

Инструкция по эксплуатации GM-460L

Chapter 1 – Safety

Laser Safety



The output of the CO2 engraving 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. While this device employs the same technology as a handheld laser pointer, it is potentially hazardous if its beam is directed into the eye.

GENERAL OPERATION PRECAUTIONS

The laser operator should observe the following:

- **NEVER** operate the machine with any of the panels removed. Be aware that removal of any portion of the cabinet will greatly increase the risk of injury and/or fire. **Remember that the CO2 laser beam is invisible!**
- **NEVER** operate your machine unattended. There is a significant risk of fire if the machine is set improperly.
- **ALWAYS** use the air assist, especially while vector cutting. Vector cutting movements are relatively slow and apply an extremely large amount of heat to the work piece. This buildup of heat can cause a significant fire risk.
- **DO NOT** disassemble the machine or remove any of its protective covers while the unit is plugged in.
- **DO NOT** look into the beam of the Alignment Laser (visible red diode laser)
- **NEVER** operate the machine without a properly operating ventilation system. Most materials produce an irritating smoke when engraved. Some materials, including but not limited to paint, varnish, composition board and plastics, produce compounds that can be harmful if concentrated.

Electrical Safety



- **DO NOT** open any of the machine's access panels while the unit is plugged in. Opening a panel may expose the operator to the unit's AC input power.
- **DO NOT** make or break any electrical connections to the system while the unit is turned on
- **DO NOT** access the electronics area with hands or tools unless the unit is **disconnected from power**.

The power supply is capable of outputting more than DC 20,000V. Always make sure to give the supply capacitors adequate time to discharge before accessing the electronics area. Your laser shipped with silicone terminal covers that prevent access to bare wiring

Fire Safety



Laser cutting and engraving systems represent a significant fire hazard due to the extremely high temperatures generated by the laser beam. While the objective of most cutting and engraving operations is to vaporize material without burning, most materials capable of being cut or engraved are inherently combustible and can easily ignite. Usually this is a small flame of burning material issuing from the cut zone which itself extinguishes due to the air assist or de-powering of the beam. However, it is possible for the flame to propagate and set fire to the machine and threaten its surroundings.

Experience shows that vector cutting with the laser has the most potential to create an open flame. Acrylic in all its different forms has been shown to be especially flammable when vector cutting with the laser. Please also be aware that stacking materials (especially organic materials such as paper) can lead to increased risk of flame propagation or work piece ignition.

Please read the following warnings and recommendations and follow them closely at all times!

NEVER leave the laser system unattended during operation.

KEEP the area around the machine clean and free of clutter, combustible materials, explosives, or volatile solvents such as acetone, alcohol, or gasoline.

ALWAYS keep a properly maintained and inspected 5lb or larger fire extinguisher on hand. We recommend a Halogen fire extinguisher or a multi-purpose dry chemical fire extinguisher. Halogen extinguishers are more expensive than a dry chemical, but offer certain advantages should you ever need to use an extinguisher. The Halogen extinguisher discharges a clean, easily removable substance that is not harmful to the mechanics or wiring of the laser system. The dry chemical extinguisher discharges a sticky, corrosive powder that is very difficult to clean up.

ALWAYS use air assist when vector cutting.

BE CAREFUL when vector cutting. Many materials have the potential to burst suddenly into flames – even materials that may be very familiar to the user. Always monitor the machine when it is operating.

KEEP YOUR LASER SYSTEM CLEAN – A build up of cutting and engraving residue and debris is dangerous and can create a fire hazard. Keep your laser system clean and free of debris. Regularly remove the cutting grid to clean any small pieces that have gotten stuck or fallen through.

Chapter 2 – Prepare

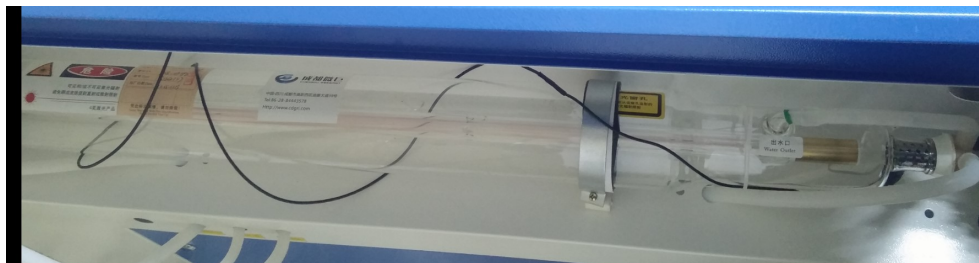
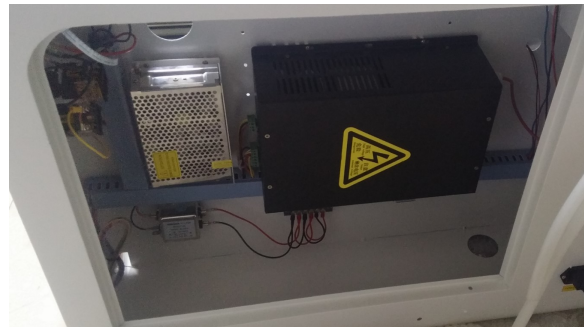
- If your AC voltage is unstable, or when the laser power is more than 150w, we suggest buy an extra 220V voltage stabilizer/ regulator.
- **Purchase distilled water for cooling the laser.** Please make sure to only use distilled water—neither filtered nor deionized water will work and **tap water will cause deposits that can destroy your tube and void the warranty.**

Note:

Please do not throw away the laser's box and packaging, you may need it later.

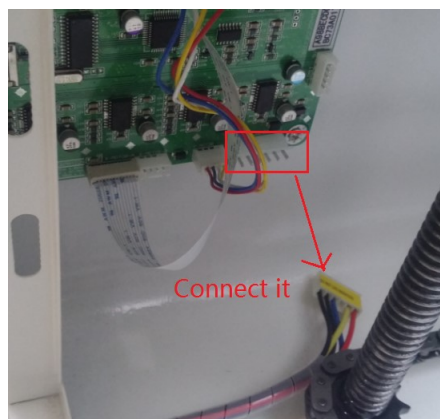
Important

First please open the panels of the laser cutter.



Check

1. Glass tube is not damaged during the transport.
2. Any electrical loose connection. Or any wire is not connected
3. Disconnect the cable tied on the laser head, it will stop the laser head moving when you power the machine on.
4. Connect the cable in the below photo, we may disconnect it after testing.



Chapter 3 – Hardware Set Up

Connect the water pump (or CW3000 Cooling system):



One in, one out

CAUTION

NEVER FIRE THE LASER WITHOUT A CORRECTLY CONNECTED AND POWERED WATER PUMP. FIRING THE LASER WITHOUT TURNING THE COOLING SYSTEM ON OR, WORSE, WITH NO WATER IN THE SYSTEM, WILL SEVERLY DEGRADE OR DESTROY YOUR LASER TUBE AND VOID YOUR WARRANTY.

The laser tube is cooled by a circulation pump.

Open the cap, and fill into **enough distilled water**.

Note: without enough distilled water, the cw3000 will beep.



Connect silicone tube from CW3000 outlet to laser tube water in.

Connect silicone tube from CW3000 inlet to laser tube water out.

Please make sure that there are **no air bubbles** inside of the water jacket of the laser tube. Air bubbles can create local hotspots in the lasing chamber and reduce the lifetime of your tube. If present, water bubbles typically migrate to the electrodes on either end of the tube. You should visually inspect the laser tube to make sure that bubbles are not present;

Remove the bubble in the laser tube.

- Slightly tilting the laser while powering on the circulation pump is usually sufficient to remove bubbles.
- Pinching the inlet water tube.



- Leave the water pump running for a while.

Please run the water cooling system first, check any water leaking in case any components are damaged during transport.

Connect Air pump:

Mount the Air fan:

Amount the air fan with pipe on the back of the cutter; make sure the motor of the fan is tight, not loose after long distance delivery.

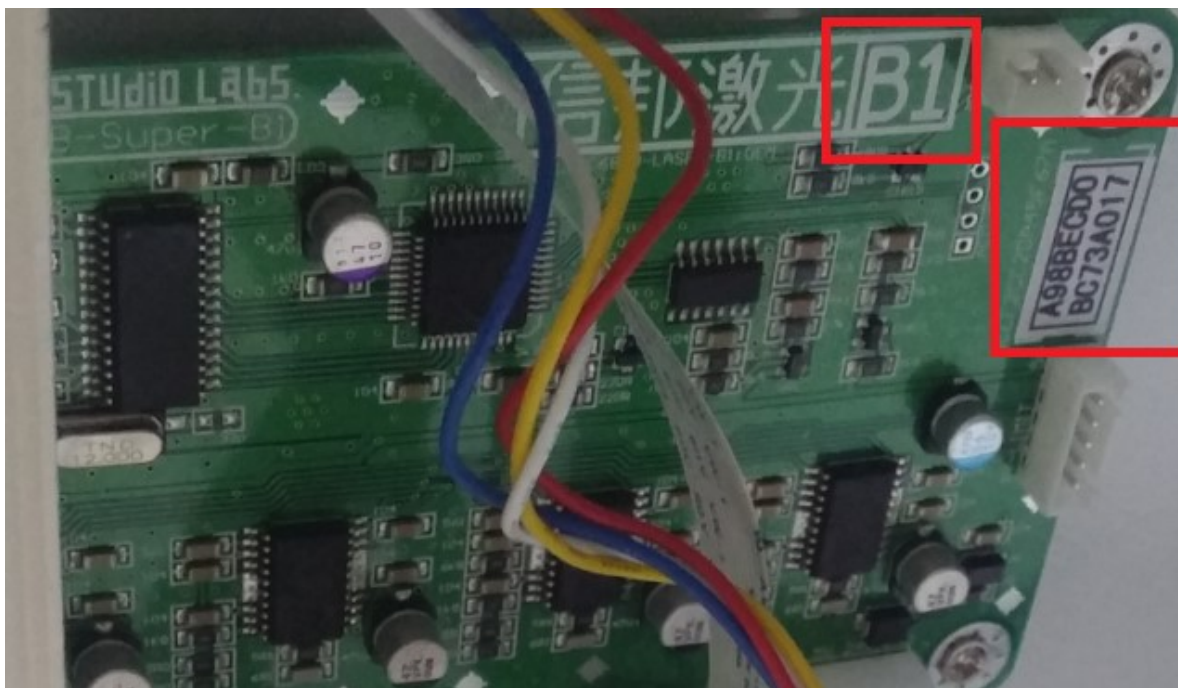
Chapter 4 – Software Installation

You can start your project using LaserDRW 2013.02 or CoreLASER 2013.02

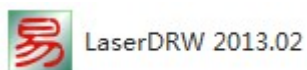


Step 1: Install LaserDRW

1. Turn off your laser cutter, open the laser cutter panel and take a photo of motherboard, you will need the Model and Device ID information later.



2. Copy the files in the CD/USB disk, Click LaserDRW 2013.02.exe to install it. Then on your desktop, should have a shortcut



3. Plug the golden USB dongle to your computer and connect the usb cable to it, turn on the laser cutter.



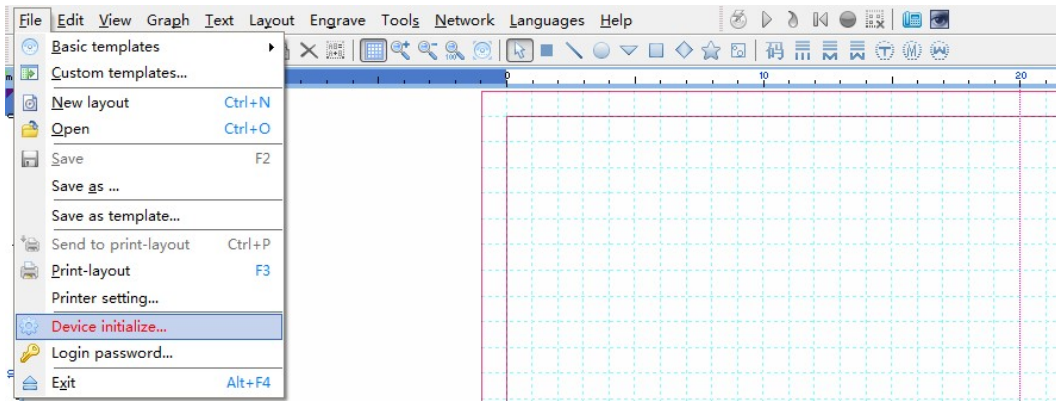
Note:

If you receive an error when open the shortcut:

Unable to create a DOM document, class not registered, verify the MSXML4 is installed.

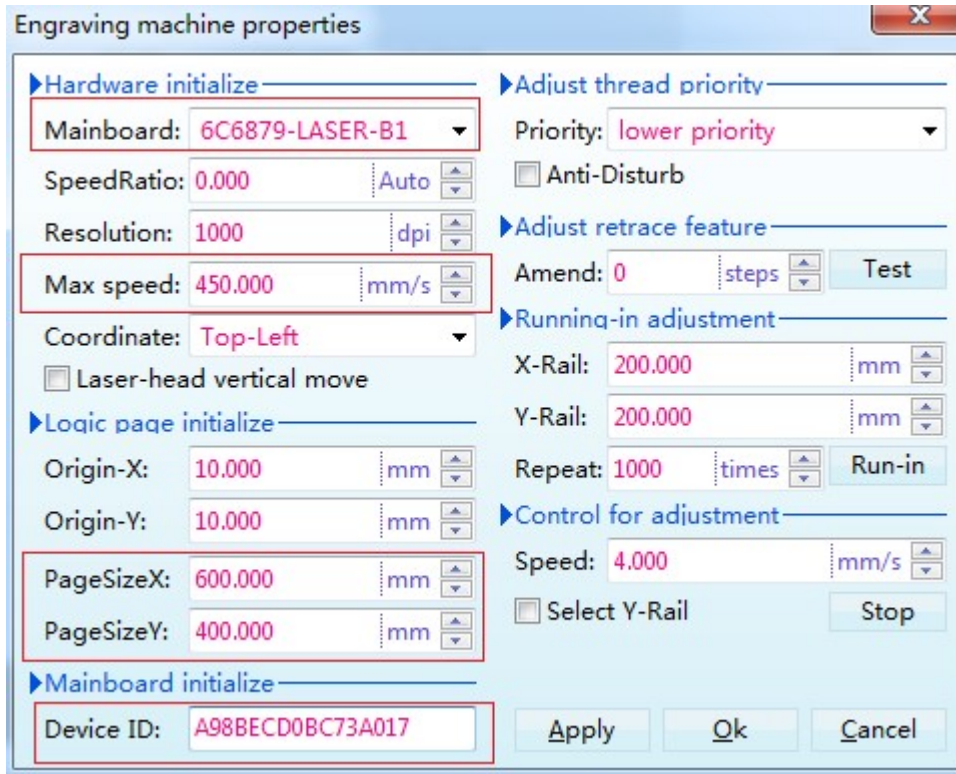
Then you need to install **msxml.msi** which is in the cd, or you can download it from Microsoft.

In the software you will see the toolbar on the top right corner.



Click the **Device initialize**

Set the Mainboard Version to **B1** and Device ID correctly.



If the laser machine model is 6040, set the page size x to 600mm, page size y to 400mm

If the laser machine model is 1040, set the page size x to 1000mm, page size y to 400mm

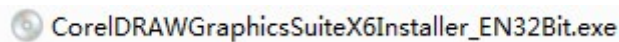
If the laser machine model is 1060, set the page size x to 1000mm, page size y to 600mm

Then restart your software.

Click the **Device initialize** again, change the **Origin-X** and **Origin-Y**, and observe the laser head, it should move immediately when you change the value in the software.

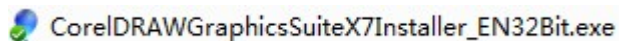
Step 2: install CorelDRAW X6/X7

Click **CorelDRAWGraphicsSuiteX6Installer_EN32Bit.exe** to install it.



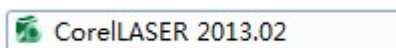
You can also download corelDRAW X7

http://www.corel.com/akdlm/6763/downloads/trials/GraphicsSuiteX7/CorelDRAW_X7_EN.exe

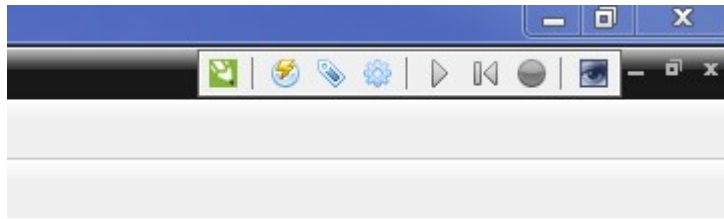


Step 3: install CorelLASER Plugin

Click **CorelLASER 2013.02** to install it.



When you start CoreLASER2013.02 the CoreLDRAW software will start, and on the right top corner, there is a laser engraving and cutting tool box.



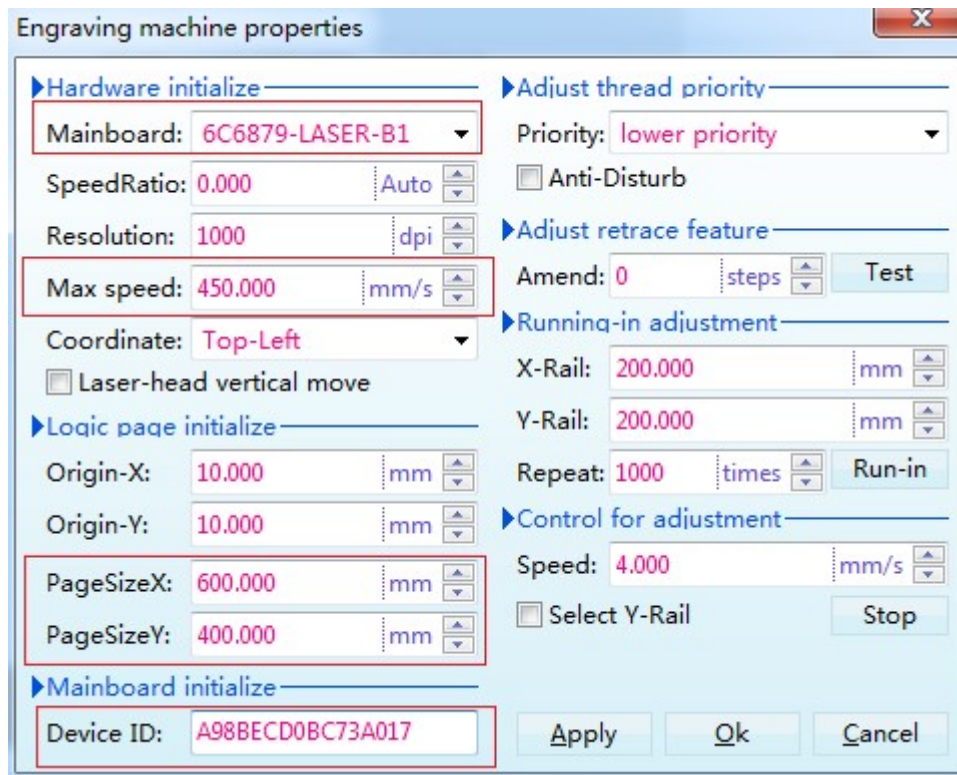
And also on the bottom.



Click the setting symbol to configure it.



Set the Mainboard Version and Device ID correctly. (You can get the information from step1)



If the laser machine model is 6040, set the page size x to 600mm, page size y to 400mm

If the laser machine model is 1040, set the page size x to 1000mm, page size y to 400mm

If the laser machine model is 1060, set the page size x to 1000mm, page size y to 600mm

Then restart your software.

Click the **Device initialize** again, change the **Origin-X** and **Origin-Y**, and observe the laser head, it should move immediately when you change the value in the software.

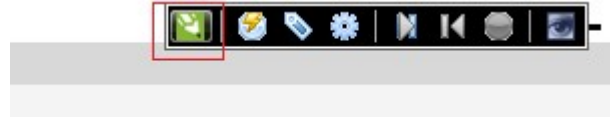
Caution: **Origin-X** value should always less than 600, and **Origin-Y** value should always less than 400, otherwise the laser head will keep moving without stopping.

Step 4: Other Settings

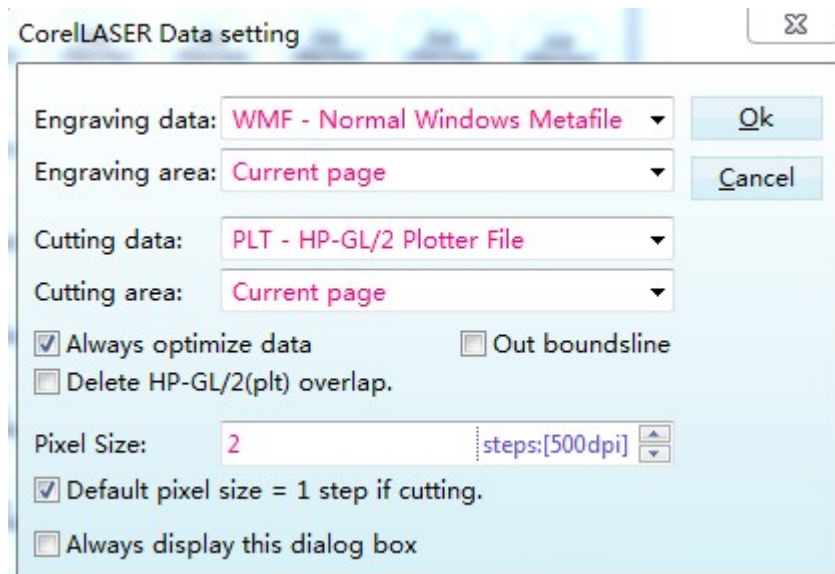
Click Corel Draw



Change the Corel Draw Setting



Untick **Out boundsline**, press ok, restart the software

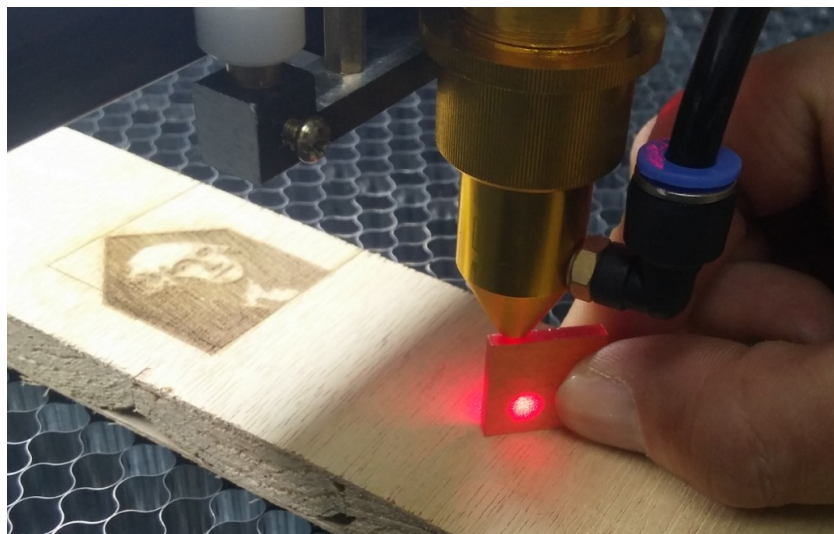


Chapter 5 –Engraving & Cutting Test

1. Focus the laser head

For 3020 machines:

There is a knob on the bottom of the laser cutter, you can move the working bed up and down by turning it. Using the small piece of acrylics board in the bag, adjust the the knob, make sure the distance between the material and the laser head is the same length of the small acrylics board.



For 6040 and higher model machines:

You can press UP / Down button on the panel to adjust the bed.

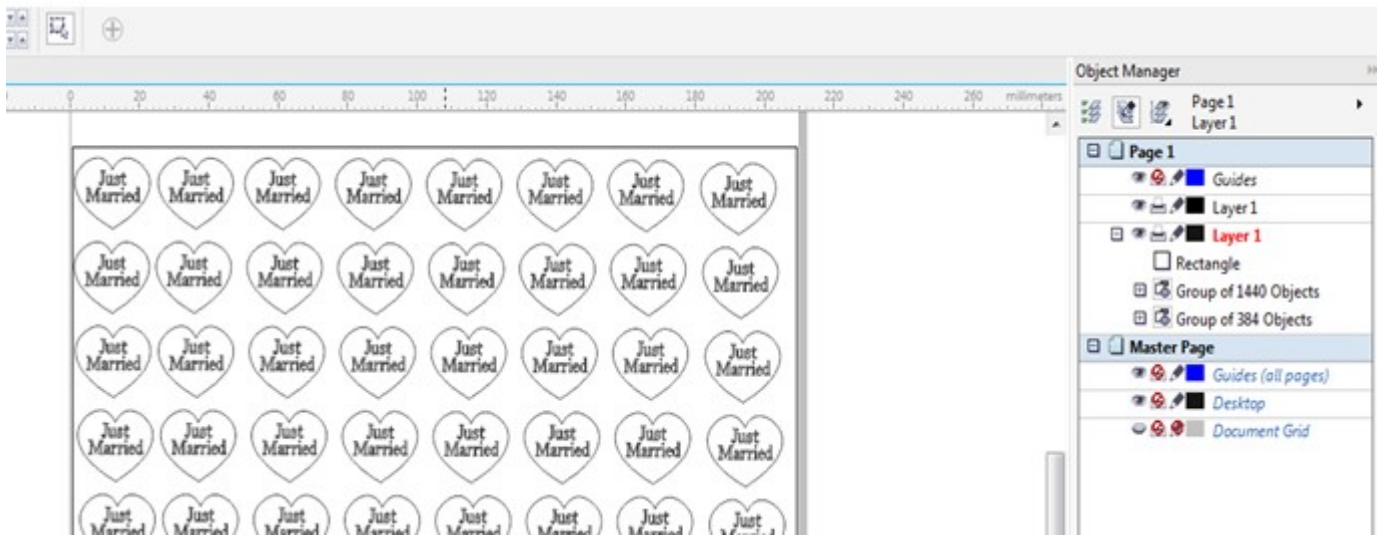
2. Engraving and Cutting Test

Start **Corel Laser**, open the test file in the usb stick, **\Gallery\card.cdr**

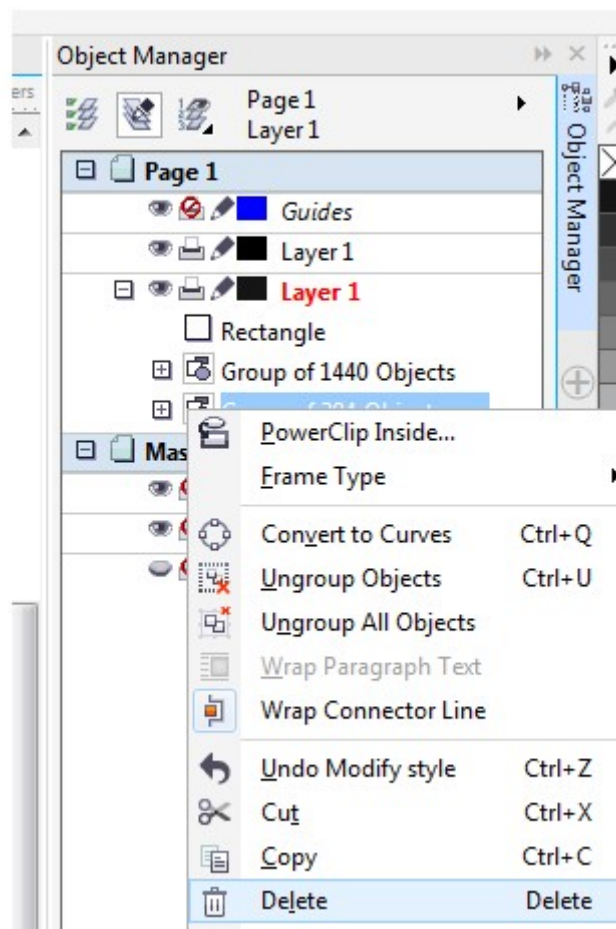
In the card.cdr, we need to do both engraving and cutting work, if you open the Object Manager in the Corel Draw, you will see we grouped all the fonts objects which need to be engraved (Group of 1440 Objects),

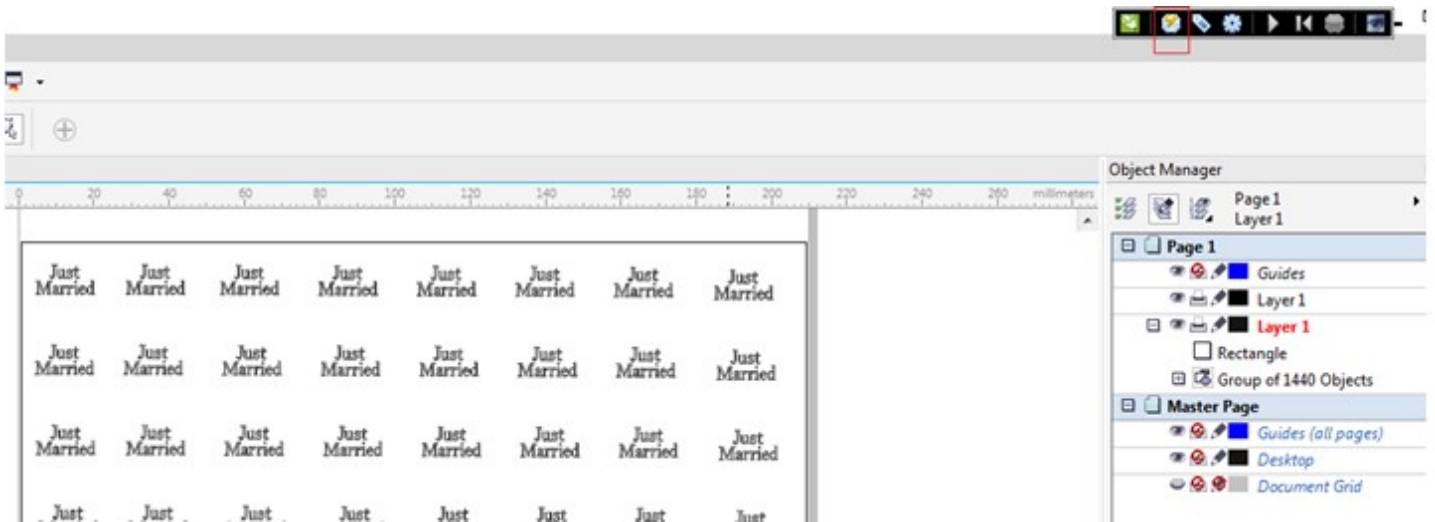
and we also grouped all the heart shape objects which need to be cut (Group of 384 Objects).

At last we draw a box/frame to contain all your designed files, this will keep engraving and cutting objects' relative position.

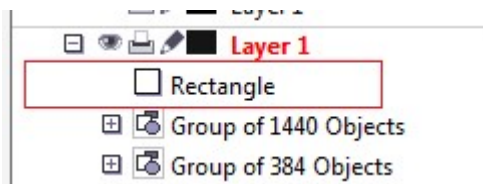


If we want to start the engraving work first, then adjust your laser power on the panel to suit your material. Then delete the cutting group in corel draw. Click Engraving button

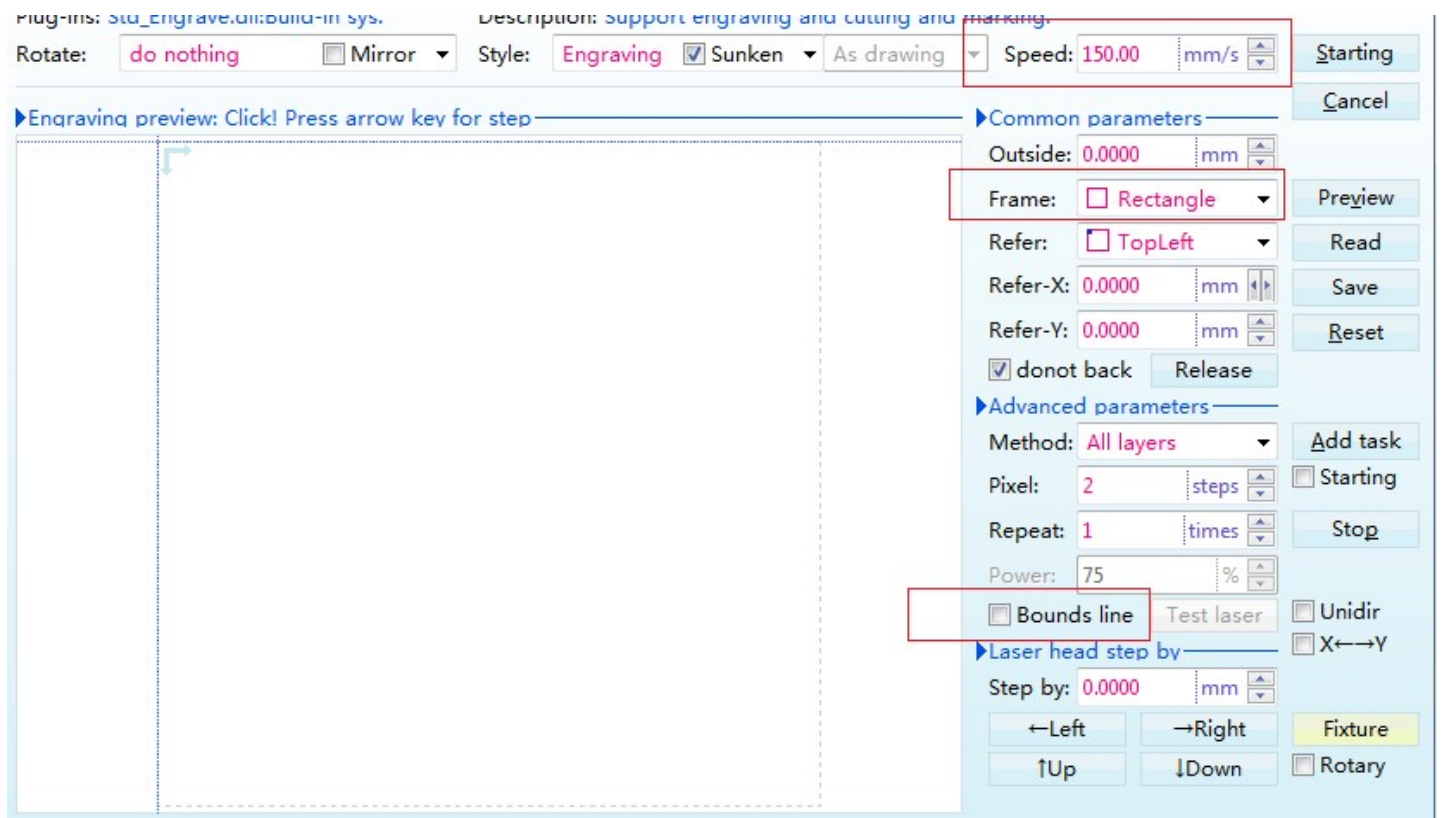




Set Engraving speed around **150mm/s**,
 Frame select **Rectangle** which we drew before



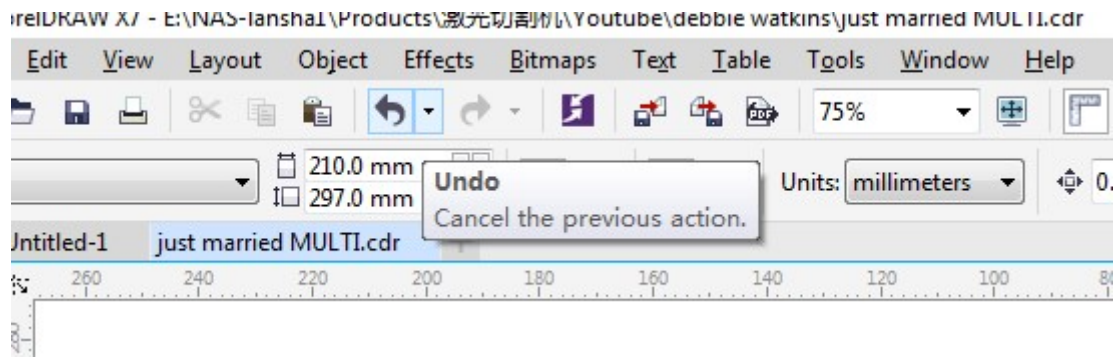
Untick **Bounds Line**



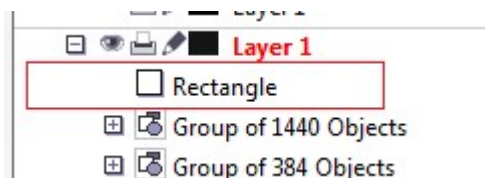
Click **Starting**

After engraving job is done, we can start the cutting job

Adjust your laser power on the panel to suit your material for cutting. Then click undo button in corel draw, delete the engraving group in corel draw. Click cutting



Set Cutting speed around **30mm/s**,
 Frame select **Rectangle** which we drew before



Untick **Bounds Line**

Click **Starting**

Click the **Preview**, the laser head will move in a rectangular path to show the real cutting/engraving size. If you don't want laser out in the Preview, you can turn off the **Laser Switch Button** on the control panel (Near Emergency Stop Button)

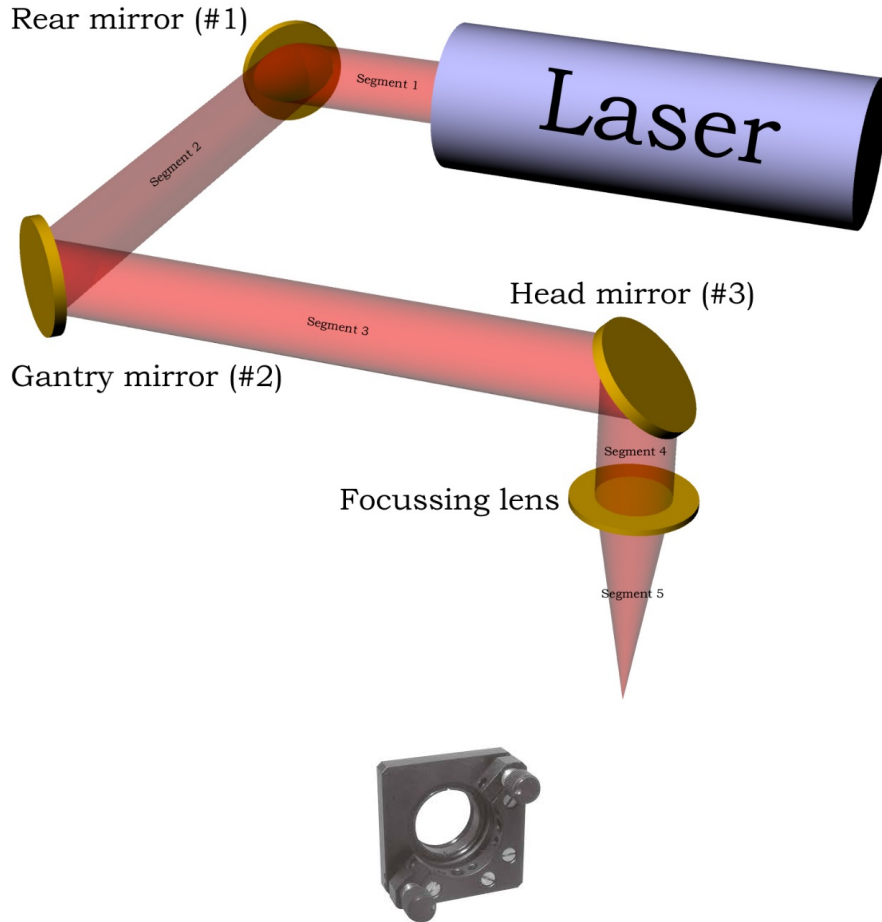


Chapter 6 – Mirror Alignment

Caution:

Remember that the CO2 laser beam is invisible!

You may need to do the mirror alignment when you changed the laser positions.



Y Axis Alignment

1. Take a piece of thermal paper, Tape two edges to the **2nd mirror**. Press your finger firmly along the edge of the aperture to make a mark on the thermal paper to show the aperture's outline.
2. Move the laser to the **upper left corner**. Close the cover. Press the **Laser Button** on the panel and observe the mark.
3. Move the laser to the **Lower left corner**. Close the cover. Press the **Laser Button** on the panel and observe the mark.
4. Observe the two burn marks, if more than 2mm of drift, you will need to align the **1st mirror**.
If the new mark is too high, then turn the top adjuster-screw clockwise. Make sure to only move the screw the slightest amount. We have seen that 1/16th of a turn could be too much adjustment.
If the new laser mark is left of the target, then turn the bottom-left adjuster-screw clockwise. This will pivot the first mirror such to reflect the laser beam more to the right.
5. Continue to use steps 1 through 4 until there is no drift.

X Axis Alignment

1. Take a piece of thermal paper, Tape two edges to the **3rd mirror**. Press your finger firmly along the edge of the aperture to make a mark on the thermal paper to show the aperture's outline.
2. Move the laser to the **lower left corner**. Close the cover. Press the **Laser Button** on the panel and observe the mark.
3. Move the laser to the **Lower right corner**. Close the cover. Press the **Laser Button** on the panel and observe the mark.
4. Observe the two burn marks, if more than 2mm of drift, you will need to align the **2nd mirror**.
If the new mark is too high, then turn the top adjuster-screw clockwise. Make sure to only move the screw the slightest amount. We have seen that 1/16th of a turn could be too much adjustment.

If the new laser mark is left of the target, then turn the bottom-left adjuster-screw clockwise. This will pivot the first mirror such to reflect the laser beam more to the right.

5. Continue to use steps 1 through 4 until there is no drift.

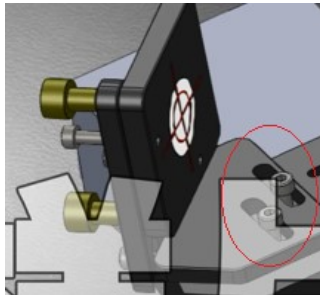
Adjust Burn Mark Close to the Center

Once the mirror 1 and mirror 2 is aligned. We want to adjust the burn mark close to the center.

1. Adjust tube holders to adjust up/down drift.



2. 2nd mirror adjustment: Use hex key to adjust bolts in the below photo to move burn mark left or right.

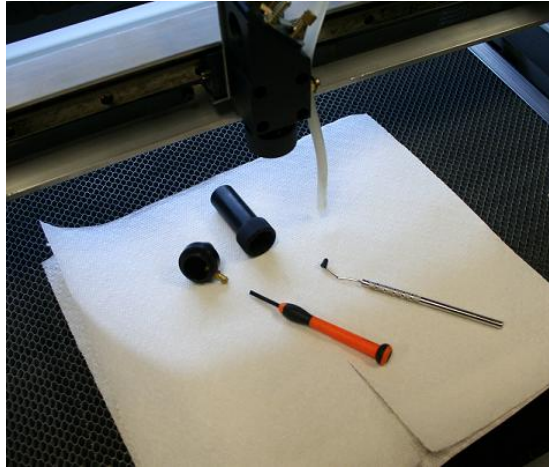


Finally move the laser to the **upper left corner, lower left corner, upper right corner, lower right corner** to observe any drift on the burn mark.

If it still have drift, please continue use steps **Y Axis Alignment, X Axis Alignment, Adjust Burn Mark Close to the Center**

Laser Head Adjustment

Remove the focal tube from the focal head. Remove the air assist hose first. There is a knurled fitting that can be loosened by hand, loosen this and slide out the focal tube.



Unscrew the top of the focal tube exposing the lens.



There is a ring (Lens Nut) that holds the lens in place, this is screwed in. Being extremely careful. Hold a small flat-head screwdriver like a pencil. We don't want a small slip to make a big scratch in the lens. Loosen and remove this retention ring.



There is a washer that absorbs abnormal pressures from cracking the lens. Remove the rubber washer. You can use a dental pick, toothpick, or needle. Again... Be careful to not scratch the lens.



Remove the lens. Tip the focal tube upside down to dump the lens onto a soft towel. Inspect the lens for deposits and scratches. Use a fluffy q-tip and denatured alcohol for cleaning. Clean the lens by dripping the alcohol onto the lens and use the q-tip only to wipe the alcohol from puddling anywhere on the lens. Do not apply pressure or scrub in any way. Use the Q-Tip to transfer the alcohol to the lens. Make sure the lens is dry and clean.



Wipe the focal tube with a paper towel. Make sure the focal tube doesn't have any oil, water, or dirt inside it. Place the lens back in the focal tube with the curved section of the lens facing into the inside of the tube. The laser should hit the curve first, pass thru the lens, then exit the flat side of the lens.



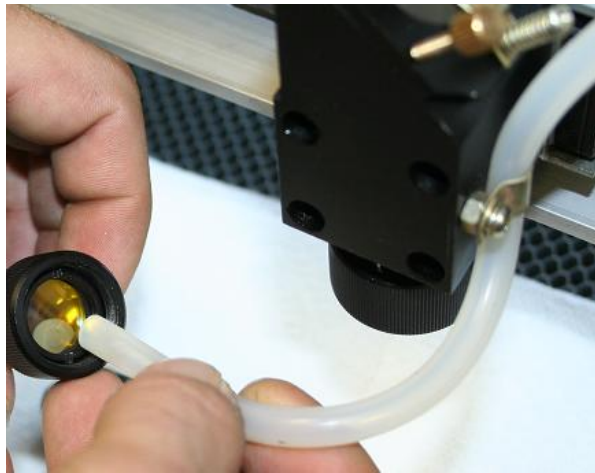
Place the rubber washer back into the focal tube. This washer will protect the lens from too much pressure or pressure that is concentrated to one side.



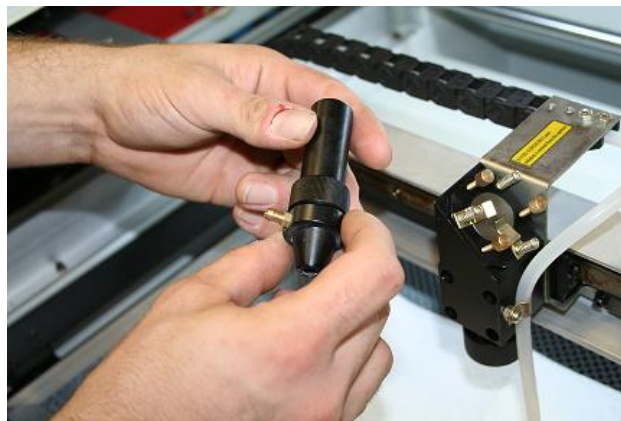
Put the retaining lens nut back and secure it in place snugly.



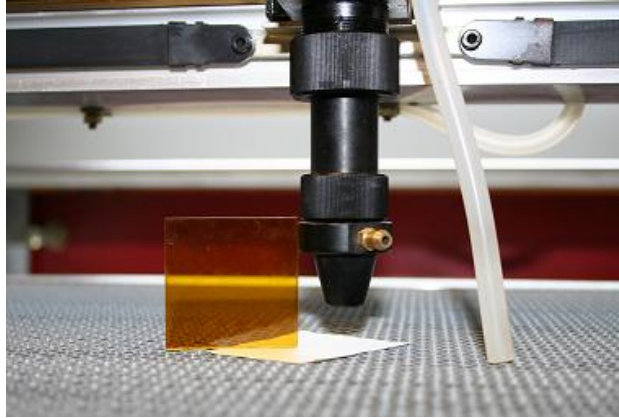
Using the air assist, blow off any debris that may be contaminating the lens.



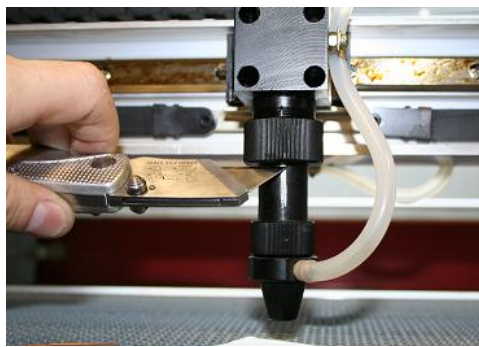
Once the lens is clean, replace the top section of the focal tube.



Move the Z-Axis table to the top position. Place the focal tube into the focal head far enough so that with the table at maximum height a single sheet of paper is in focus. Make sure the air assist inlet is facing the correct direction and not obstructing movement. Then tighten the knurled fitting so that the focal tube is snug. Place the air assist hose back onto the hose-barb fitting.



Using a utility knife, mark the front of the focal tube and how deep it is placed into the focal head. This step will make cleaning your lens a faster process.



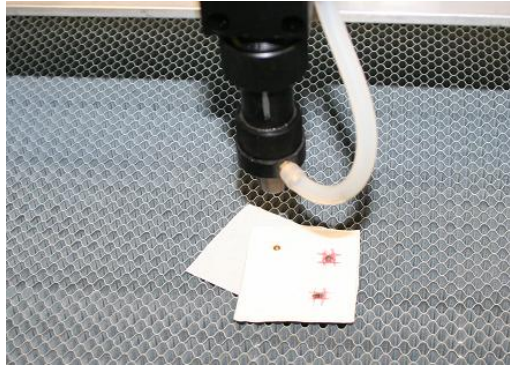
Using the focal tool, move the table so that the machine is out of focus like shown in the picture. Place the masking tape target on the table under the focal tube.



Tighten the set-screws on the focal head assembly until the springs are snug.



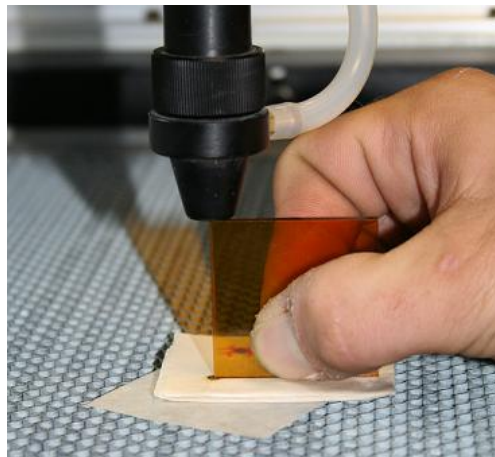
Close the lid and press the laser button. The result should be a circular laser spot about 1/4 inch in diameter. Make sure the spot is dark and easily seen. If the laser spot is shaped like a cat-eye, then the laser may be striking the aluminum nozzle.



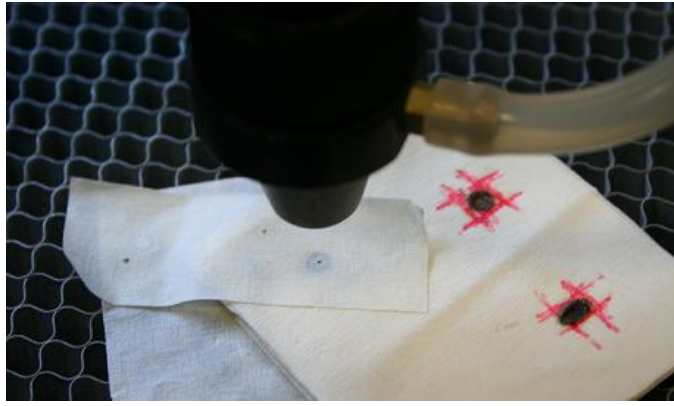
Use the focus tool as a square. Check the spot to insure that it is coming out of the center of the focal tube in the y-axis plane. We remember that the laser should come into the focal head assembly center. The spot might be slightly to the left of center nozzle. If the mirror #3 is elevated out, then the spot will shift to the right. Do not excessively tilt the mirror. Tilting the mirror could make the laser beam strike the aluminum nozzle.



Using the focus tool as a square, Check the spot to insure that it is coming out of the center of the focal tube in the x-axis plane.



Bring the table up so that the masking tape target is in focus. Close the lid and press the laser button once. Check if the dot is in the center of the 1/4 spot. If the dot is high(to the rear of the machine), tighten the left and back-right screws. If the dot is low(to the front of the machine), tighten the front-right and left screws. If the dot is to the right, tighten the left screw. If the dot is to the left tighten both right screws.



Repeat the process of steps until the results are $\frac{1}{4}$ spot and center dot. .. Then you are done.

Chapter 7 – Maintenance

Continuous Maintenance (Every job, done by all Laser Cutter Users)

- Clean the laser bed with IPA and cloth or wipes
- Clean any debris off laser bed and surround using soft brush

Basic Maintenance (Every week, done by Laser Cutter Maintainers)

- Clean the laser lens with IPA and cotton buds
- Oil the movement parts
- Thoroughly clean the laser bed with IPA and cloth
- Replace the distilled water.
- Clean and remove debris from the machine base and catchment drawer
- Properly clean lenses and mirrors

Full Maintenance (Every 4 weeks, done by Laser Cutter Maintainers)

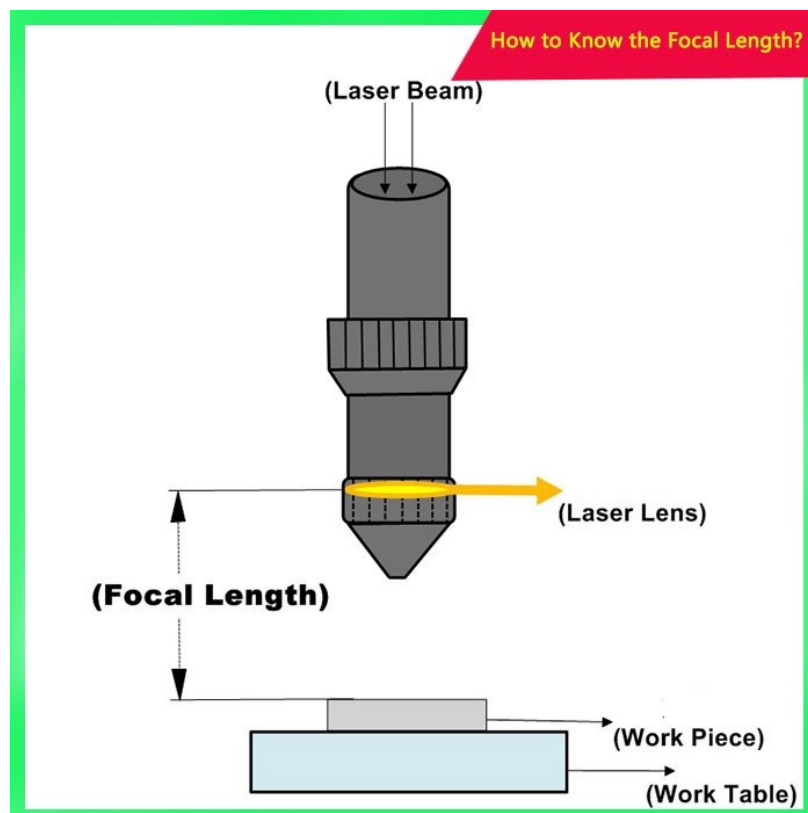
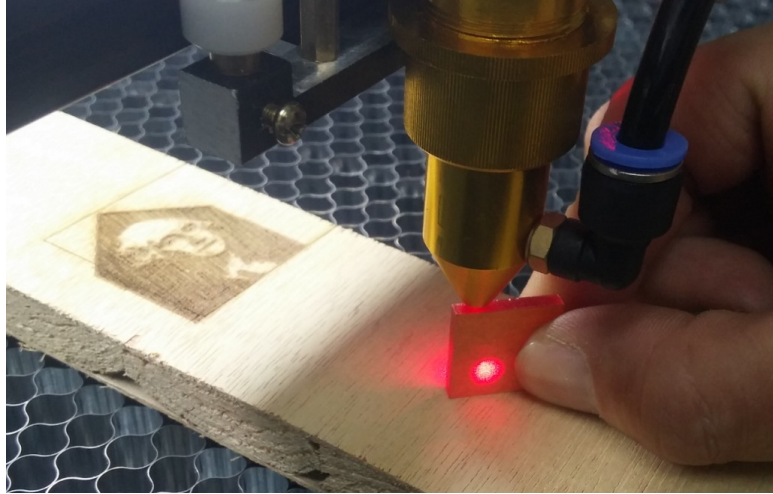
- Oil the movement parts
- Check mirrors and clean with a disposable sachet lens cleaner cloth (only if needed, mirror coatings are delicate)
- Work through mirror alignment procedure to check alignment of mirrors

If you are not going to use the laser cutter for a long time, please disconnect the power cable, and drain the water in the laser tube and cooling system.

In the extreme cold environment, please drain the water in case they are frozen.

Chapter 8 – Q&A

1. If your laser doesn't cut through your material, you may need to adjust focal length. The small piece of acrylic board is used to focus the laser beam.



2. There is not laser.
 - a. Turn off the machine, unplug power cable, and leave it for a while. Check all the cables (open side panel to check cables, open tube cover to check positive and negative cable), make sure there is no loose connection.
 - b. Check whether the **Laser Switch** is on or off

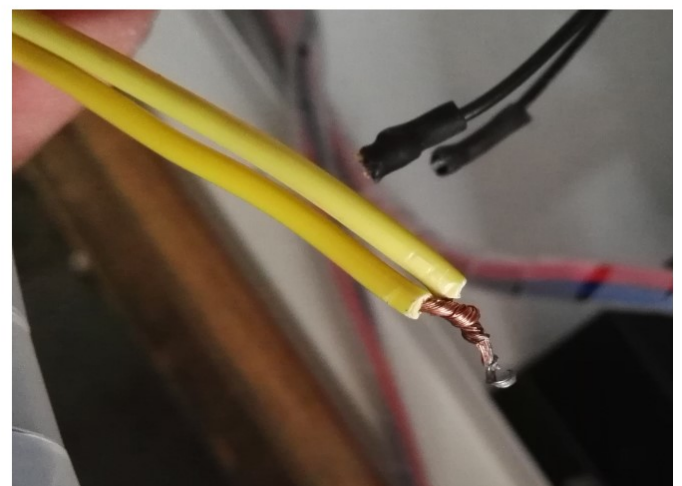
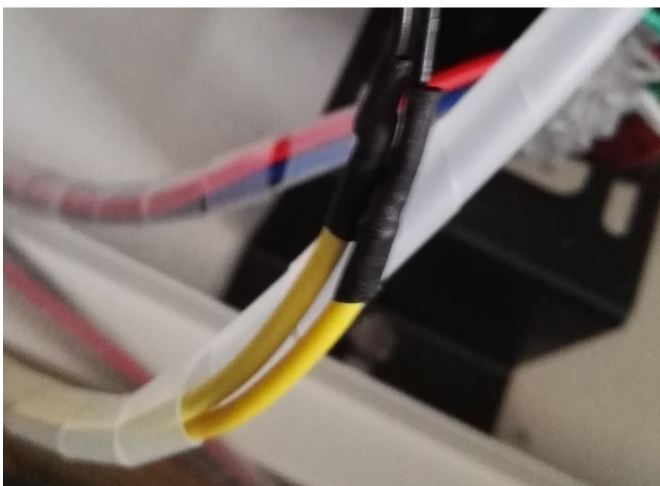
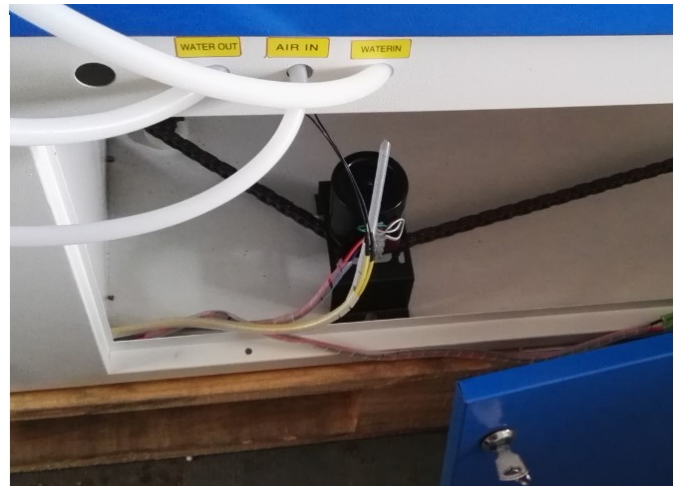
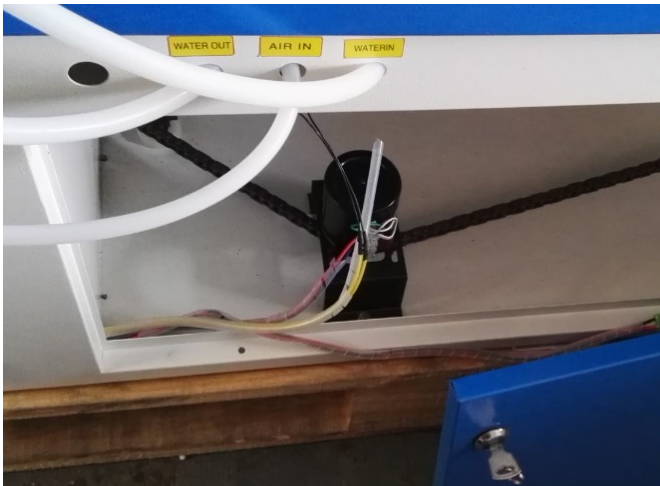


c. Press the Test button on the panel, ask someone to stand behind the tube, check whether he can see the laser beam inside the tube when you press the Test Button

Note: when you the laser is outside the tube, you won't be able to see it.

If there is lase inside the tube, but not showing on the material, then you need to do the Mirror Alignment (Chapter 6), because the laser beam is not aligned.

d. If still there is no laser beam inside the tube when you press the button. Then we check the water protection circuit. Open the panel behind. Find out there are yellow and black cables connected together. Cut it off, and wire the two yellow cable together.



3. I heard there is a loud ticking noise / HV Arcing.

The insulation has deteriorated resulting in the HV arcing, this can be caused by mechanical friction (wear), moisture (humidity) or just electrical breakdown. Repair the insulation, reconnect and it should work again.

Check the red positive cable coming out from the Laser Power Supply. Find any burning mark, make a clean solder connection and then either wrap in HV tape or use a HV rated silicone (most are).