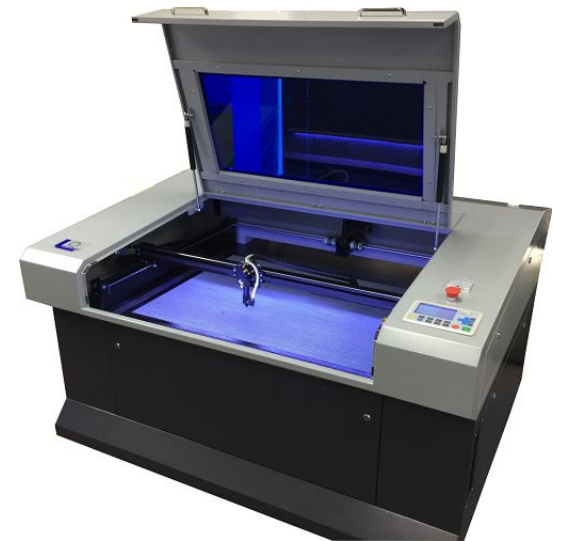
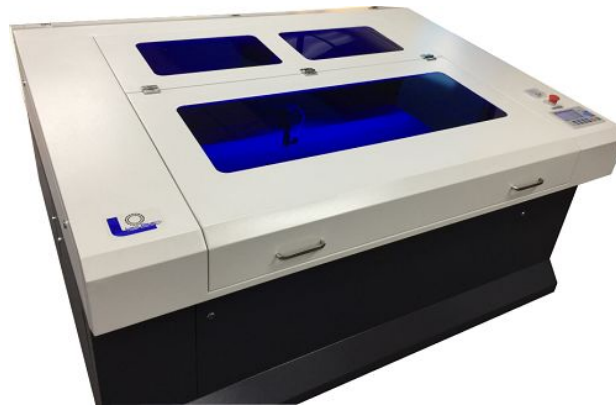
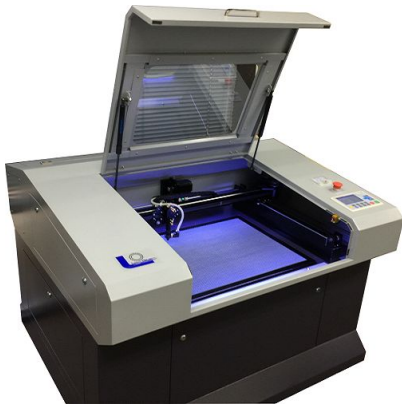
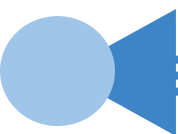


# LASER MACHINE OPERATION MANUAL



**Read and understand operator's manual before using this machine.  
Failure to follow operating instructions could result in death or serious injury.**



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# CO<sub>2</sub> Laser Safety/Policies

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- **WARNING:** The safety precautions below are mandatory guidelines that must be followed. LightObject will not be held responsible for damages or injuries resulting from improper use of the laser machine.
- **DO NOT** operate the laser machine until you have been properly trained.
- **ALWAYS** wear proper goggles during machine operation.
- **NEVER** look directly at the laser while in operation and avoid exposure to laser.
- **ALWAYS** keep hands away from machine while operating and stand clear from laser tube area.
- **NEVER** set anything on top of the laser and/or on the worktable when not in use.
- **DO NOT** make contact with any exposed wires on the machine while laser is on.
- **NEVER** leave the laser machine running while unattended. Monitor the machine when it is running at all times to be able to hear and observe abnormalities and potential hazards.
- **DO NOT** use any unapproved or unsafe materials such as Polyvinyl Chloride (PVC) which emits noxious gases that can harm your central nervous system.
- **DO NOT** operate the laser near flammable/explosive substances.
- **ALWAYS** unplug the machine before making any further adjustments.
- **NEVER** push or pull on the laser head housing or gantry while the laser is running.
- **NEVER** dismantle the laser machine as there are laser and high voltage parts that could harm or result in injury.
- **NEVER** open the upper cover of the laser machine while it is running.
- **DO NOT** engrave a shiny metal or mirror as the laser beam can be reflected and deviate that may result in blindness or serious injury.

## In Case of an Emergency:

Turn off the **POWER SWITCH** of the machine.

# Accessories

*Note: All accessories shown below are what is included in the full laser machine package.*

(Figure 1)



Air Exhaust Fan



Air Exhaust Hose



Tubing for Water Chiller & Air Pump



Water Chiller



Laser Tube Extension Case



USB Cable



Exhaust Hose Clamps (2)



CO<sub>2</sub> Laser Protection Goggles

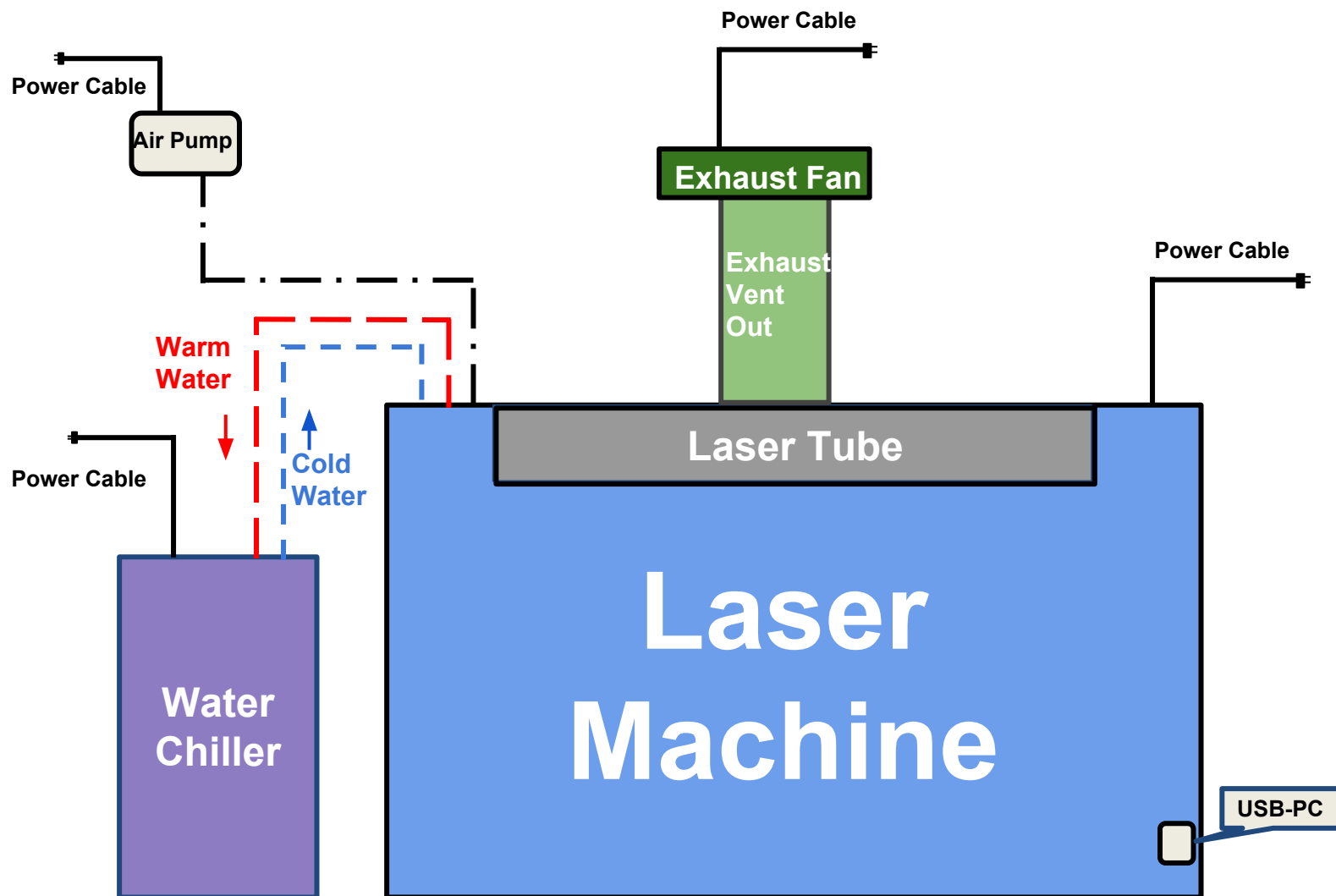


Laser Tube



Air Pump

# First Time Laser Setup



(Figure 2)



# First Time Laser Setup

---

**The following components shown on figure 1 are required for setting up and operating the laser machine:**

- **Air Pump** : is necessary to blow excess smoke away from the beam, allowing for a visible and precise focus. It is necessary to prevent damage to the lens and to prevent burning the material.
- **Water Chiller** : *to circulate cool water into the laser tube to prevent the tube from overheating. The laser tube needs to be at a cool temperature of 15°C-25°C or else the laser tube may overheat and potentially crack. This is a must for all laser machines.*
- **Silicone Tubing for Water Chiller(2) and Air Pump(1)** : *2 hoses to transfer water for cooling of the laser tube and 1 hose to blow air around the laser head to avoid dust build-up.*
- **Air Exhaust Hose and Air Exhaust Fan** : *to provide ventilation removing fumes from laser machine.*
- **USB-PC Connection/Adapter Cable** : *to connect to the computer.*

# Unpacking and Setting Up the Machine

- 1) Unbox the laser machine crate.



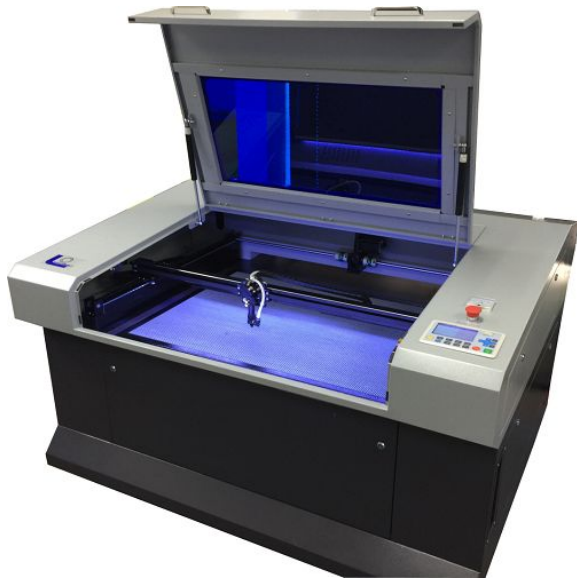
- 2) Open up the laser machine and retrieve all accessories that may be inside the machine when shipped.



**\*Note:** These may have shipped separately and may not be inside the machine.

# Unpacking and Setting up the Machine

- 3)** Once all of the accessories have been removed, you are now ready to begin setting up the machine.



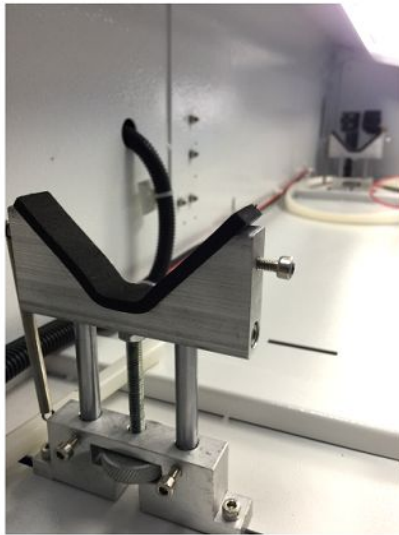
- 4)** Depending on the size of your laser tube, you may need to remove the side panel and install the laser tube extension case.





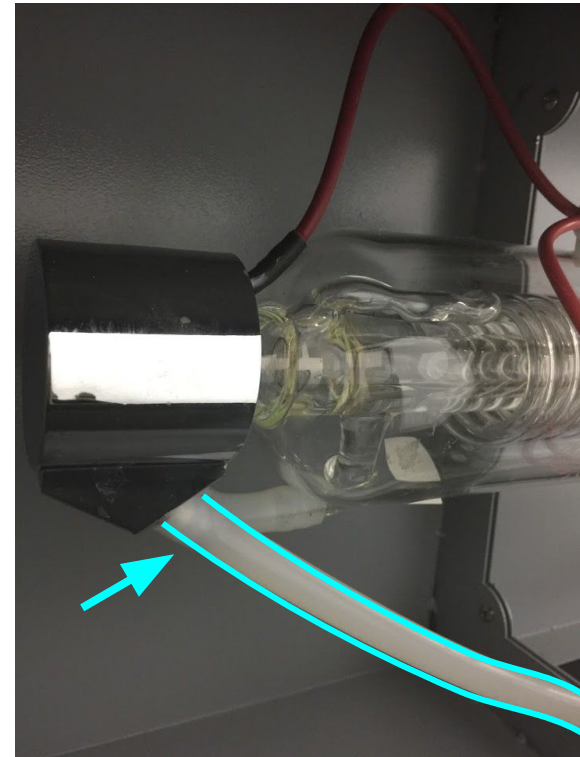
# Unpacking and Setting up the Machine

- 5) Locate the laser tube within your accessories and place it on the laser tube mounts located on the back of the laser machine.



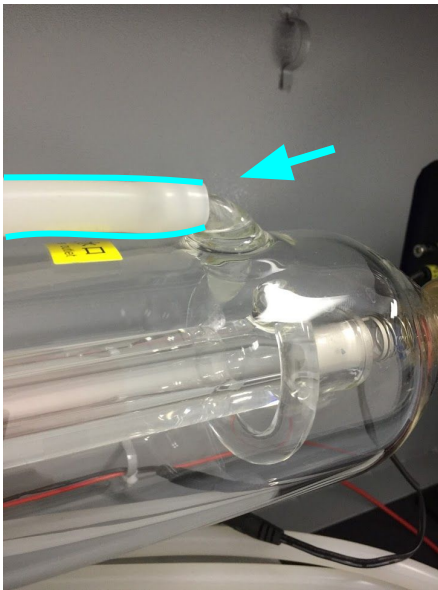
**Note:** The laser head faces the black reflection mirror mount.

- 6) Now connect the silicone tubing that will transport water into the tube.



# Unpacking and Setting up the Machine

- 7) Be sure to connect the silicone tubing on both sides of the laser tube. Failure to connect the silicone tubing from the machine to the laser tube on both sides may result in damaging the laser machine with water when powering on the chiller.



- 8) Now grab the silicone tubing(2) from the accessories box and connect the tubes to the water inlet and water outlet ports on the machine as shown in the picture below and on the next step.



# Unpacking and Setting up the Machine

- 9) After you have connected the tubing to the water ports on the machine, you will now need to connect the tubes to the water chiller. The water outlet port on the machine will go to the inlet port on the water chiller and so forth for the other port. **See below for more clarification.**



- 10) Next, fill up the water chiller up with water. Depending on the chiller that you have, there may be a water meter on your chiller. For those with a meter, fill to where it reaches halfway or more in the green normal zone. For chillers like below that do not have a water meter, fill it up to the top of the coil. **For our water chillers, we recommend using distilled water rather than regular tap water.** This is because overtime algae may begin to form when using distilled water.

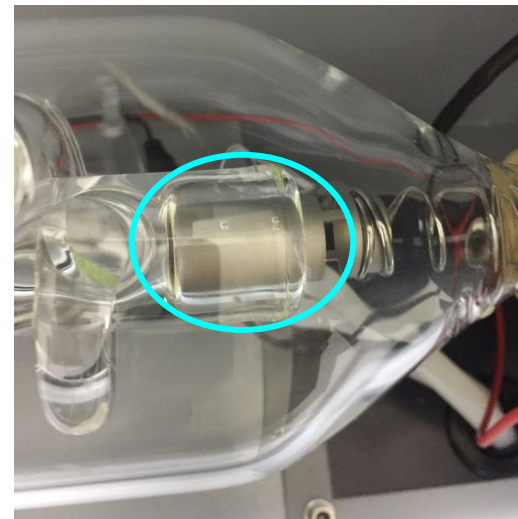


# Unpacking and Setting up the Machine

## 11) Double check before proceeding to the next step.

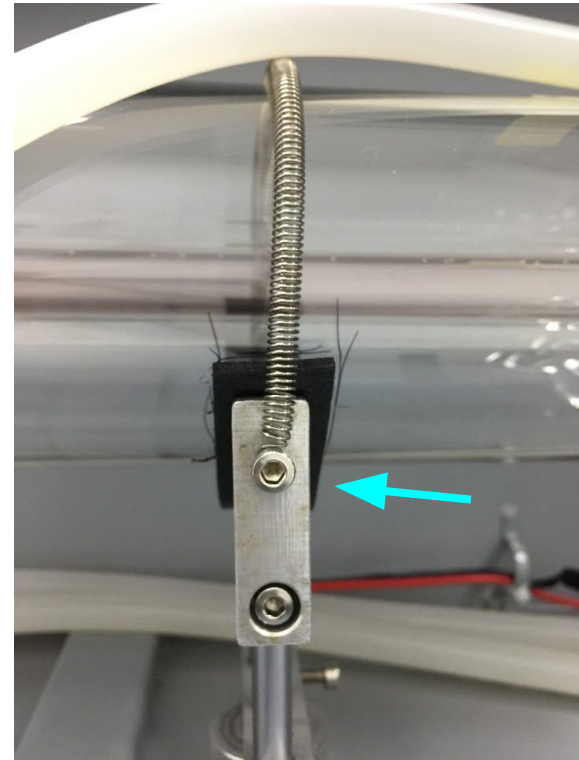
- Check that the silicone tubing on the laser machine is connected to both sides of the laser tube. (If not, refer back to steps 6 & 7)
- Make sure that the water inlet and outlet of the machine is connected to the inlet and outlet of the water chiller.
- Check that the water chiller is filled with water.

## 12) Now you can begin filling up the laser tube with water from the water chiller. **Keep in mind that the front of the laser tube area when filling should not have any bubbles in that area.** You may need to tilt the laser head side of the laser tube down when turning on the water chiller to prevent this. If you happen to have a bubble in that area, simply drain some of the water out and keep trying until you achieve no large bubbles. (The small bubbles shown in the image below are ok) **This is very important as the tube can overheat quickly if bubbles are present when the laser is firing which can cause the tube to crack.**



# Unpacking and Setting up the Machine

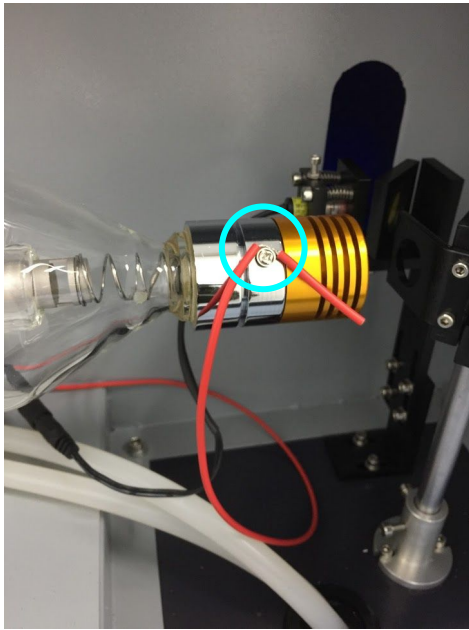
- 13)** Next, for convenience, we have already marked the tube position. Simply align them as shown below with the markings and secure the tube onto the mount by using the spring and screw.





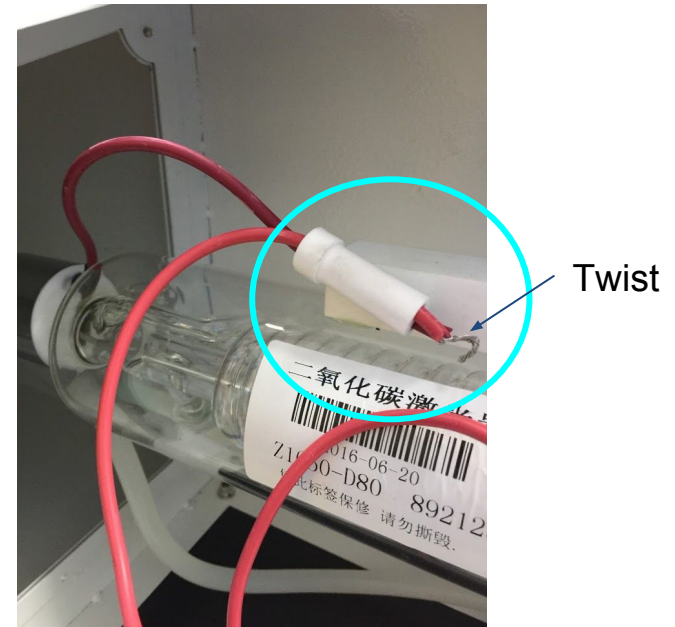
# Unpacking and Setting up the Machine

- 14)** Once both mounts are secured and the tube is aligned in place, it is time to connect the wires. You may need to loosen the screw slightly to be able to connect the wire by wrapping it around the screw.



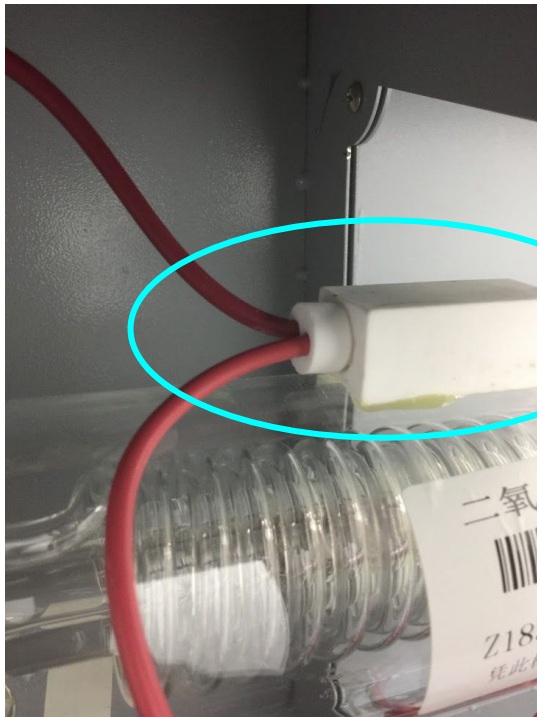
**Note:** The laser head faces the black reflection mount as shown above.

- 15)** For connecting the wire at the other end of the tube, locate the wire connected to the tube and insert the wire from the machine into the white ceramic holder and twist the two wires together.



# Unpacking and Setting up the Machine

- 16)** After the wires are both inside the ceramic holder and twisted together, insert the ceramic holder into the port located on the laser tube.



- 17)** Once that is completed, you have now completed the main setup phase for your laser machine. Plug in the AC cable and flip the main power switch and press the main power button on your machine.



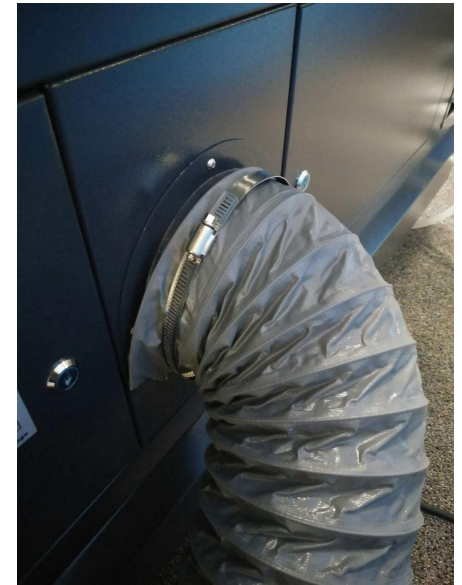
If your machine still does not power on, the emergency button next to the DSP may be pressed down which will prevent it from turning on. Release it by turning and your machine should turn on.



# Installing Other Accessories

## ***Exhaust Fan Installation***

Connect the air exhaust hose with the exhaust fan and the laser machine exhaust outlet by using the two hose ring clamps provided. Turn the exhaust fan on when doing any cutting and especially engraving to remove the smoke and fumes that are created.



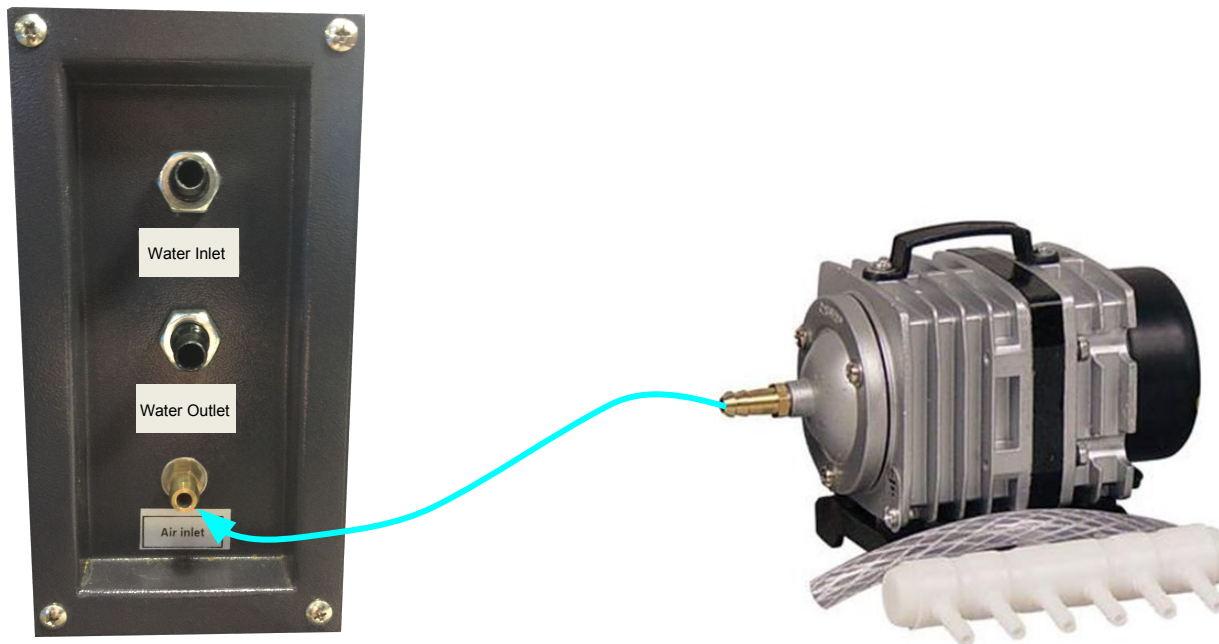
***Note: Avoid excessive length, kinks and turns when installing the exhaust pipe/hose.***



# Installing Other Accessories

## *Air pump*

Connect the air pump to the laser machine air input by using one of the silicone tubing and be sure to turn on when doing any cutting or engraving to prevent any clouding on the lens and to prevent the material from burning

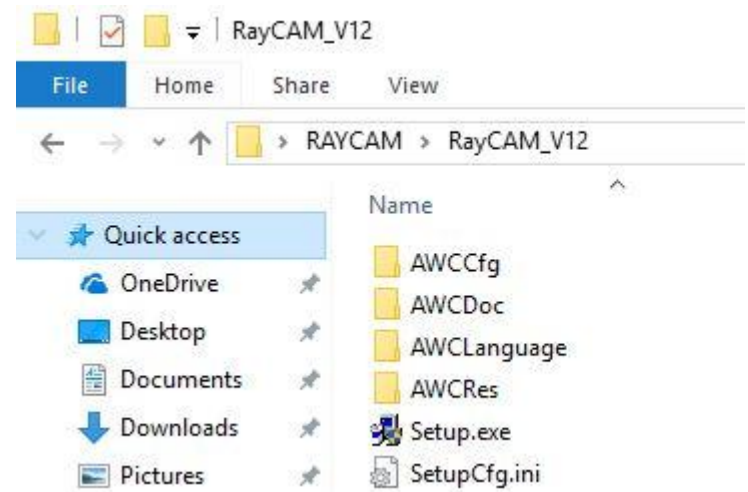


# Connecting Laser Machine to Computer Setup

- 1) Download the **RayCam** software from our forums onto your Computer.

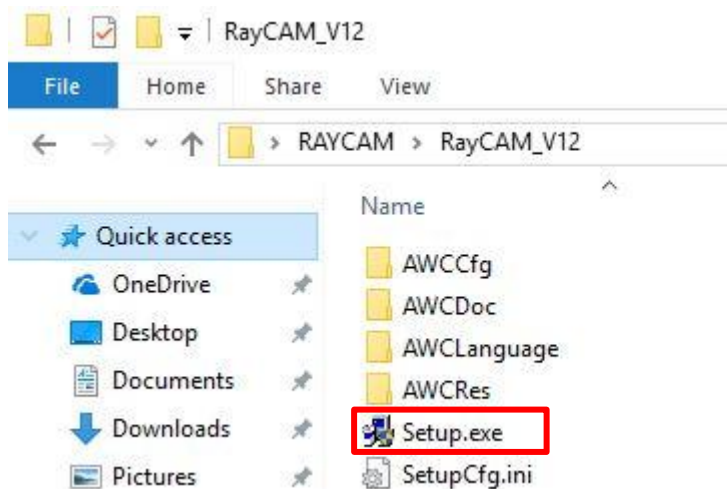
**Note:** You will need to register an account on the forums and it will need to be approved by an administrator before you will be able to see the software downloads on our forums. If you have any problems downloading the software, give us a call or send us an email.

- 2) For opening and installing Raycam, you will need to unzip the RAR files so you may have to download a software online such as WinRAR. Unzip the file and open up the RAYCAM folder.

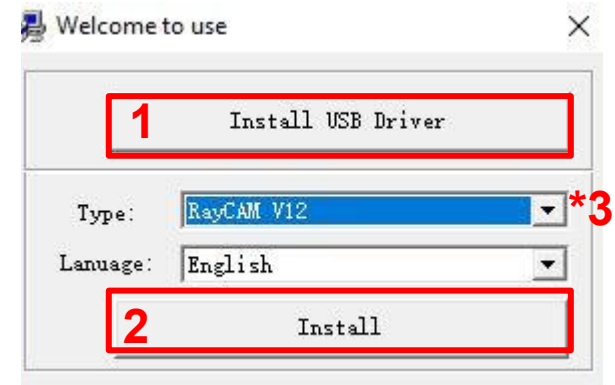


# Connecting Laser Machine to Computer Setup

- 3) Double-click on the **Setup.exe** file to begin installing.



- 4) Then the window shown below should pop-up.

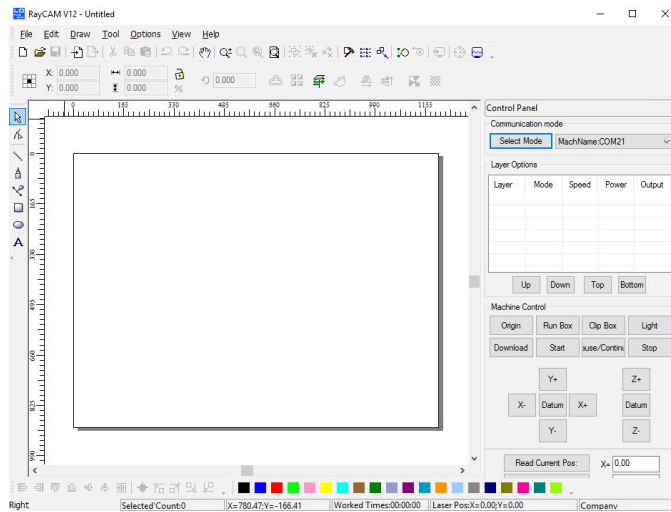


On this window,

1. **begin by first installing the USB Driver.** (This will allow you to establish a connection with your laser machine and computer through the USB Cable we provided.)
2. Click **Install** to finish downloading the RayCAM V12 Software.
3. **\*Optional\*** This drop down menu has options for downloading the plugins for AutoCAD, CorelDraw, and Illustrator for transferring files from those software directly.

# Connecting Laser Machine to Computer Setup

- 5) Open up **RAYCAM V12** Software from your computer.

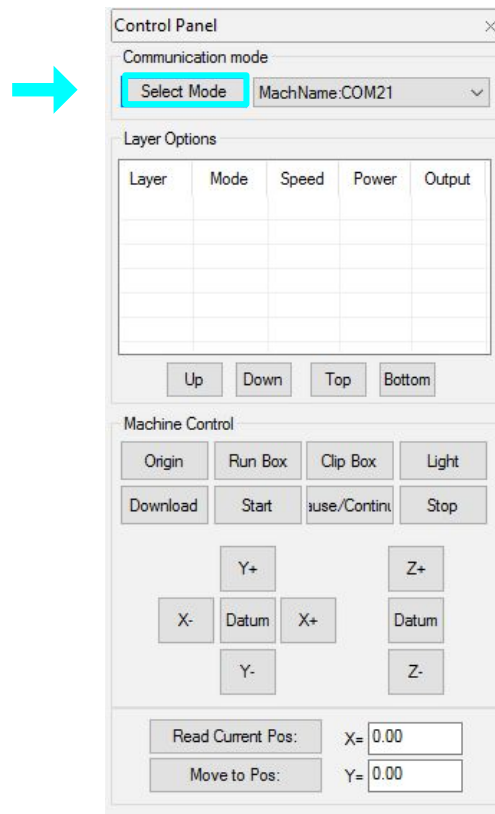


- 6) Then connect the USB Cable from your computer to the port on your laser machine.

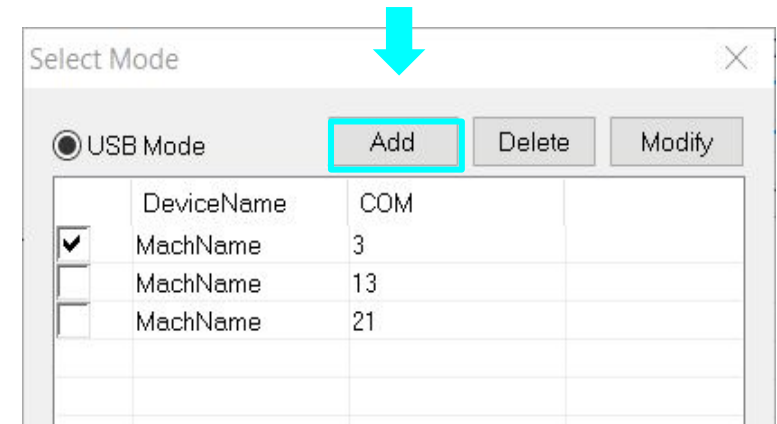


# Connecting Laser Machine to Computer Setup

- 7) On the Control Panel located on the right hand side in the RAYCAM Software, click the **Select Mode** button right under communication mode.

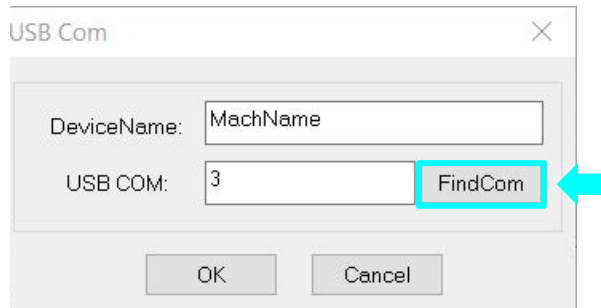


- 8) The pop-up window below will appear. Click the add button for the USB Mode.



# Connecting Laser Machine to Computer Setup

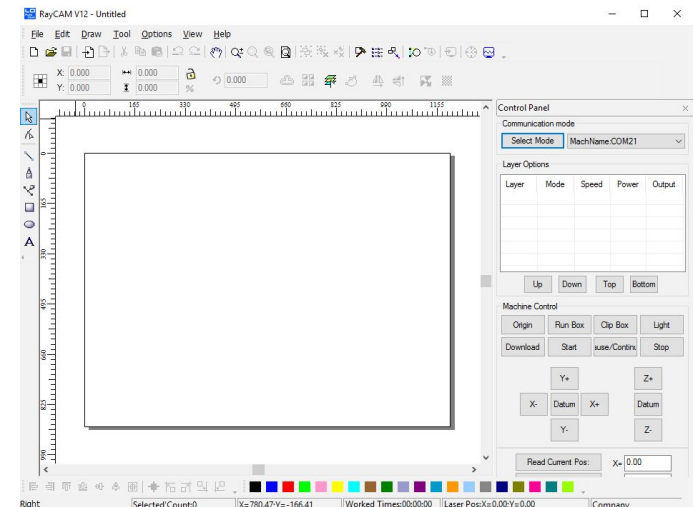
- 9) Another window will appear. In this window, click on **FindCom** to search for your laser machine DSP.



If the **Communicating Unsuccessful** window appears, you will have to double check if

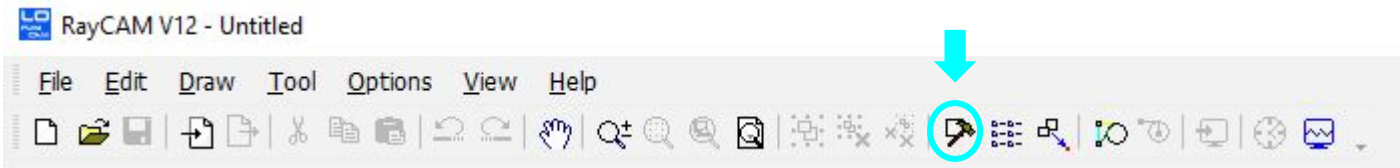
- the USB cable is plugged in on both the laser machine and your computer.
- your laser machine is powered on.
- make sure that the USB Driver is installed. Install it again if you are not sure. (Refer back to step 4 for more information)

- 10) Once it has found your laser machine when pressing **FindCom**, your computer is now connected to your laser machine. Click ok and exit back to the Raycam software main page.

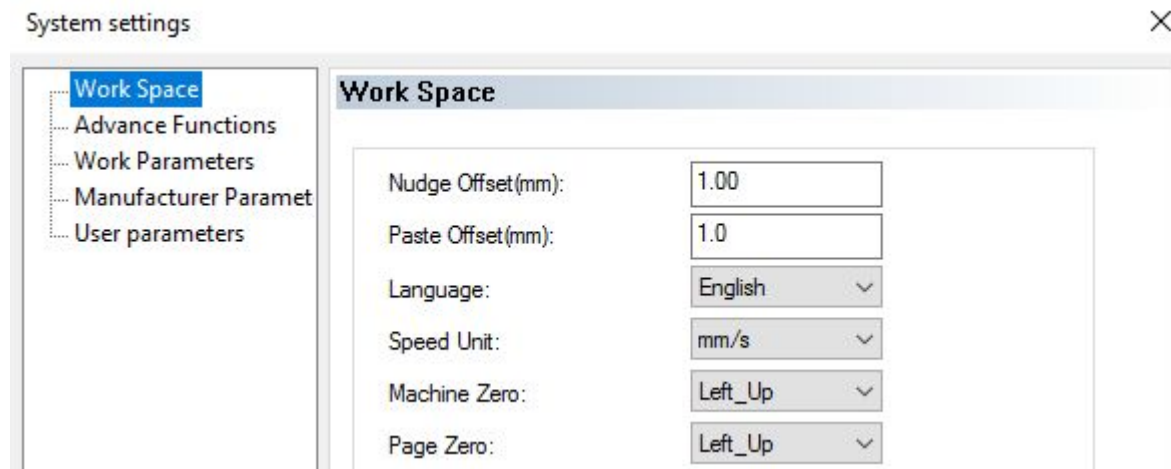


# Connecting Laser Machine to Computer Setup

- 11) Now you will need to transfer the saved parameter settings that we have calibrated and tested onto your computer. To begin this process, click on the icon located on the toolbar shown below to enter the system settings. (or select *Options>System Settings*)



- 12) In the **Work Space** tab for **System Settings**, be sure that the **Machine Zero** and **Page Zero** is set at **Left\_Up**



# Connecting Laser Machine to Computer Setup

- 13)** In the **System Settings** window, click on the **Manufacture Parameter** tab on the left side.

Once you are in the **Manufacturer Parameters** page, click the **Read** button located on the bottom to show the settings that we have already calibrated and adjusted to fit your machine. **This is very important to Read your current settings to ensure that your machine is performing the same way that we tested it.**

After you have **Read** your current settings on your machine, click the **Save** button. (This may require a password which is **608**)

System settings

Work Space  
Advance Functions  
Work Parameters  
**Manufacturer Para**  
User parameters

**Manufacturer Parameters**

X_Axis	Y_Axis
Um/Pulse: 12.500000	Um/Pulse: 12.500000
Pulse edge: Falling edge	Pulse edge: Falling edge
Datum: Negative	Datum: Negative
Key direction: Negative	Key direction: Positive
LimitPolarity: Negative	LimitPolarity: Negative
Range: 300	Range: 200
Start Speed: 15.000	Start Speed: 15.000
Max_Acc: 10000.000	Max_Acc: 3000.000
Max_Speed: 500.000	Max_Speed: 400.000

IO  
☐ Water Protect ☐ Open Protect ☐ Foot switch **Z/U Axes Options**

Laser Parameters  
 Laser Mode: Glass tube  
 TTL Level: Low level effective  
 PWM Frequency: 20000  
 Max\_Power: 98

Function config  
☒ XY axis home OnPower  
☐ Hardware limit  
☒ Return origin after work

Other Options

Import Export **1 Read** Save **2**

OK Cancel Apply



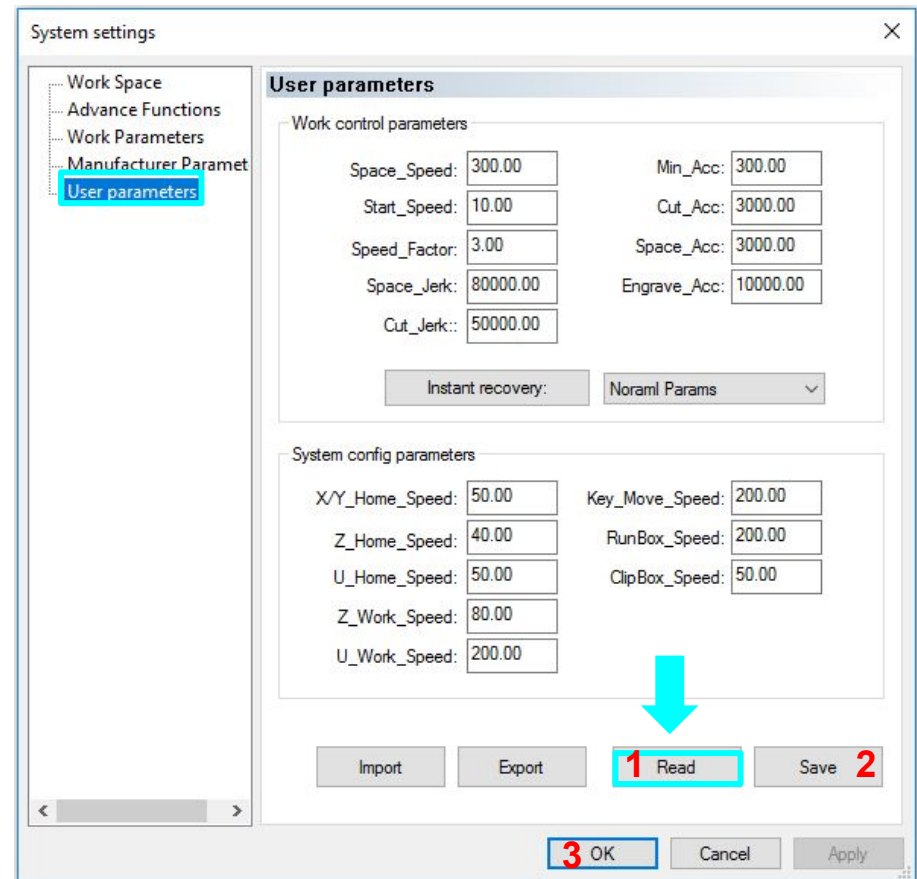
# Connecting Laser Machine to Computer Setup

- 14)** Then, in the **System Settings** window, click on the **User Parameter** tab on the left side.

Once you are in the **User Parameters** page, do the same as previously in step 13 and **click the Read button located on the bottom** to show the settings that we have already calibrated and adjusted to fit your machine. **This is very important to Read your current settings to ensure that your machine is performing the same way that we tested it.**

After you have **Read** your current settings on your machine, click the **Save** button. *(This may require a password which is 608)*

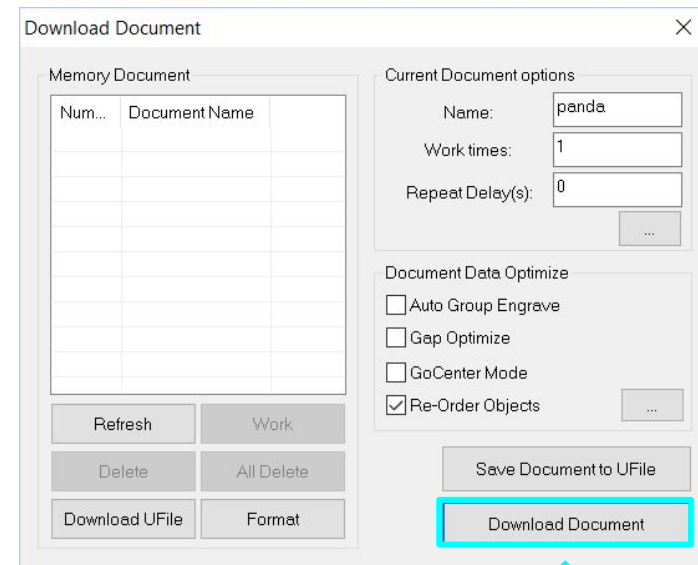
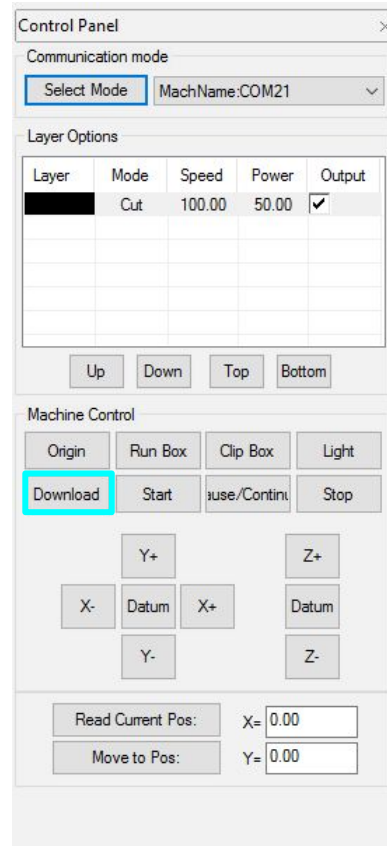
Once you are done, click **OK** to exit back to the main Raycam Software page. **You have now completed the setup phase for connecting your computer and your laser machine.**



# Sending files to your Laser Machine

- 1) Once you have established the connection between your computer and your laser machine, you can now send any job from your computer to the machine. (**See page 19 if you have not established the connection to your machine**)

To do this, simply click on the **Download** button located on the right side of the Raycam Software main page under the **Machine Control** options. When the **Download Document** window pops up, click on the **Download Document** button to send it to the machine.



# Switches, Buttons, and Ports



## Laser Machine Switches on Top of Machine:

**Emergency Button:** In case of an emergency, push this button down. It will stop all operations and will shut off the machine.

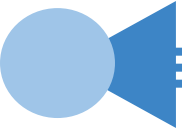
**DSP Control Panel:** The main controller that operates the laser machine. Refer to the corresponding DSP manual for more information on the functions of each button.

**Amp Meter:** Shows the current mA output from the laser tube. It is recommended that ampere is below the max limit. For specific amount, please refer to the table.



Power of Laser Tube	Max Limit of Current
15w	9-12 mA
20w	10-12 mA
35w	16 mA
40w	16 mA
45w	18 mA
60w	20-22 mA
80w	26-28 mA
100w	26-28 mA
130w	26-28 mA
150w	28-30 mA

# Switches, Buttons, and Ports



## Laser Machine Switches on the side:

**Main Power Switch:** On/Off switch that brings power to the machine.

**Main Power Button:** On/Off button for turning on the laser machine.

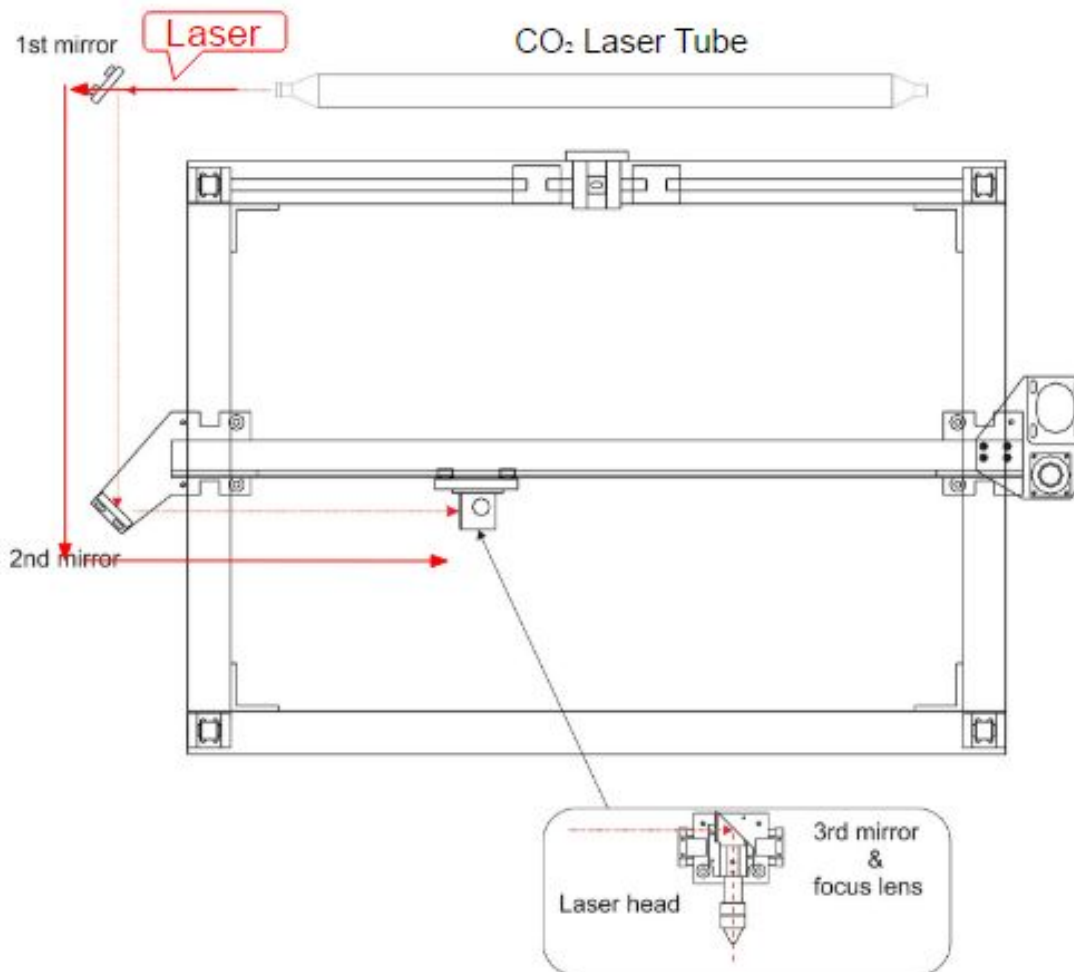
**Laser Power Button:** On/Off button for powering up the laser tube

**USB-PC:** Connection port from your PC through USB.

**Ethernet:** Connection port from your PC through ethernet.



# Laser Alignment



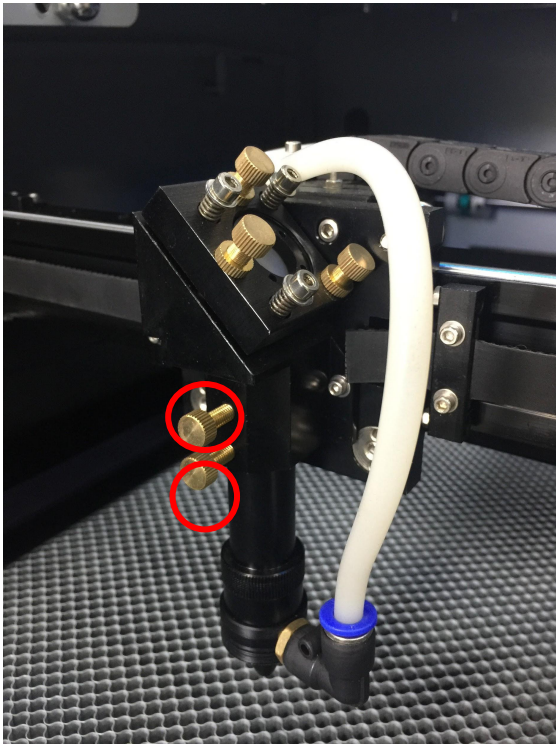
**WARNING:** Do not obstruct the path of the laser.

**NOTE:** Due to transportation, the alignment of the machine may be off.

*To make sure that the laser is properly aligned, place an adhesive note around the areas where there is a mirror to reflect the laser. Start with the first mirror shown in the diagram and press the laser test button. If that mirror is aligned correctly, the burned mark should be in the center of the circle on the mirror housing. If it is not aligned then the three screws for each mirror must be adjusted little by little until the laser hits the center. Test after each adjustment. Once the first mirror is done, repeat the steps to align the 2nd and 3rd mirrors. Only when the laser is going through the centers of all mirror housings, will the mirrors be aligned correctly. (Must follow 1,2,3 order when aligning lasers)*



# Focusing the Lens



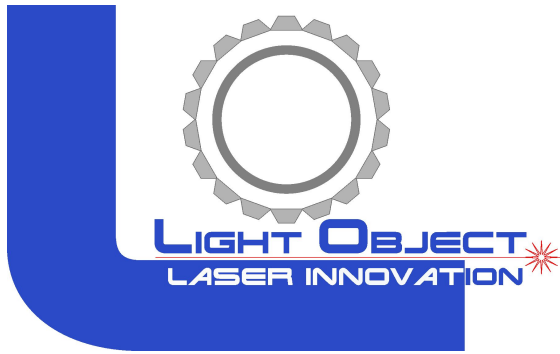
(Figure 3)

The lens should be adjusted and focused according to the thickness and type of material. To adjust the focus, there are two brass thumbscrews that can be loosened as shown on (Figure 3). After loosening the screws, the height can be adjusted to accommodate the laser to the thickness of the material.

To adjust the focus of the laser, you may use a test object of similar thickness. Press the “Laser” button on the DSP panel to emit a test beam. Check the burned mark on the object. You will need to do several of these tests adjusting the z table or the laser head. When the burned mark is smaller, you attain a sharper focus on the surface.

**Note:** Be sure the tube is connected to the laser head and that the air pump is turned on to prevent clouding or damaging of the lens.





LMM 04-2017

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