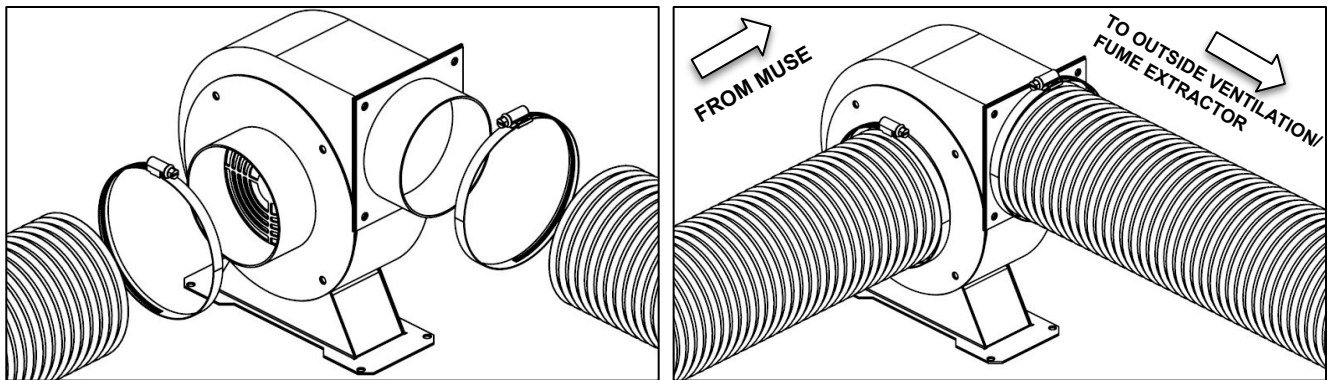


Fig. 4

3. **Attach Exhaust Fan:** Secure the free end of the ducting to the exhaust fan. Repeat the ducting and clamping process in the other side of the exhaust fan and plug in the fan into the bottom power plug marked "exhaust" on the back of your Muse Core machine. (see Fig. 4).
4. **Ventilate Outside or to Fume Extractor:** Set the open end outside of a window or to a fume extractor. Check your system for leaks and be aware that the protective housing is not designed to be airtight; the front grill is designed to allow an exhaust system to draw fresh air though the work area.
5. **Connect to Power:** Plug the power cord from the exhaust fan power into the plug marked "exhaust fan" on the back of your Muse Core.

**Note:** Accessories plugged into the back of your 3D will only turn on when the laser is fired (as intended).



# Section III. Setting Up Your Muse

## 3. Water System Assembly

The Muse Core comes with an optional Hobby Kit that contains both the Air Compressor and Water Pump. If the Coolbox option was selected instead, then proceed to the “Add-on” section on pg 62.

Muse Core uses a water-cooled continuous beam CO2 laser tube. The tube requires a flow of room temperature water to help regulate the temperature of the laser tube. Your purchase includes a water chiller for cooling the laser tube.

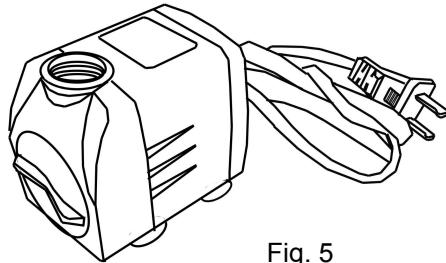


Fig. 5

1. **Remove Water Cap:** Remove the short silicone tubing, capping the water inlet and outlet on the back off the machine.

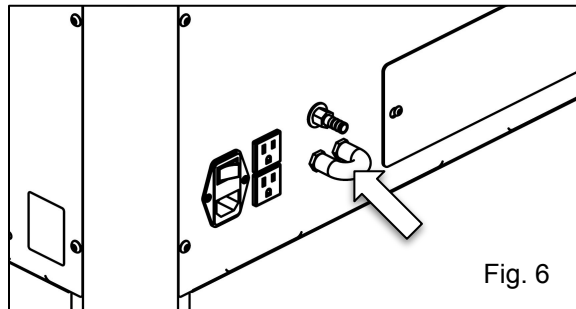


Fig. 6

2. **Attach Water Pump Fitting:** Remove the water pump from its packaging. Attach the plastic fitting to the water pump and screw on.

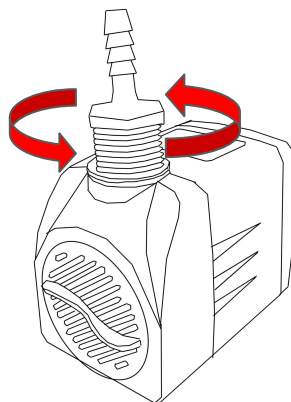


Fig. 7



**Never Fire the Laser without a correctly connected and powered water chiller.** Firing the laser without turning the pump on or with no water in the system will severely degrade or destroy your laser tube and void your warranty.

# Section III. Setting Up Your Muse

- 3. Prepare the Water Bucket:** Fill a 5 gallon bucket(not included) by about 2/3rd using distilled water. Make sure to only use distilled water and replace often. If you live in a cold climate you can use a 1:2 Propylene Glycol and Distilled water mix to prevent freezing. Generally Muse Titan systems should not be run in temperatures less than 20°F (-6°C).

**Note:** We recommend a bucket with a lid be used to prevent debris from falling in. Make holes for tubing if needed.

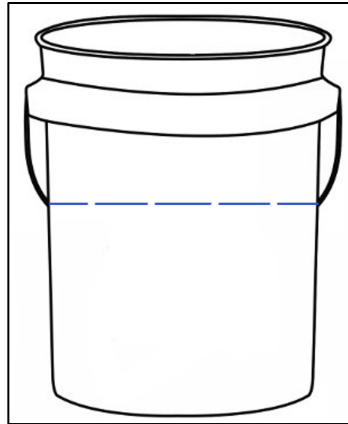


Fig. 8

- 4. Attaching the Water Outlet Tubing:** Connect one end of a water tube to the Water Out tube on the back of your machine. Place the other end of the tubing into the bucket of water.
- 5. Attaching the Water Inlet Tubing:** Connect the second tube to the Water In tube and place the other end on the plastic filling on the pump.

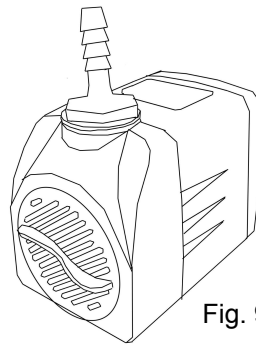


Fig. 9

- 6. Place the water pump into the bucket and plug in for use.**

## NOTICE!



- We recommend that you attach the laser and water pump to a power strip and use that to control the main power to the unit, ensuring that the water pump is always on when the laser is powered.
- **Make sure that there are no air bubbles inside of the water jacket of the laser tube as it can reduce the lifetime of your tube.** If present, water bubbles typically migrate to the electrodes on either end of the tube. Visually inspect the laser tube to make sure that bubbles are not present. If bubbles persists completely drain the tube of water then turn the chiller back on and check once more.

# Section III. Setting Up Your Muse

## 4. Connect the Air Compressor

Air is used as a pressurized gas to assist in cutting and engraving operations. This pressurized air is critical to safe and efficient cutting operations as it not only helps cut through material more quickly, but also helps prevent the formation of flames.

1. **Tubeing:** Remove the air compressor from its packaging and attach the silicone tube on the air compressor.

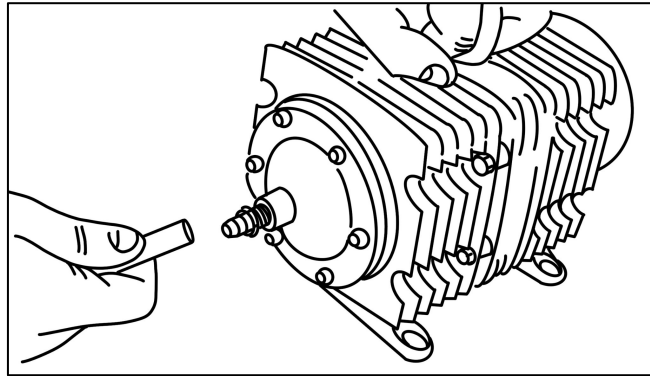


Fig. 10

2. **Attach Air Hose to Laser Cutter:** Insert the other end of the hose into the “air inlet” nozzle in the back of the laser cutter through the barbed air connect.

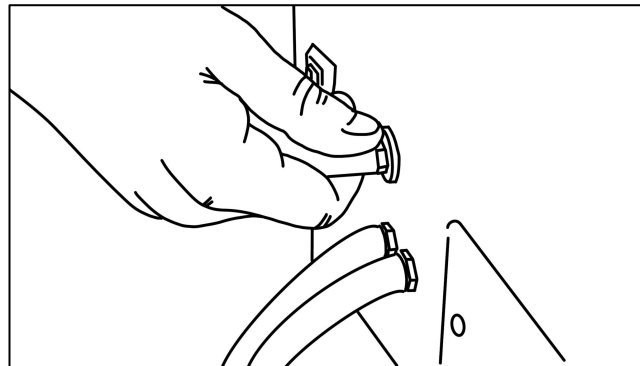


Fig. 11

3. **Connect to Power:** Plug the air compressor power cord into the marked “Air Assist” on the back of your 3D.

# Section III. Setting Up Your Muse

The Muse Core and its accessories are configured to accept 110VAC at 60Hz. For international purposes we offer an optional single-phase 220VAC converter.

1. **Prepare Power Cord:** Remove the electrical cord from its packaging.
2. **Plug in Power Cord To Laser Cutter:** The power cord plugs into the C14 slot located on the back of the machine. Ensure the red power switch is turned on.
3. **Plug in Power Cord to Outlet:** Plug the power cord into any proper outlet socket in your workspace.

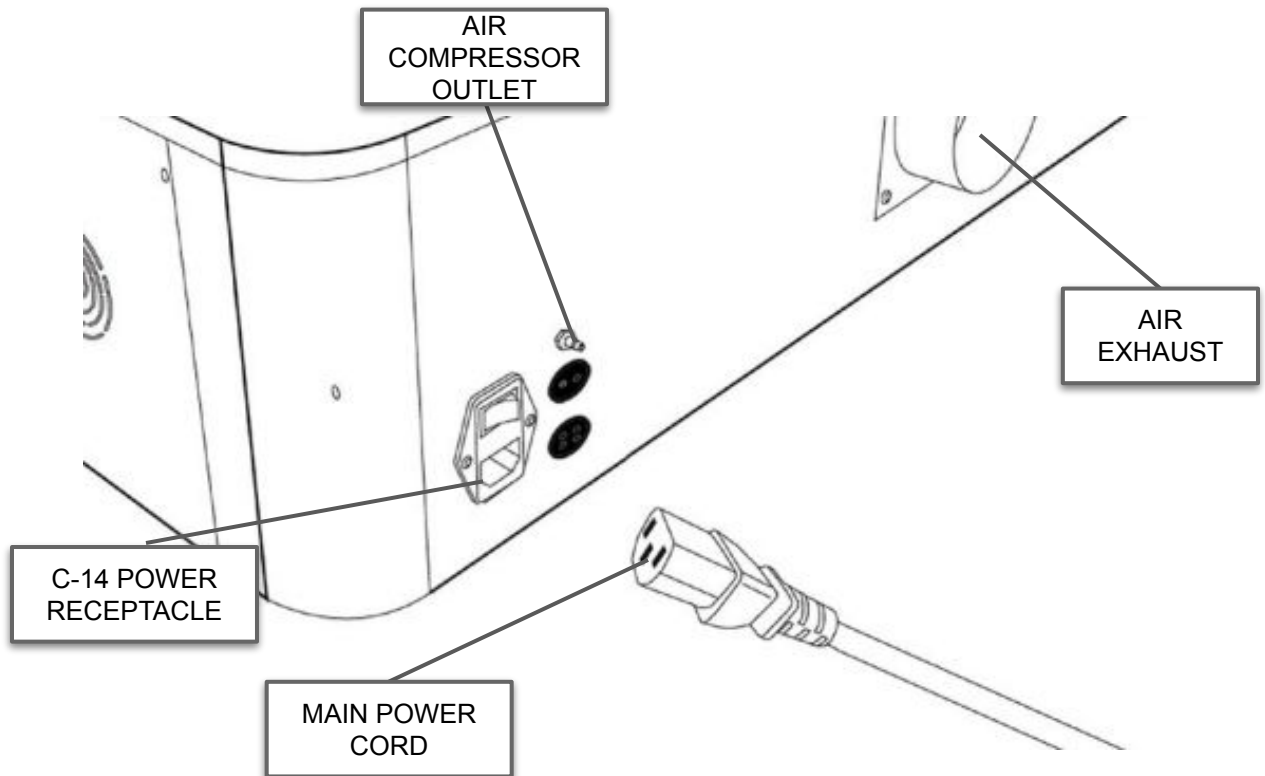


Fig. 12



**NOTICE!**

- **Please be aware that the accessories will increase circuit load**  
The most significant power draw usually comes from the blower/exhaust system. Consult the manufacturer's information and manual for the operating parameters of your exhaust system.
- **The power inlet is equipped with a fuse to protect the machine from surges or short circuits in case of emergencies. If this fuse ever needs replacement, please contact Full Spectrum Laser technical support.**



# Section III. Setting Up Your Muse

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## Section Review:

### Do's:

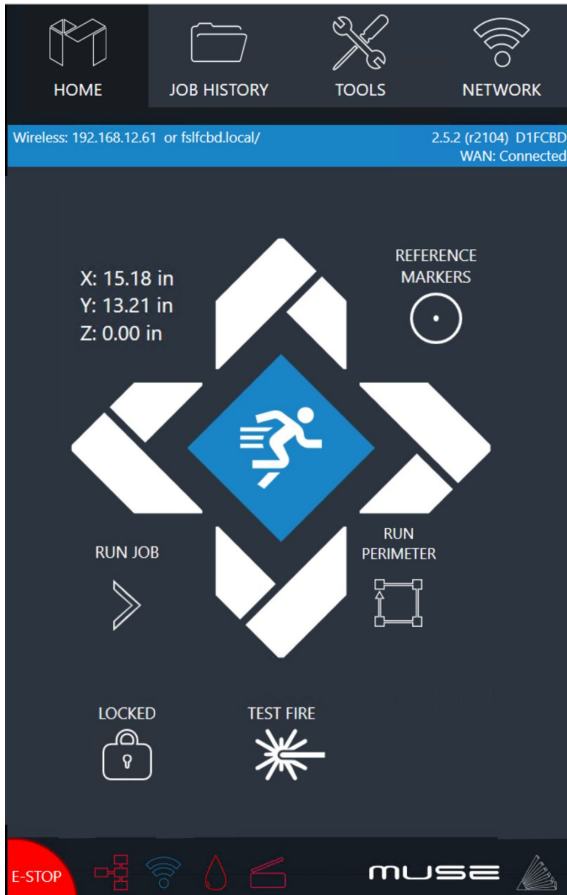
- Remember to remove all the zip-ties before trying to use your machine.
- Remember to connect the machine to external ventilation, such as to a window or a fume extractor.

### Don'ts:

- **Do Not** use your machine with the zip-ties on.
- **Do Not** use your machine if the water assembly or Coolbox are not working properly. They are needed for machine operation.
- **Do Not** use your machine if the air Compressor is not working properly. The air compressor is needed for machine operation.

# Section IV. Touchscreen Interface

The touchscreen that comes on your Muse allows you to control the basic functions of your laser without needing a computer. Jobs are accessible through the touchscreen once loaded in from the RE3 interface.

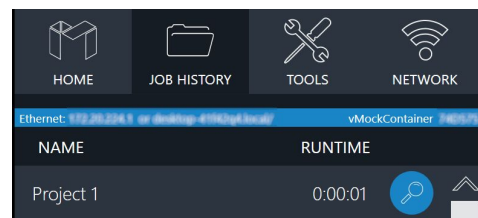


## Home

The Home screen contains the device's IP address, the QR Code for RE3 and controls for the laser head.

## Job History

The Job History icon allows the user to access previous projects. Selecting the File allows the user to view and re-run it. No internet is needed to run the file saved here.



## Tools

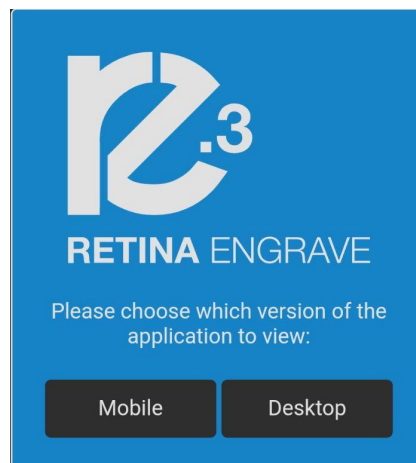
The tools icon allows the user to check and adjust the machine settings, enable rotary attachments, home the laser, and get information about the machine.

## Network ⇄ Wi-Fi

Allows the user to connect to the Wi-Fi.

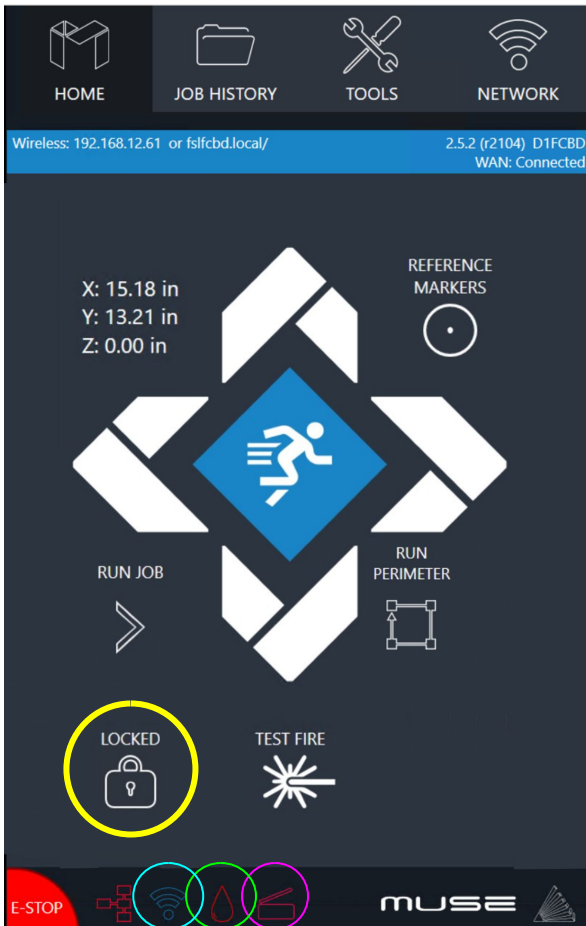
## Mobile Version

A mobile version is available by scanning the QR Code or by inputting the device's IP address into your phone's web browser. (See Connect to Software for more information)



# Section IV. Touchscreen Interface

## Machine Indicator:



### Lock Indicator:

**Locked Icon:** Indicates the gantry is locked. When locked, the user must move the gantry using JOG controls.

**Unlocked Icon:** Indicates the gantry is unlocked. When unlocked, the user must manually move the gantry



### Lid Indicator:

The Titan's lid has a magnetic failsafe that disconnects the laser when the lid is open. The Lid indicator located at the bottom right of your touch screen, will be have an open icon in red in response. When the Lid is closed a blue closed icon will appear indicating that the laser is now reconnected.



### Waterflow Indicator:

The water flow indicator is located right next to the Lid Indicator. The water flow indicator is normally blue but will turn red if the water sensor does not detect any water flowing through it.

If the water indicator turns red, check water tube connections and make sure the tubes and water chiller are assembled correctly. More than likely, the water tubes are reversed or the water sensor is dirty.



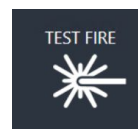
### Wi-Fi Indicator:

The Wi-Fi indicator will arrive red until connected to the Wi-Fi.



### Test Fire:

This button fires the laser.



# Section IV. Touchscreen Interface

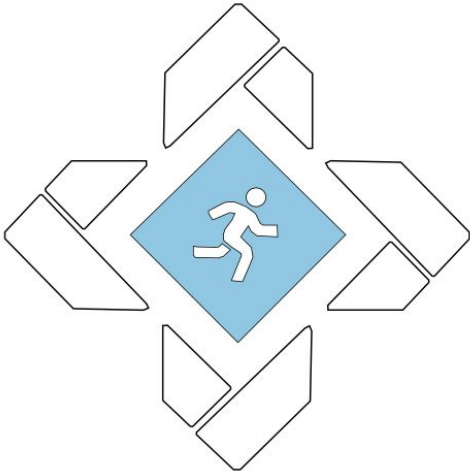
---

## Speed Indicators:

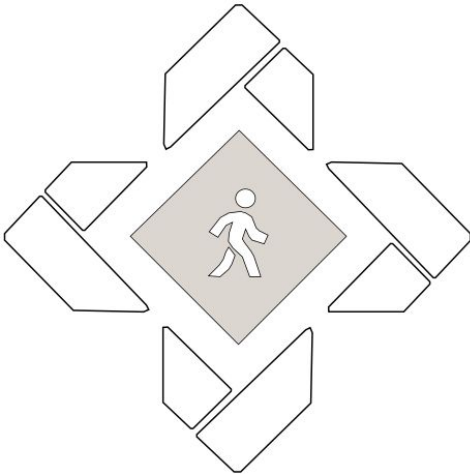
Your machine has 3 speed setting that can be changed by selecting the icon on the touchscreen or from RE3.



**Running Icon:** The machines default speed and the fastest speed, used for fast movement across the work area



**Jogging Icon:** The second speed, also known as the intermediate speed, used for normal adjustments before running a job



**Walking Icon:** The final and slowest speed, used for small adjustments.

# Section IV. Touchscreen Interface

---

## Section Review:

### Do's:

- Make sure your Gantry is locked before use.
- Make sure the lid is closed before use.
- Make sure the water system is running.

### Don'ts:

- Do Not use your machine if the gantry is unlocked.
- Do Not use your machine if the water system is off.

# Section V. Internet Connection

The Muse Core software is browser-based, meaning no download is required. RetinaEngrave v3.0 (RE3) is locally hosted on the machine's internal computer so it will function even without an internet connection. Using any computer, only an internet browser (such as Google Chrome) is needed to access RE3. There are three methods of connecting to the internet. The method chosen will depend on you or on the location of the machine.

## Connect Via Router (Recommended):

Connecting the Core to the router is the most reliable way to establish a link to RE3.

1. The Core comes with an ethernet cable(see Fig. 13).

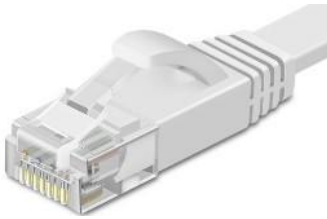


Fig. 13

2. Connect the cable to the ethernet ports on both devices(see Fig. 14).

**Note: Ethernet port looks the same on all devices**

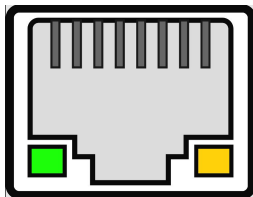


Fig. 14

## Connect to Wi-Fi:

1. Your machine should come with a device called a dongle attached to the usb port. This device enables your machine to connect to the wifi. Make sure that it is there and connected.

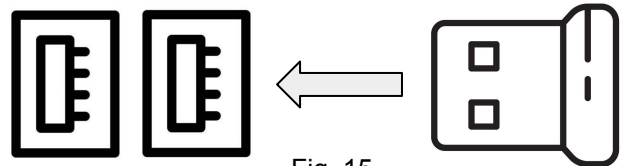
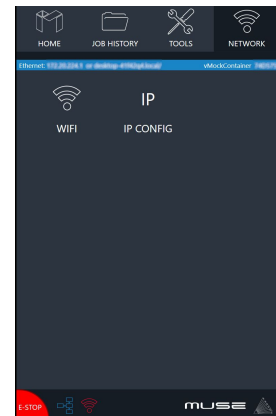


Fig. 15

2. Select the Network button on the top right of the Touchscreen.
3. Select WiFi and look for your network. Select it and enter your password



## Connect Directly to Computer:

Connecting the Muse Core and the computer should only be done if the previous two options are not possible. The Muse can connect to the computer via ethernet cable.

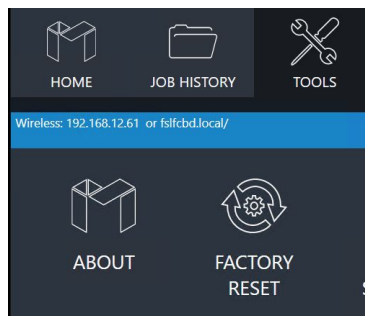
**Note: The location of the ethernet port varies on computer models. Some computers may not have an ethernet connection and may need an ethernet adapter.**



# Software Connection

RetinaEngrave v3.0 (RE3) is a combination of a print driver and control software that communicates with, downloads jobs to, and controls the laser system. There is no download required for RetinaEngrave v3.0. With a local connection (achievable with Wi-Fi or the included Ethernet cable) your Muse Core will link with the software's IP address

1. **Turn On Muse Core: Turning on your Muse Core will automatically boot up your Muse Touchscreen interface.** Allow 30 seconds or so for the machine and touch screen to boot up.
2. **Locate the IP Address in the blue line under the Home icon.** Alternatively, you can find the IP Address of the machine by tapping Tools -> About. The address will be listed there. This IP Address is of the network you connected the machine to. Wireless and Wired connections will have different IP Addresses.

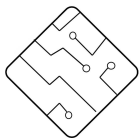


3. **Type IP Into Browser**(Google Chrome is preferred). This will link you to the RetinaEngrave v3.0 (RE3) interface. You now have full access to the software. There is no need to install or download anything. You must, however, keep a local connection, either through Wi-Fi or the Ethernet cable.

### Using QR Code:

Another method is to use the QR code which is visible in the Home and About sections.

1. Take a picture of the QR code with your camera or use a QR code reader.
2. A link will appear that can be selected.



Your machine comes installed with the latest version of RetinaEngrave v3.0. It will only be updated by support. You will know the machine is updating when the interior lights of the Muse Core turn off. **Do not turn off your machine until the update to complete and the machine lights will turn back on.**

The laser must be powered on when operating the software or when connecting the laser via the Ethernet cable. You will need uninterrupted Network access for this process.

# Section V. Internet Connection

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## Section Review:

### Do's:

- Make sure your machine is connected to the internet before you attempt your first project.
- Remember to let your machine fully boot up before attempting to enter RE3.

### Don'ts:

- Do Not take off the Wi-Fi dongle.
- Do Not connect the machine to your computer's ethernet port unless the other two options have already been attempted.
- Do Not attempt to enter RE3 if the machine is off. It will not load.

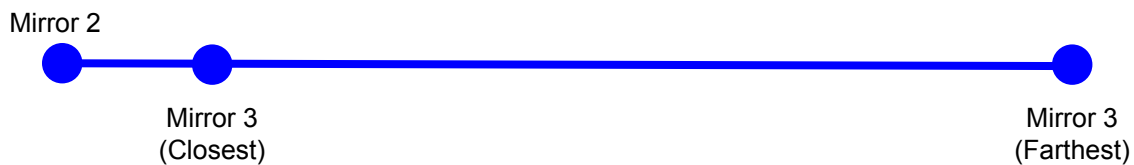
# Section VI. Laser Alignment

The laser tube that came pre-installed in your Muse Core was carefully aligned in our facilities in Nevada. However, it is possible that the mirrors may come out of alignment during shipping. Before running your first job, you will want to check and make sure the mirrors are properly aligned using the following procedure. If your mirror is out of alignment, or if you have installed a new laser tube, you must align the laser.

## Alignment Test:

Before you start your first job, it is important that your laser is tested in case it needs to be adjusted. Follow the following steps to test your laser:

For this alignment test, we will test-fire the laser both at the closest possible position and at the farthest possible position between Mirror 2 and Mirror 3.



### 1. Open the Safety Lid:

You will need to access the interior of the machine.

### 2. Place Thermal Paper:

Take a small piece of thermal paper or craft tape and place it on the air assist cone under Mirror #3. Make sure to place the thermal paper firmly on, creating a reference ring on the paper.

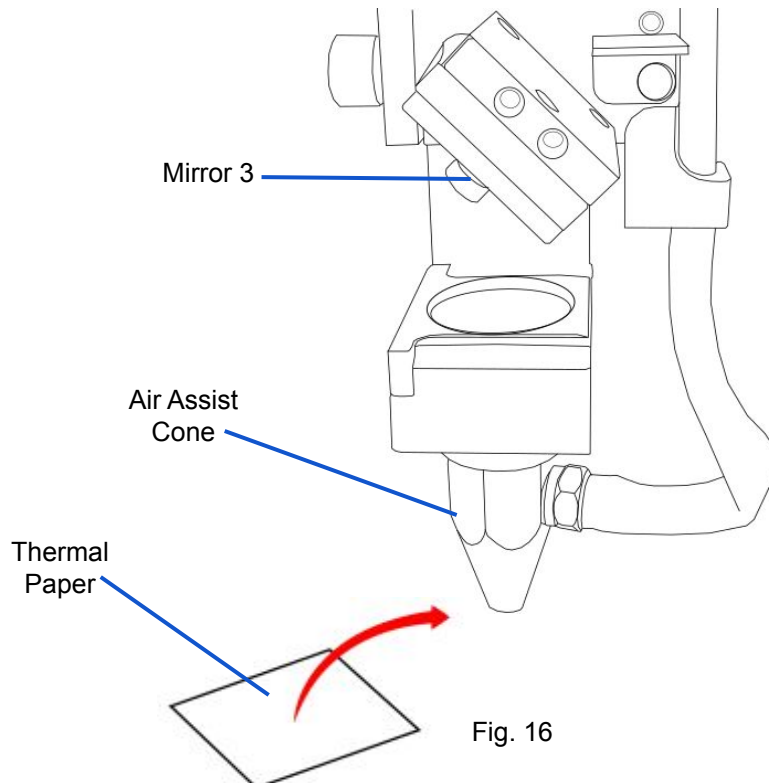


Fig. 16

# Section VI. Laser Alignment

## 3. Position Laser Head to 1st Position:

Move the laser head into the left most position.

## 4. Close The Safety Lid:

Safety measures are in place to ensure laser does no fire with the safety lid open. Regardless, never attempt to fire the laser with the safety lid open.

## 5. Fire the Laser:



Press the Test Fire Laser Icon on the touch screen until a burn mark becomes visible on the thermal paper.

## 6. Repeat Test Fire in Second Position:

Move the laser head to the rightmost position. Without removing the thermal tape, fire the laser again.

## 7. Check Results:

With the test fires complete, open the lid and remove the thermal tape. The burn marks should overlap each other. If they do not overlap perfectly, you will need to align the mirrors.

Please note that the burn mark will most likely resemble the shape of an oval.

## Mirror Alignment:

### DO NOT ATTEMPT IF INITIAL TEST WAS ACCEPTABLE!

The goal of the mirror alignment is to adjust the invisible Co2 laser beam properly so that in can engrave anywhere on the works space. Once the CO2 beam is consistent along the X- axis the visible red beam will serve as the primary indicator for mirror alignment.

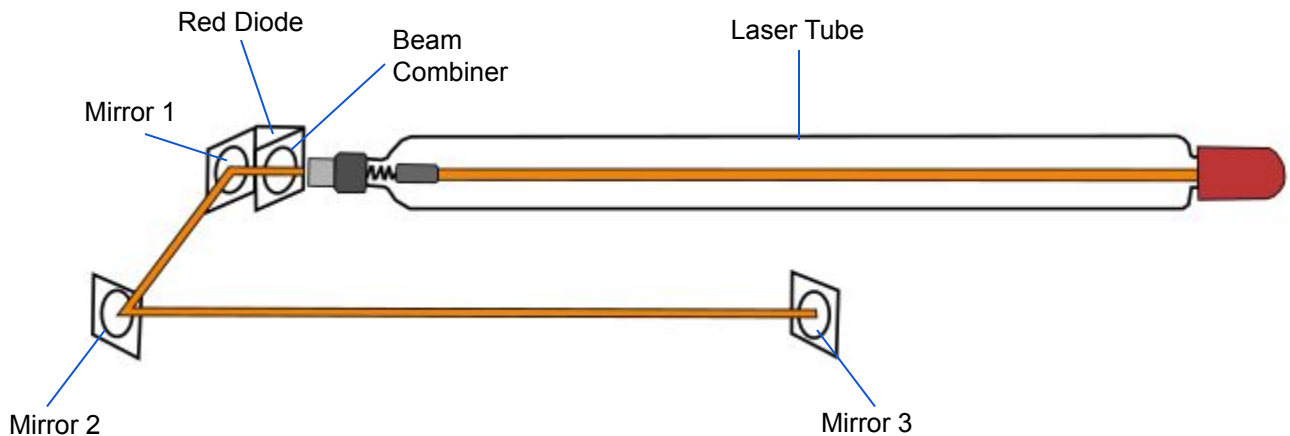


Fig. 17

# Section VI. Mirror Alignment

Preparation:

**Tools:**

- Thermal Paper (included with accessories)
- 2.5mm Hex Wrench (included with accessories)

Make sure to prepare your tools and workspace.

- 1. Turn on Titan:**  
Allow the machine time to fully boot up.
- 2. Unlock Driver Motor:**  
On the touch screen, press the “Locked” icon. It will enter the “Unlocked” position signifying the gantry motor is disabled.
- 3. Gather Tools:**  
A 2.5mm hex key and thermal paper are required to perform the mirror alignment procedure.
- 4. Remove the Left Side Panel.**

**Orientation Guidelines:**

Each Mirror and the Red Diode come with three adjustment screws. When working to align the mirrors, use the hex key provided to make incremental adjustments to move the mirror into position. You would want the mark to be centered on the mirror itself. Align the Red Diode to your burn mark on Mirror 1 and then wait to align the Red Diode again on Mirror 3.

The diagram below shows the movement caused by each adjustment screw.

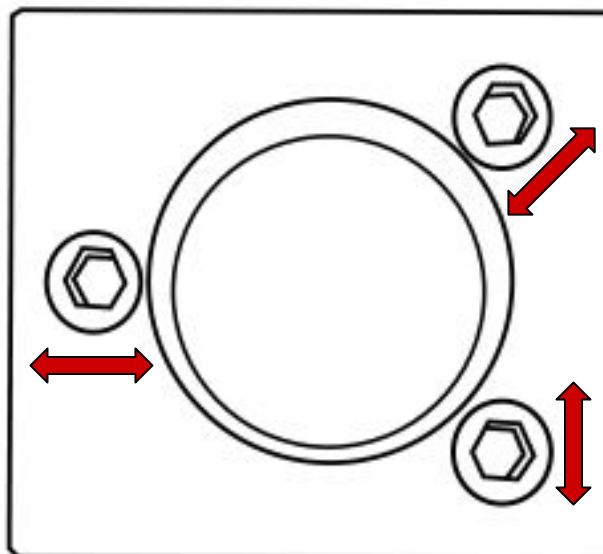


Fig. 18

# Section VI. Mirror Alignment

## Laser Output to Mirror 1:

Align the laser output to Mirror #1 making sure that the beam hits close to the center of the mirror.

- 1. Open the Safety Lid.**
- 2. Place Thermal Paper On Mirror 1.**  
Make sure to place it firmly over **Mirror #1** to create a reference ring.
- 3. Close Safety Lid:**  
Machine should be unable to fire the laser with the safety lid open.
- 4. Fire the Laser:**  
Press the Test Fire icon on the touch screen. Open the lid and check the thermal paper for a burn mark.
- 5. Adjust The Mirror 1 Assembly:**  
Loosen the top two screws and adjust the assembly so that the burn mark will be at the center.  
Test again and adjust as needed.

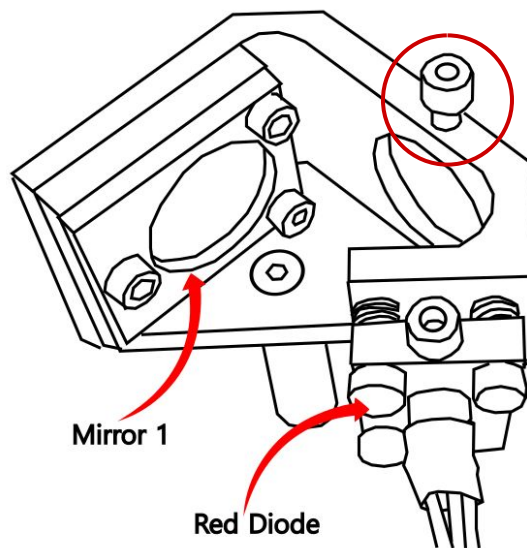


Fig. 19

- 6. Adjust Red Diode:**  
Use your hex wrench, make incremental adjustments to the adjustment screws of the red beam diode, and position the red dot exactly over the center of the burn mark.



**Please Note: If You Are Having A Hard Time Reaching The Mirrors Then The Left Side Panel May Be Removed. However It Must Be Replaced Before Firing The Laser.**

# Section VI. Mirror Alignment

## Mirror 1 to Mirror 2:

Mirror 1 is stationary but Mirrors 2 and 3 are located on the Y and X gantry respectively. Therefore both of those Mirrors need to be aligned in the nearest and farther position from the previous Mirror for proper alignment.

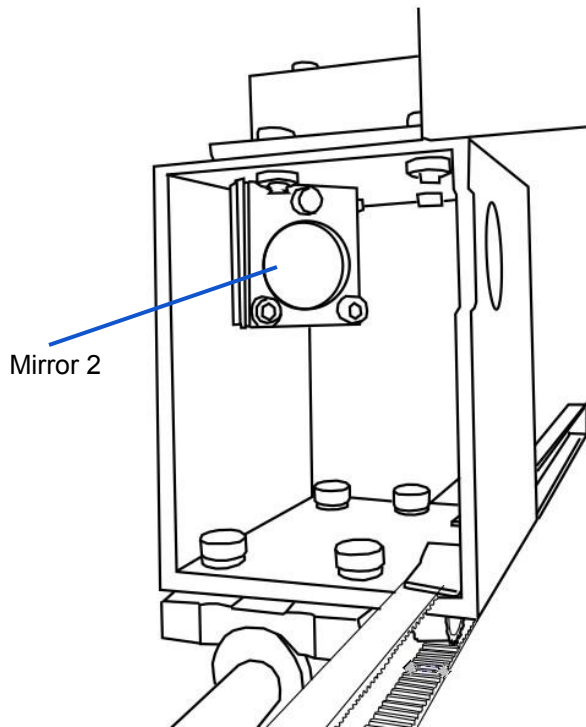
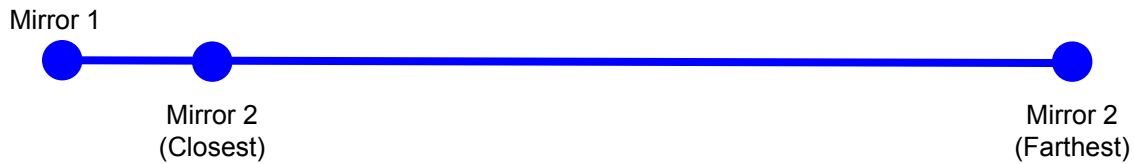


Fig. 20

Mirror 2 is located at the left corner of the gantry (see picture above).

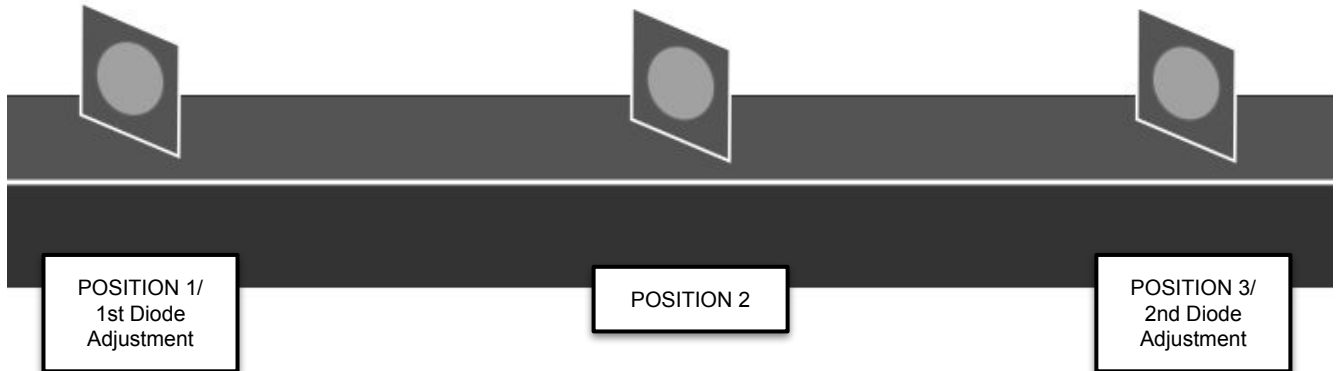
- 1. Open the Safety Lid.**
- 2. Place Thermal Paper:**  
Take a piece of thermal paper and place it firmly over **Mirror #2** to create a reference ring.
- 3. Close Safety Lid.**
- 4. Test Fire the Laser:**  
Press the Test Fire icon to create a burn mark on the thermal paper.
- 5. Adjust Mirror #1:**  
Make incremental adjustments to the adjustment screws of **Mirror #1**.



# Section VI. Mirror Alignment

## Mirror 2 to Mirror 3:

Mirror 3 is located on the laser head assembly, we will have to check the alignment along the X-gantry. We recommend selecting three positions to test the alignment and using two of those positions to adjust the red diode.

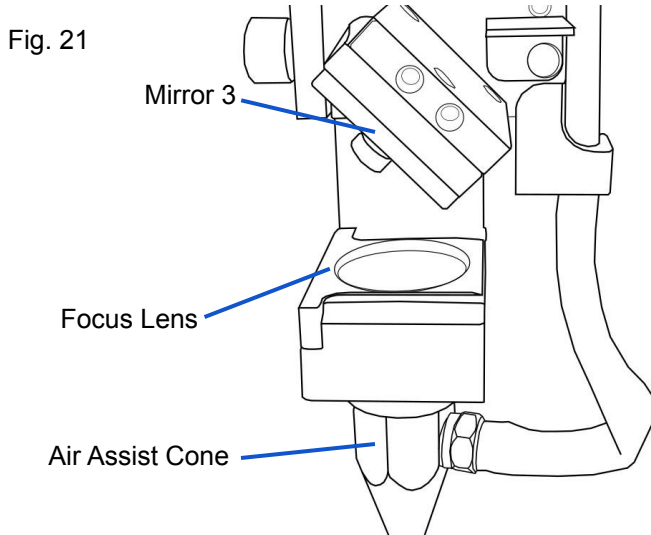


- 1. Open the Safety Lid.**
- 2. Place Thermal Paper.**  
Take a piece of thermal paper and place it firmly over **Mirror #2** to create a reference ring.
- 3. Move the Laser Head Assembly to Position 1.**
- 4. Close Safety Lid.**
- 5. Fire the Laser.**  
Press the Test Fire icon to create a burn mark on the thermal paper.
- 6. Check Results.**  
Adjust the Mirror if needed. Replace Thermal Paper as needed.
- 7. Adjust Red Diode.**  
Make sure the diode is at the center of the burn mark.
- 8. Move the Laser Head Assembly to Position 2.**
- 9. Close Safety Lid.**
- 10. Fire the Laser.**  
Press the Test Fire icon to create a burn mark on the thermal paper.
- 11. Check Results.**  
Adjust the Mirror if needed. Replace Thermal Paper as needed.
- 12. Repeat For Positions 3 to 5.**

# Section VI. Mirror Alignment

## Mirror 3 to Focus Lens:

The focus lens converges the laser beam to a single point. The focus lens does not require manual focusing, however it is important to ensure that the path from mirror #3 to the focal lens is straight throughout the Z-axis.

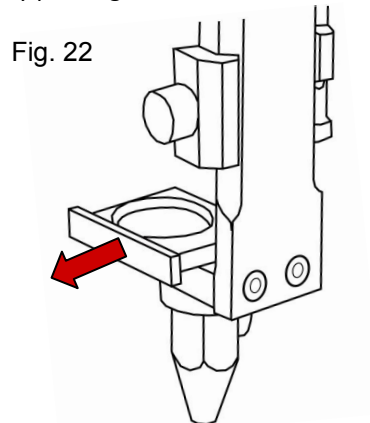


**Please Note:** The Focus Lens is taken off for this part as the coating can be damaged by the thermal paper.

**1. Open the Safety Lid.**

**2. Remove Focus Lens.**

The Focus Lens is removed by gently pushing the back of the lens until a clicking sound is heard. Then remove the Lens from the front.



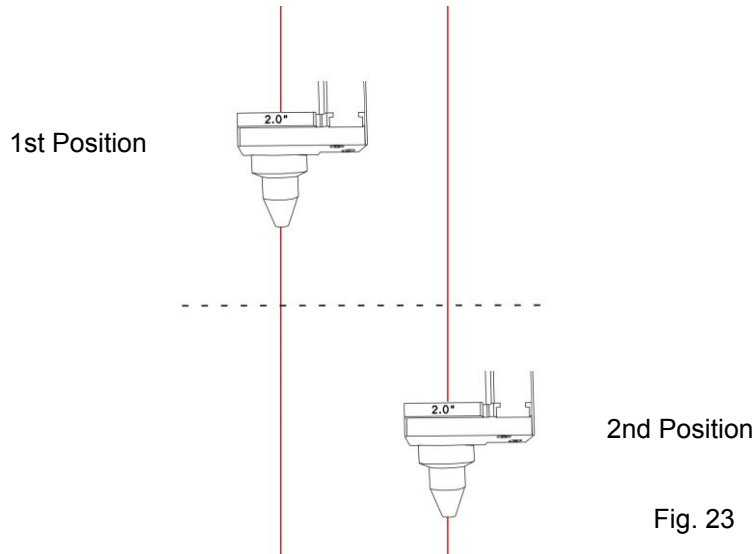
**3. Place Thermal Paper.**

Take a piece of thermal paper and place it firmly over the **Focus Len Mount** to create a reference ring.

**4. Close Safety Lid.**

# Section VI. Mirror Alignment

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5. **Position Laser Head to 1st Position.**

Manually adjust the laser head assembly so that the z- belt is as high as it goes.

6. **Close Safety Lid.**

7. **Fire the Laser.**

Press the Fire Laser icon to see a burn mark on the thermal paper.

8. **Adjust Mirror #3:** Make incremental adjustments to the adjustment screws of **Mirror #3** to move the burn mark over the center of the **Focus Len Mount**.

9. **Open the Safety Lid.**

10. **Position Laser Head to 2nd Position.** Manually adjust the laser head assembly so that the z- belt is as low as it goes.

11. **Close Safety Lid.**

12. **Fire the Laser.** Press the Fire Laser icon to see a burn mark on the thermal paper.

13. **Adjust Mirror #3:** Make incremental adjustments to the adjustment screws of **Mirror #3** to move the burn mark over the center of the **Focus Len Mount**.

If done correctly Mirror 3 will direct the beam directly through the Focus Lens as seen on Fig. 23.

For a video on Alignment, please visit our [Youtube](#) Channel.

For information on our lenses, please visit our [Blog](#).

# Section VI. Laser Alignment

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## Section Review:

### Do's:

- Before attempting to run a project you should perform the Alignment Test.
- Remember to adjust the Red Diode after Adjusting Mirror 1 and during the alignment of Mirror 3.
- Remember to unlock the gantry before starting the Alignment Test and the Mirror Alignment.
- Remember to remove the Focus Lens for the final adjustment to prevent possible damage.

### Don'ts:

- Do Not perform the Mirror Alignment if the Alignment Test was fine.
- Do Not move the Mirror 1 Assembly after the initial adjustment.
- Do Not lock the Gantry to Move The Z-Axis. Move it manually.
- If the side panel is open for Alignment do not fire the laser until the panel is closed.

# Section VII. Focusing Your Laser

## Focus Procedure

The Muse Core must be focused manually for each new material. The Muse Core comes with a 20mm focusing billet.

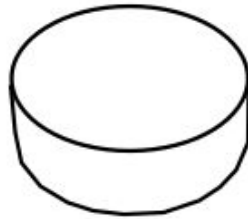
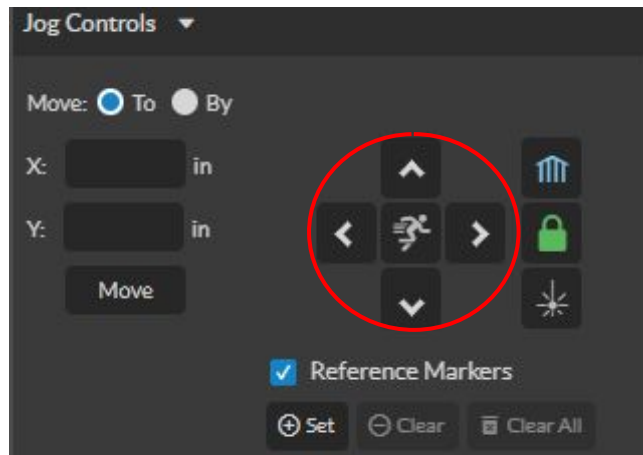


Fig. 24

1. Use the job controls on RE3 or from your touchscreen to move the laser over your material.



2. Place the billet on top of the material and use the knob to lower the laser head until it is on top of the puck.

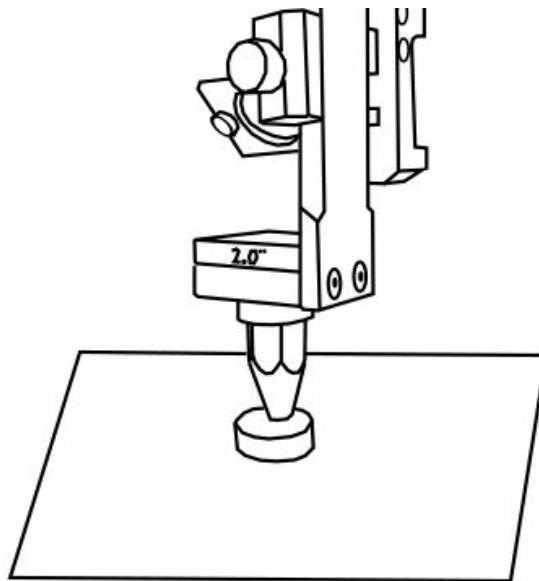


Fig. 25

# Section VII. Focusing Your Laser

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3. Adjust the knob to secure the laser head in place.

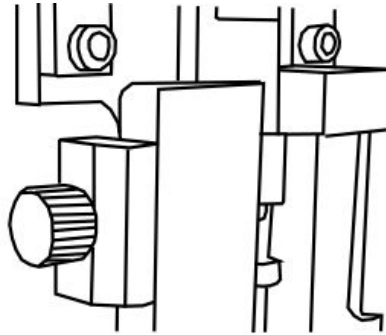


Fig. 26

4. Remove the billet. Your laser is now ready to start engraving.

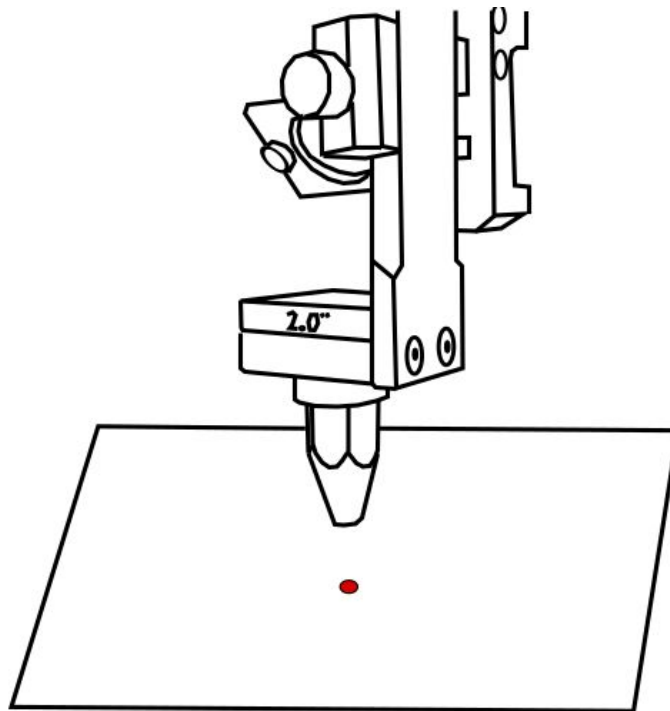


Fig. 27

# Section VII. Focusing Your Laser

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## Section Review:

### Do's:

- Focusing can be done manually using the focusing billet or something of equal height.
- If you place a new material into the workspace remember to refocus your laser head.

### Don'ts:

- Do Not attempt to connect to the Setup Page if the machine is off.

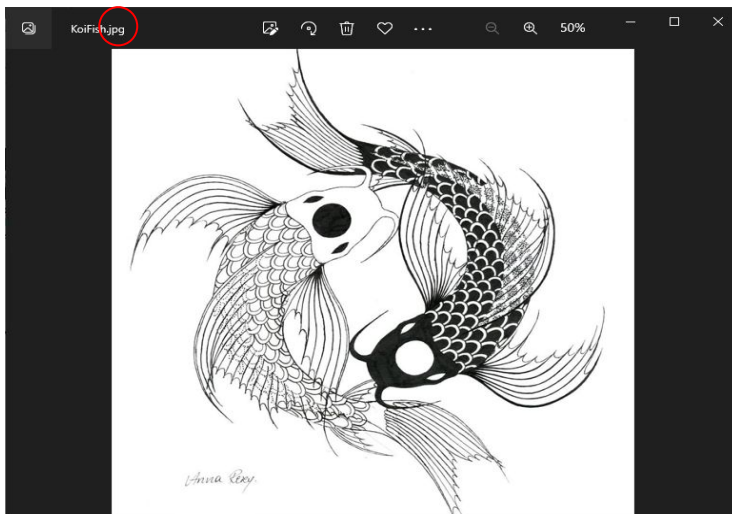


# Section. VIII Operations

This section will guide you through using your Muse Core. To get started, it is important to understand the meanings of “Vector Cutting” and “Raster Engraving” and their associated file types.

Vector Cutting	Raster Engraving
Vectors use mathematical formulas to create paths that form a shape.	Rasters are made of white and colored pixels. The colored pixels are what is engraved.
Uses for creating signs & logos	Used for creating surface marking & engravings
Vectors are found in PDF, SVG, DXF, and AI files.	Rasters are found in JPEG, PNG, BMP, and TIF files
PDF is preferred.	JPEG is preferred.

RE3 is compatible with: AI, BMP, PNG, PDF, JPG, TIF, DXF, SVG, and RE3 files. When importing images the resolution for the preview image will be at 100 dpi but the resolution of the actual image will be 500 dpi.



The file type of an image can be viewed by opening it or by looking at the properties/details section.

## Creating a Design

You may decide that instead of just importing a picture you want to make one. When creating a design in design software, we recommend using a software you are familiar with. RE3 can work with a variety of file types but we recommend saving your files as a pdf, svg, or jpeg. PDF and SVG files contain both raster and vector data, making them the most suitable for both engraving and cutting. Jpeg is the most suitable for rastering.

Beside the file types there are two things to keep in mind when designing:

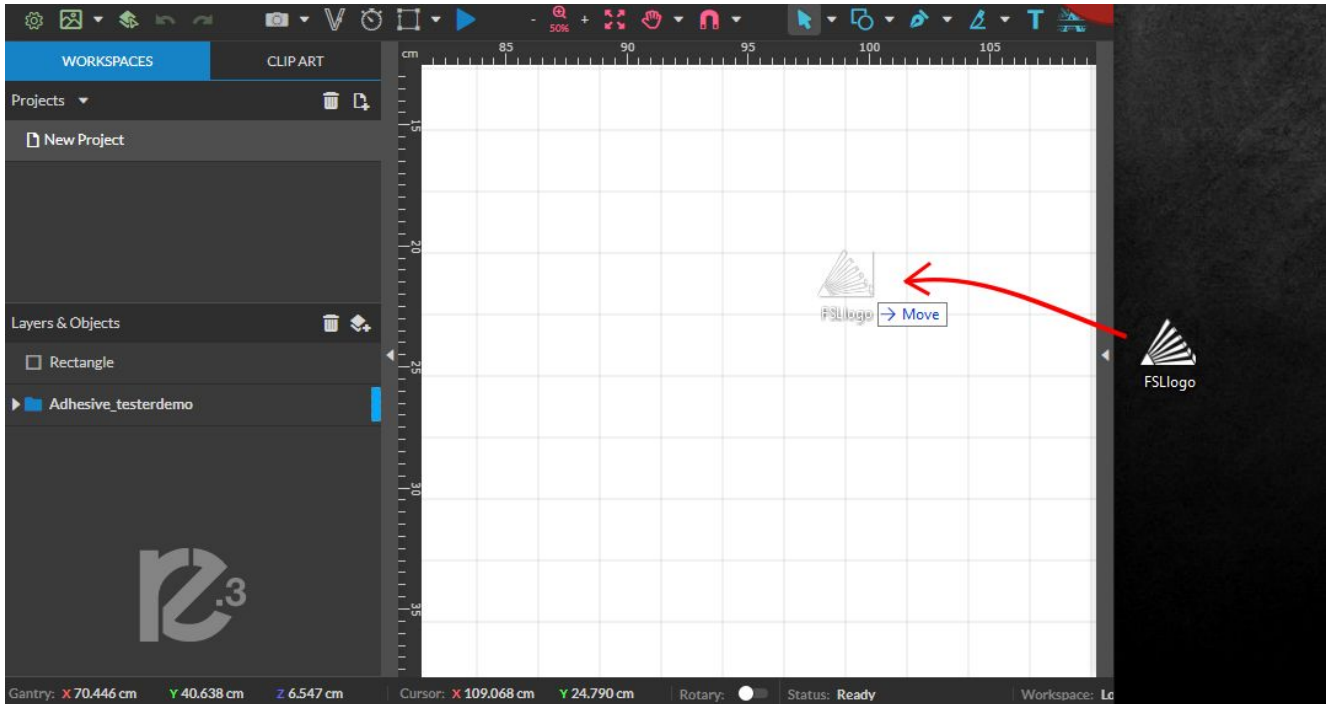
1. **Line thickness-** When designing an image for RE3 the lines in the drawing should be a decent thickness. If the lines are too thin, then RE3 will have trouble reading them.
2. **Coloring-** When importing an image it is important to keep in mind the laser's function in two ways: on and off. The laser will fire when it reads a shaded image and stop when it doesn't. For that reason, when an image is imported it is converted into a grayscale image. This also means that any colors chosen will vanish. To compensate, you can make the image monochrome or cut out their designs on aspect at a time to get the whole object.
3. **File Size-** Files larger than 10MB may slow down the machine. Vector files are typically harder to run than rasters.

# Section. VIII Operations

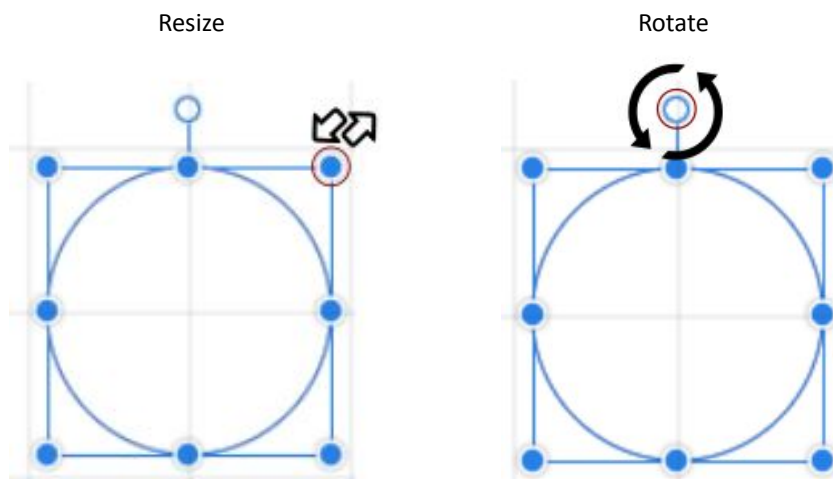
## Mouse Controls:

1. **Drag 'n Drop:** Click and hold a design file, it will become highlighted letting you know it can then be dragged. Drag it into the workspace and a move prompt will appear below the object showing it can be dropped into the workspace. Release the file and it will be imported into RE3. Once uploaded, click and hold the left mouse button and drag the mouse to move the object in the workspace.

## Importing Images:



2. **Resize / Rotate:** Clicking on the object with your mouse will highlight the border in blue. The adjusters for size and orientation will become visible. We can use the mouse to manipulate the object's size by expanding or constricting the square adjusters on each edge (see Resize) or rotate the object using the rotation node usually located above the object (see Rotate).



# Section. VIII Operations

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## Section Review:

### Do's:

- PDF is preferred for Vectors, while JPEG is preferred for Rasters.
- Remember when preparing your own design to use thicker lines.
- Remember that previews are seen in 200 DPI but are imported as 500 DPI.
- Remember that importing files larger than 10MB can slow down your machine.

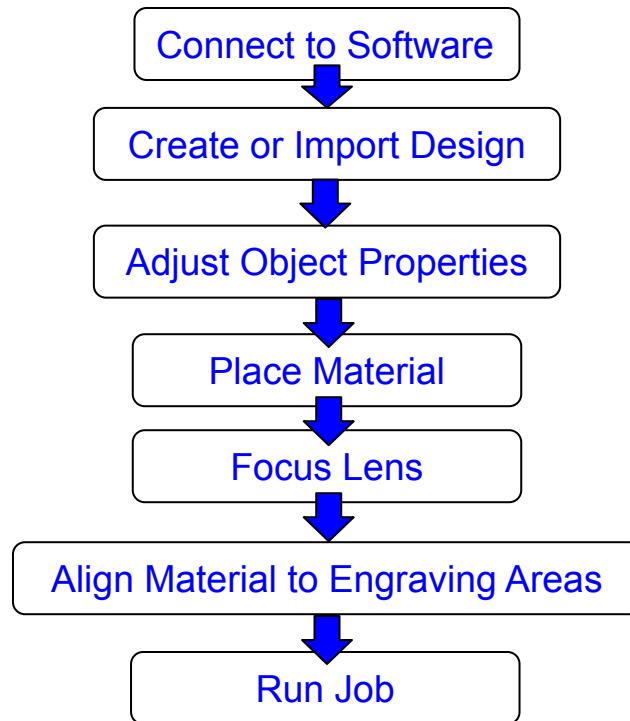
### Don'ts:

- Do Not use thin lines when making a design as It could get cut.

# Section. IX Retina Engrave V3

## Starting on RE3

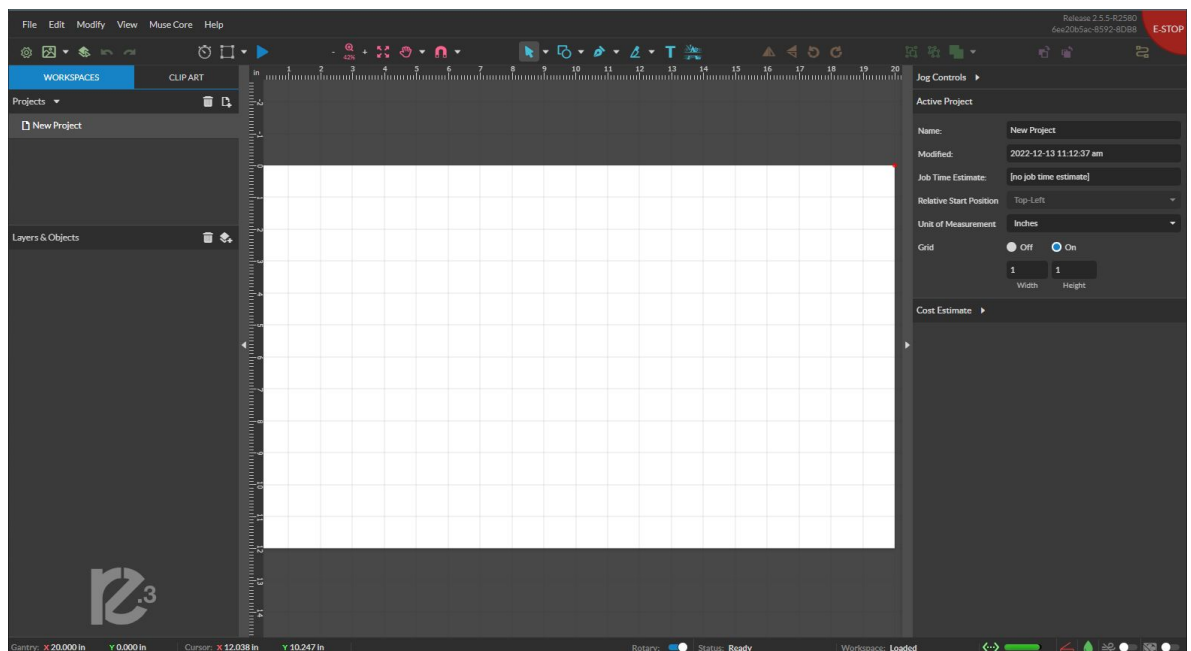
Using your new machine for the first time can seem intimidating but we've worked to make this guide as clear as possible regarding our software. We have broken down the entire process into 7 steps.



Before starting your project, make sure that the all your accessories are properly connected and functional.

### 1. Entering RE3.

Enter RE3 if you have not already done so. Below is a picture of how RE3 should look one loaded.



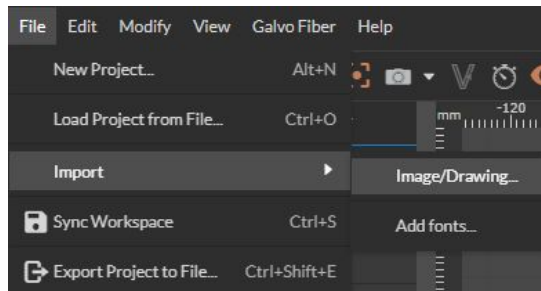
# Section. IX Retina Engrave V3

## 2. Import Design

Select the file you wish to engrave via your editing software or an image saved on your computer.

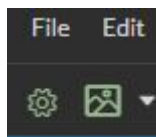
It can be placed into RE3 using three methods:

-It can be imported by going to the File->Import->Image



-It can be “dragged” into your RE3 workspace using your mouse(Drag ‘n Drop).

-It can be placed using the photo icon.



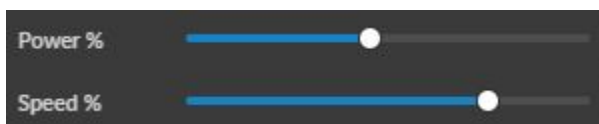
The Arrow next to the photo icon is for selecting the properties you wish to import. If you wish to be asked when importing the image, then do not save any setting.

## 3. Adjust Object Properties

Modify the image in RE3 using the right toolbar. The main things you’ll be adjusting are the size, power, and speed.



The size can be adjusted individually by using the Width/Height bars or together by selecting the white oval. When the white oval is on (see left), then the width and height will change proportional to each other.



The Power and Speed will depend on the wattage chosen. The settings are set in terms of percentage with 100% being full power. If you purchased a laser of 50W or higher we recommend performing your first engraving at 50% or lower and then adjusting based on results.

## 4. Place Material

Prepare the material you wish to engrave. If the material you are working with is new to you or untested, make sure you have enough material to test with to ensure your settings are correct before marking the final part/design.

# Section. IX Retina Engrave V3

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## 5. Focus Lens

Your Core will need to be manually focused before each project.

## 6. Align your design with your material.

This can be done by using the perimeter icon to preview the area where the laser will engrave.

***\*You can the camera capture option that can help for better alignment of your design. You should still make sure to check the engraving perimeter before running your project.\****

Once adjusted to ensure your design is engraved in the desired area, you should make sure the material does not move from the workspace. This can be done by weighing down the material using an object that will not interfere with the engraving, such as jig, fixture, putty, or tape.

7. Once the picture is aligned, close the Lid.

## 8. Run job.

You can start the job by selecting the play button.



While the job is running you should not look directly at the engraving process unless you have on safety glasses. Instead, the project can be viewed from the Video Feed or Touchscreen.

Once the marking is complete, do not move the part until you are sure that it has the desired look, as re-aligning becomes significantly difficult.

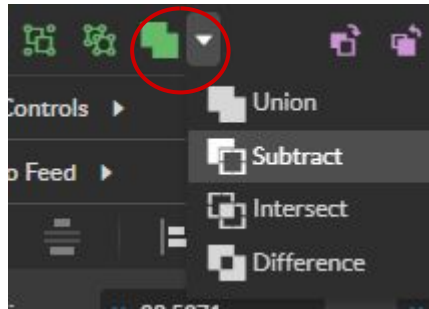
Once completed, wipe your part clean of any dust or residue resulting from the engraving process

Congratulations!! You have made your first engraving on RE3. It's an exciting process to engrave material to your liking. Sometimes a little trial and error is needed to see what designs go well in what ways. The following pages will provide more information on how to use RE3 for more detailed and precise engravings.

# Section. IX Retina Engrave V3

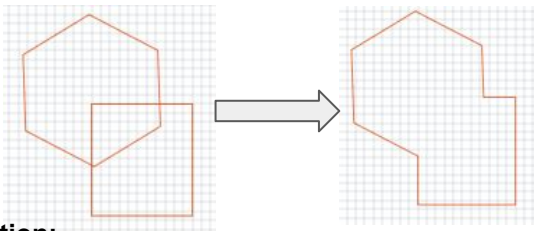
Here is some other information that will be useful when performing your first jobs on RE3.

## Creating and Manipulating Compound Shapes & Objects

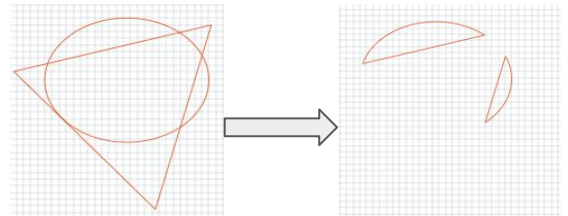


These functions are available in the Grouping section of the toolbar (see above). Compound Shapes & Objects Operators can combine and modify shapes and objects to create unique compound shapes and objects with these functions:

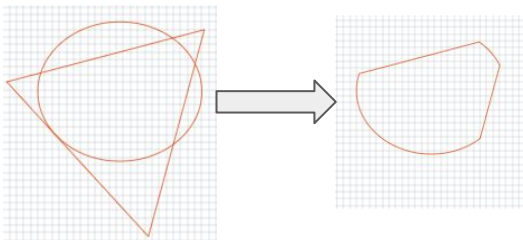
### Union:



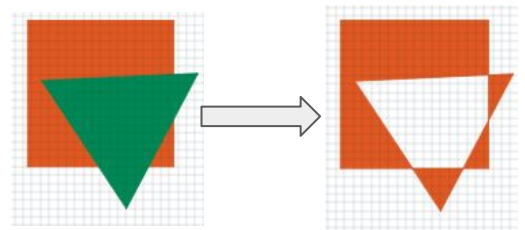
### Subtract:



### Intersection:



### Difference:



**Split Selection (Shift+Ctrl+G):** Split up a previously created compound shape(s) or object(s) that has been combined with other shapes. Select the compound shape and choose Split Selection. The different objects are split back up into individual layers that can be moved independently.

### Infill:

Before:

INFILL IS USED  
TO ADD SHADING  
TO YOUR VECTORS

After:

INFILL IS USED  
TO ADD SHADING  
TO YOUR VECTORS

Infill are mainly used when one wants to engrave words or shapes into an object. Once the infill is placed it can be rasterized for engraving. If the shape is something you want to cut out, then the infill is not needed.



# Section. IX Retina Engrave V3

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## Passes:

Passes are typically used for different things in rastered material than in vectored.

### Vector Passes

In vectors, multiple passes are done to cut through thicker material. Sometimes, such as when cutting wood, a single cut is not enough therefore we can program multiple passes to ensure we cut through our material.

**Note: Certain material will need more passes than others and may result in some charring around the edges.**

### Raster Passes

In rastered images passes are done to add more depth into a picture. Multiple passes are mainly done to add more details to you design.

Below will be an image done on a Fiber Galvo to show to difference multiple passes will have on an image.



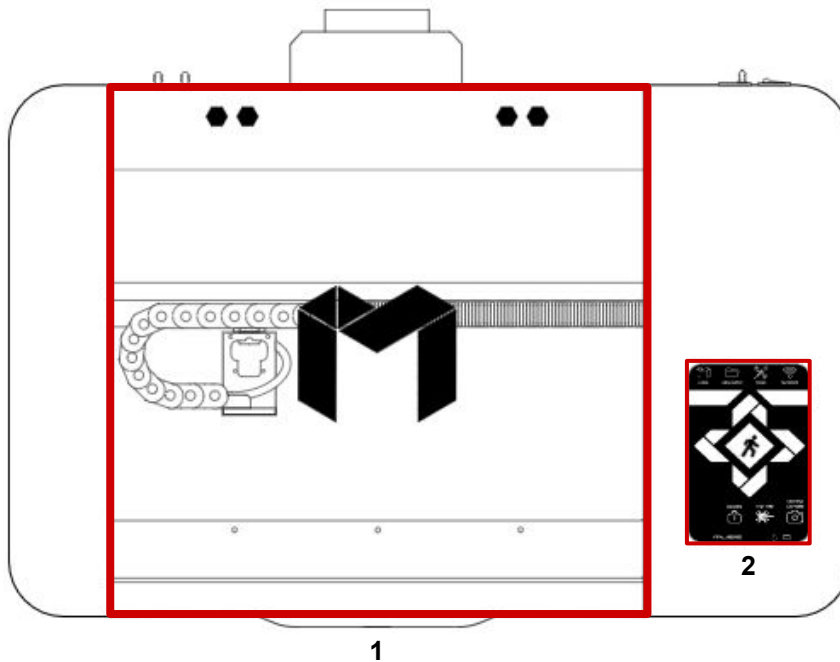
The Final Pass (pass 4) is far more detailed than the first pass. The final product looks much closer to the original than the other one. However, one should keep in mind that the more passes you add, then the longer it will take the job to be completed. This job has 4 passes programmed, therefore the time was 4 time longer than doing 1 pass .

**Note: Different materials may not need to perform multiple passes. It depends on user preference if an image should be engraved multiple times or not.**

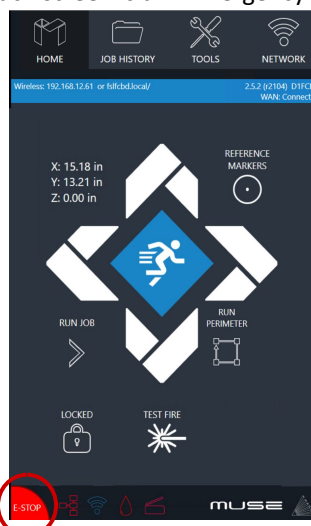
For a more detailed and in-depth look into RE3, please use the RE3 Guide, which can be found at <https://fslaser.com/resources/> .

# Section. IX Retina Engrave V3-Stopping Laser

Once a project has begun, the laser will continue until the project is complete. If for any reason an operator needs to stop the laser immediately, choose one of these options:

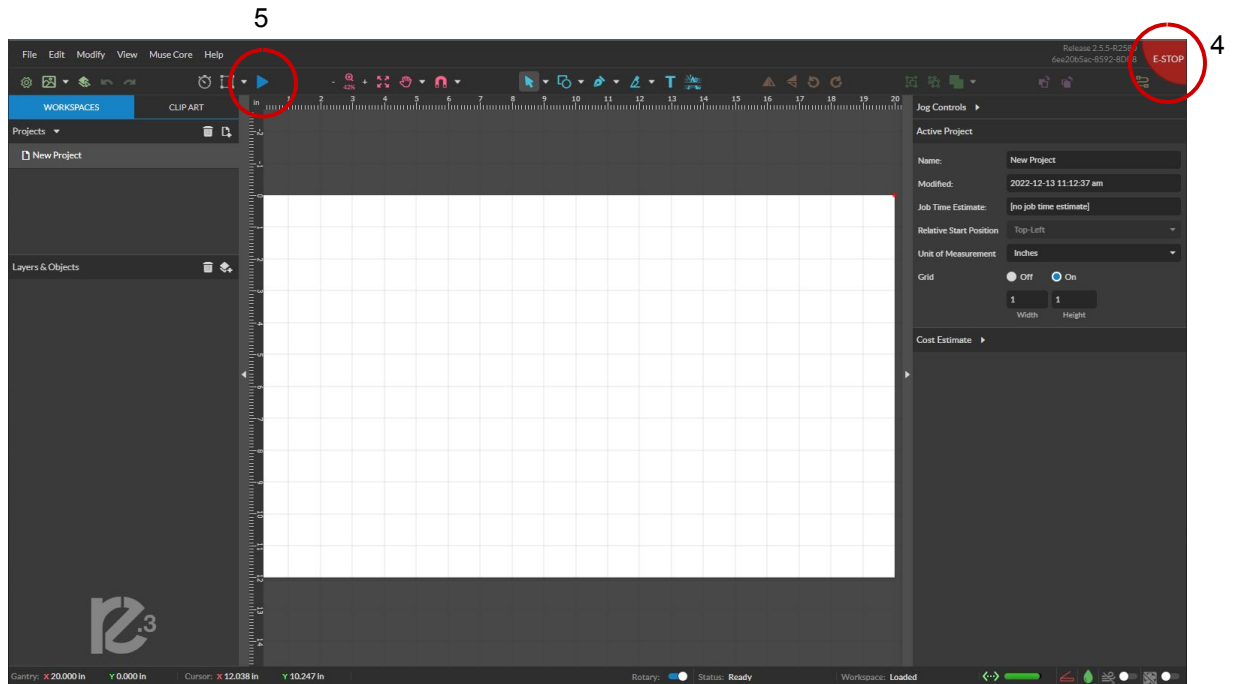


- 1. Open the Lid:** The large workbed access lid is installed with a device that automatically (and instantly) cuts off the laser if it is opened even slightly. This should be your first method of stopping the laser during an emergency. This is a safety feature of Muse Core and under no circumstances should this safe lid auto-shutoff device be tampered with or removed. Doing so will void your machine's warranty. If the machine ever fails to shut off the laser when the safety lid is open, immediately unplug the machine and contact Technical Support.
- 2. Touch Screen Pause Button:** On the top of the Touchscreen there are two buttons that appear when the job is in progress. These buttons can pause and stop the laser. Once a job is stopped, starting again will start the project from the beginning.
- 3. E-Stop:** In the lower left corner for the touch screen is an "Emergency" stop button (E-Stop). Pushing this button will instantly cut power to the laser.

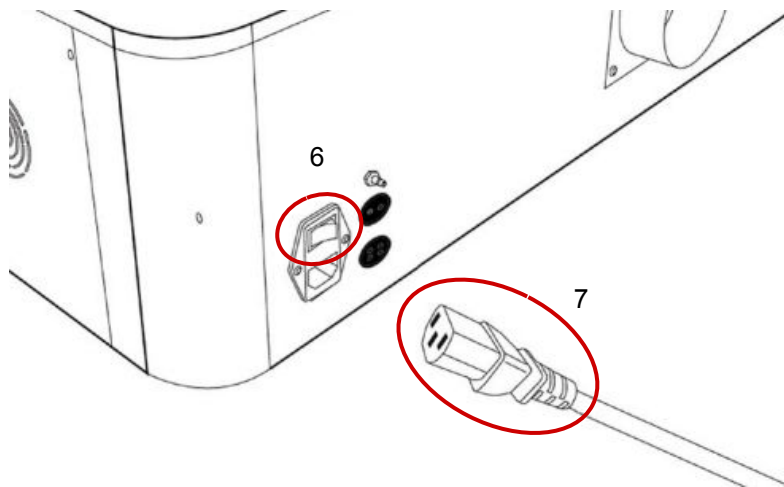


**Note: The E-Stop is still part of the touch screen and therefore fragile. Do not slam this button!**

# Section. IX Retina Engrave V3-Stopping Laser



4. **Software E-stop:** Located on the top right corner of the webpage.
5. **Software Pause Button:** If near your computer, the Pause Button (found were the Play button was) can halt the laser. This may take a second to process, so it is not recommended as a method of stopping the laser in an emergency.



6. **Power Switch:** Flipping the power switch to the off position instantly cuts power from the entire machine.
7. **Unplug Power:** As a last resort users can unplug the power cord of the Core from the electrical outlet. This method may cause damage to your cables.

# Section IX. Retina Engrave V3

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## Section Review:

### Do's:

- Remember there are three methods to importing a file. If one does not seem to be working for you, then try the others.
- Remember to use the Perimeter option to align your design with your materials.
- Remember that compound objects are made using the Grouping section.
- Remember to adjust your object properties before running your project.
- Remember that infills are used to fill in vector objects for engraving.
- The laser can be stopped or pause using various methods, find the one that works best for you.

### Don'ts:

- Do Not select any options on the photo icon if you want to be asked each time.
- Do Not run a project if your material is not secure. Brace it in some way before continuing.
- Do Not run multiple vector passes on something you don't want to cut.
- Do Not unplug the machine unless all other stopping methods fail.

# Section X. Maintenance

## Replacing the Laser Tube

This section provides procedures and a walkthrough to replace the laser tube on your Muse Core. Although it should last for hundreds of hours, the laser tube is considered a consumable and will eventually need to be replaced. Please carefully read all instructions before beginning the replacement procedure as there are several critical steps which must be properly followed to avoid breaking the laser tube. The included pictures show how to properly connect wires to the tube's electrodes and secure the connections.

### Required Parts and Tools

- 40W or 45W Replacement Tube
- 2.5 mm Hex Wrench/Key

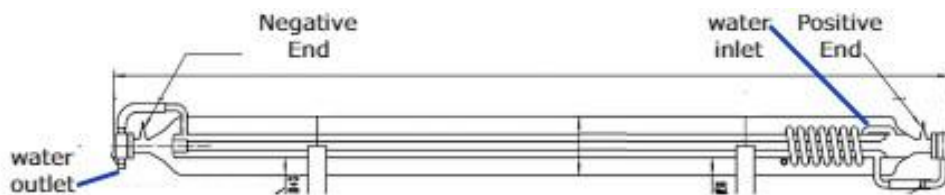


Fig. 28

### Installation Procedure:

1. **Power Off Machine:** Power off and unplug your unit. Wait at least 1 hour for capacitors to discharge.
2. **Remove Screws:** Using the 2.5mm hex wrench remove the three M4 bolts at the top of the cover.

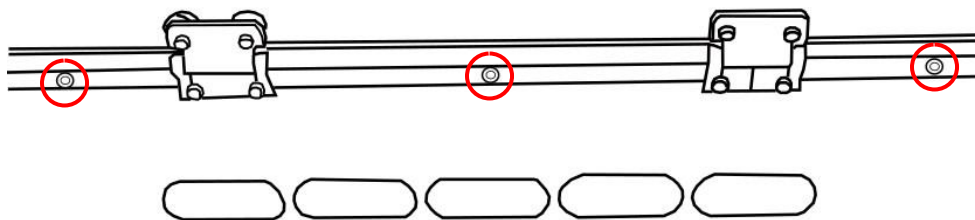


Fig. 29

3. **Remove the Laser Shroud:** Carefully remove the shroud to access the laser tube.

# Section X. Maintenance

4. **Remove the Return/Grounding Wire:** Remove the grounding wire using the clip attached.

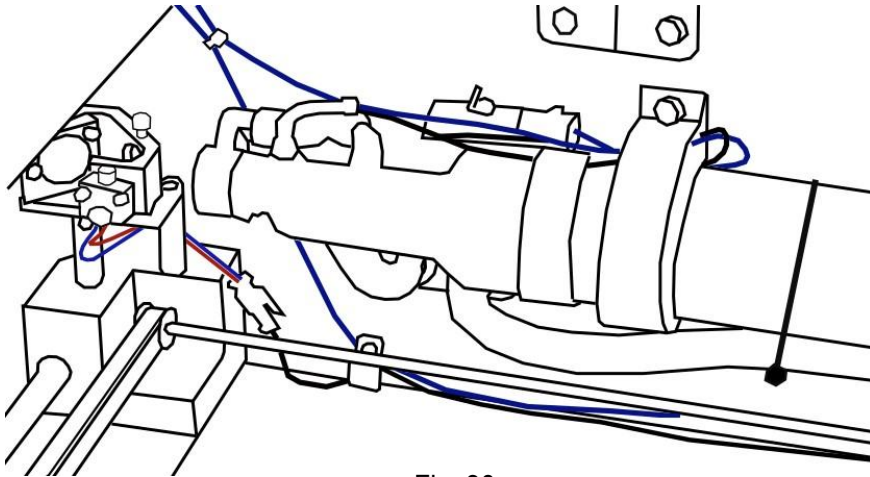


Fig. 30

**Note:** The clips in the grounding wire may appear differently than the picture but functions the same.

5. **Disconnect High Voltage wire:** The voltage wire is found on the right side of the laser tube. Unplug the wire.

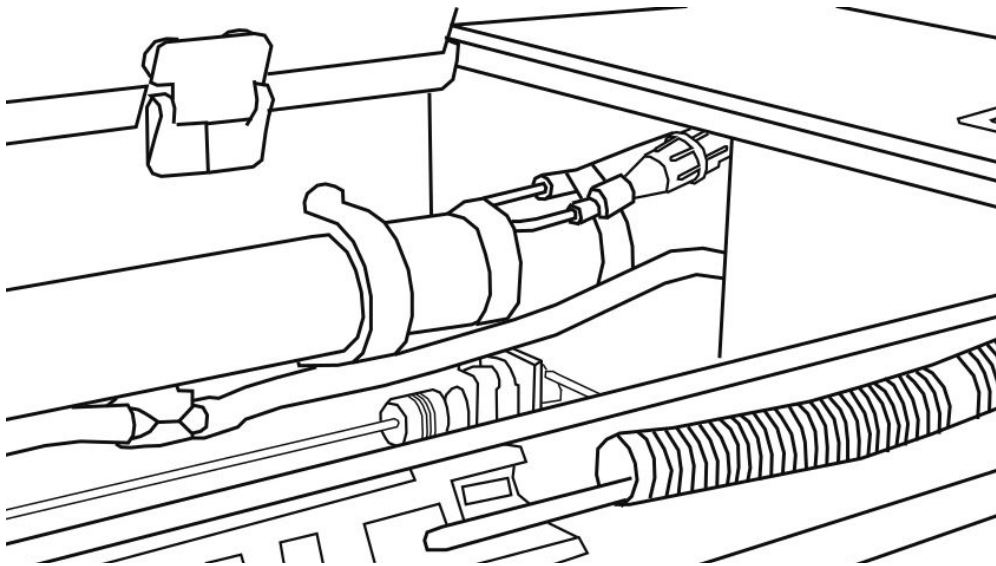


Fig. 31

**Please Note:** You can label the wire with tape or take a picture of the wires to make sure the wires are plugged correctly.

# Section X. Maintenance

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6. **Disconnect Water:** Detach the water tubes from their connectors on the laser tube from both ends and drain the water into a bucket.

**WARNING! INLET AND OUTLET ARE FRAGILE! DO NOT PULL EXCESSIVELY!**

**WARNING! WATER CAN SPILL! HAVE A CLEANING RAG NEARBY IF NEEDED!**

7. **Removing Laser Tube:** Take the provided hex key and remove the screws atop each bracket to release the tube.
8. **Tube Disposal:** There are no special disposal instructions for the laser tube as the CO<sub>2</sub> contained inside is not at levels harmful to humans. Carefully break the tube to release the gas before disposing of glass as normal.

## Installing New Tube:

1. **Mounting Laser Tube:** Have someone ready to hold the tube in place if needed. Take the provided hex key and secure the screws atop each bracket to hold the tube.
2. **Connect Water:** Detach the water tubes from their connectors on the laser tube from both ends and drain the water into a bucket.

**WARNING! INLET AND OUTLET ARE FRAGILE! DO NOT PULL EXCESSIVELY!**

3. **Connect High Voltage wire.**
4. **Connect the Grounding wire.**
5. **Replace the Laser Shroud:** Carefully replace the shroud to access the laser tube.
6. **Secure the Shroud:** Using the 2.5mm hex wrench replace the three M4 bolts at the top of the cover.

## Installation Notes:

- Make sure all the wires are secure.
- The red cap should be fully secured.
- Ensure there is silicone tape on the high voltage end of the tube.
- Be careful when lifting the tube from the enclosure, make sure to angle it and guide it out first from the left side to ensure the right side where the coils are doesn't hit the interior of the chassis.
- When remounting tube onto shelf, make sure the wires are not getting pinched, as this may damage them and make installation difficult.

# Section X. Maintenance

## Belt Replacement:

The belts on your laser system are a consumable item and will eventually stretch beyond a usable length or break. You can contact Full Spectrum Laser support for replacements.

### Required Parts and Tools

- 2.5mm Hex key (included with accessories)

### Belt Replacement Instructions:

- 1. Power Off and Unplug Machine:** Wait at least 1 hour for capacitors to discharge.
- 2. Locate the Belt Screws:** The belt screws are located under the gantry (see below). Move the gantry as needed to access the screws.

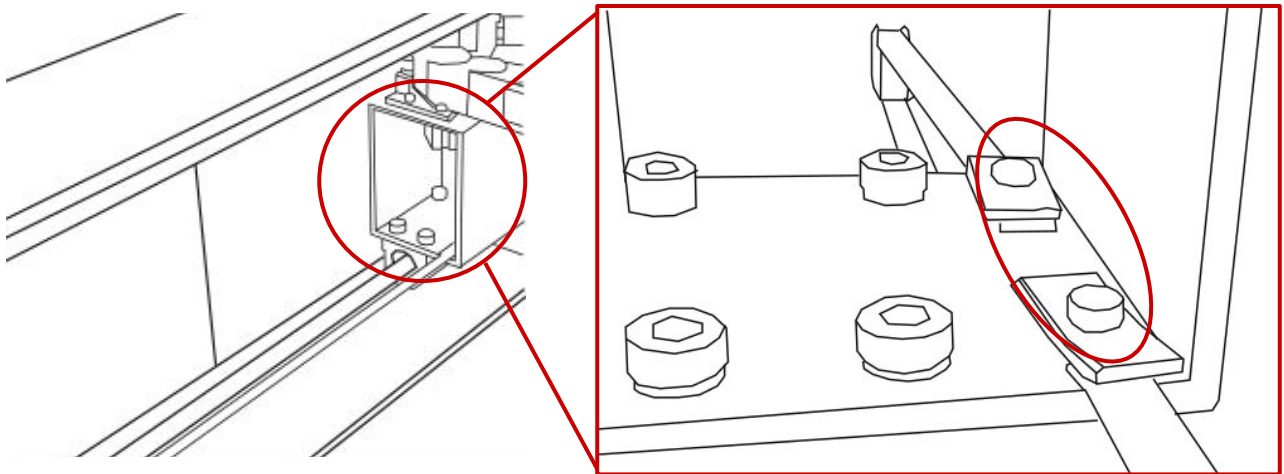


Fig. 32

- 3. Loosen Retaining Screws:** Loosen or remove the M4 retaining screws and washers so that the old belt can be removed and discarded.
- 4. Remove the Belt:** Remove one end first and then the other,
- 5. Mounting 1st End of The Belt:** Run one end of the new belt through the mounting slot. Make sure that the folded part of the belt is facing up, as shown above.
- 6. Tighten Retaining Screws:** Tighten the M4 screws to secure and retain the belt. By using your fingers the threading process can be speed up.
- 7. Run Belt on Pulley:** Once the first end of the belt is secure run the belt along the pulley so that it rest flat. Make sure that the second one of the pulley has the same end facing up.
- 8. Mounting the Other End of The Belt:** Once the belt is around the pulley system. The second end will be mounted into the mounting slot.
- 9. Tension Belt:** Move the gantry up and down to check the tension on the belt. Adjust as needed.



# Section X. Maintenance

## Focus Lens and Air Assist Cone Replacement Instructions:

Parts: Air Assist Cone, Assist Fitting, and Focus Lens w/ Case (C)

**Note:**This is for replacing air assist cones and different sized lenses.If you are replacing a lens that has become damaged or broken you just need to slide the new lens in.

1. Take out lens from the lens housing.
2. Disconnect the air hose by gently pulling each end.

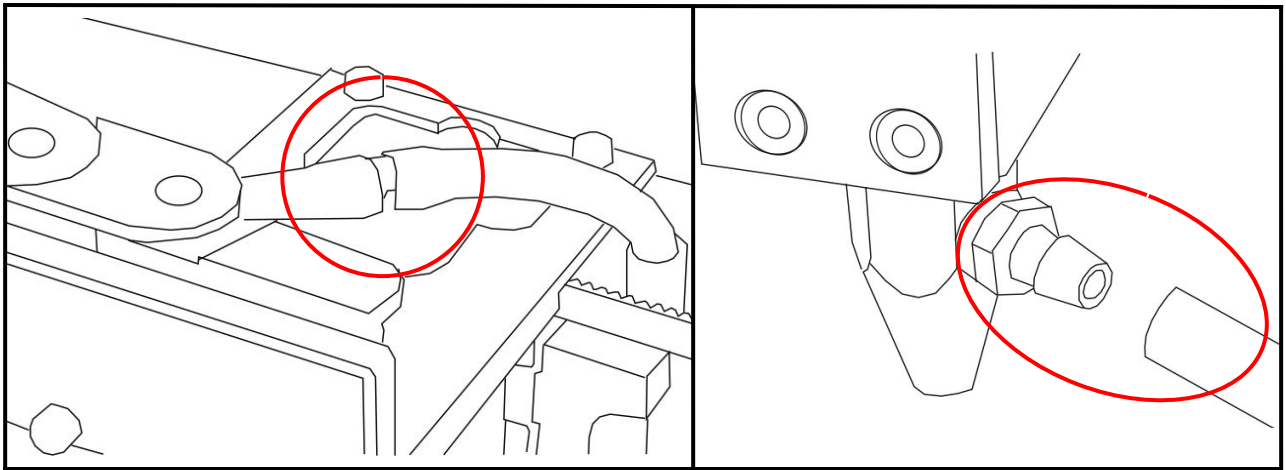


Fig. 33

3. Using a 1.5 hex wrench (not included), loosen the “set” screw on the cone, but do not remove.

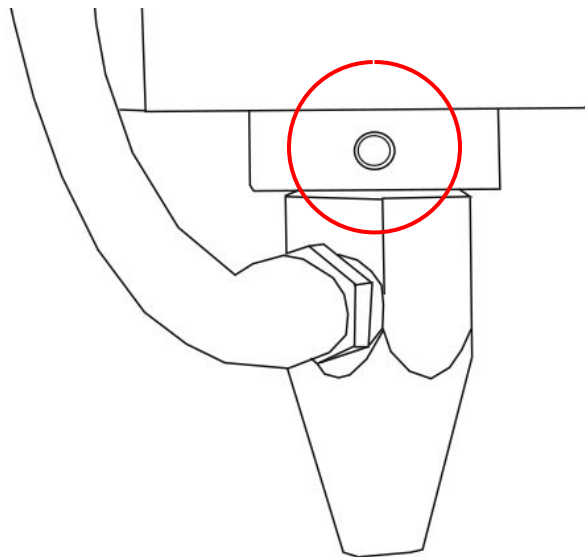


Fig. 34

4. Remove the current air assist cone.

# Section X. Maintenance

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5. Place the new air assist cone under the focus lens and into the slot. Tighten "set" screw with a 1.5hex wrench. Reattach air hose.

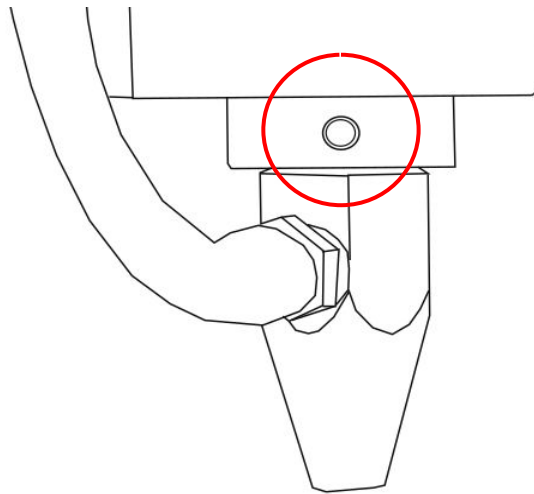


Fig. 35

6. Slide the current focus lens out of the slot. This does not require tools.
7. Slide the new lens into the slot.

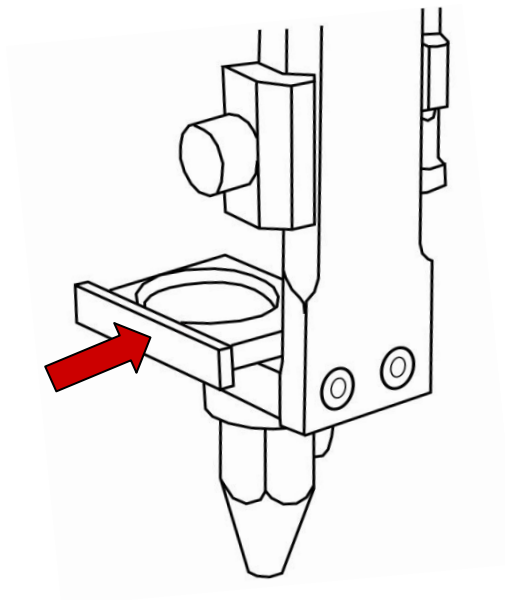


Fig. 36

# Section X. Maintenance

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The Muse Core and Muse 3D both come with removable floors. These are ideal for cutting/engraving larger materials or using our rotary accessory. It is also possible to install a passthrough for longer materials. This opens you up to a wide range of products and materials to use with your Muse laser.

For more information visit: [Muse Riser](#) or [Rotary-Riser](#) page.

1. Remove the Honeycomb Tray before starting.
2. To remove your floor, place the Muse on it's side.
3. Unscrew the bracket using your 3mm hex key.
4. You can now use your removable floor.

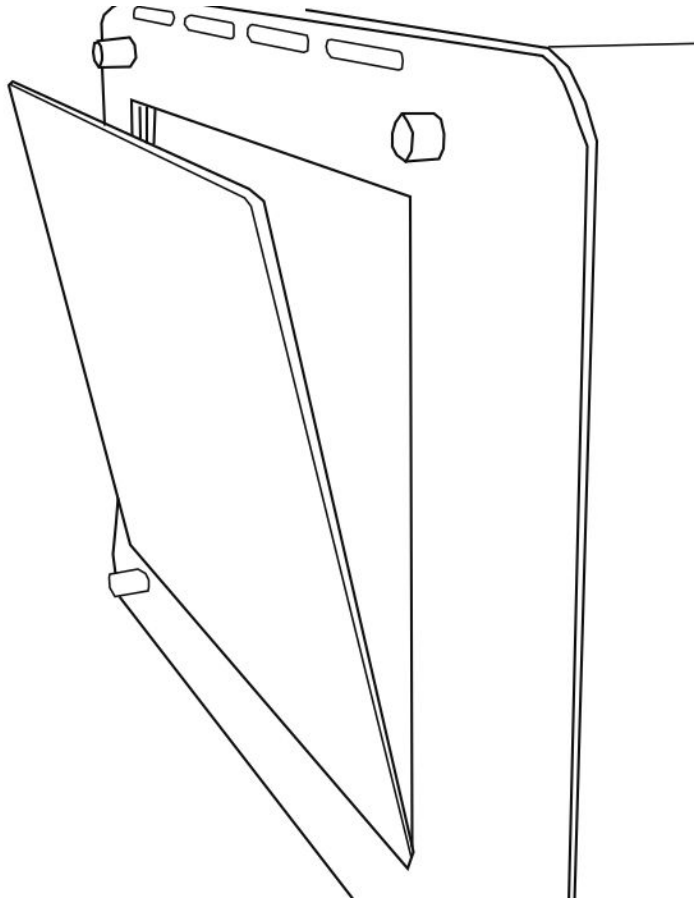


Fig. 37

5. To reattach floor line up the bottom bracket to the screw holes and re-tighten.

# Section X. Maintenance

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## Before starting a job:

Make sure the lens and optics are clean and cleared of debris using an optic lens wipes.

**Note: This is the only recommended options for cleaning lenses as other options can cause micro scratches in your optics.**

Check your gantry rails for any debris. If you find that a piece of debris fell into your gantry rails, then we suggest removing the belt to remove the debris as it can interfere with your lasers output. Double check that no material is near your belts, laser head, or any moving components as the laser will move to the front right side of your laser upon boot up.

**Always** check the Material Safety Data Sheet (MSDS) properties of the material you are planning on cutting OR engraving and **never cut any material containing PVC**, as it is highly toxic.

## Daily:

- Check that your air, water, air exhaust, and power systems are properly assembled and operating normally.
- Keep your machine and workspace clutter-free.
- Read all material warnings and make sure you are working in a well-ventilated workspace.
- Keep your Halogen or multipurpose dry chemical fire extinguisher up to regulation and easily accessible.
- Always follow all safety protocols.

## Weekly:

- Wipe down the walls of the machine with a clean rag.
- Use optical-grade lens wipes to clean both sides of the beam combiner, all mirror surfaces, the focus lens, and the tube aperture. Optic surfaces may need to be cleaned more often if cutting materials produce excessive residue (possibly daily).
- Clean fallen debris from the bottom of the machine to reduce fire risk, and provide better exhaust power.
- Clean filters bi-weekly(or sooner depending on use)
- Keep rails, motors and moving parts free from excess material as it can obscure movement and cause damage.

## Monthly

- Check your fume extractor filters. Depending on your output and the materials being cut, your fume extractor filters may need to be replaced as often as every month (or sooner).
- Change water in the cooling system. This will keep your tube safe from unwanted debris, mold or evaporation. If you live in an area that gets cold it is recommended adding a 1:2 Propylene Glycol and Distilled water mix to prevent freezing your system to keep your tube from breaking.
- Check for wear on belts. Belts may eventually wear and crack. If you find that the belts have become loose over time you can add tension by loosening the motor, adding tension, and re-tightening the bolts.

# Section X. Maintenance

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## Section Review:

### Do's:

- Remember to follow daily, weekly, and monthly maintenance to ensure a long lasting machine.
- When installing a new laser tube, make sure all the wires are securely fastened.
- When replacing tubing make sure to check for holes.

### Don'ts:

- When cleaning the lens or mirrors do not use Lens Wipes that are not optic grade.
- Do Not replace the Laser Tube with the machine on.
- Do Not perform any jobs if your machine is trying to exceed its movement limits.

# Section XI. Add-ons

## Coolbox Set-up

Muse 3D comes with the Muse Coolbox. The Muse Coolbox acts as both a water and air system.

1. **Remove Water Cap:** Remove the short silicone tubing, capping the water inlet and outlet on the back of the machine.
2. **Attach Water Tubes:** Remove the coolbox from its packaging. Push one of the two (2) silicone tubes onto the water in and the other into the water out of the coolbox. Connect the two (2) silicone tube from the Coolbox to the contrasting **INLET** and **OUTLET** of the Muse 3D.

**(Remember: In to Out, Out to In).** Your laser will not fire if this is installed backwards thanks to the water flow sensor.

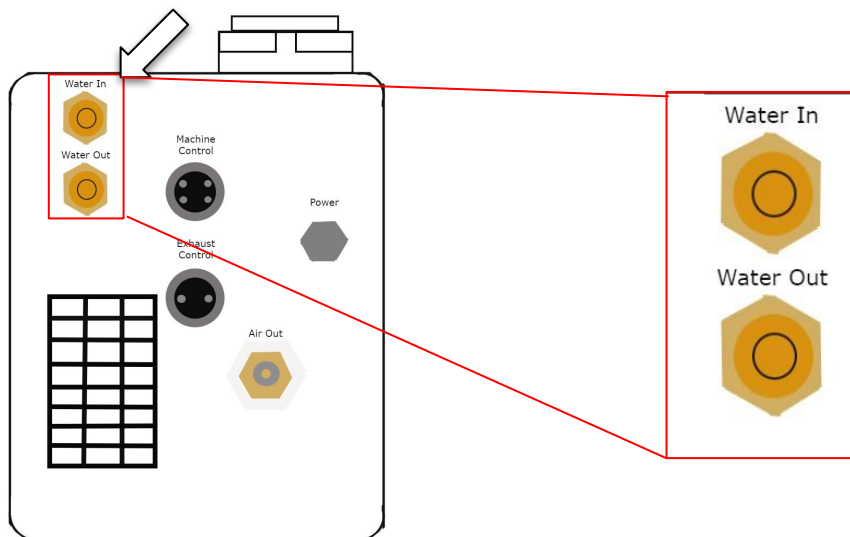


Fig. 38



**Never Fire the Laser without a correctly connected and powered water chiller.** Firing the laser without turning the pump on or with no water in the system will severely degrade or destroy your laser tube and void your warranty.

# Section XI. Add-ons

3. **Attach the Air Tubing:** Connect one end of the air tubing to the back of the 3D and the other to the air out on the back of the Coolbox.

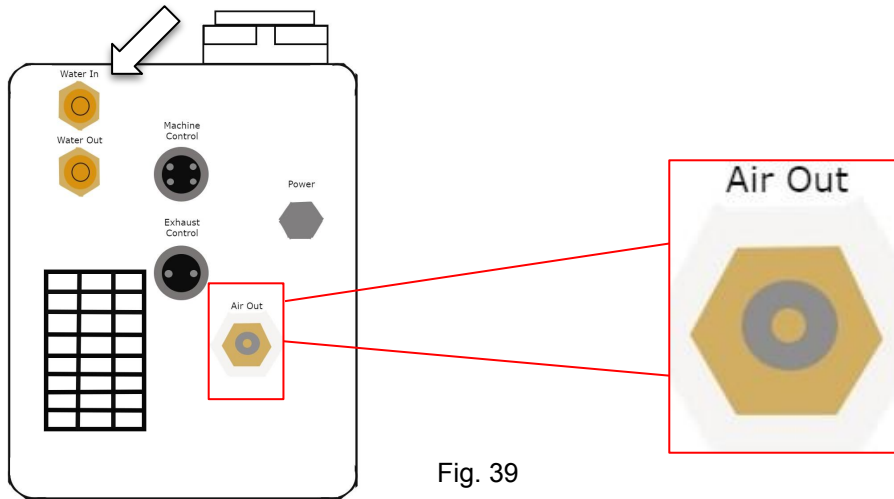


Fig. 39

4. **Preparing the Coolbox:** Fill the Coolbox using 1.5 Liters of **DISTILLED** water. Make sure to only use distilled water and replace often. If you live in a cold climate you can use a 1:2 Propylene Glycol and Distilled water mix to prevent freezing. Generally Muse Titan systems should not be run in temperatures less than 20°F (-6°C).

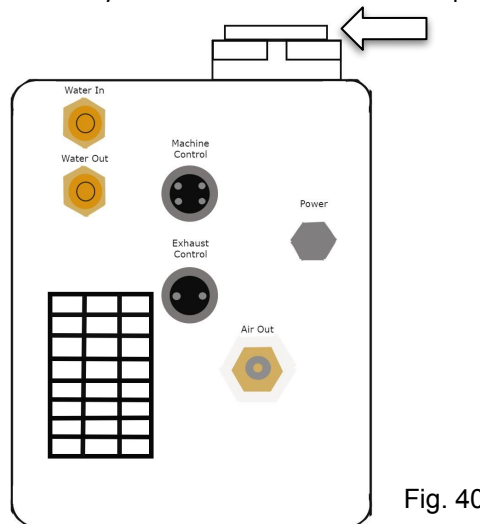


Fig. 40

5. **Plug in your machine.**

## NOTICE!



- We recommend that you attach the laser and water pump to a power strip and use that to control the main power to the unit, ensuring that the water pump is always on when the laser is powered.
- **Make sure that there are no air bubbles inside of the water jacket of the laser tube as it can reduce the lifetime of your tube.** If present, water bubbles typically migrate to the electrodes on either end of the tube. Visually inspect the laser tube to make sure that bubbles are not present. If bubbles persists completely drain the tube of water then turn the chiller back on and check once more.

# Warranty

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**Full Spectrum Laser will replace or repair any defective parts free of charge within the first 30 days. Ground shipping is free with overnight shipping available at extra charge.**

Full Spectrum Laser will replace or repair any defective part within the warranty period free of charge but shipping charges are the responsibility of the customer. Warranty includes parts and labor only. Shipping of defective and replacement components is excluded.

The customer may arrange their own shipping. Parts can be dropped off at our warehouse free of charge.

All defective parts must be returned to Full Spectrum Laser for evaluation before replacements are issued, unless otherwise authorized. The warranty is valid for normal use only and excludes uses not stated in manual. Parts damaged by fires are considered user error if the machine is left unattended. Always stand next to the machine with a fire extinguisher and be ready to turn it off in case of an emergency. Never operate the machine unattended.

Our lasers have a 30-day full warranty and include a 1-year extended warranty. The 1-year extended warranty excludes shipping and consumable items. All electronic items (control cards, power supplies, motors) and most mechanical items are covered under the extended warranty unless damaged by abuse. Fire damage is not covered under the warranty. Consumables not covered include, but are not limited to, rubber parts (such as tubing, belts, plastic wheels, lenses, mirrors, other optics, and laser tubes).

The original purchaser may transfer the balance of the warranty to anyone free of charge provided we are notified in writing within 30 days. After 30 days, we will only provide warranty and tech support services to the original purchaser unless a warranty transfer fee is paid.

Warranty will remain valid if product is sold. However, the buyer must request RMAs and repairs from the original purchaser unless a warranty transfer fee is paid.

**NOTE: Full Spectrum Laser DOES NOT offer warranties or customer support for 3rd Party parts, including replacement laser tubes, as it may not be compatible with Full Spectrum Laser machines and can cause damage to your laser system.**

Visit <https://laser101.fslaser.com/support> for most current warranty postings.



# Customer Support

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For a list of Frequently Asked Question and a series of help guides, visit us at our [Help Center](#) .

We offer a variety of free projects to help you get started, just check out our [Free Projects](#) page.

For more information on laser engraving, check out our [Blog](#) .

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## Financing:

We work to provide a perfect option for any budget.

For more information contact sales:



**M-F 8AM-5PM PST**  
[sales@fslaser.com](mailto:sales@fslaser.com)  
**702-802-3101**

## Technical Support:

Are you having an issue not found in the Help Center?

Contact support:



**M-F 8AM-5PM PST**  
[support@fslaser.com](mailto:support@fslaser.com)  
**702-802-3103**

---

## Contact Information:

Phone: (702) 802 - 3100

Fax: (702) 987 - 0150

6216 S Sandhill Rd.  
Las Vegas, NV 89120

Sign into our website to check your order status or email us.

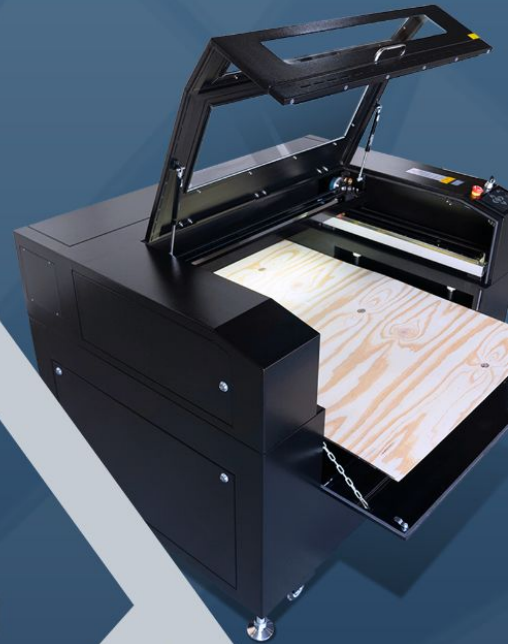
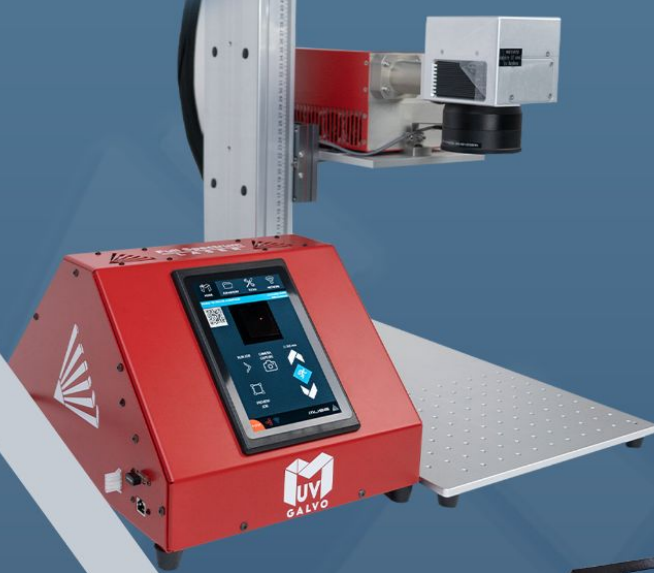
Shipping: [shipping@fslaser.com](mailto:shipping@fslaser.com)  
Accounting: [accounting@fslaser.com](mailto:accounting@fslaser.com)

# READY TO UPGRADE ?

Have you gotten the most out of your desktop laser? Have you hit the limits of your output quotas and want to see how the professionals do it? Step up to Professional Grade with P-Series and the Muse Titan by Full Spectrum Laser.

Our P-Series and Muse Titan take your production to the next level. Industrial grade components give you faster movement, better precision and increased laser power. All P-Series and Muse Titans come with our RetinaEngrave software, Motorized Z-stage, AutoFocus, Knife Edge and Honeycomb tables.

Do you have a more specific marking and or engraving application? Something to engrave the smallest of details? Look no further than the Muse Fiber Galvo and the UV Galvo. These machines are designed to capture and engrave extreme details on metal and other special materials.



**Full Spectrum**  
**L A S E R**



# JOIN THE FULL SPECTRUM LASER COMMUNITY

FULL SPECTRUM LASER INVITES YOU TO JOIN OUR COMMUNITY OF HOBBY MAKERS AND PROFESSIONAL MANUFACTURERS THROUGH OUR SOCIAL MEDIA CHANNELS (FACEBOOK, INSTAGRAM, TWITTER, YOUTUBE) WE ALWAYS HAVE SOMETHING POSITIVE TO SAY ABOUT HOBBY MAKER CULTURE OR THE INDUSTRY WE WORK IN. YOU CAN FOLLOW US AS WE CROSS THE COUNTRY GOING TO CONVENTIONS AND MAKER EVENTS OR JUST CHECK OUT ALL THE AWESOME STUFF WE MAKE. BEST OF ALL, WE OFFER ALL THOSE DESIGNS FOR ALL THOSE PROJECTS WE MAKE WITH OUR LASER CUTTERS FOR FREE. JOIN OUR COMMUNITY AND SEE WHAT ALL THE EXCITEMENT IS ABOUT

- [WWW.FACEBOOK.COM/FSLASER](http://WWW.FACEBOOK.COM/FSLASER)

- [WWW.INSTAGRAM.COM/FULLSPECTRUMLASER](http://WWW.INSTAGRAM.COM/FULLSPECTRUMLASER)

- [WWW.TWITTER.COM/FULLSPECLASER](http://WWW.TWITTER.COM/FULLSPECLASER)

- [WWW.YOUTUBE.COM/FULLSPECTRUMLASERS](http://WWW.YOUTUBE.COM/FULLSPECTRUMLASERS)



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