

# MUSE TITAN

USER MANUAL



Full Spectrum  

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LASER

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# Fire Warning

## Fire Warning



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 proven to have the most potential for igniting material, however fires can be started when performing Raster Engraving if negligent.

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 store any flammable materials in or near the machine.**
- **Never stack materials near or in your work area.**
- **Never operate your machine unattended.**
- **Always use the air assist, especially while vector cutting.**
- **Never attempt to run a laser with the lid open.**
- **Never cut PVC (polyvinyl chloride) under any circumstances!!**
- **Clean the surrounding area regularly to avoid dust getting into the machine.**

## Materials

Below is a small list of materials usable with the Muse Titan. We will include a list of hazardous material as well.

	Cuts	Engraves
Acrylic	✓	✓
Coated Metals	X	✓
Paper	✓	✓
Fabric/Leather	✓	✓
Glass	X	✓
Rubber	✓	✓
Stone	X	✓
Wood	✓	✓



# Fire Warning

## 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>

# Introduction

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Thank you for purchasing your new Muse Titan. 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.

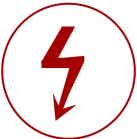
This user manual will guide you through the safety guidelines and operation of your machine. We recommend that you familiarize yourself with this manual before using your laser engraver. Remember to be safe and have fun!

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

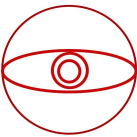
## Safety Symbols & Meanings



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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## 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** 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** leave the laser system unattended during operation.
- Keep your laser system clean.
- **Do not** disassemble the machine or remove any of its protective covers.
- **Always** have a first-aid kit designed for the initial treatment of burns and smoke inhalation.
- **Never** operate the machine with any of the panels removed.
- **Never** place hands or fingers into moving parts such as cooling fans.

## Safety During Operation

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 material containing PVC or vinyl under any circumstance. Your warranty will be void if your machine is damaged by corrosion from engraving or cutting PVC or vinyl.
- **Never** engrave or cut any unknown material.
- **Never** operate the machine without a properly operating ventilation system.
- **Never** run a laser with the lid open.
- **Never** look or stare into the visible red diode laser.

# Section I. Safety

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## 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 unless the unit is disconnected from the power for at least one hour.**
- **Never replace the installed 20 amp fuse with one of a higher rating.**
- **POWER ON/OFF is controlled by the switch at the back of the machine, with (-) being ON and (o) being OFF.**
- **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:

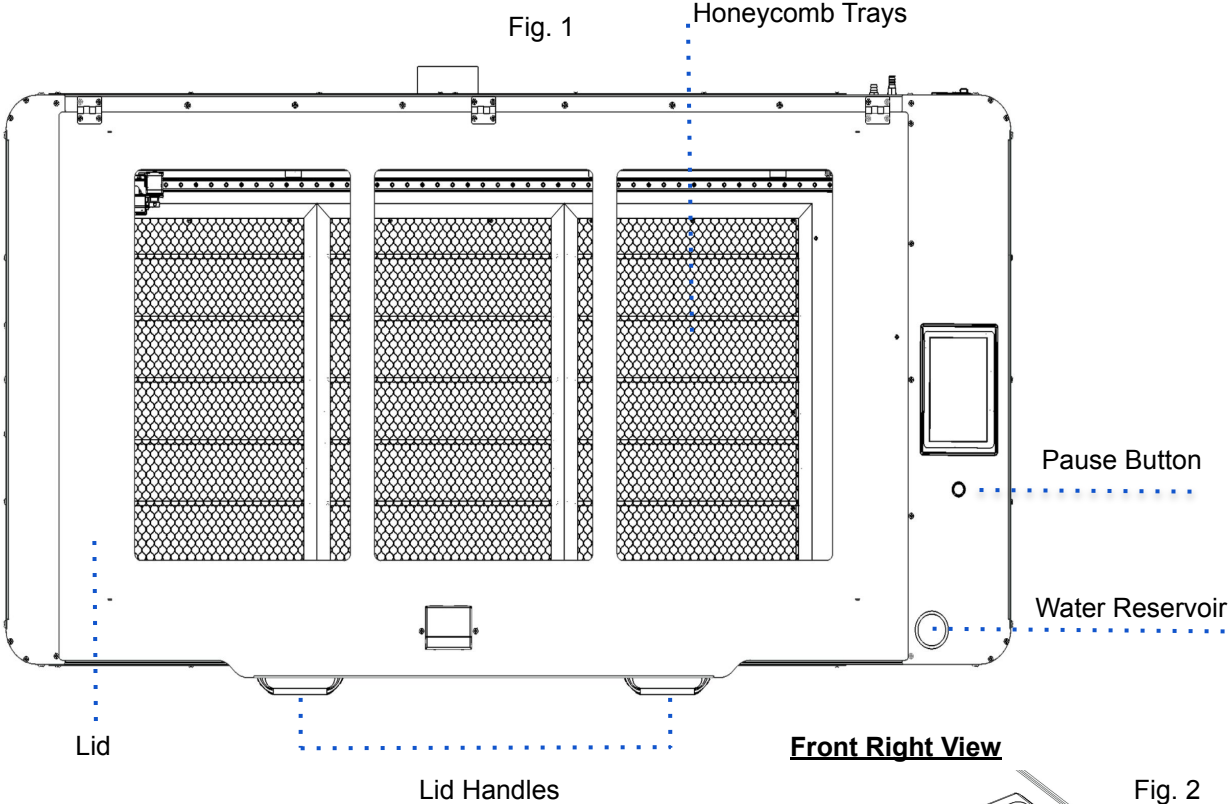
**LASER INSTITUTE OF AMERICA 12424 RESEARCH PARKWAY, SUITE 125 ORLANDO, FL 32826 (407) 3801553.**

# Section I. Safety

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

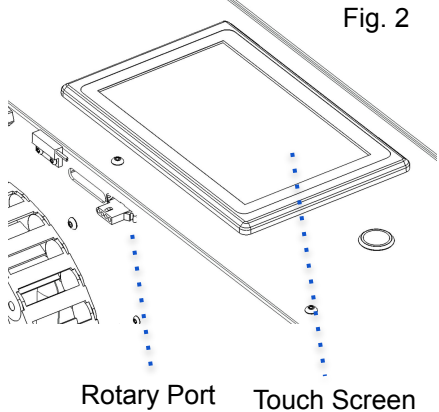
**Top View**

Fig. 1



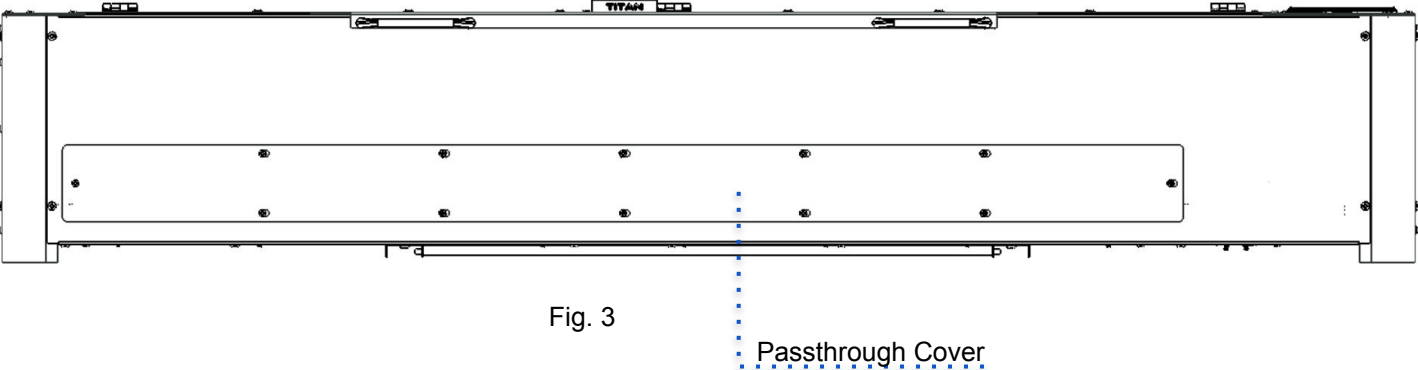
**Front Right View**

Fig. 2



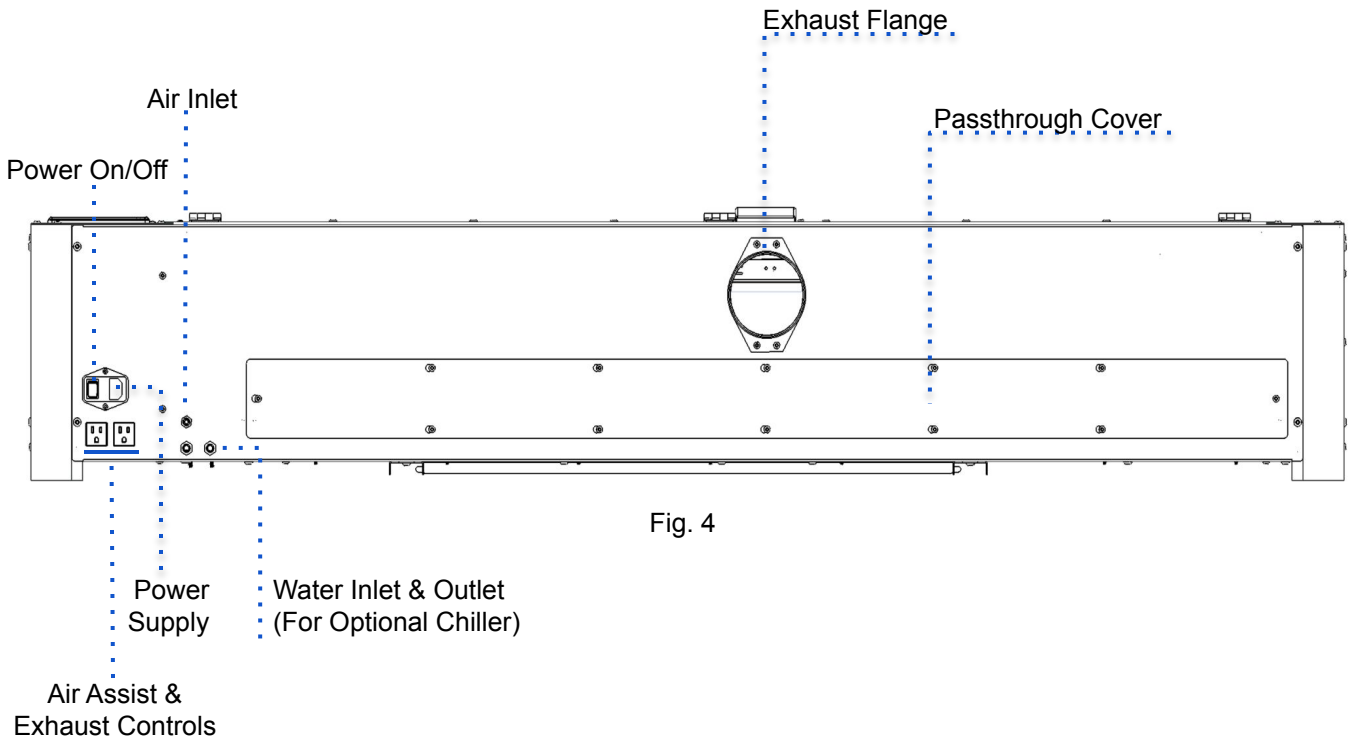
**Front View**

Fig. 3

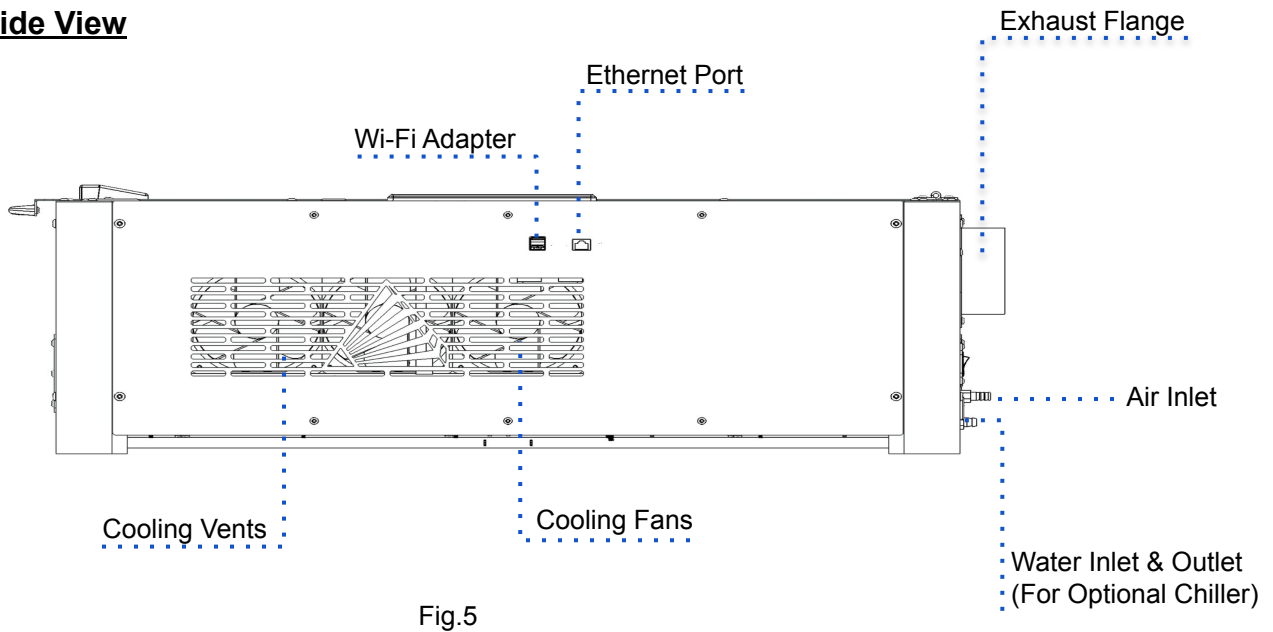


# Section I. Safety

## Back 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.
- Always keep an eye on your machine.
- Always inspect your machine for damage or breakage before each use.
- Keep your laser system clean.
- Always keep a fire extinguisher on hand.
- Always have a first-aid kit designed for the initial treatment of burns and smoke inhalation.

### 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.
- 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.
- Never operate the machine without a properly operating ventilation system.

# Section II. Unboxing

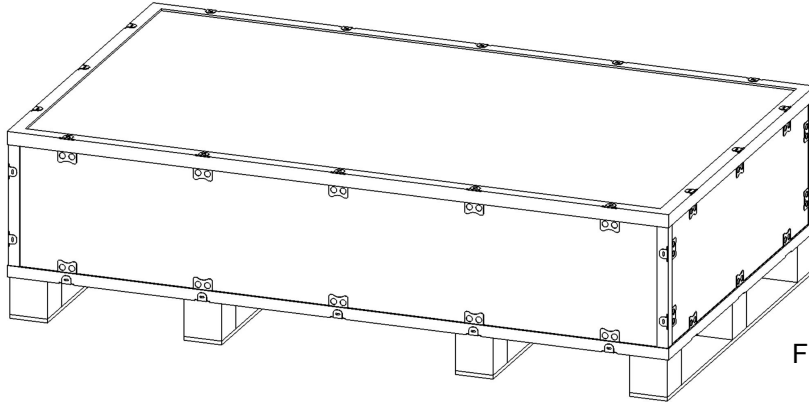


Fig. 6

## WARNING!!

The Muse Titan v2 is approximately 200 lbs. At least two people are required to lift and unbox the machine. DO NOT TRY TO LIFT ALONE!!

## 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(66" x 34" x 12") is recommended. Be sure the table is free of clutter and can support a minimum of 300lbs (the machine itself weighs 176 lbs).
- 2. Place Box:** Due to weight set the box as close to the work area as possible. Flatten the metal tabs on the bottom of the crate. There are a total of 16 tabs, 5 on the front and back and 3 on the sides.

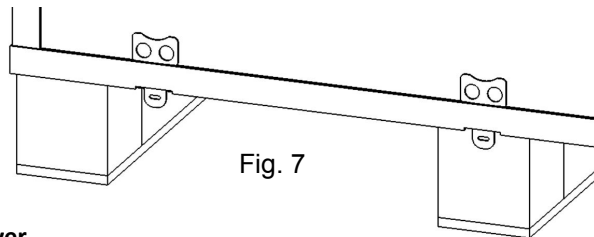


Fig. 7

- 3. Carefully remove the Cover.**

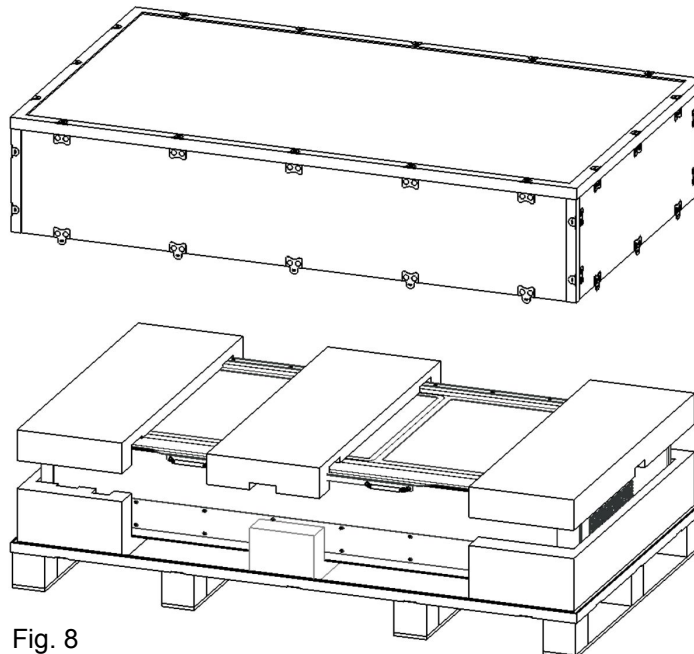


Fig. 8

**4. Remove the Foam Packaging from the Top and Sides.**

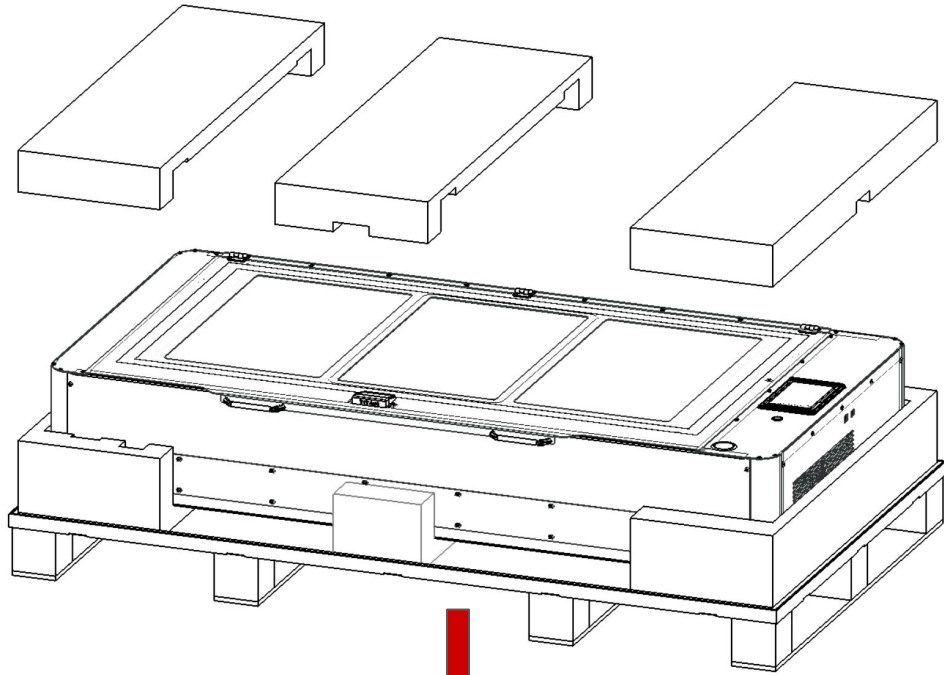
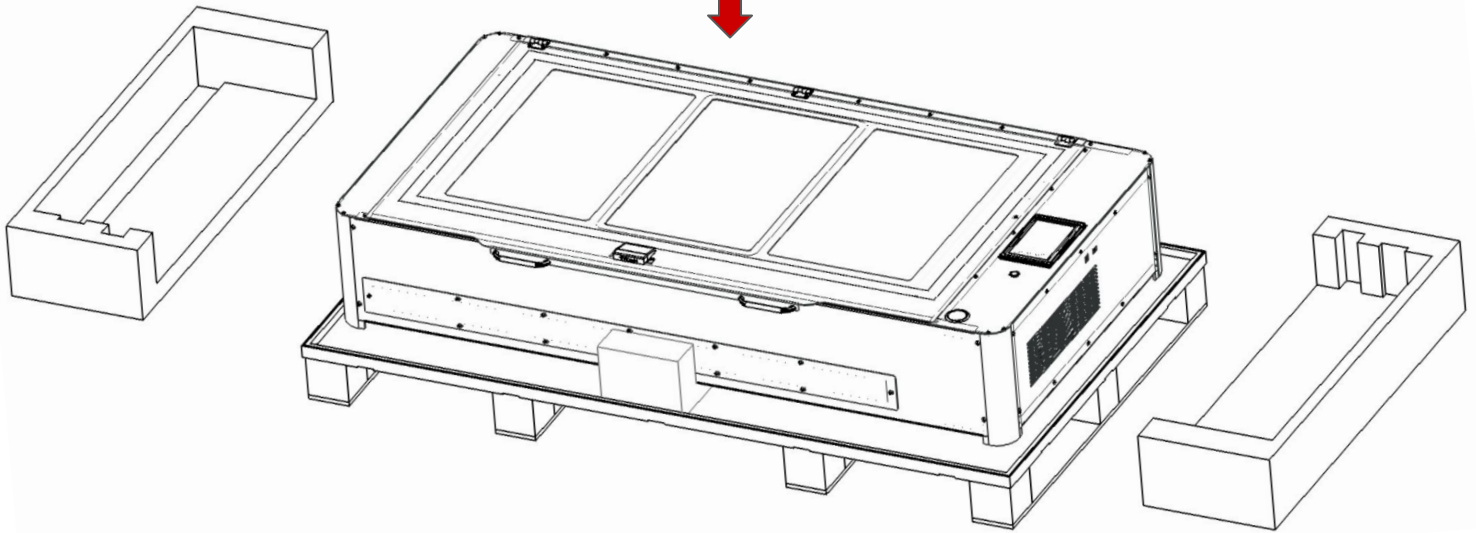


Fig. 9



**5. Lift the Machine with your lifting buddy and place it into the Work Area.**

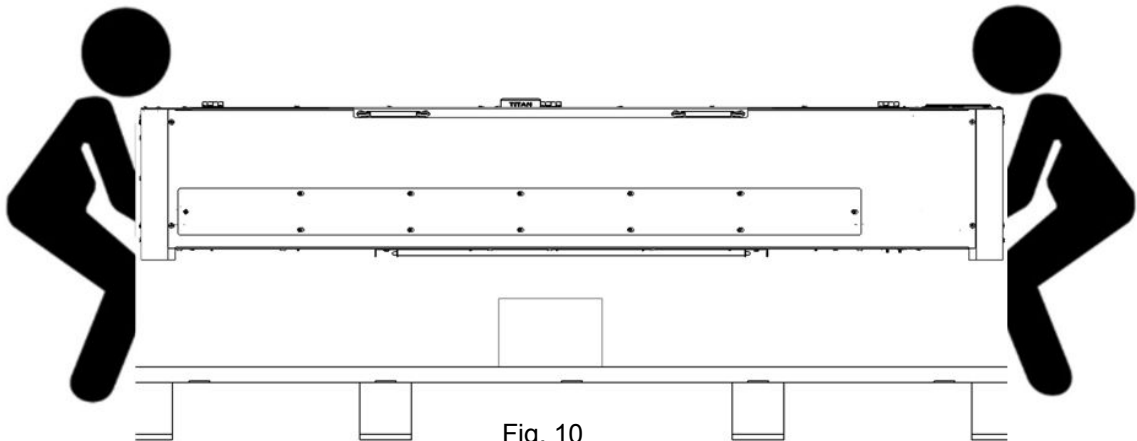
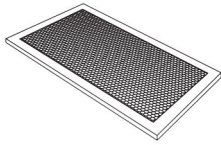


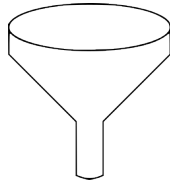
Fig. 10

# Checklist

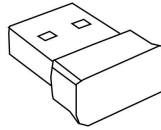
Your laser should come with the following included parts and accessories:



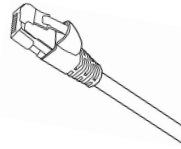
**Honeycomb  
(QTY: 3)**



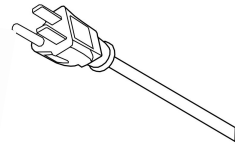
**Funnel**



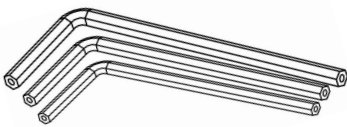
**Wi-Fi Dongle**



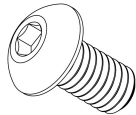
**Ethernet Cable**



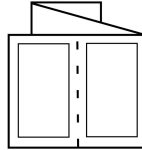
**Power Cable**



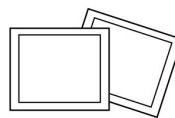
**2.0, 2.5, and 3.0  
mm Hex Key**



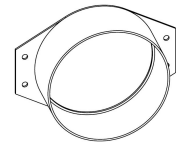
**M4X8 Flange Bolt  
(QTY: 4)**



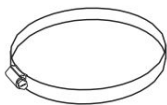
**Thermal Paper  
(QTY: 5)**



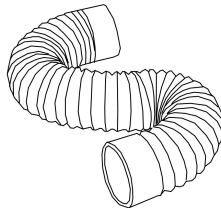
**Lens Wipes  
(QTY: 2)**



**Exhaust Flange**

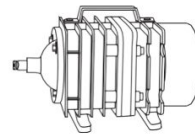


**4" Duct Clamp  
(QTY: 4)**

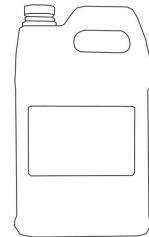


**4" Ducting (10')  
(QTY: 2)**

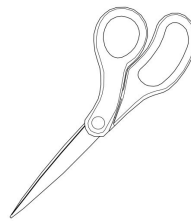
The following items are also needed to run your machine.



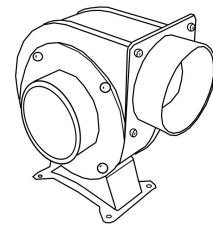
**Air Compressor**



**1 liter of Distilled Water**



**Scissors (Optional for  
Unboxing or Set-up)**



**Exhaust Fan  
(Optional)**

**CAUTION!**



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

**DANGER!**



**Never operate your laser without a working exhaust.** Full Spectrum Laser recommends exhaust systems capable of 500 CFM. 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.
- Remember to use the lifting strap when lifting the Titan.
- Check your Titan 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 The Box Using Your Waist 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 Machine

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

1. Remove Protective Foam
2. Locate & Remove Zip Ties
3. Connect the Exhaust System
4. Preparing Water Reservoir
5. Assemble the Air Compressor
6. Connect Electrical Power
7. Passthrough

## 1. Remove Protective Foam

The Titan comes with protective foam inside to prevent damage during shipping. The foam must be taken off before using your machine.

The first is located below the tube shelf.

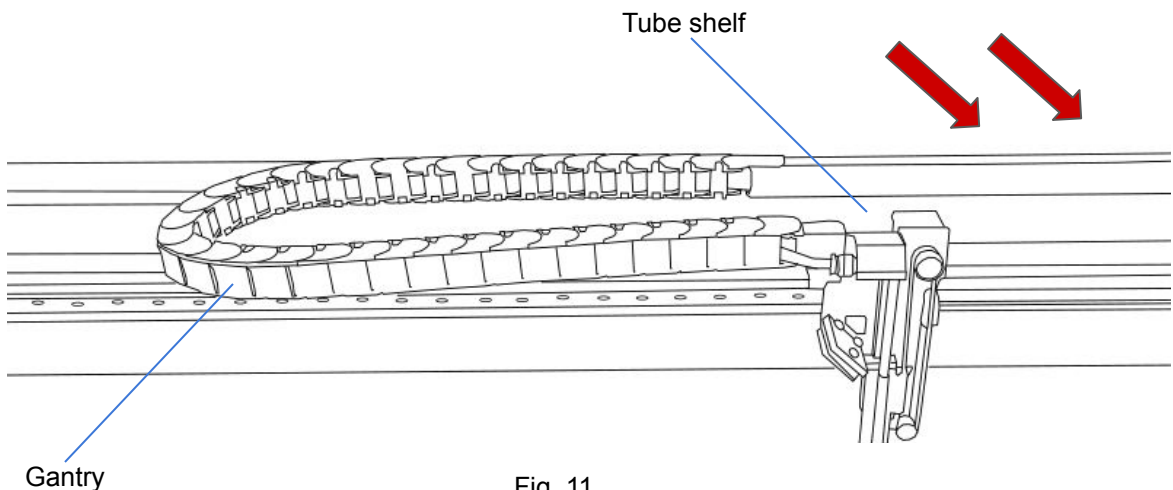


Fig. 11

The second is located under the laser tube, which can be accessed behind the tube shelf.

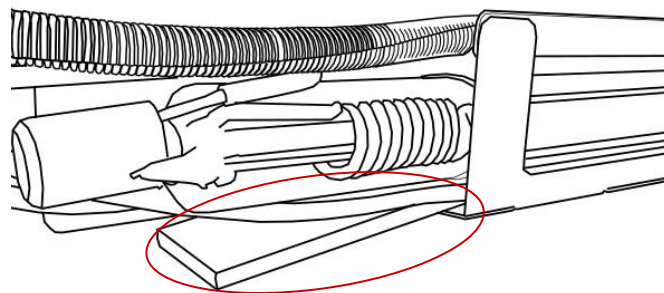


Fig. 12



# Section III. Setting Up Your Machine

## 2. Locate and Remove Zipties

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.

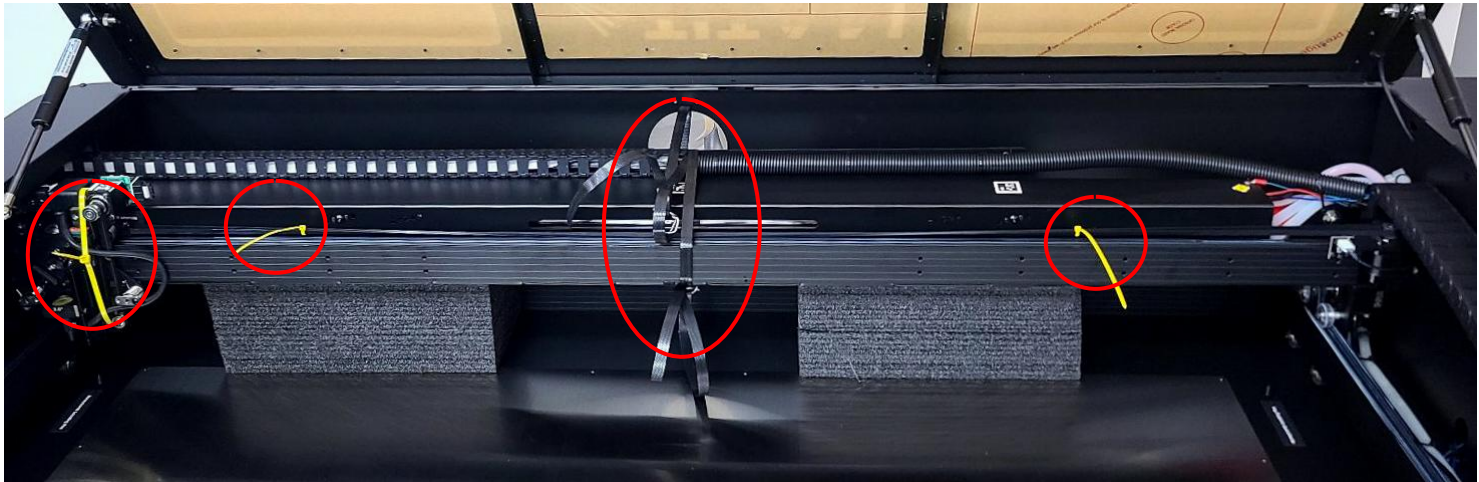


Fig. 13

1. **Locate Zip Ties:** Refer to Picture above.
2. **Cut and Remove Zip Ties:** Using a small pair of scissors or wire snips remove all eight zip ties.

**Note:** The colors of the zip ties may vary depending on availability. The pictures above refer to the general location of the zip ties. Position may vary depending on movement. Failing to remove all zip-ties will prevent the gantry from moving.

**WARNING!!** Do not remove anything else!

# Section III. Setting Up Your Machine

## 3. 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. 14).

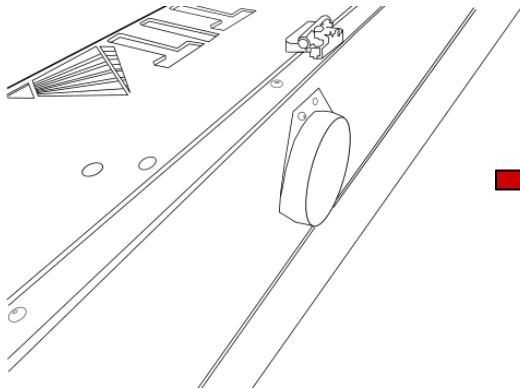


Fig. 14

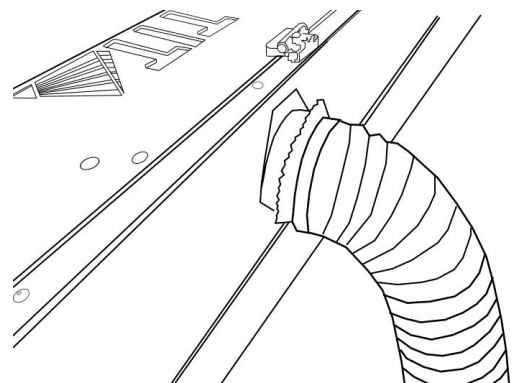


Fig. 15

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. 15)
3. **Attach Exhaust Fan (Optional):** 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 Titan machine. (see Fig. 16).

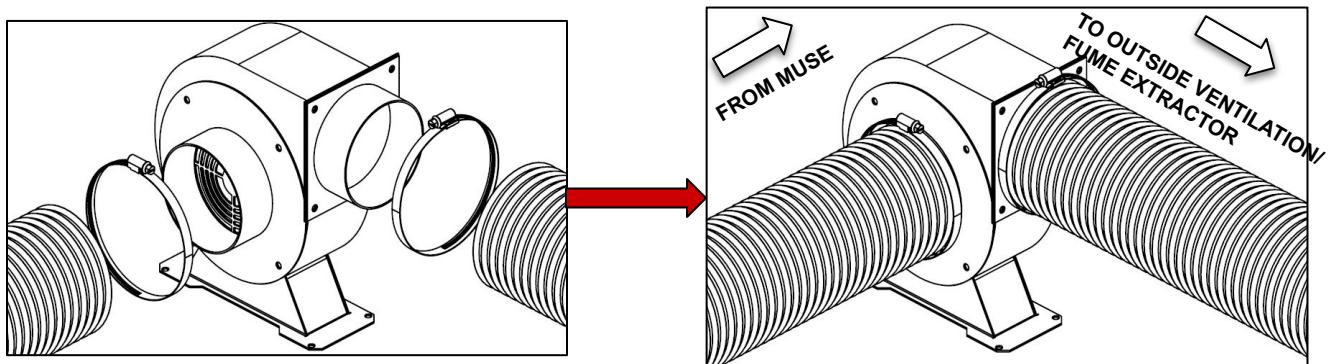


Fig. 16

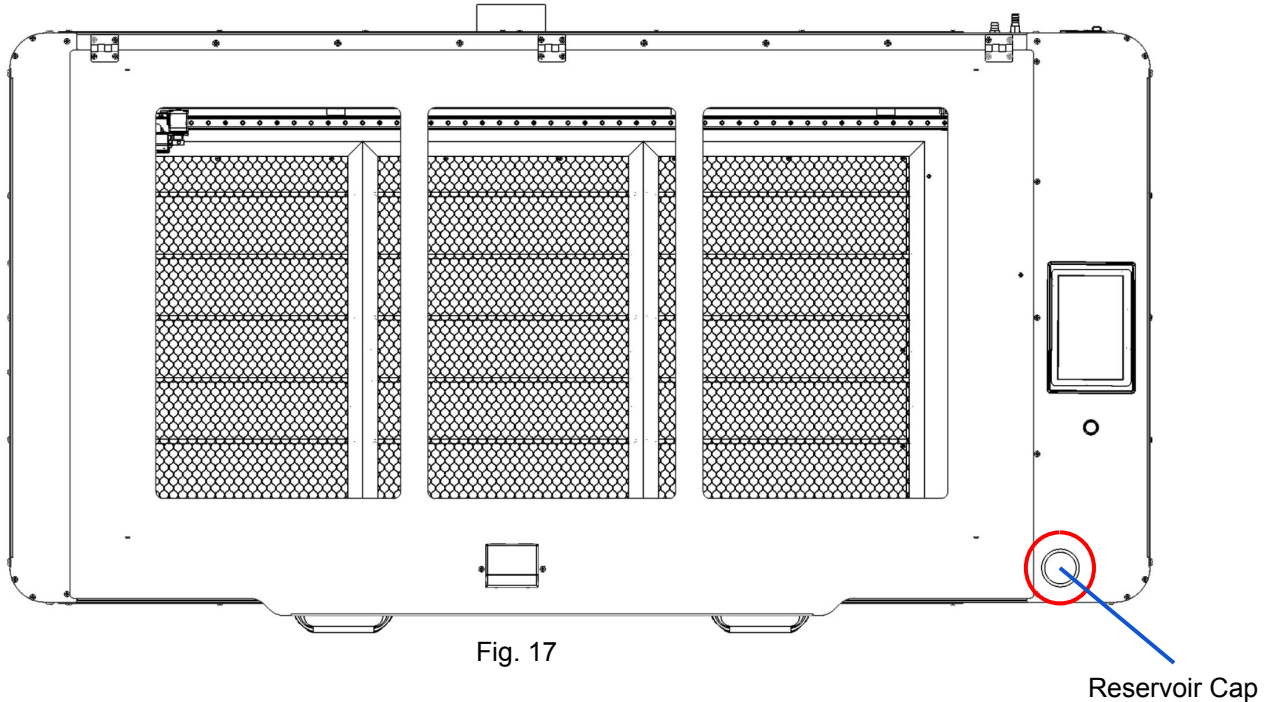
4. **Ventilate Outside or to Fume Extractor:** Set the open end outside of a window or to a fume extractor. Check your system for leaks and be aware that the protective housing is not designed to be airtight; the front grill is designed to allow an exhaust system to draw fresh air through the work area.
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 Titan.

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

# Section III. Setting Up Your Machine

## 4. Preparing Water Reservoir


The Titan V2 comes with an integrated water cooling system found at the bottom of the right control panel. (Refer to picture below) The water reservoir must be filled with 1 liter (.26 gallon) of distilled water using the funnel provided.



**Note: The water reservoir must be filled before using the machine. Failure to do so may cause damage. Failure to put distilled water into the reservoir can lead also cause damage and may void the warranty.**

The water reservoir has a max capacity of 1.75L (.46 gallon). Do not fill more than that.

The water reservoir is equipped with a sensor that will notify you when the water level is low.



**CAUTION!**

**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 Machine

## 5. Air Compressor Assembly

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.

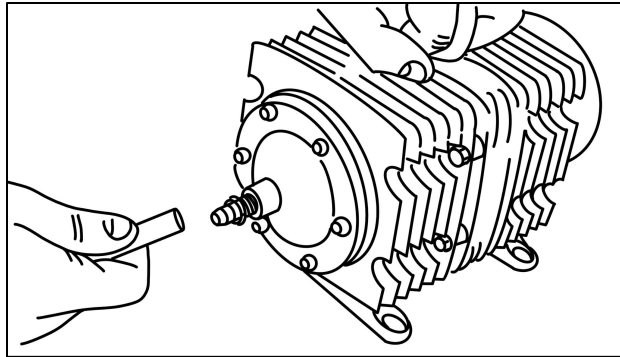


Fig. 18

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.

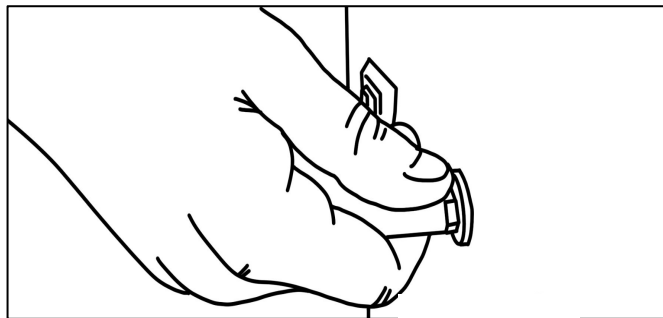


Fig. 19

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

Your air compressor is now ready for use.

# Section III. Setting Up Your Machine

## 6. Connect the Electrical

The Muse 3D and its accessories are configured to accept 110VAC at 60Hz. For international shipments, 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.

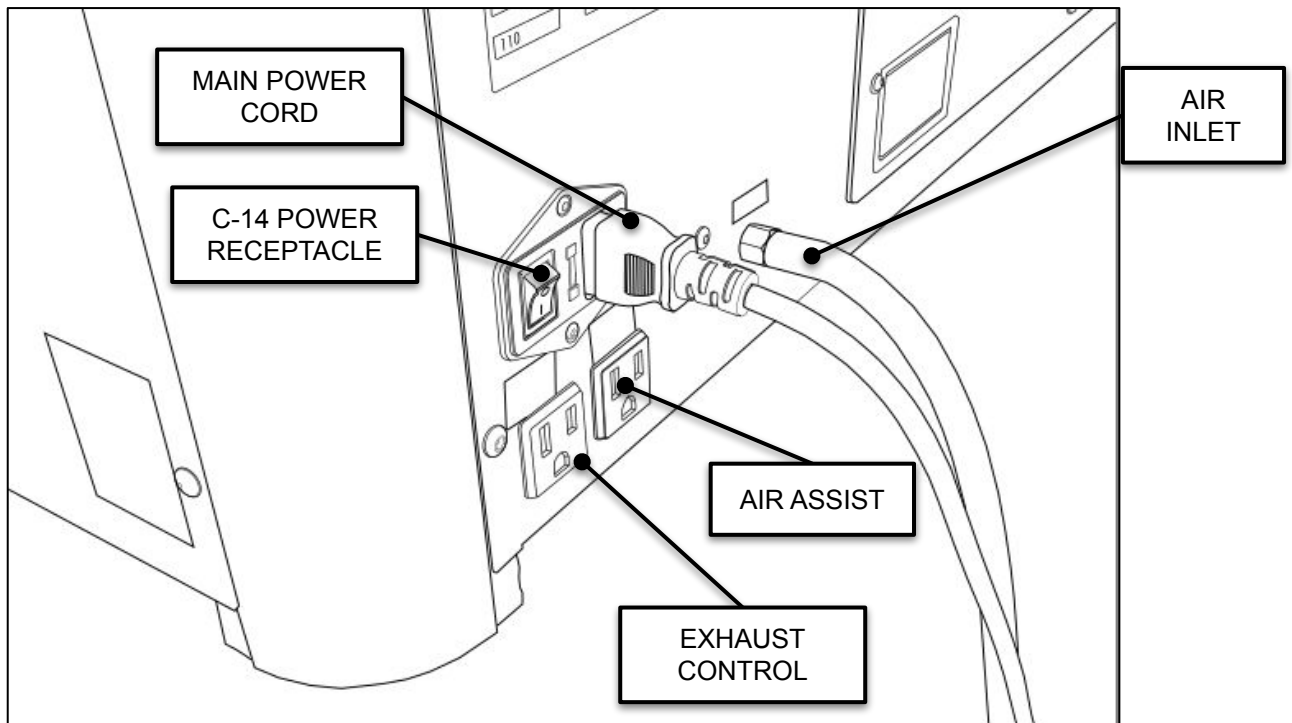


Fig. 20



**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 Machine

## 7. Pass-through

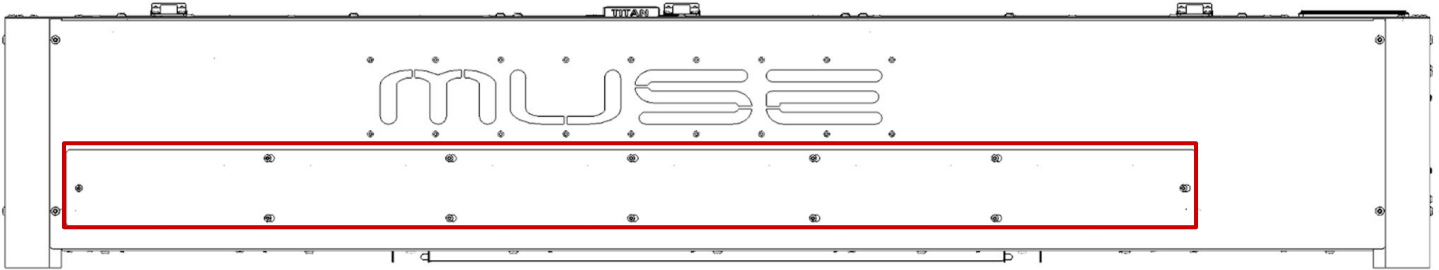


Fig. 21

1. The Muse Titan, along with other Muse models, come with pass-through in the front and back of the machine for projects that may require the use of longer materials, such as signs. All one needs to get the pass-through open is to loosen the twelve screws along the pass-through slot. (see Fig. 21)

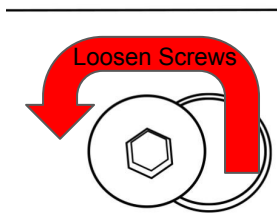


Fig. 22

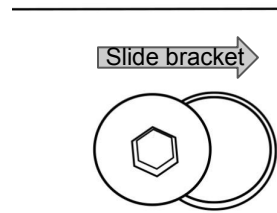


Fig. 23

2. Once the screws are loosened you can push the pass-through bracket to the right to clear the screws (see Fig 22).
3. You can now pull the bracket off the machine and use your pass-through (see Fig. 24).

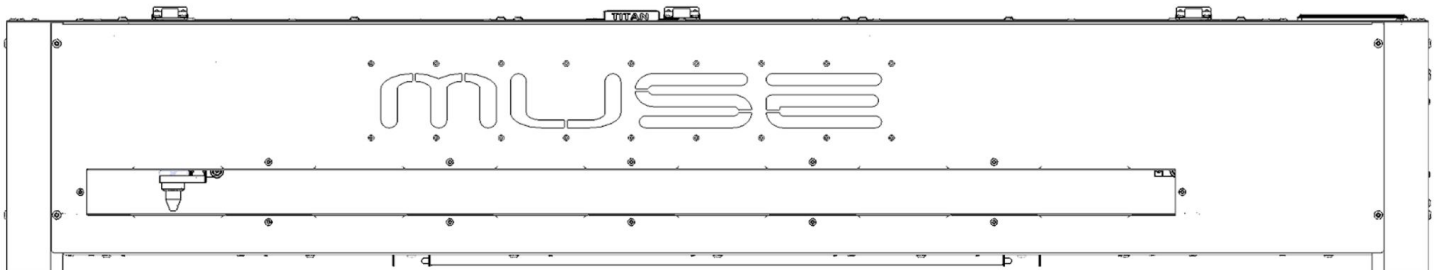


Fig. 24

4. If you decided you want to re-attach the bracket, then re-insert the bracket into the screw cutouts and slide it left. That will hold the bracket in place so that the screws can be re-tightened.



# Section III. Setting Up Your Machine

---

## Section Review:

### Do's:

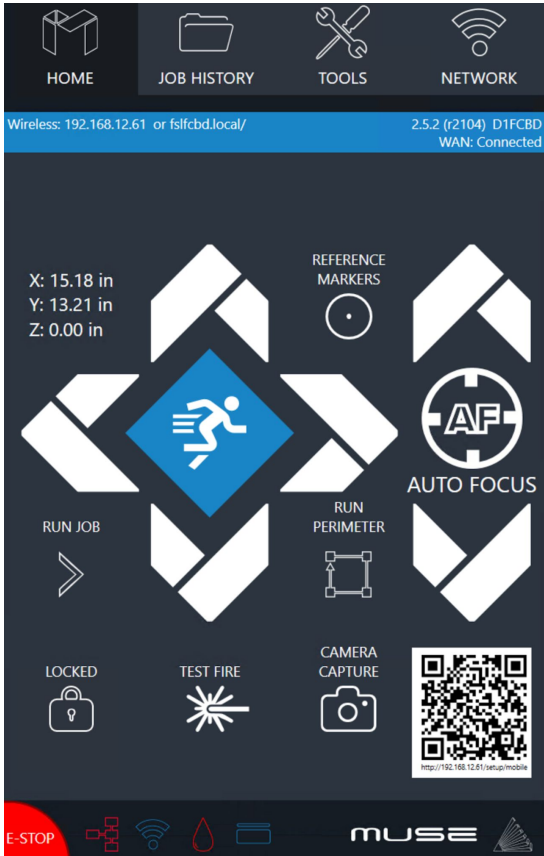
- Remember to remove all the foam from your machine.
- Take off all the zip ties.
- Make sure to check that your exhaust is properly installed.
- Remember to fill your water reservoir before use.
- Make sure all your accessories are on and functioning properly before attempting to run your machine.

### Don'ts:

- Do Not Use Your Machine Without Taking Off the Foam or Zipties.
- Do Not Use Your Machine Without Filling Your Water Reservoir.
- Do Not Use Your Machine if Any Of Your Accessories Are Not Functional.

# 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.

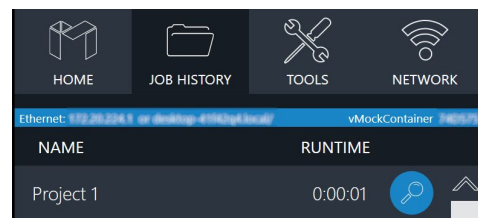


## **Home**

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**

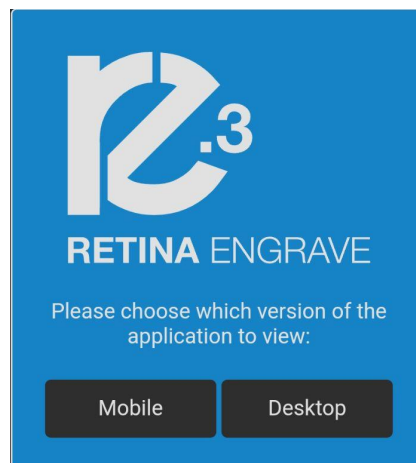
The tools icon allows the user to check and adjust the machine settings, enable rotary attachments, home the laser, and get information about the machine.

## **Network ⇄ Wi-Fi**

Allows the user to connect to the Wi-Fi.

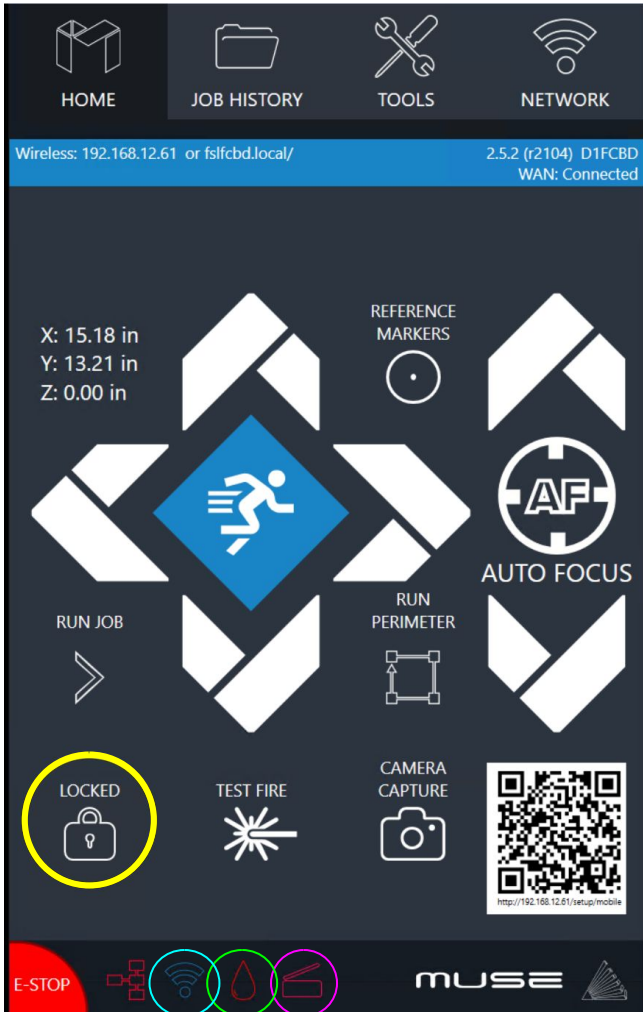
## **Mobile Version**

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

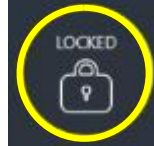
## Machine Indicator:



### 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.



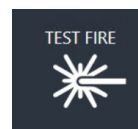
### Wi-Fi Indicator:

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



### Test Fire:

This button fires the laser.



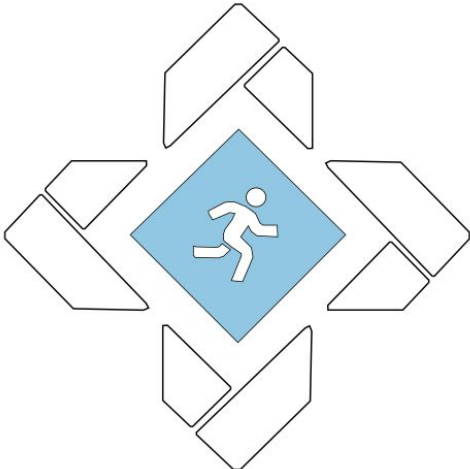
# Section IV. Touchscreen Interface

## Speed Indicators:

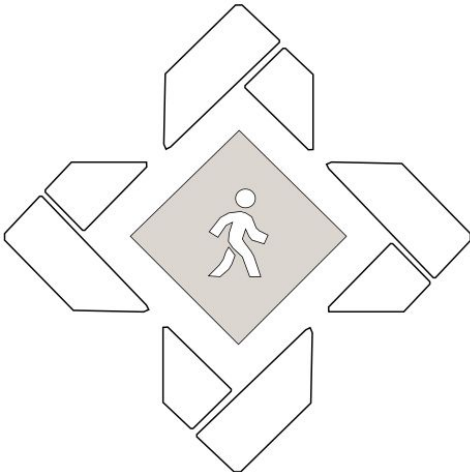
Your machine has 3 speed setting that can be changed by selecting the icon on the touchscreen or from RE3.



**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 Titan 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 Titan to the router is the most reliable way to establish a link to RE3.

1. The Titan comes with an ethernet cable(see Fig. 25).

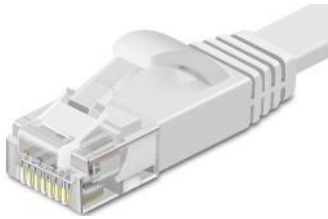


Fig. 25

2. Connect the cable to the ethernet ports on both devices(see Fig. 26).

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

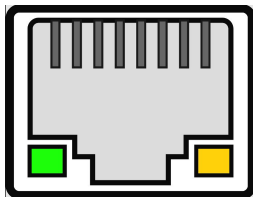


Fig. 26

## 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.

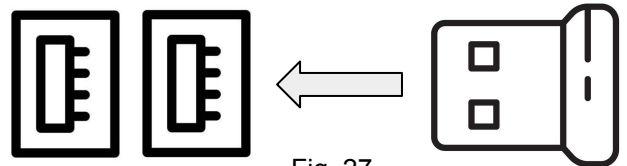
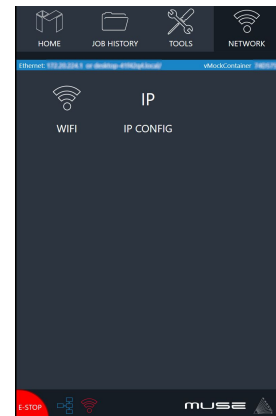


Fig. 27

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 Titan 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.

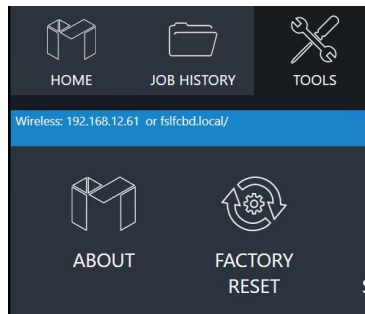
**Note: The location of the ethernet port varies on computer models. Some computers may not have an ethernet connection and may need an ethernet adapter.**



# 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 Titan will link with the software's IP address

1. **Turn On Muse Titan: Turning on your Muse Titan 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.

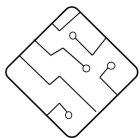


3. **Type IP Into Browser**(Google Chrome is preferred). This will link you to the RetinaEngrave v3.0 (RE3) interface. You now have full access to the software. There is no need to install or download anything. You must, however, keep a local connection, either through Wi-Fi or the Ethernet cable.

### 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 Titan 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

---

## 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 Run.
- Do Not Attempt To Enter RE3 If The Machine Is Off. It Will Not Load.

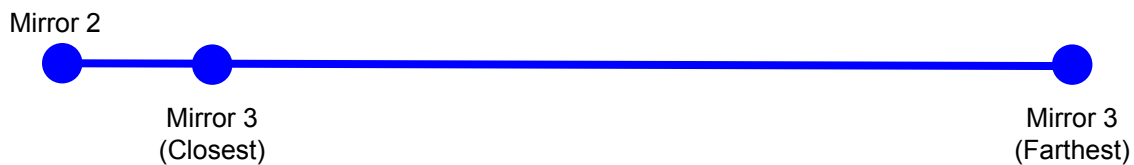
# Section VI. Laser Alignment

The laser tube that came pre-installed in your Muse Titan 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.

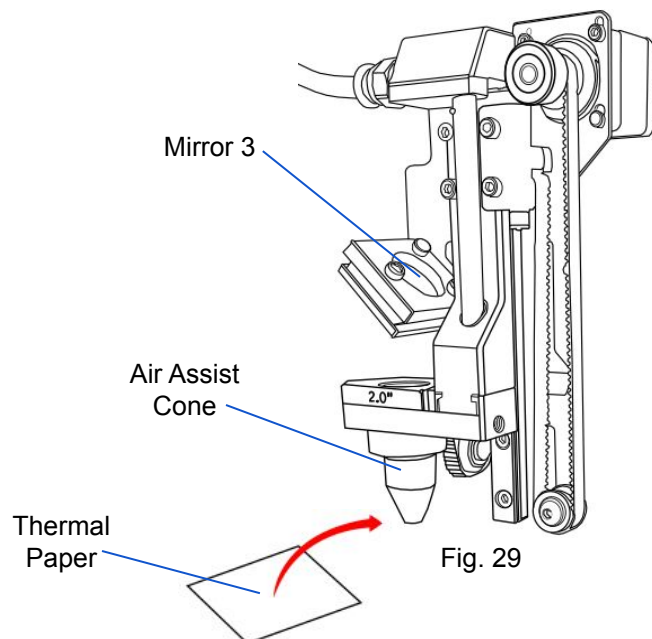


### 1. Open the Safety Lid:

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.



# 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.

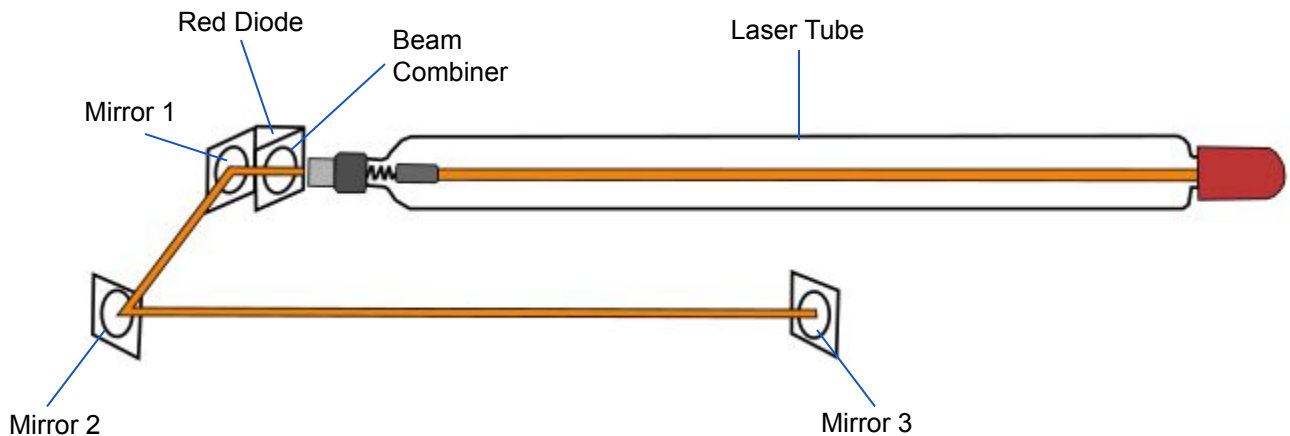


Fig. 30

# 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:**

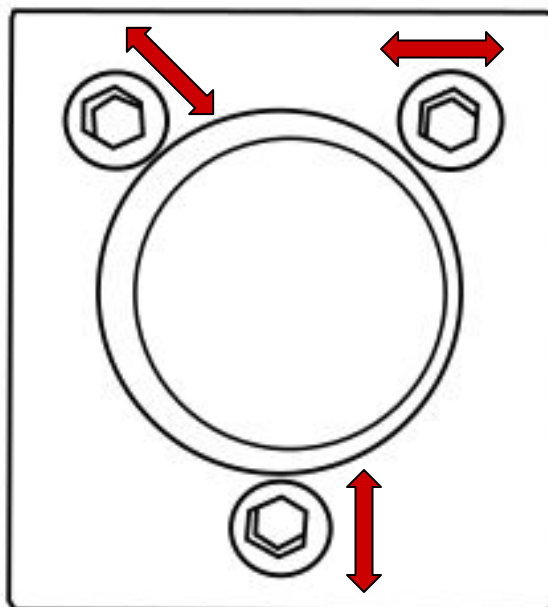
A 2.5mm hex key and thermal paper are required to perform the mirror alignment procedure.

**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.

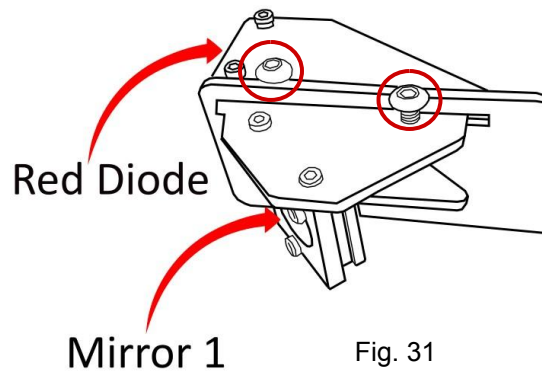


# Section VI. Mirror Alignment

## 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.



- 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.

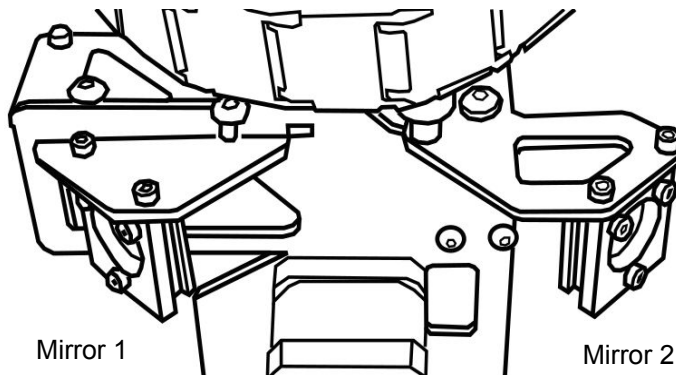


**Please Note: If You Are Having A Hard Time Reaching The Mirrors Then The Left Side Panel May Be Removed. However It Must Be Replaced Before Firing The Laser.**

# Section VI. Mirror Alignment

---

## Mirror 1 to Mirror 2:

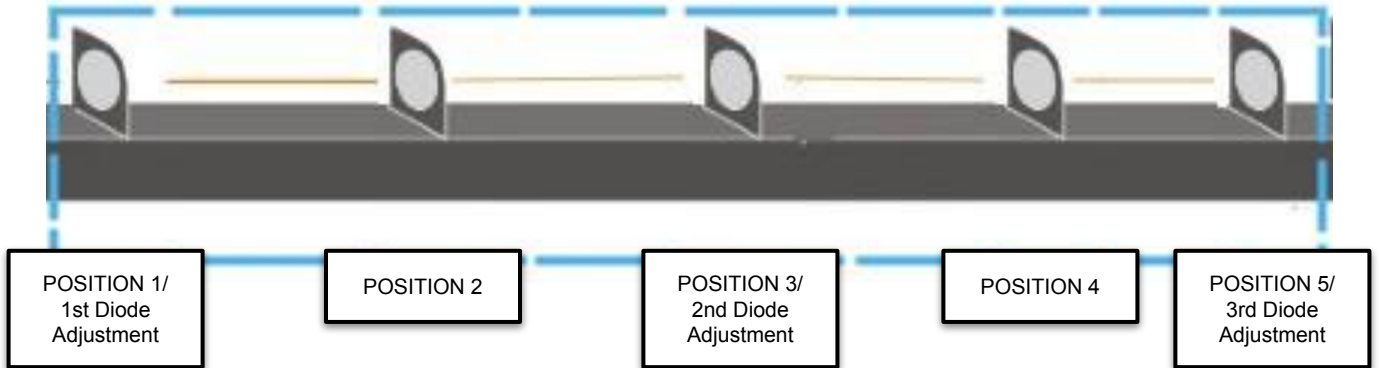


1. **Open the Safety Lid.**
2. **Place Thermal Paper:**  
Take a piece of thermal paper and place it firmly over **Mirror #2** to create a reference ring.
3. **Close Safety Lid.**
4. **Test Fire the Laser:**  
Press the Test Fire icon to create a burn mark on the thermal paper.
5. **Adjust Mirror #1:**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

# Section VI. Mirror Alignment

## Mirror 2 to Mirror 3:

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



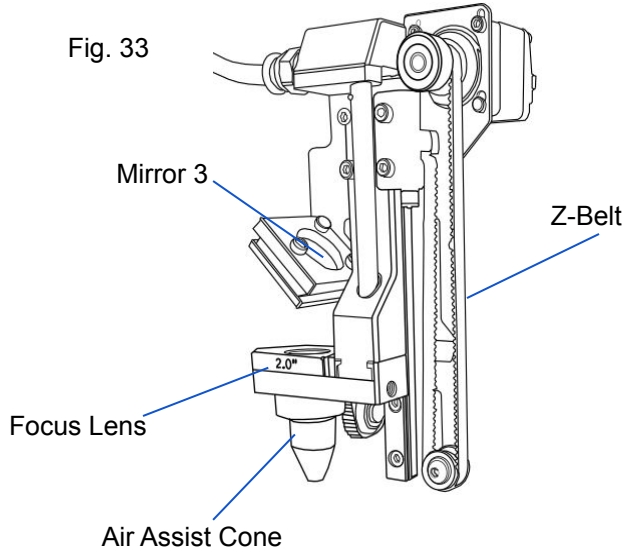
- 1. Open the Safety Lid.**
- 2. Place Thermal Paper.**  
Take a piece of thermal paper and place it firmly over **Mirror #2** to create a reference ring.
- 3. Move the Laser Head Assembly to Position 1.**
- 4. Close Safety Lid.**
- 5. Fire the Laser.**  
Press the Test Fire icon to create a burn mark 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:

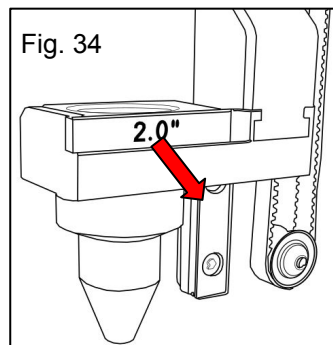
The focus lens converges the laser beam to a single point. The focus lens does not require manual focusing, however it is important to ensure that the path from mirror #3 to the focal lens is straight throughout the Z-axis.



**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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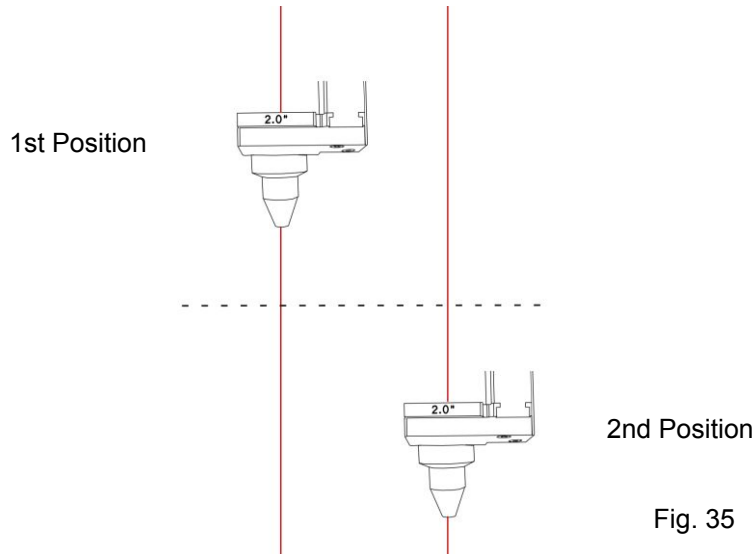


Fig. 35

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 ask seen on Fig. 35.

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

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

# Section VI. Laser Alignment

---

## 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.

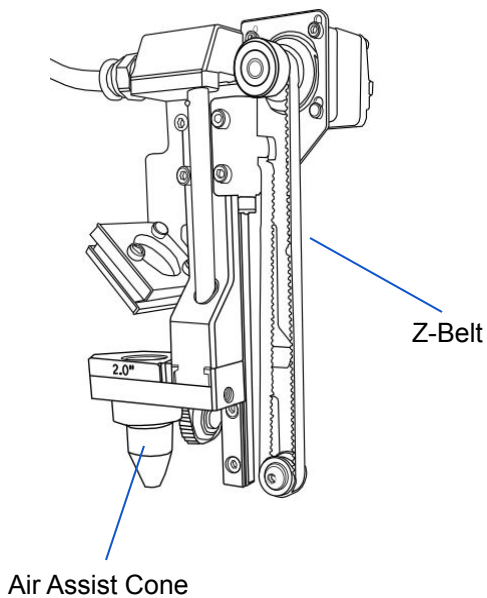
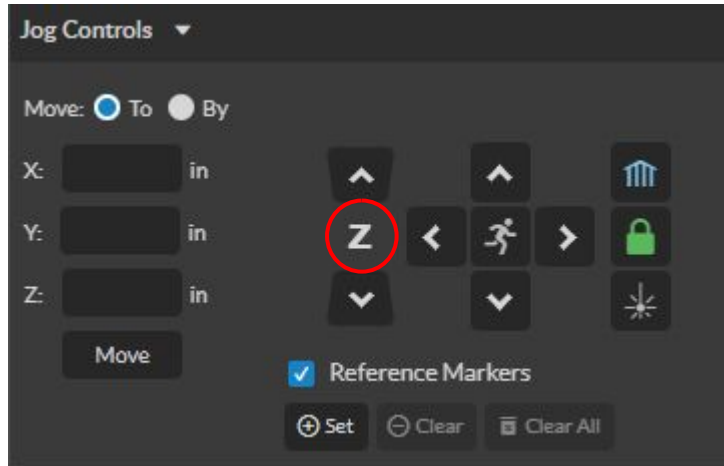
### Don'ts:

- 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. Autofocus

## Autofocusing Your Laser:

Your laser will focus automatically before each job. However it can be focused manually using the autofocus icon on the Touchscreen or by selecting the auto focus button located under the Jog Control window on RE3.



When your machine autofocuses, the z- belt will move the focus lens and air assist cone down until the cone touches the material, then retracts the distance needed to perform engraving.

Fig. 36

# Section VII. Autofocus

## Adjusting the Stallguard:

If excessive shaking or vibrations are experienced when autofocusing the machine then you may need to adjust the machine's stallguard.

What is the Stallguard?

The Stallguard is the component inside the machine that controls the amount of tension the machine will take before stopping. We want your machine to sense your material and then move to its focus distance. If the stalling value is too low then the machine will hit your material instead and may damage itself.

Stallguard Adjustment:

1. **Have Machine On.**
2. **Connect to the Setup Page:** Connect to the software's Setup page using the format: IP address/setup.  
Ex. 000.000.00.000/setup
3. **Select The Laser Tools Tab.** Once in the Setup window, locate and select the **Laser Tools** tab.
4. Locate the **Set Motor Type** section.
5. Go to the Z-axis settings and change the Autofocus Stallguard Value.

### Set Motor Type

Changing these settings will restart the server and the laser head will re-home.

Speed %:

100



SET X 0.9 STEP ANGLE

SET Y 0.9 STEP ANGLE AND X 1.8

SET X AND Y TO 0.9 STEP ANGLE

SET X AND Y TO 1.8 STEP ANGLE

RESTORE DEFAULT

### Z-Axis

Homing Stallguard Value (0-255):

21



Autofocus Stallguard Value (0-255):

21



Homing Current (0-2):

1.2



Autofocus Current (0-2):

1.2



SAVE VALUES

# Section VII. Autofocus

---

## Section Review:

### Do's:

- Autofocusing can be done from your Touchscreen and from RE3.
- If your machine experiences excessive shaking or vibration, then adjust the stall guard value on the Setup page.

### Don'ts:

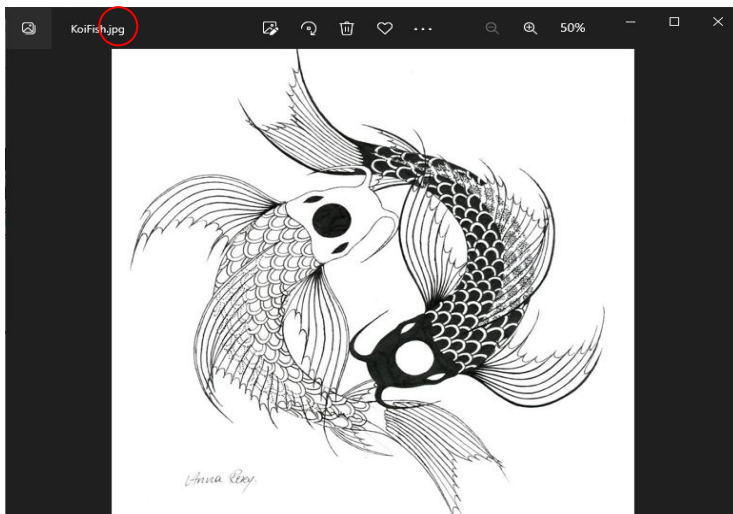
- Do Not Attempt To Connect To The Setup Page If The Machine Is Off.

# Section. VIII Operations

This section will guide you through using your Muse Titan. 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:

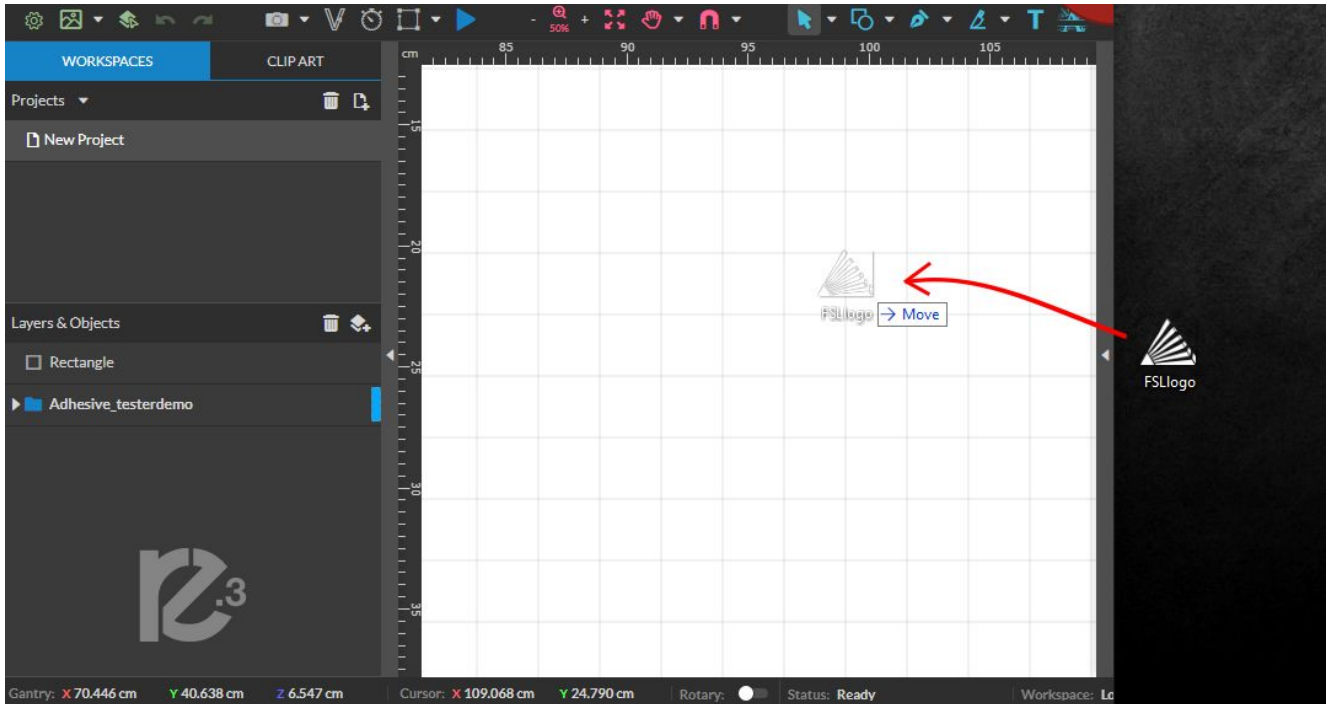
1. **Line thickness-** When designing an image for RE3 the lines in the drawing should be a decent thickness. If the lines are too thin, then RE3 will have trouble reading them.
2. **Coloring-** When importing an image it is important to keep in mind the lasers function in two ways: on and off. The laser 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

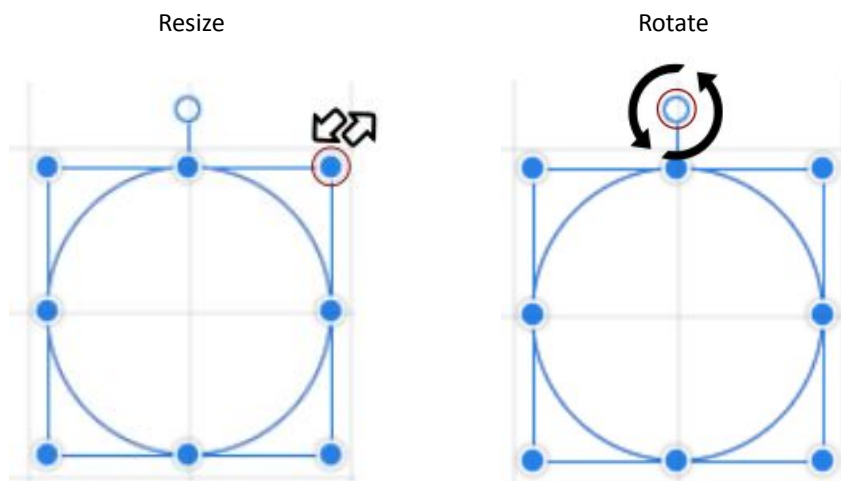
## Mouse Controls:

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.

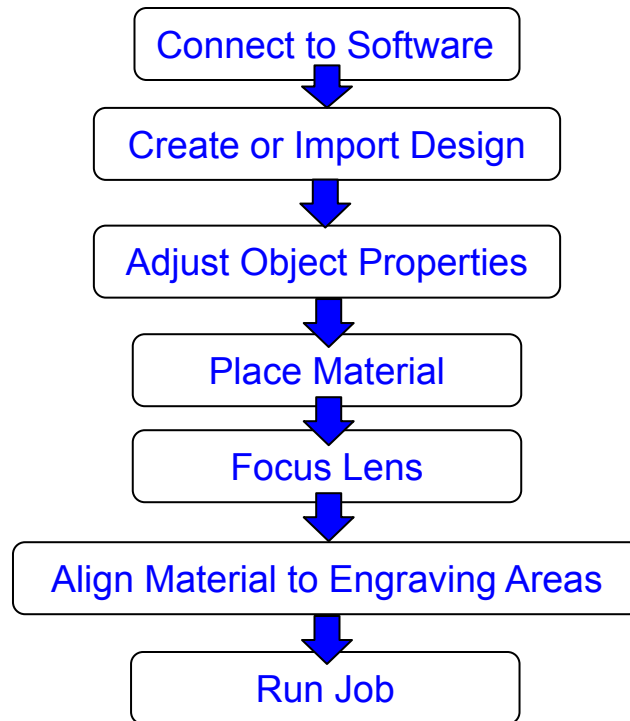
### Don'ts:

- Do Not Use Thin Lines When Making A Design As It Could Get Cut.

# Section. IX Retina Engrave V3

## Starting on RE3

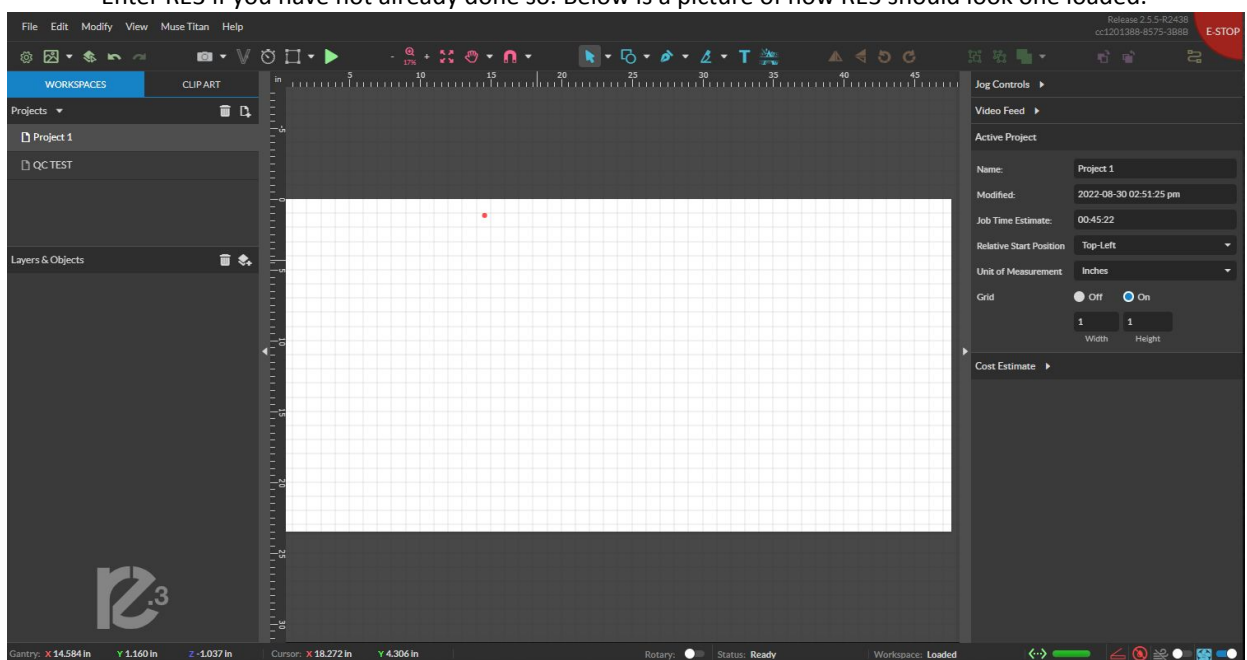
Using your new machine for the first time can seem intimidating but we've worked to make this guide as clear as possible regarding our software. We have broken down the entire process into 7 steps.



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.



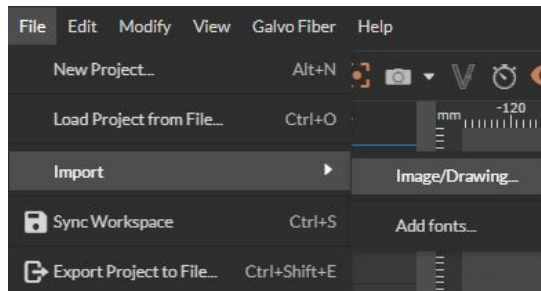
# Section. IX Retina Engrave V3

## 2. Import Design

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

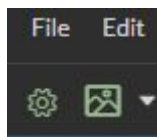
It can be placed into RE3 using three methods:

-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).

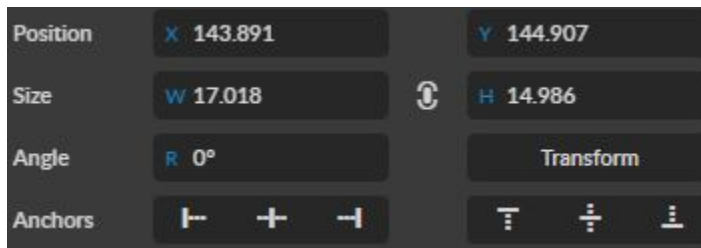
-It can be placed using the photo icon.



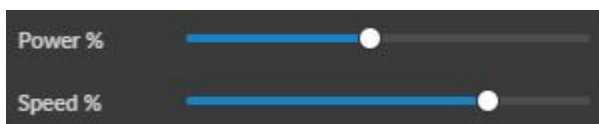
The Arrow next to the photo icon is for selecting the properties you wish to import. If you wish to be asked when importing the image, then do not save any setting.

## 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 Titan will auto focus before each project. If you wish to focus beforehand the Titan comes with an autofocus feature in RE3 and on the touchscreen

**NOTE: The focus distance number set in the RE3 interface is machine relative. It signifies a distance away relative to home, not a distance away from the part.**

## 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.

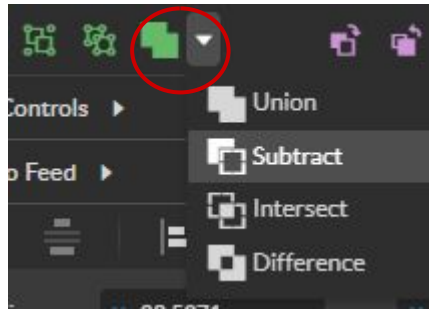
Once completed, wipe your part clean of any dust or residue resulting from the engraving process

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

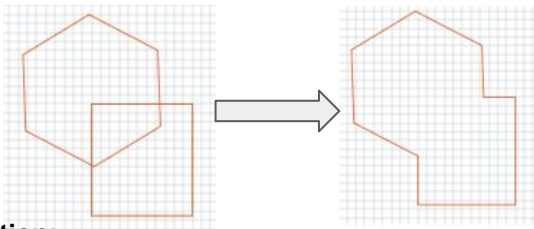
Here is some other information that will be useful when performing your first jobs on RE3.

## Creating and Manipulating Compound Shapes & Objects

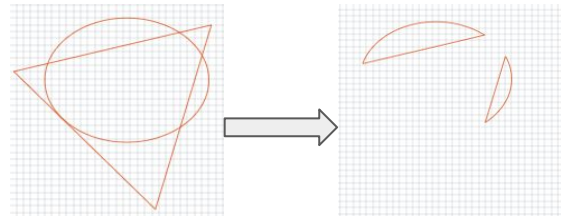


These functions are available in the Grouping section of the toolbar (see above). Compound Shapes & Objects Operators can combine and modify shapes and objects to create unique compound shapes and objects with these functions:

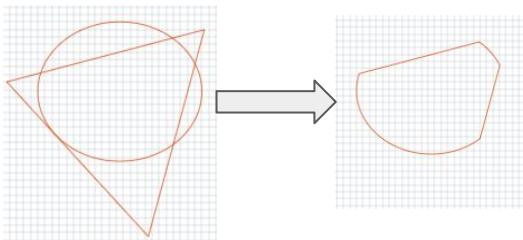
### Union:



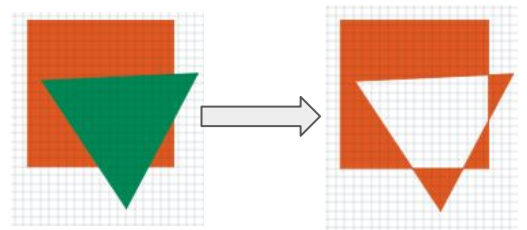
### Subtract:



### 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 .

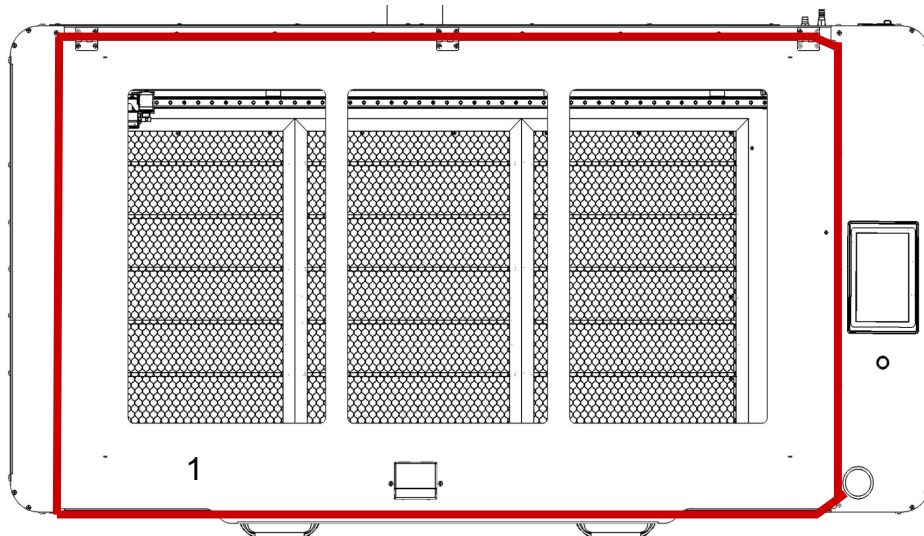
**Note: Different materials may not need to perform multiple passes. It depends on user preference if an image should be engraved multiple times or not.**

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

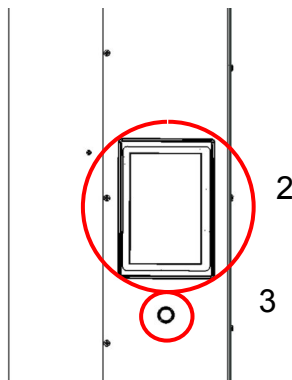
## Stopping the Laser

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 Titan's access lid is installed with a device that automatically cuts off the laser if opened. If the machine ever fails to shut off the laser when the safety lid is open, immediately unplug the machine and contact customer service.



### 2. Touchscreen Stop/Pause Button:

When a project is being done the touchscreen will enter the project status window. There we can pause or stop the laser. Stopping the job will mean that selecting Play will start the project from the beginning.

### 3. Pause Button: The Titan V2 comes with a pause button located right under the Touch Screen.

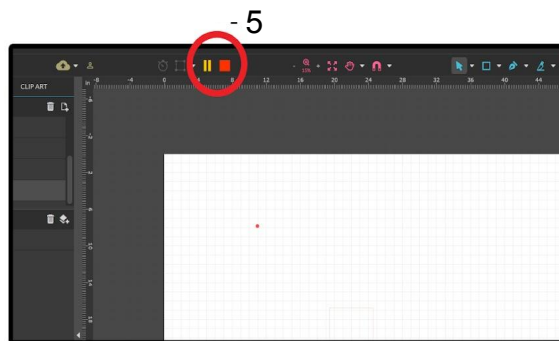
# Section. IX Retina Engrave V3



4

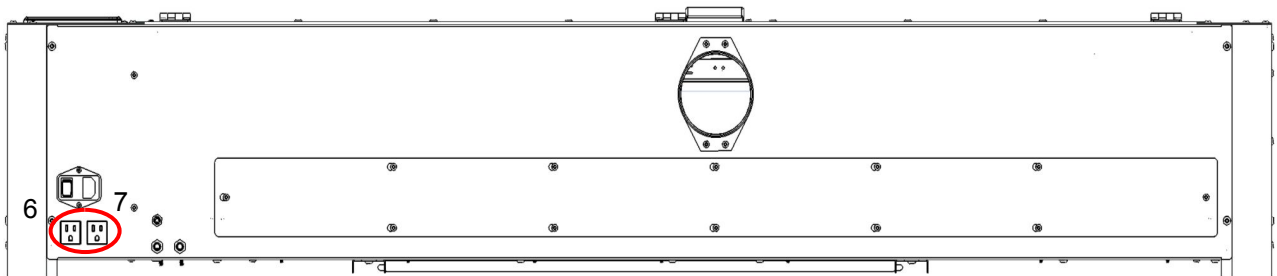
- E-Stop:** In the lower left corner for the touch screen is an “Emergency” stop button (E-Stop). Pushing this button will instantly cut power to the laser.

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



- 5

- RE3 Stop/Pause Button:** If near your computer, the Pause Button on RE3 (found where the Play button was) can halt the laser. This may take a second to process, so it is not recommended.



- Power Switch:** Flipping the power switch to the off position instantly cuts power from the entire machine.
- Unplug Power:** As a last resort, users can unplug the power cord of the Muse Titan 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 and/or Camera Capture options 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. Camera Functions



Inside your Muse Titan you will find an Intel RealSense 3D camera. This camera uses multiple cameras simultaneously to create a 3D map of your workspace to get the most accurate data for your laser projects. Saving time and money on materials with the 3D camera system is a major benefit. Also the 3D camera allows you to do cool things like our trace feature in RE3. To learn more take a look at our software section.

Fig. 38

The 3D camera is mounted on the lid of your Muse Titan. When the lid is open the camera can capture your workspace for easy alignment and when the lid is down the camera will watch your projects as they are cut.

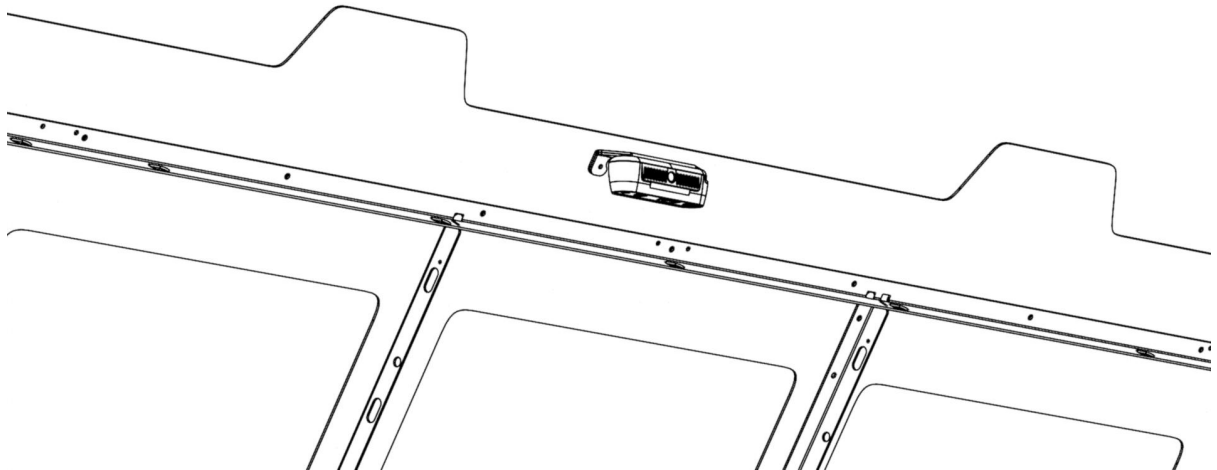


Fig. 39

## Camera Capture:

1. Place material in the laser bed.
2. Open the Lid.
3. Select the Camera Icon on RE3 or from the touchscreen. The workspace will be captured.



The Workspace can be cleared using the arrow.

4. Align design to material. Run perimeter to double check your position.
5. You can now adjust your settings to run your job.

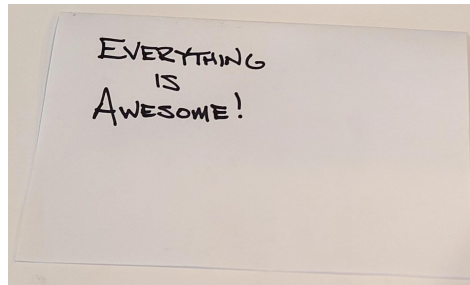
# Section X. Camera Functions

Our Muse 3D and Muse Titan come with a Vector Tracing feature that allows the user to create their own engraving using an image drawn by hand and uploaded into RE3 to save for future works.

1. Prepare the material you want to use. Flat objects work best. We recommend placing masking tape on the surface before marking with a pen or sharpie or making the design on paper for better visibility.

**Note: Don't allow the masking tape to overlay on the material when applying more than one strip.**

2. Draw your design with thick solid lines to ensure a proper reading. If coloring in an area, ensure it is completely filled in.



3. Capture the workspace. (Refer to Camera Capture.)

**Note: Lid must be open on the Titan (closed for the 3D) for camera to run.**

4. Then, select the "Vectorize" icon and create a box over the item you wish to capture.

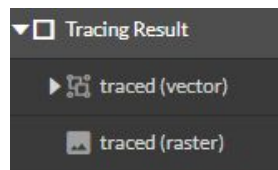


**Note: If there is difficulty capturing the area, place a white piece of paper behind your design.**

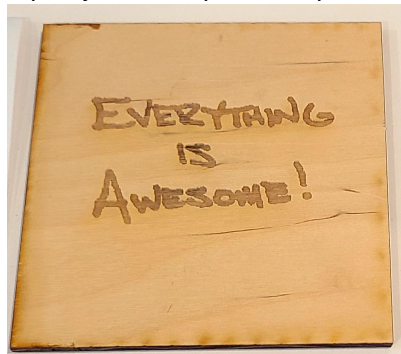
5. RE3 will trace the image.

**Note that the image cannot be moved from the captured area. Items you wish to cut or engrave must be placed within the captured area for the job to be done.**

6. You will now have the Raster and Vector data for your object available in the Layers & Object window. Remember the raster data is for engraving, while the vector data is for cutting. If you will not be using one of them we recommend deleting it.



You can now adjust your setting to run your job as many times as you wish.



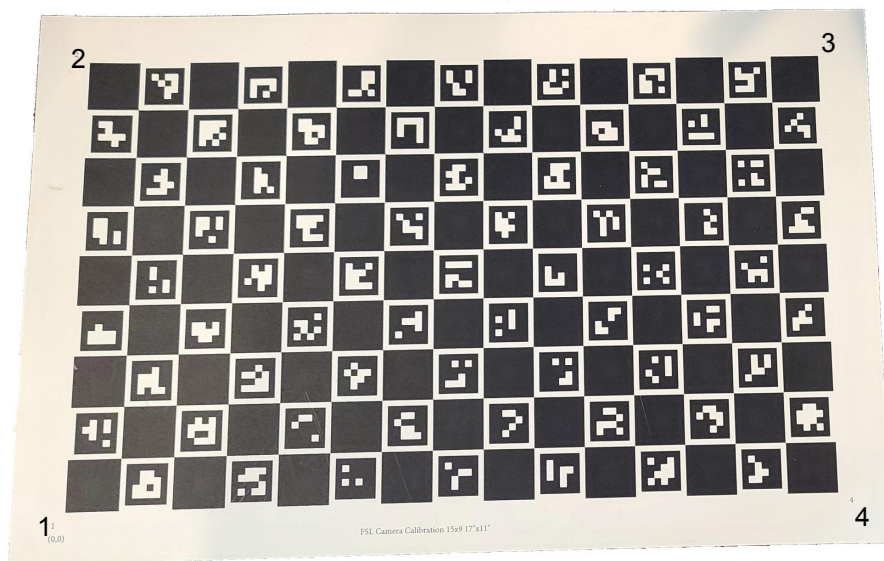
# Section X. Camera Functions

Keep your camera clean and functioning at peak performance: Just like with mirrors, you will need to clean the camera lens periodically. Use optic lens wipes to gently clean the camera lens as needed. It may be necessary to correct the camera offset if the camera is bumped or jostled. Follow the “ Camera Calibration” instructions below.

## Camera Calibration

Muse Titan can detect the height and position of the material using the camera feature. It is possible, however, that the height and positional accuracy of the calibration can be jarred out of alignment. To check calibration, follow these instructions:

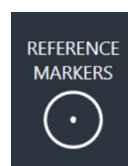
- 1. Power on Machine:** Power on your Muse unit and verify all the connections.
- 2. Prepare the Calibration Paper.** The Titan comes with an 8 x 12 calibration paper. If not found the paper can be printed from the Setup page.



- 3. Set the Calibration Paper.** Place the Calibration paper in the center of the workspace. Note the number 1-4 on each corner they correspond to the reference marks we will make for the Camera Calibration.
- 4. Autofocus to Calibration Paper.** We recommend autofocusing the machine to get the appropriate engraving height.

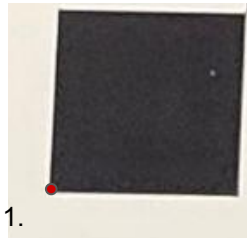
**Please Note:** The paper may need to be secured. Make sure that the tags are not covered to ensure proper calibration.

- 5. Select the Reference Marker Icon.** The icon is located in the Home tab next to the gantry control.



# Section X. Camera Functions

6. **Set the Reference Marks.** Go to the first corner marked **1** and adjust your laser head until the beam is resting at the very corner of the grid. Select **Set Marker** and then proceed to the other corners in order.



7. **Connect to the Setup Page:** Connect to the software's Setup page using the format: IP address/setup.  
Ex. 000.000.00.000/setup
8. **Select The Laser Tools Tab.** Once in the Setup window, locate and select the **Laser Tools** tab.
9. Locate the **Stationary Camera Calibration** section.
10. **Run the Camera Calibration.** Select the Camera Calibration button.

## Stationary Camera Calibration

Print out one of the patterns linked below at 100% scale (it must be the correct size), and place the pattern near the center of the laser's work area. Be sure to enter the correct columns & rows below.

Using RE designer, jog the laser until the red dot is pointing to the bottom-left corner of the pattern marked (1), making sure that the red dot is focused into a narrow beam and exactly over the corner. Press the (m) keyboard key to add reference marker here. Jog to corner (2) which is CW and press the (m) key to create another reference marker. Repeat for corner (3) and (4). After you have marked the 4 corners in the order (1) (2) (3) (4), press the Run Camera Calibration Button.

[SMALL TAG PATTERN DOWNLOAD \(9 COLS X 7 ROWS\)](#)

[LARGE TAG PATTERN DOWNLOAD \(15 COLS X 9 ROWS\)](#)

Pattern Details

Columns Across: 9

Rows Down: 7

**RUN CAMERA CALIBRATION**

CANCEL

**You will know the camera is calibrated when the red diode turns off. The laser head will touch marker 4 and then retract. Then, the gantry will move to take a new camera capture which will display under the calibration page.**

11. **Check Results.** Below the camera capture the results of the test will be displayed.  
If an error occurs, check the camera cable and try again.  
If it's successful then exit the Setup Page and re-enter the RE3 designer.

# Section X. Camera Functions

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## Checking Calibration:

We want to make sure that the calibration was successful by moving our laser to a specific point on the workspace.

1. **Autofocus to the Calibration Paper.**
2. **Perform a New Camera Capture.**
3. **Zoom in to a spot on RE3.** We recommend the corner of one of the tags on the page.
4. **Home the Laser to Selected spot.** Once a spot is chosen use **Ctrl/Command+Left Click** on the spot to home the laser. It should land exactly over it.

If the laser is off slightly then redo the calibration.

You can now use your Camera Capture on your Titan.

# Section X. Camera Functions

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## Section Review:

### Do's:

- Remember the camera capture can only be done when the Lid is open.
- The Camera Calibration must be done with the Calibration paper.
- Vector tracing can only be done after the workspace has been captured with your image.

### Don'ts:

- Do Not Run The Camera Calibration If The Calibration Paper Is Damaged.
- Do Not Run The Camera Calibration If The Calibration Paper Is Not Flat On The Workspace.
- Do Not Attempt Vector Tracing With Small Pictures or With Thin Lines As The Machine Will Have Difficulty Reading Them.

# Section XI. Maintenance

## Replacing the Laser Tube

This section details how to replace the laser tube on your Muse Titan. Although it should last for hundreds of project 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

- 75W/90W/100W Replacement Tube
- 2.5 mm and 3mm Hex Wrench (included with accessories)
- Water Bucket

### Removing Procedure:

1. **Power Off Machine:** Power off and unplug your unit. Wait at least 1 hour for capacitors to discharge.
2. **Go to the Back of the Tube Shelf.** Locate and remove the screws holding the back panel in place.

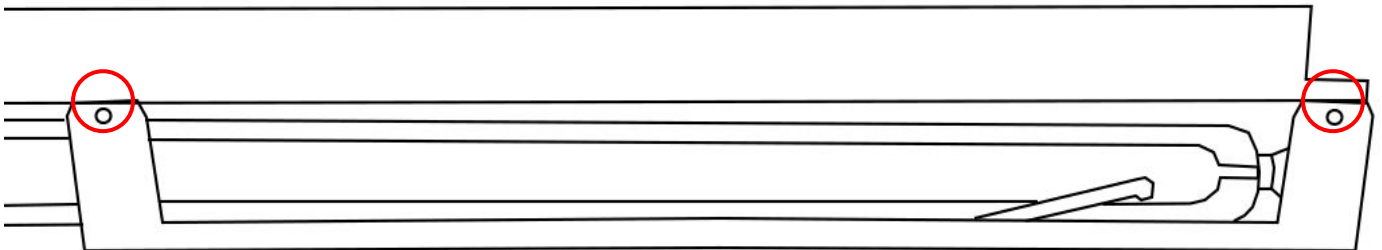


Fig. 40

3. **Fold Down The Back Panel:** Carefully push the panel downwards to gain access to the tube.

**Please Note:** The back panel is made to bend, however excessive bending may cause the hinges to fail.

4. **Locate the Mounting Screws.** The laser tube is mounted onto the Tube Shelf using 4 screws located behind the gantry.

Find the first screw.

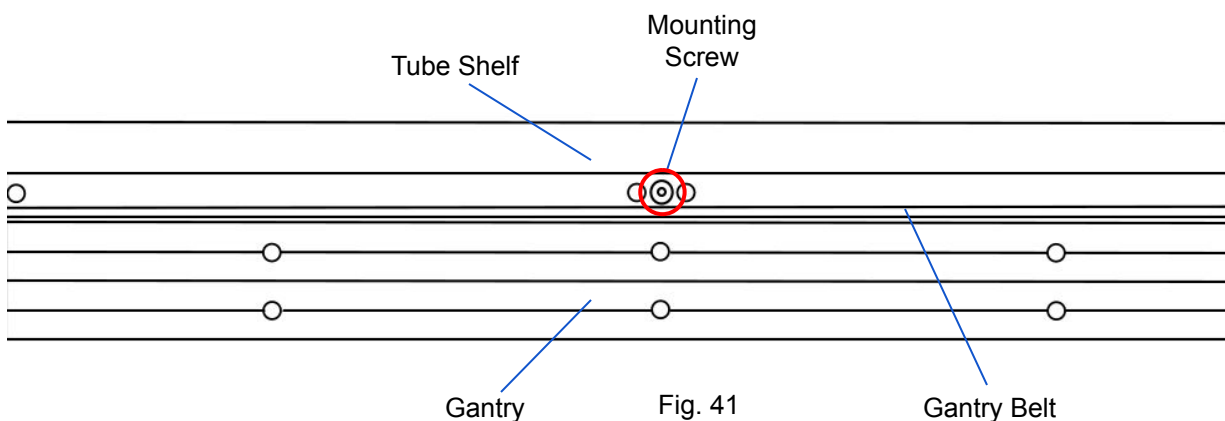


Fig. 41



# Section XI. Maintenance

Upon locating the first screw, look down and the second screw will be directly below the first. Find the third and fourth screws the same way.

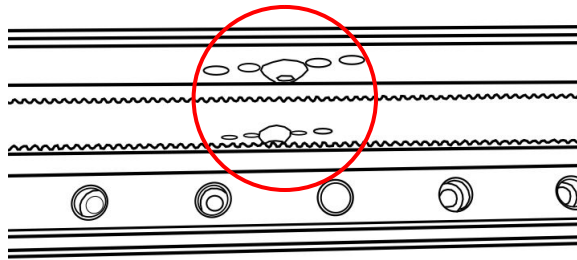


Fig. 42

5. **Remove The Four Screws:** Use the 3mm Hex key to remove the four M5 bolts that hold the tube. Have another person hold the tube when removing the bolts so it does not fall. Remove the tube and set it down on the workspace.
6. **Remove the Grounding Wire:** Remove the green grounding wire from the upper right corner of the tube shelf.

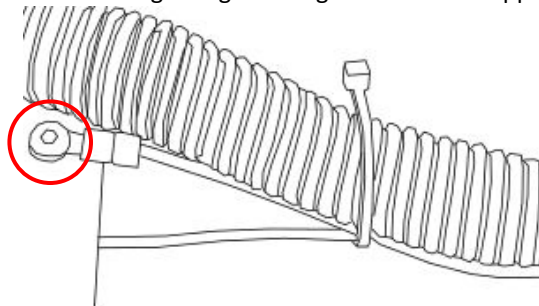


Fig. 43

7. **Disconnect Blue Voltage Wire:** Use a screwdriver to remove the blue voltage wire from the uncapped end of the tube, located on the left side of the tube shelf.

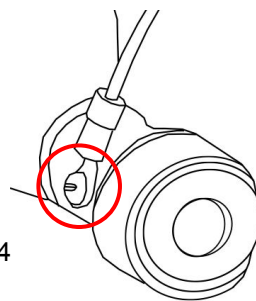


Fig. 44

8. **Remove the red cap from the other end.**

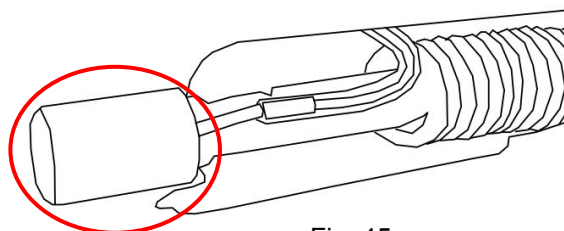


Fig. 45

# Section XI. Maintenance

9. Remove the last voltage wire.

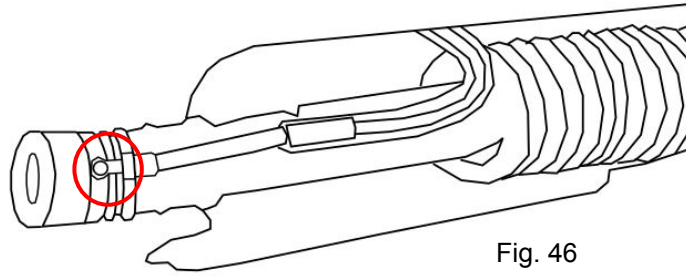


Fig. 46

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

**Remember which tubes correspond to each connector for later. We recommend taking a picture or labeling the tubes and connectors if needed.**

11. **Remove the Laser Tube.** Take the provided hex key to remove the screws on top of each bracket to release the tube. Be careful when lifting the tube from the enclosure.
12. **Dispose of the Old Tube.** The laser tube requires no special disposal. It can be tossed in the trash or recycled.

## Setting Up The New Tube:

1. **Attach the Tube to the bracket.**
2. **Connect the Water Tubes.**
3. **Take Off the Red Cap.**

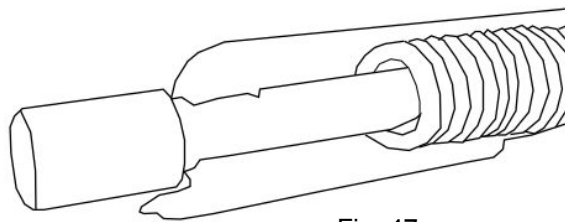


Fig. 47

4. Attach the first voltage wire to the laser tube.

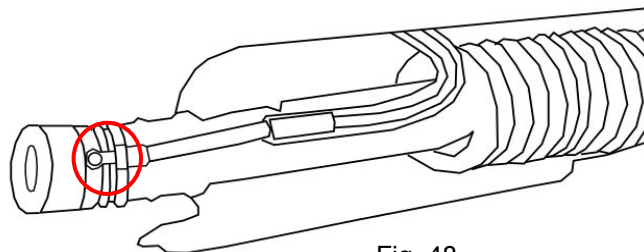


Fig. 48

5. Replace the Cap.

# Section XI. Maintenance

6. **Connect Blue Voltage Wire:** Use a screwdriver to connect the blue voltage wire from the uncapped end of the tube, located on the left side of the tube shelf.

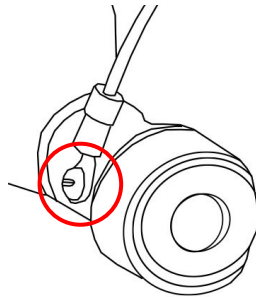


Fig. 49

7. **Attach the Grounding Wire:** Attach the green grounding wire from the upper right corner of the tube shelf.

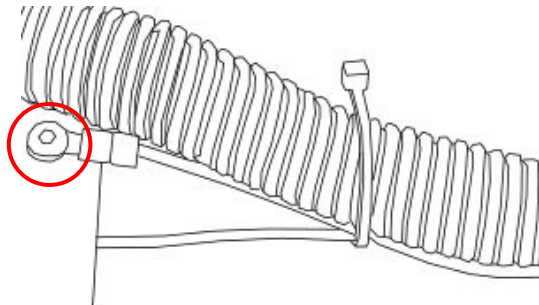


Fig. 50

8. **Attach The Four Mounting Screws:** Attach the four M5 bolts to secure the new laser tube.
9. **Fold The Back Panel:** Carefully push the panel upwards to close the access.
10. **Secure The Back Panel:** Re-attach the back panel screws.

Your laser tube replacement is complete. When a new tube is installed, check the laser tube's alignment before use. If the alignment test is successful, then your tube is ready for use. If not perform the mirror alignment.

## 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.
- When remounting tube onto shelf, make sure the wires are not getting pinched, as this may damage them and make installation difficult.

# Section XI. Maintenance

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## 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 Installation Instructions:

#### Side Belts:

- 1. Power Off Machine:** Wait at least 1 hour for capacitors to discharge.
- 2. Remove the Retaining Screws:** Unscrew the M4 screws on the belt so that the belt can be removed and discarded. We recommended removing one side at a time.

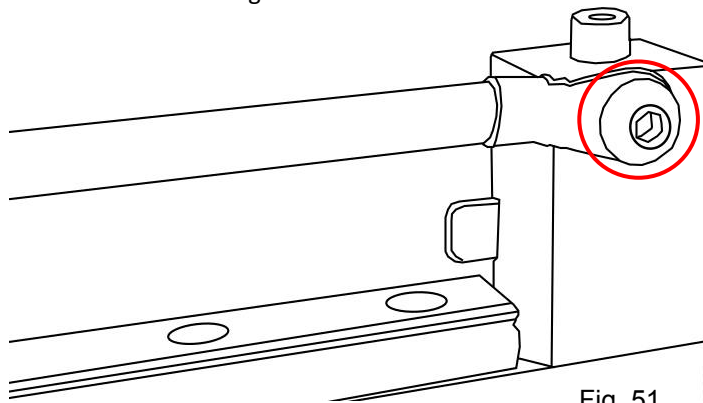


Fig. 51

- 3. Remove the Belt.**
- 4. Mount The New Belt:** Attach the new belt to the same location making sure the M4 screws slides into the gantry.
- 5. Tighten Screws:** Once both ends are in place tighten the screws to secure and retain the belt.

# Section XI. Maintenance

## Belt Replacement (Continue):

### Gantry Belt:

1. **Power Off Machine:** Wait at least 1 hour for capacitors to discharge.
2. **Locate Belt Retaining Screws:** The screws for the gantry belt are located behind the laser head assembly. (see below)

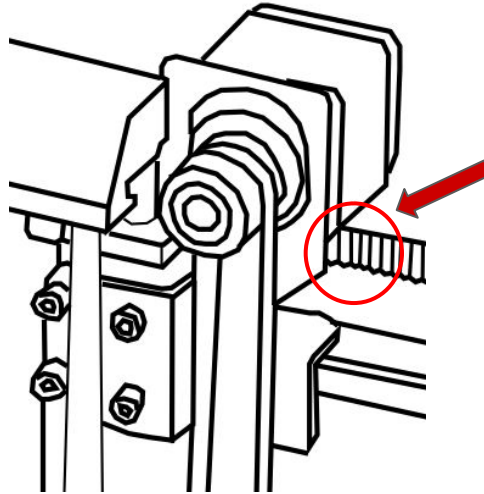


Fig. 52

3. **Loosen Retaining Screws:** Remove the M4 retaining screws and washers so that the old belt can be removed and discarded.

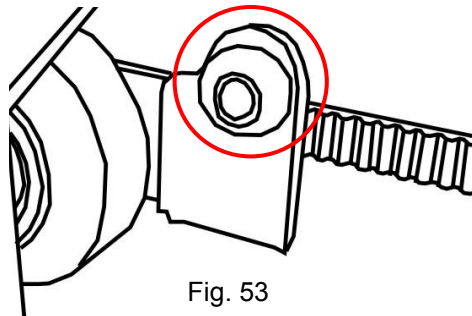
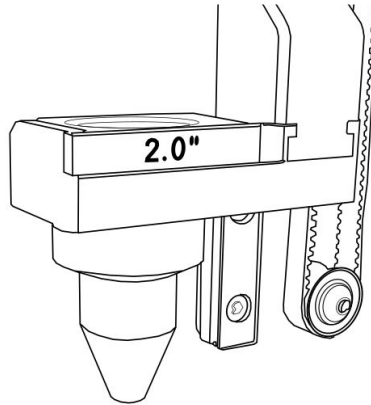


Fig. 53

4. **Mount The New Belt:** Run each end of the new belt through the mounting slot.
5. **Tighten Screws:** Once both ends are in place tighten the screws to secure and retain the belt.
6. **Loosen the motor on the mount:** Once the belt has been installed on the rail, loop over the drive motor and pull the belt then re-tighten the bolts.
7. **Tension the belt:** Pull on the motor on the mount with your hand. Moderate to strong force is recommended, then re-tighten the bolts. If the motors do not jog, verify that the motors are connected to the control card.

# Section XI. Maintenance

## Changing Lens & Air Assist Cones:



### Removing Lens and Air Assist Cone:

The Titan comes with the 2.0" lens and 2" air assist cone by default. If you purchase another lens to use, then both the lens and air assist cone need to be replaced. If you have not purchased the corresponding cone make sure to do so before attempting to replace the lens or else risk damage to the machine.

1. **Remove the lens.** The lens can be removed by prodding the lens forward. A clicking sound can be heard indicating the lens can now be slid out of its position.

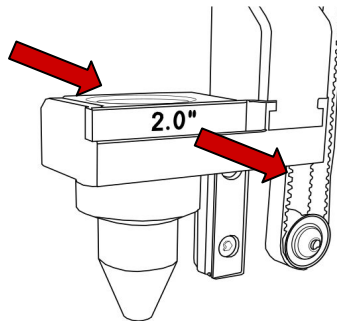


Fig. 54

2. **Remove the air assist cone.** The 2" air assist cone can be removed simply by twisting the cone counter-clockwise to unscrew it.

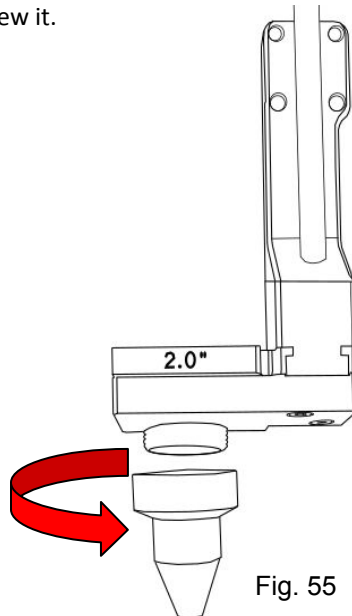


Fig. 55

# Section XI. Maintenance

## Installing the New Lens and Air Assist Cone:

1. **Insert the New Lens.** Slide the new lens into the mount until it clicks into place.

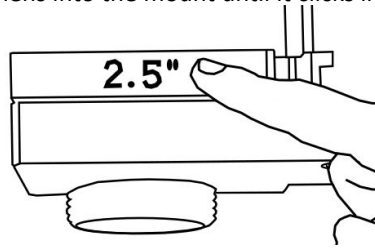


Fig. 56

2. **Install the set screw.** Thread the M3 screw into the air assist cone and tighten.

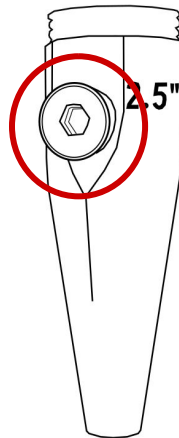


Fig. 57

3. **Install the cone.** Insert the Cone into the air assist cone mount, then tighten the set screw in place using the provided hex key.

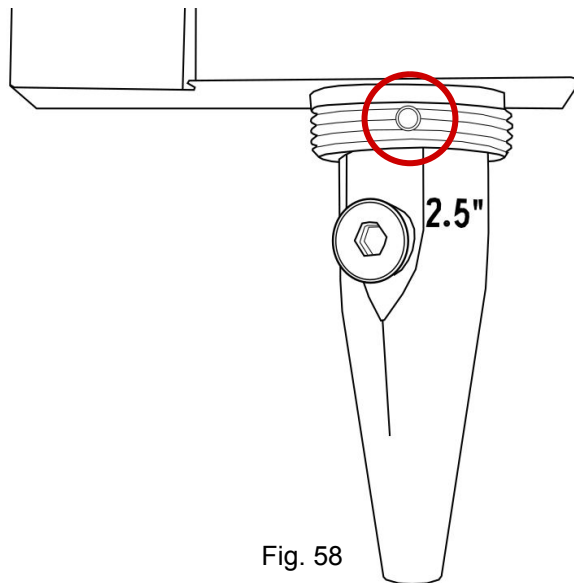


Fig. 58

Please Note: This replacement method is for 1.5", 2.5", and 5" lenses.

# Section XI. Maintenance

## Limit Sensor Replacement:

Your Gantry stops before it hits the walls of your machine. That is thanks to the limit sensors located inside your machine. If your machine tries to move past its movement limits or bumps into the walls, you may need to replace the limit sensor.

### X-axis Limit Sensor:

The X-axis Limit sensor is located on the gantry at the right corner of the machine.

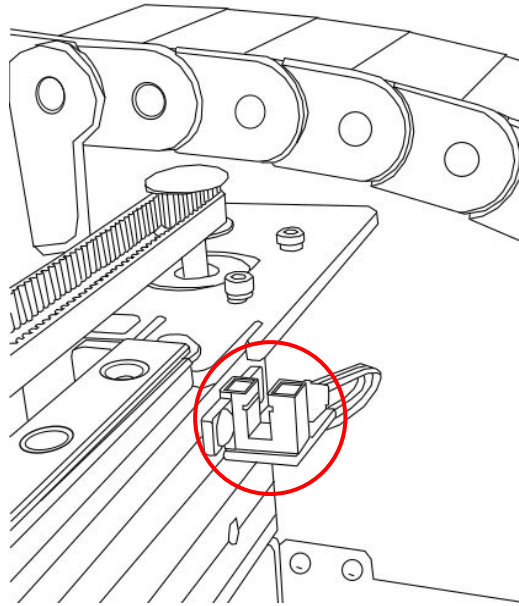


Fig. 59

### Y-axis Limit Sensor:

The Y-axis has two limit sensors:

One located on the gantry near the rails, while the other is located on the on the belt block.

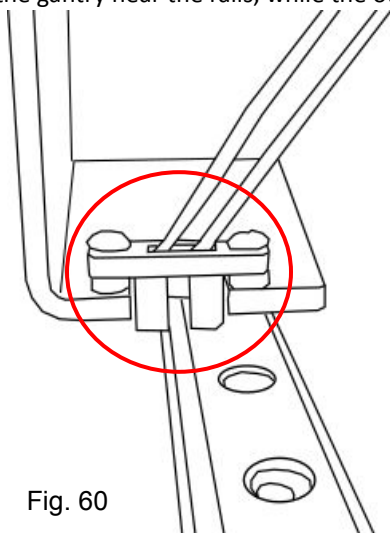


Fig. 60

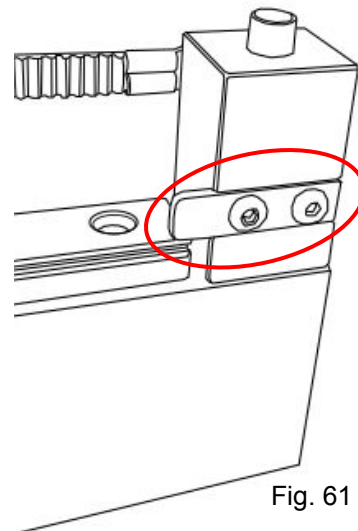


Fig. 61

The limit sensors can be changed by removing the m3 screws. Make sure to remove any connected cables before replacing the sensors.



# Section XI. 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 XI. Maintenance

---

## 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.
- If your machine tries to move past its movement limit or bumps into the walls, you may need to replace the limit sensor.

### Don'ts:

- When Cleaning The Lens Or Mirrors Do Not Use Lens Wipes That Are Not Optic Grade.
- Do Not Perform The Laser Tube Replacement With The Machine On.
- Do Not Perform Any Jobs If Your Machine Is Trying to Exceed Its Movement Limits.

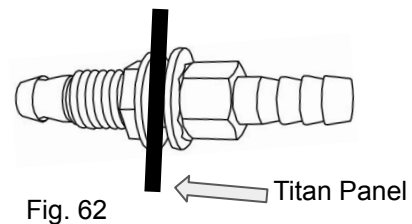
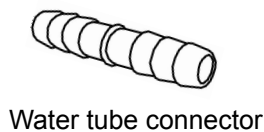
# Section X. Optional Add-ons

## Water Rerouting Instructions:

If you have purchased the optional Water Chiller with your Titan, then it will already come re-routed. This part is only for customers who are buying their chiller separately or wish to convert back to the previous wiring.

For Chiller SetUp Proceed to pg. 72.

1. An additional water tube (Water Tube 3), a water tube connector and two water fitting assemblies will be provided. The fittings need to be installed into the holes located below the Air Control (see Fig. 62).



2. Remove the Titan's right side panel.
3. Locate the water reservoir and its connected tubing. (See Fig. 63)

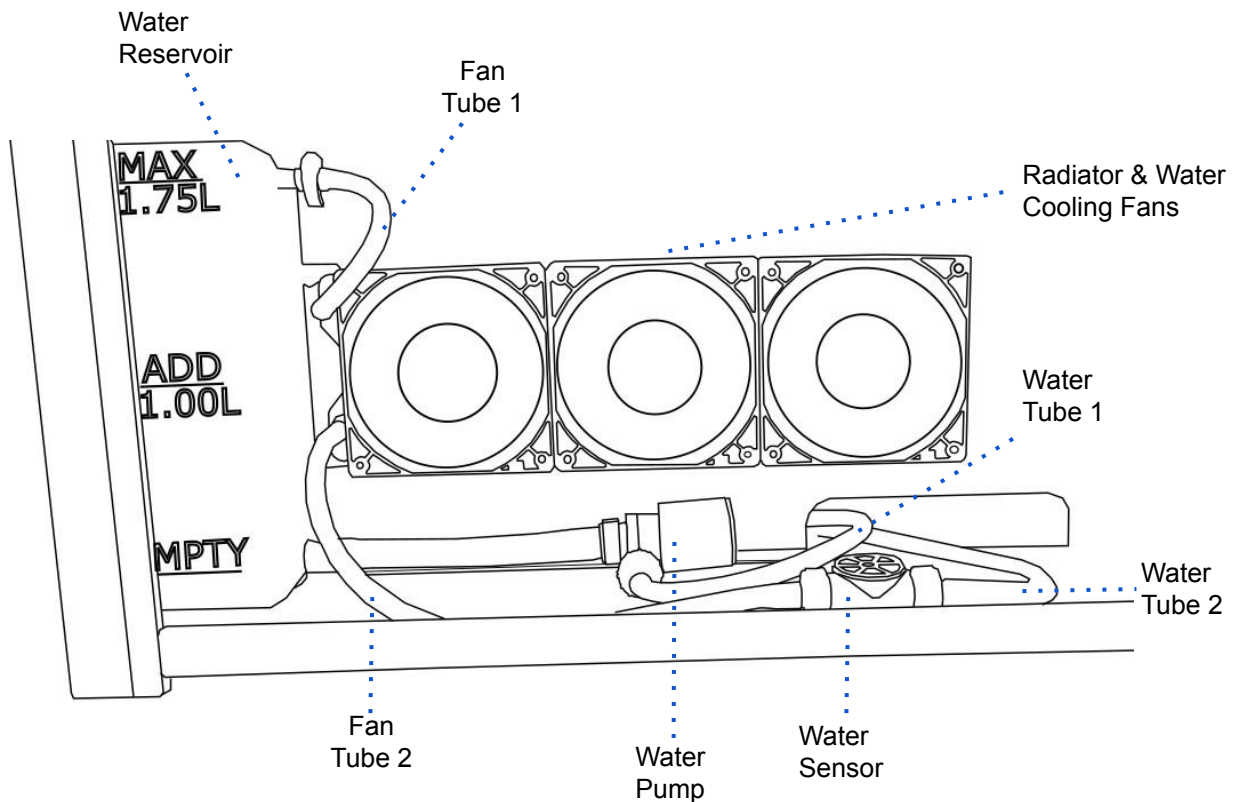
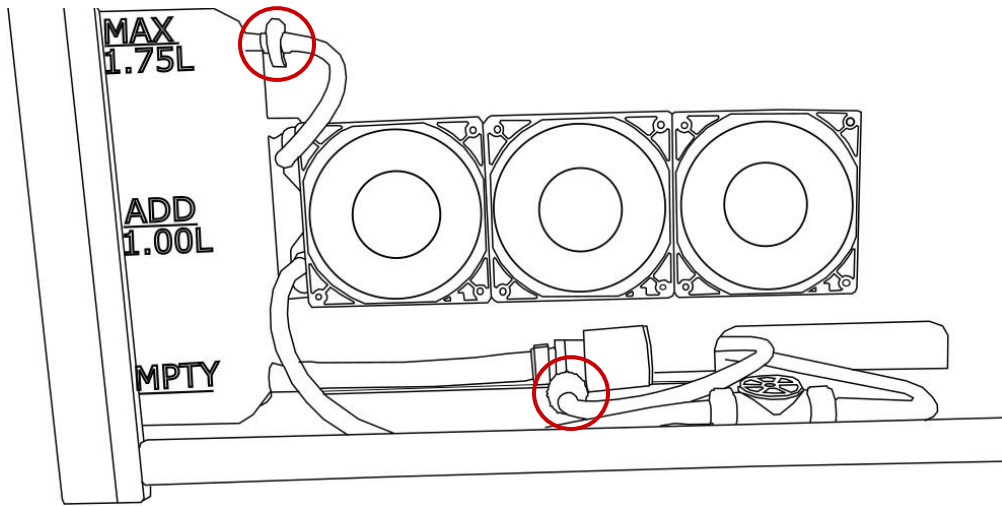


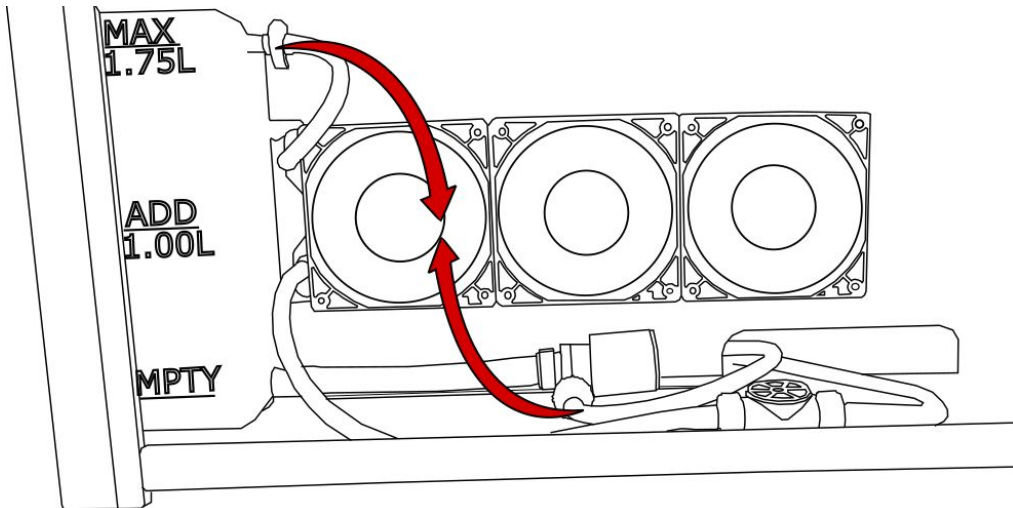
Fig. 63

# Section X. Optional Add-ons

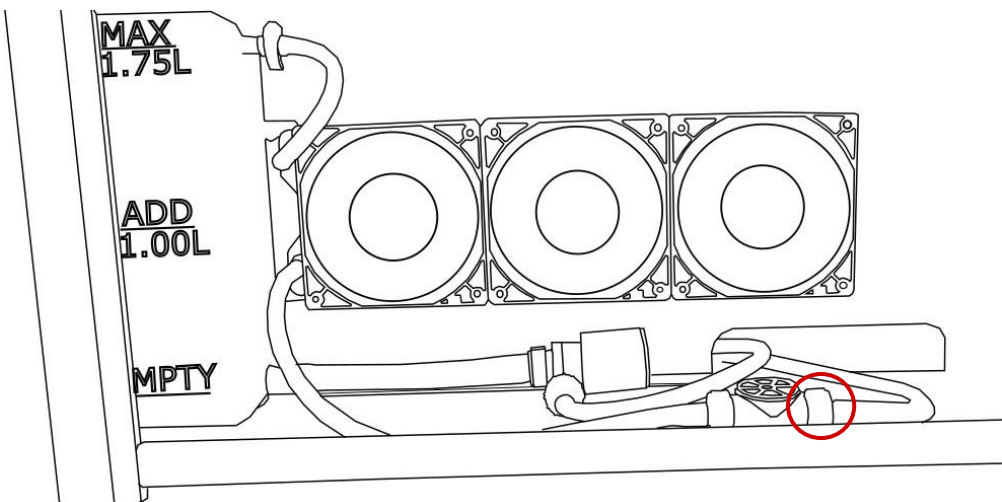
4. Disconnect Fan Tube 1 from the Water Reservoir and Water Tube 1 from the Water Pump.



5. Connect both tubes using the water tube connector.

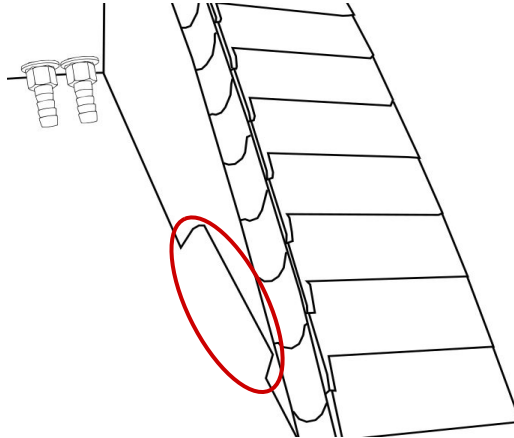


6. Disconnect Water Tube 2 from the Water Sensor

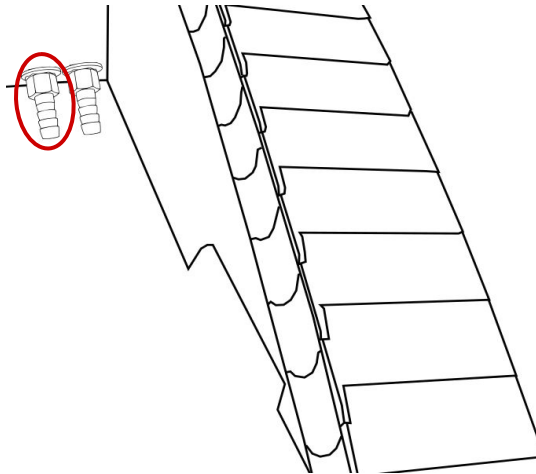


# Section X. Optional Add-ons

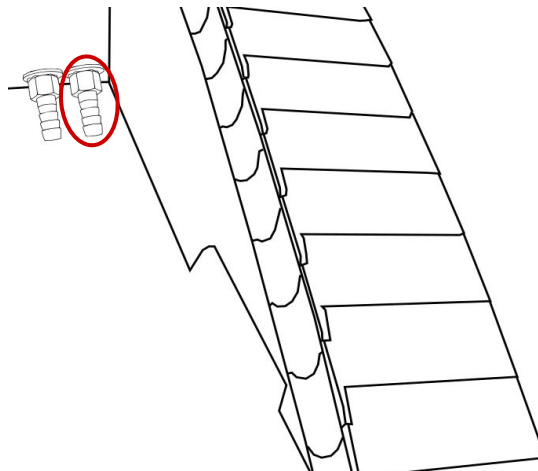
7. Run Water Tube 2 through the cable opening and into the other side.



8. Connect Water Tube 2 to the water inlet.



9. Connect Water Tube 3 to the water outlet and run through the hole.



10. Connect the other end of tube to the Water Sensor.

The Re-routing is done. The machine can now be connected to an external chiller. To convert the machine back run through steps 10- 4.

# Section X. Optional Add-ons

## Water Chiller Installation

**1. Attach Water Chiller:** Remove the chiller from its packaging. Push one of the two (2) silicone tubes onto the inlet and the other into the outlet of the water chiller.

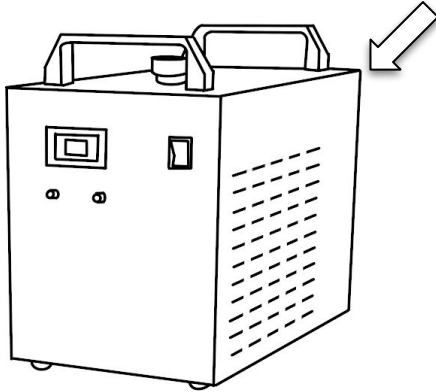


Fig. 64

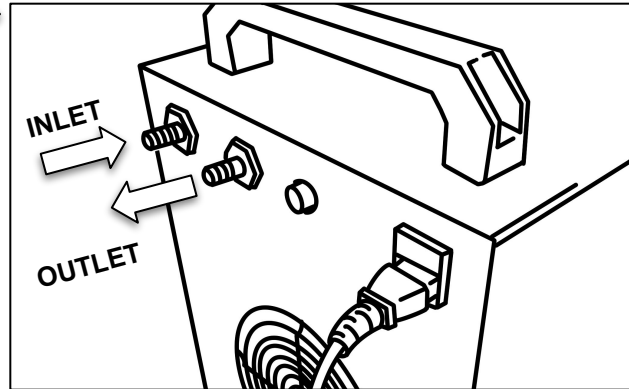
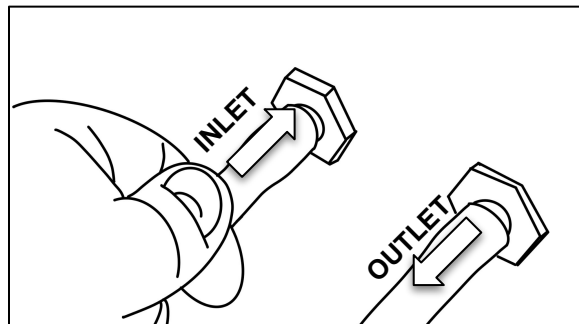


Fig. 65

**2. Attach Water Tubing to Your Titan:** Connect the two (2) silicone tubes from the chiller to the contrasting **INLET** and **OUTLET** of the Muse Titan (**Remember: In to Out, Out to In**). Your laser will not fire if this is installed backwards thanks to the water flow sensor.



**3. Preparing the Chiller:** Fill the chiller using **1 gallon 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).

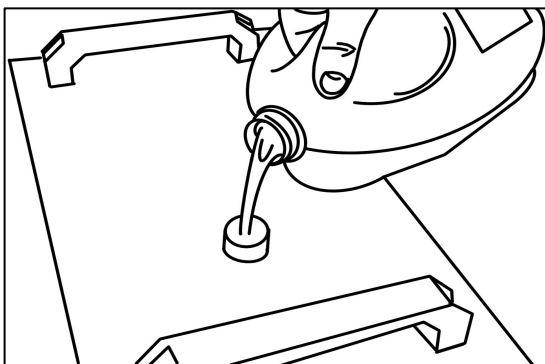


Fig. 66

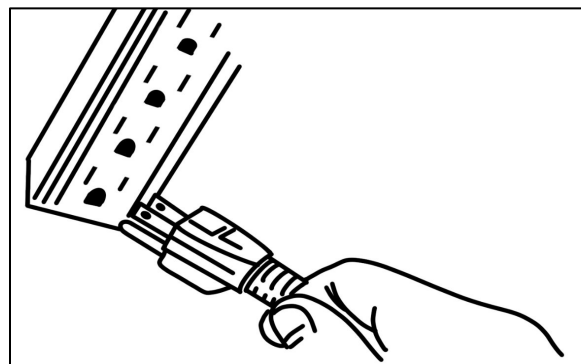


Fig. 67

# Section X. Optional Add-ons

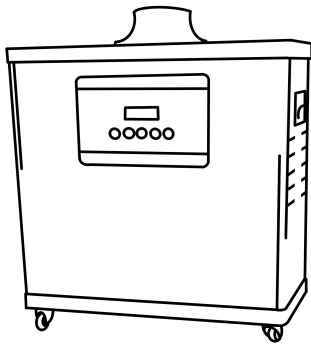
## Fume Extractor Upgrade

Fume extractors are air purifiers that clean the air through HEPA Filters. Fume extractors do not require outside ventilation. This is a great choice for workshops that do not have the option to ventilate outside.

Both extractors and the filters are available on the Full Spectrum Laser [Accessories](#) page.

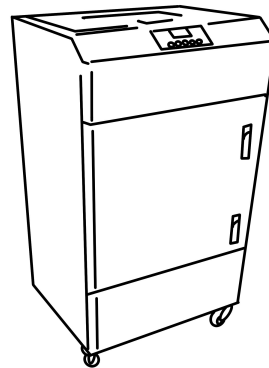
Ask a customer support representative which fume extractor is right for your needs.

Fig. 68



**FSL100**  
**Small Fume Extractor**

Fig. 69



**FSL300**  
**Large Fume Extractor**

Fume Extractor filters require routine cleaning and replacement, dependent on use and materials cut. Generally, fume extractor suction will diminish and odors will be detected as filters clog.

### **Maintenance guidelines:**

**Pre-Filters:** Clean often using a shop vacuum. Check weekly, especially if cutting a lot of wood. When about 70% of accumulated debris remains after cleaning, replace.

**HEPA Filters:** Clean immediately when suction seems reduced, using the shop vacuum. When cleaning does not return optimal suction power, it is time to replace it.

**Activated Carbon Filters:** Clean when odors are detected or suction is reduced. Shake to remove excess dust and debris before proceeding with the shop vacuum. When cleaning no longer eliminates detectable odors, replace Activated Carbon Filters.

From information on how often one should clean or replace filters see the **General Maintenance** section (pg. 67).

# Section X. Optional Add-ons

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## Section Review:

### Do's:

- **Make sure to take the water out of the water reservoir before starting to re-route the system.**
- **Check the Tubes for holes before plugging them in.**
- **Remember to double check your connections from the external water chiller to the Titan.  
(In to Out, and Out to In)**

### Don'ts:

- **Do Not Reroute The Water System While The Machine Is Running.**



# 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](#) .

---

## 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**

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## 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.

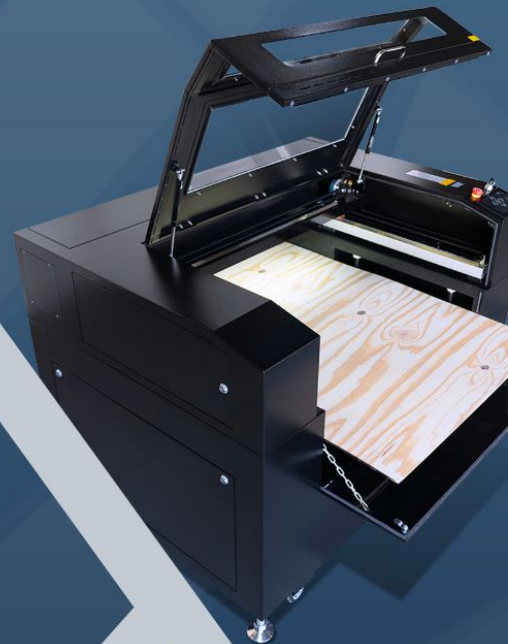
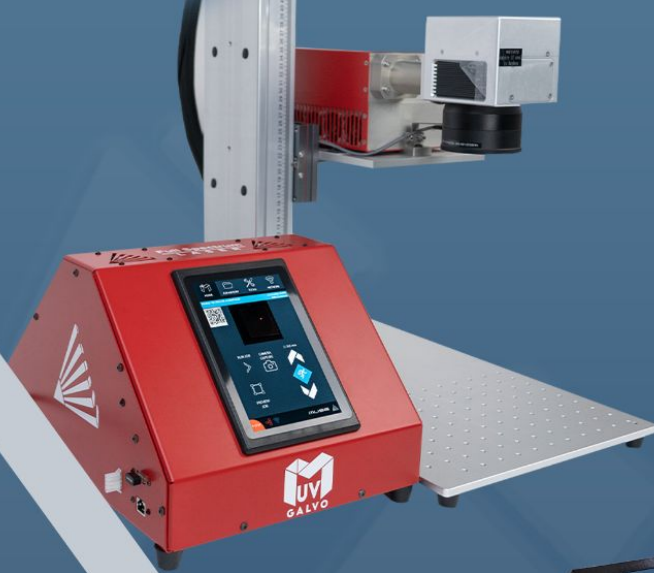
Shipping: [shipping@fslaser.com](mailto:shipping@fslaser.com)  
Accounting: [accounting@fslaser.com](mailto:accounting@fslaser.com)

# 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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