

Volume

1

FULL SPECTRUM LASER LLC v0.85

40W Hobby CO2 Laser Engraver Setup and Installation Guide



Hardware Setup and Operation

SETUP AND INSTALLATION GUIDE

Hardware Setup and Operation

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Getting Started

Thank you for your recent purchase of your 4th generation Full Spectrum Laser LLC Hobby Laser. It is our wish that this product adds value to your business or hobby activities for years to come. Please take time to read this manual in its entirety to safely use your laser to its full potential.



Important:

Please carefully read all the instructions before attempting to operate the laser. **Never** operate or test the laser without the water pump running and water. **Never** attempt to operate the laser with the lid open or attempt to override the magnetic lid protection switch.

These installation instructions available online:
<http://fslaser.com/resources/software-manual-downloads>.

Familiarize yourself with the major components of your new hobby laser before use.

Unpacking instructions:

1. Open the box and remove the documentation located between the packing material and box flaps as well as the honeycomb table.
2. Remove packing material and inspect the unit for any damage during shipping. Open the front lid and remove accessories within. Please open the back lid and inspect the laser tube carefully for any shipping damage. Contact us **immediately** if there are any visible cracks.
3. Often we will ship the laser with a hose clamp on the right round rail which must be removed before use.

HOW TO OPERATE YOUR LASER

Box Contents:

1. 40w Hobby Laser w/ Power Cord
2. Black Water Pump
3. White Exhaust Fan and blue 4" diameter hose (Located inside Electronics Bay on the right)
4. Silver Honeycomb Cutting Table
5. Air compressor (Optional but highly recommended)
6. RetinaEngrave USB card and mini USB cable
7. Brown cutting depth adjustment ruler
8. Set of keys that operates on/off switch, opens control panel compartment and rear laser tube compartment.

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A Brief Tour



Main Assembly

- 1) Lid with Safety Glass
- 2) Control Panel
- 3) Stationary Mirror
- 4) Y Axis Mirror
- 5) Laser Head
- 6) Secondary Laser Pointer for optional beam combiner
- 7) Beam Combiner (Optional)
- 8) X folding cable carrier
- 9) Y folding cable carrier
- 10) Feet Standoffs
- 11) Z table adjustment screw (adjusts the height of the table from the **bottom**)
- 12) Lid Magnet (silver)
- 13) Magnetic Safety Interlock Switch (black)

HOW TO OPERATE YOUR LASER



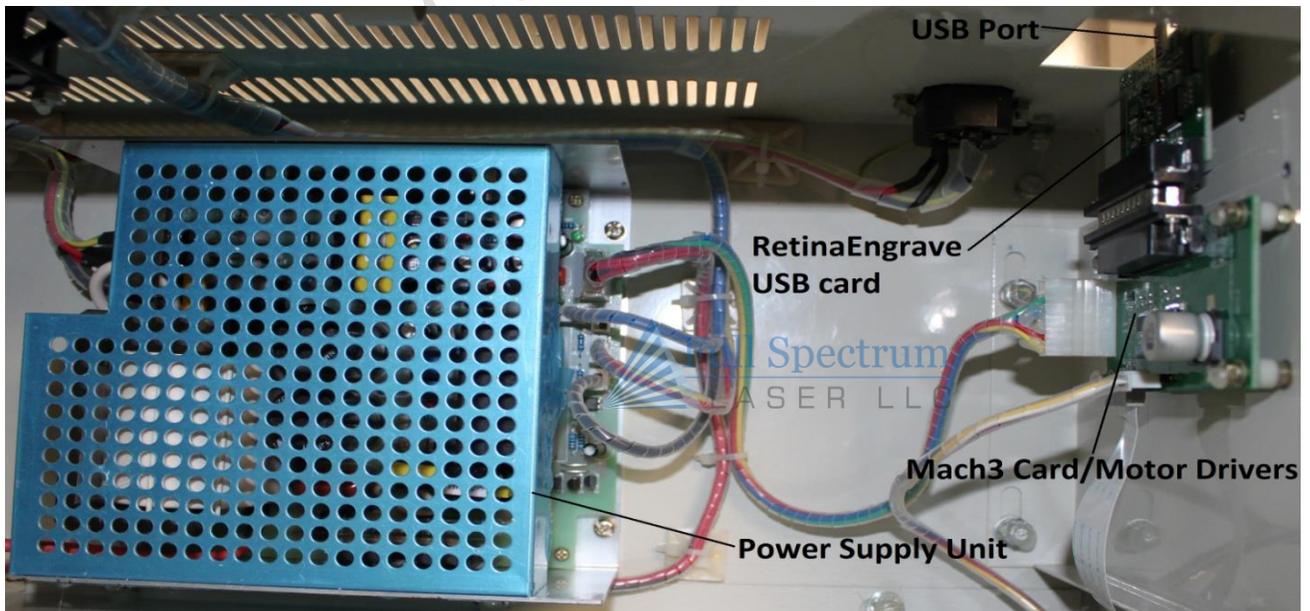
Rear Compartment

1. Laser tube
2. Laser Exhaust Fan mount holder
3. 110v Outlet for water pump (**not** recommend for use, plug pump directly to wall outlet)
4. 110v Outlet for air compressor (**not** recommend for use, plug directly to wall outlet)
5. 110v Outlet for fan (**not** recommended for use, plug the fan directly to wall outlet)
6. Water inlet hose
7. Water outlet hose
8. Stationary mirror
9. Red high voltage laser power cable
10. Black high voltage laser power cable
11. Hose from Air compressor (push blue nub inward to allow insertion of tube)

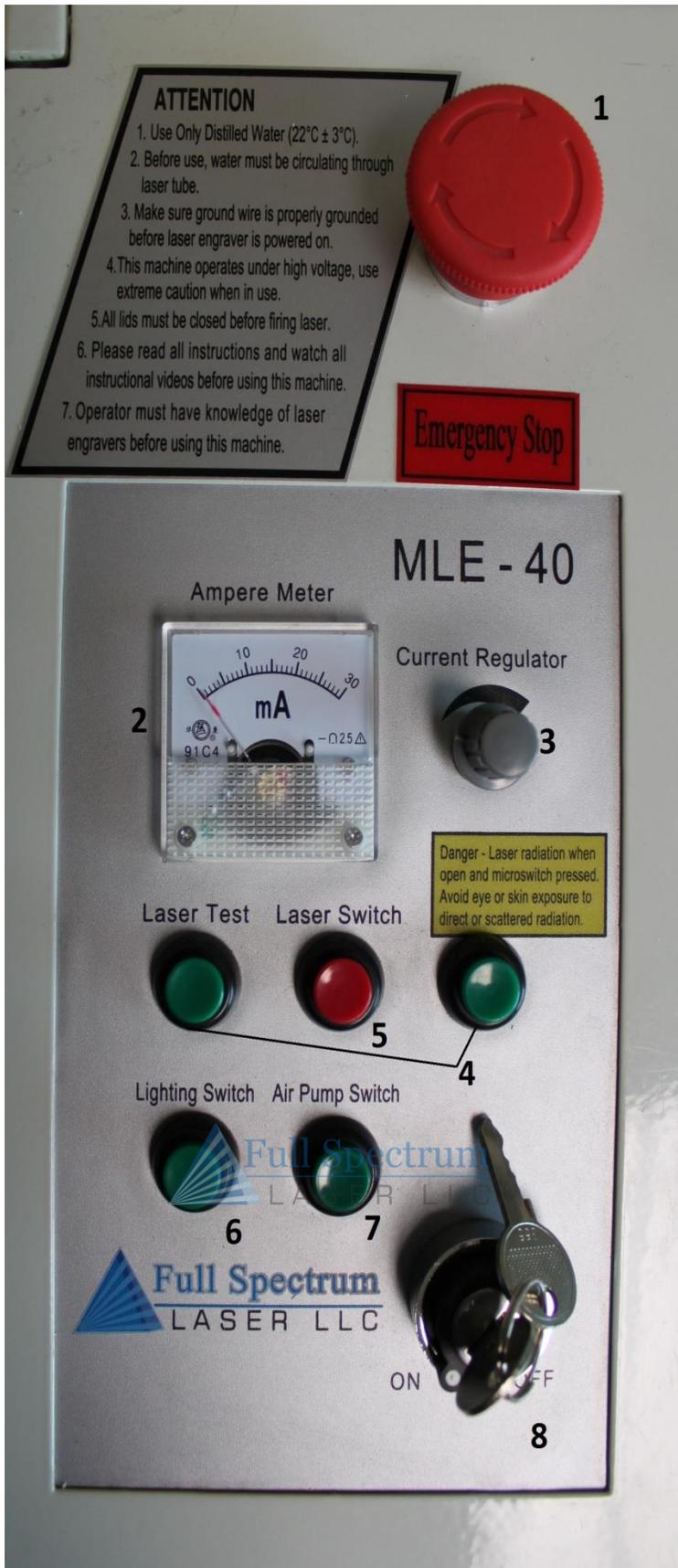


Side Panel

1. Power supply Exhaust Fan
2. RetinaEngrave USB access point
3. 110V 3-prong power plug with 6A fuse(maximum 660W)
4. Ground Point (attach this to the table top if using a metal table; otherwise do not attach to anything).



HOW TO OPERATE YOUR LASER



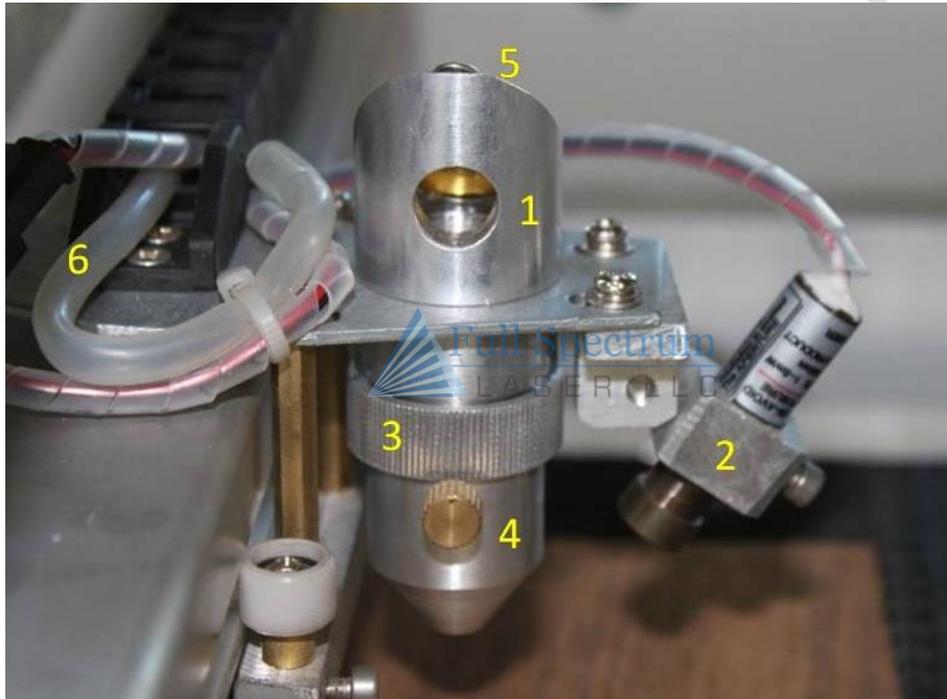
Control Panel

1. E-stop button (depress to disable)
2. Power meter (0-30mA)
3. Current Regulator knob (10 turns)

Knob disabled in Lasers shipped in 2012. Control power and test fire functionality using the Software. Pressing the test fire buttons will result in a full power test fire.

4. Laser test fire buttons (Press **both** simultaneously to activate)
5. CO2 Laser enable/disable switch
6. Switch for interior light
7. Air compressor switch (inactive)
8. Key switch

Laser Head



1. Invisible CO2 laser beam entrance hole
2. Side shooting Class 3a red laser pointer - always on. Focus invisible CO2 laser first with the ruler then fire a dot on a piece of paper and align the red laser dot so it hits the same spot. The optional beam combiner provides better performance since it goes through the lens. Red dot size will be around 0.2" without beam combiner and around 0.001" with beam combiner upgrade.
3. Knurled aluminum lens holder (remove air assist nozzle first before removing lens).
4. Screw which holds the air assist nozzle
5. Screw which holds final mirror
6. Flexible air assist hose into self-folding cable carrier on X axis gantry

Safety Information

Please carefully read all the instructions before attempting to operate the laser. **Never** operate or test the laser without the water pump. **Never** attempt to operate the laser with the lid open or attempt to override the magnetic lid protection switch. Please inspect the laser tube carefully for any shipping damage and contact us immediately if there are any visible cracks.

Laser Safety

Your Full Spectrum Laser LLC MLE-40 40w Hobby Laser is a Class 3a laser product, as defined in

International Standard IEC 60825-1. The laser complies with 21 CFR 1040.10 and 1040.11, the Federal Performance Standards for Light-Emitting Products, except for deviations pursuant to Laser Notice No. 50, dated July 16, 2001. The Center for Devices and Radiological Health, of the US FDA, issued Laser Notice No. 50 to permit manufacturers to classify and manufacture their products in accordance with the International Standard.

The output of the CO₂ engraving laser is fully contained in a Class 1 enclosure except for the visible red laser pointer which is rated as a Class 3a laser product.

The laser cabinet has a magnetic safety interlock switch that deactivates the laser off if the door is opened during operation, and no special precautions are necessary to operate the highpower laser safely. **Never** attempt to defeat the magnetic safety switch.

The operator of the 40w Hobby Laser should observe the following general precautions:

- ❖ **DO NOT** disassemble the machine or remove any of its protective covers while the unit is plugged in.
- ❖ **DO NOT** attempt to defeat the door interlock.
- ❖ **DO NOT** view directly into the beam of the Red Laser Diode Pointer.

Caution – Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous laser radiation exposure.

Electrical Safety

The AC input power to the 40w Hobby Laser is potentially lethal and is fully contained within the cabinet.

- ❖ **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.

Fire Safety

Laser cutting and engraving systems represent a significant fire hazard. Most engraving materials are inherently combustible. While, the objective of most cutting and engraving operations is to vaporize material without burning, it is easy to ignite a flame. 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 read the following warnings and recommendations and follow them closely at all times!

- ❖ **NEVER** let the laser system operate if it will be unattended.
- ❖ **ALWAYS** keep the area around the machine clean and free of unnecessary clutter, combustible materials, explosives, or volatile solvents such as acetone, alcohol, or gasoline.
- ❖ **ALWAYS** keep a properly maintained and inspected fire extinguisher on hand.
- ❖ **KEEP YOUR LASER SYSTEM CLEAN**– Regularly remove the honeycomb grill to clean any small pieces that have fallen through the grid.

Additional Safety Measures

NEVER operate the machine without a properly operating vent to the outside!

NEVER engrave or cut any material containing chlorine or hydrogen gas such as PVC or vinyl. Doing so will produce gasses that will corrode the interior of the laser and is **not** covered under warranty.

NEVER operate your machine unattended. There is a significant risk of fire if the machine is set improperly, or if the machine should experience a mechanical or electrical failure while operating.

NEVER vector cut any material while the machine is unattended. Because vector cutting moves relatively slowly compared to raster engraving, a tremendous amount of heat is applied to the material being cut. This buildup of heat can cause significant fire risk and the machine should always be monitored.

NEVER operate with any of the covers or enclosures removed, and never modify the enclosure. The laser beam is invisible!

Hardware Setup

Although power outlets are supplied on the back of the Hobby Laser for the Exhaust Fan, water pump and air compressor, we recommend connecting these devices to a power strip or circuit breaker separate from the laser. Always ensure these devices are powered on before starting the Hobby Laser.

Water Pump



Important: Do not run the laser without water cooling! The water pump is 110V and needs to be plugged into a power bar. Do not plug in the water pump into the back of the laser.

The laser has 1/4" OD plastic water tubing for inlet/outlet. The tubing comes recessed inside the unit. Simply pull out of the corresponding holes and connect to the water pump. A 5 gallon bucket filled with **distilled water** or other receptacle must be utilized to hold the water and contain the pump



Exhaust Fan



Important: Do not cut materials without proper ventilation! The fan also extracts smoke to keep the laser cabinet clean. Do not vector cut any material without the fan running.



Install the 4" Exhaust Fan port on the back of the laser. Slide it downward so that it is secured between the three holding braces. The exhaust hose is 4" diameter. One end is flanged and should exhaust debris away from the unit. Ensure that it leads to an open space, away from and outside the engraving area. Fit the end of the hose that is not flanged on to the Exhaust Fan port. A hose clamp can be used but is not necessary.



Air Compressor (optional upgrade)



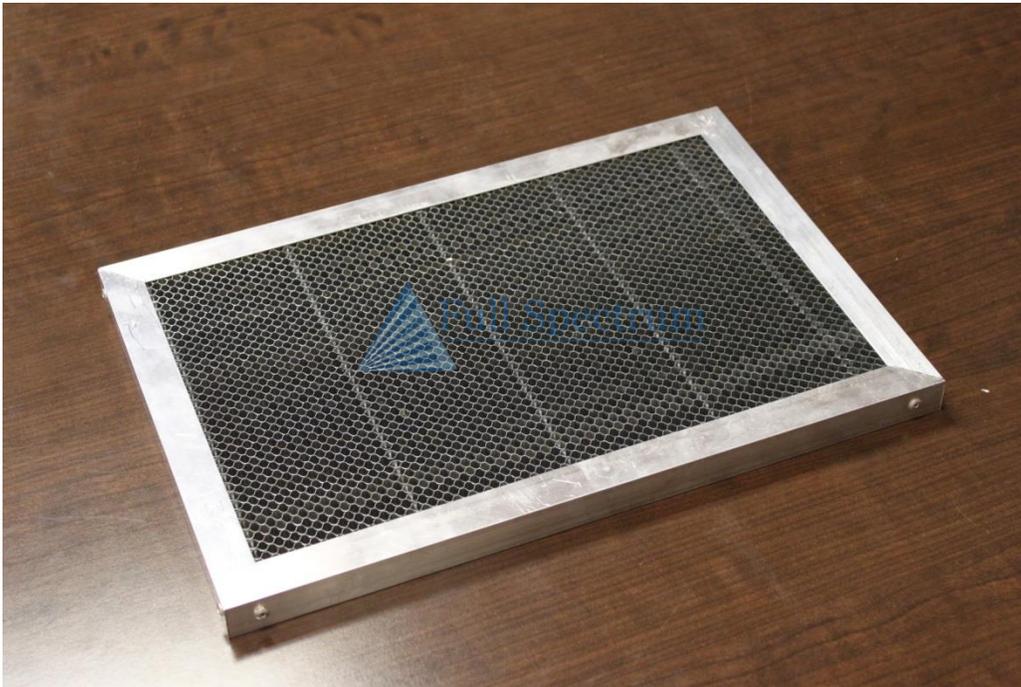
Important: Do not cut anything on the laser without the air compressor running. Constant air flow keeps smoke from depositing soot onto the laser lens.

Install the optional air compressor by connecting the air compressor tubing. The blue air hose connector on the back of the laser accepts hard plastic tubing with 0.23" outer diameter (OD) tubing and 0.17" inner diameter (ID) by means of a friction lock. Simply push the tubing into the blue connector and it will lock into place. This tubing is included with our air compressor. The Full Spectrum Laser air compressor puts out around 2200L/hour of air. You may use any comparable airbrush compressor.



Honeycomb Cutting Table

The cutting table serves to disperse any reflected laser energy as well as position the engraving material within the proper distance from the laser head. Turn the Z-axis adjustment screw underneath the unit to raise or lower the platform.



Full Spectrum

Typical Workbench Setup



- 1) Laser on stainless steel work table
- 2) Computer on stand
- 3) 5 gallon bucket of distilled water with water pump fully submerged
- 4) Extended 4" air exhaust hose to outside dryer vent (not included)
- 5) Fire Extinguisher
- 6) Air compressor on ground (not shown)
- 7) Power strip with laptop/laser/water pump/air compressor plugged in (not shown)

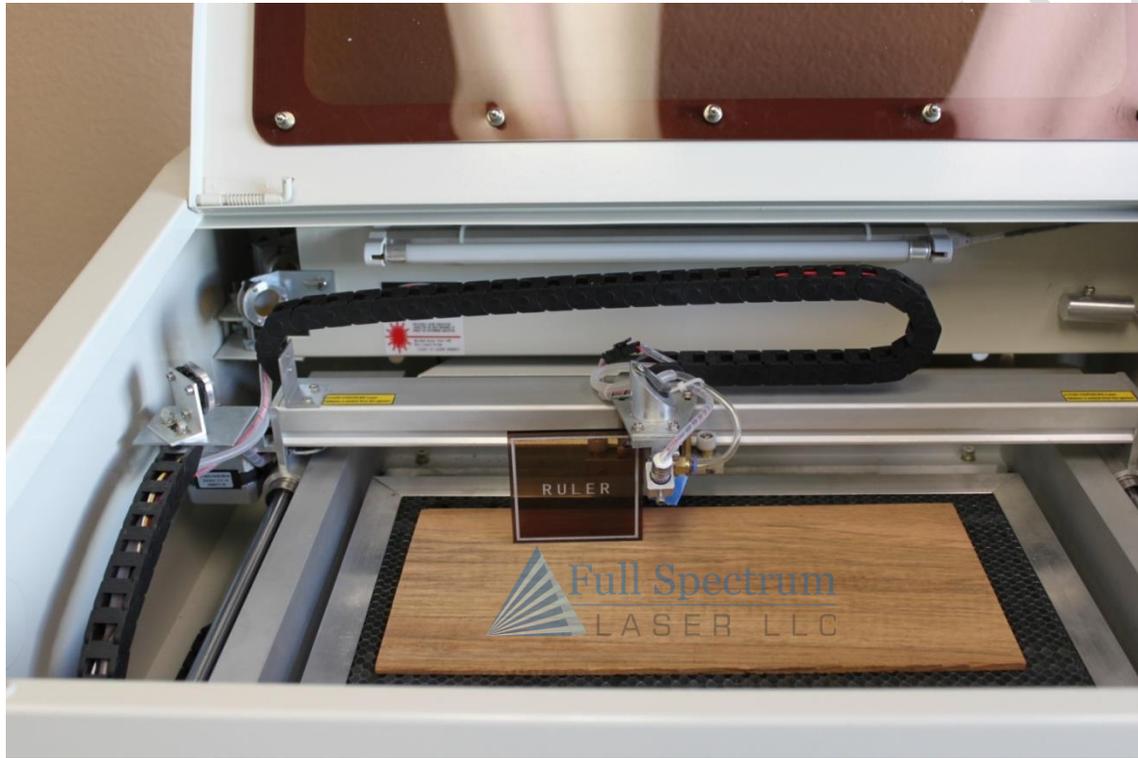
Focusing Your Laser



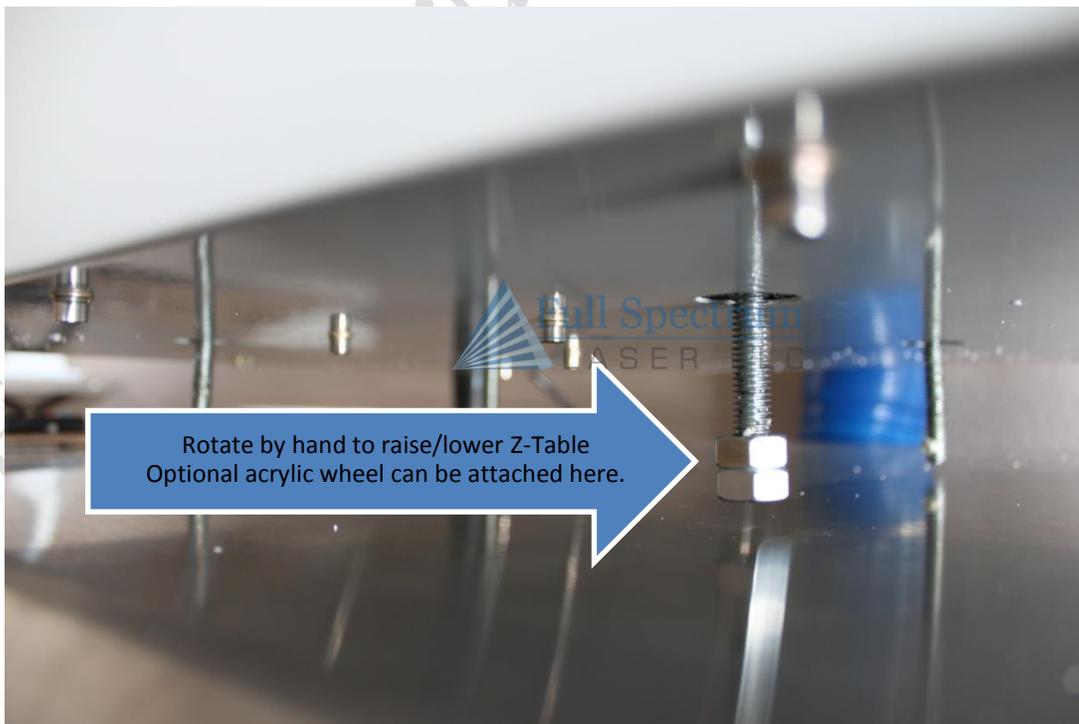
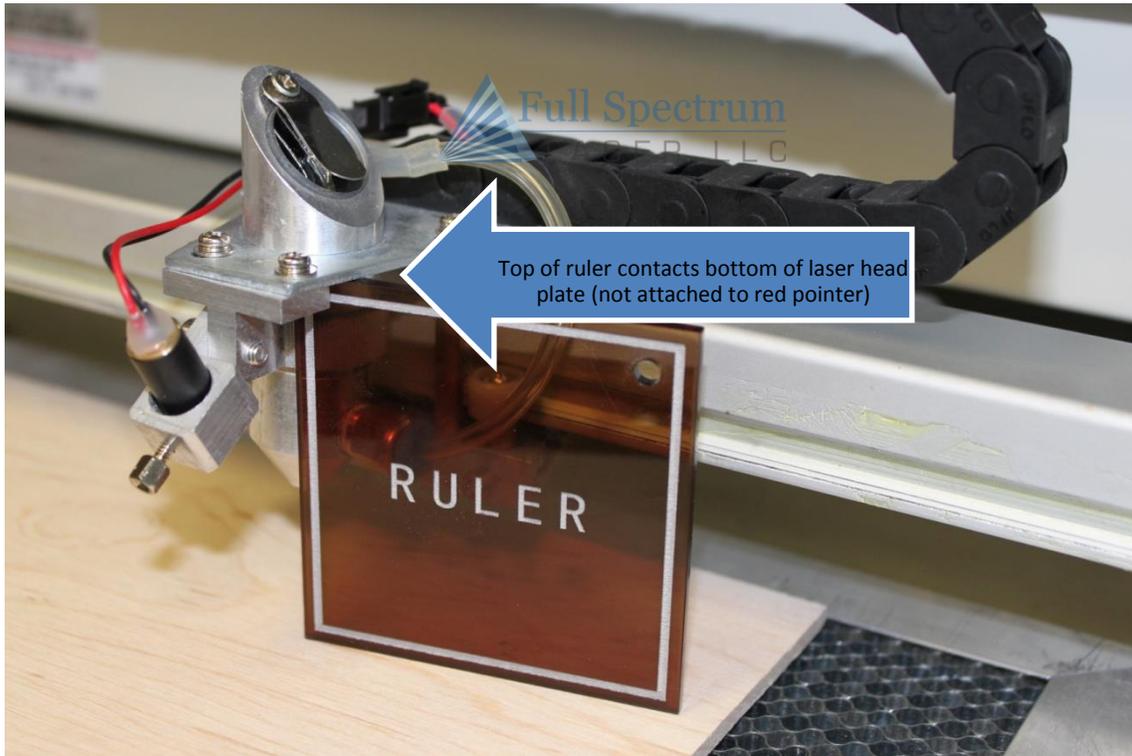
Important: The laser must always be in focus when in operation. Not only will you not have full power but low power out of focus laser beams will tend to burn or start fires instead of cutting through materials.

HOW TO OPERATE YOUR LASER

The laser lens works like a magnifying glass and produces a sharp cone of light. Focusing the laser is done with the included focus ruler. The focal length of the lens included with the laser is 2 inches (55mm) but the plastic ruler measures 2.77". Slide the gauge between the aluminum laser plate and the work surface as shown in the picture below.

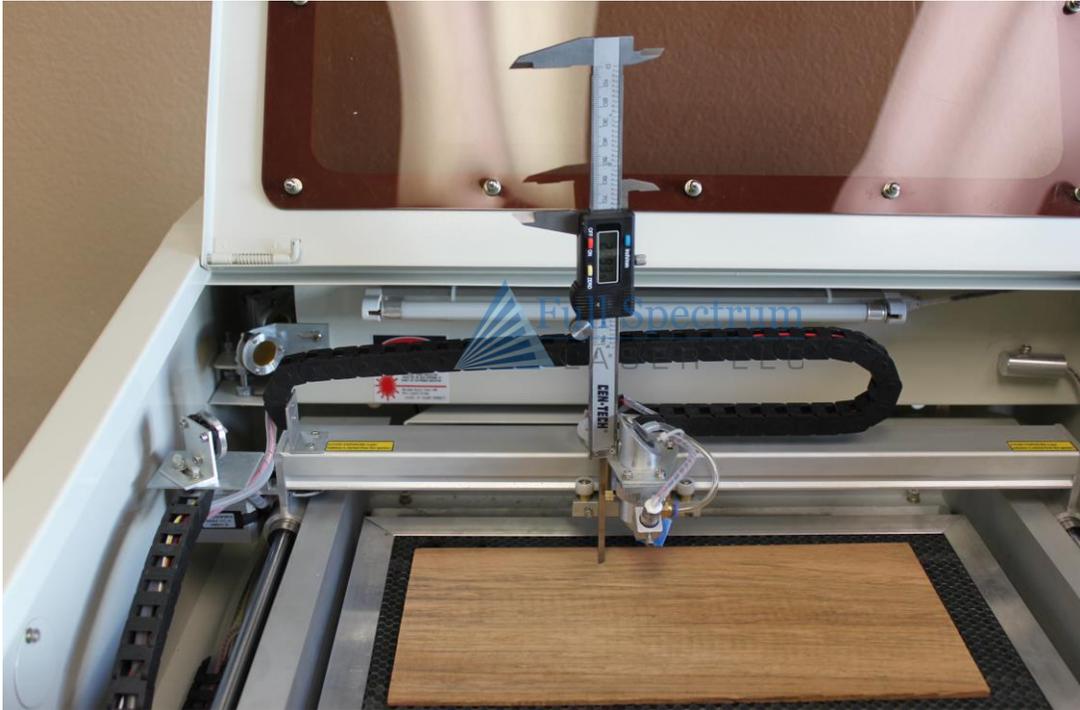


HOW TO OPERATE YOUR LASER



HOW TO OPERATE YOUR LASER

Optionally, the focus can also be set with a digital depth gauge as shown below. Here we measure 2.89" from the top of the aluminum laser head plate to the work surface according to the default 2.0" lens included with the laser. Add 0.89" to any longer focus length lenses you may use.



Aligning Your Laser

Please view our alignment video for detailed instructions, available at the following address: <http://fslaser.com/resources/software-manual-downloads>

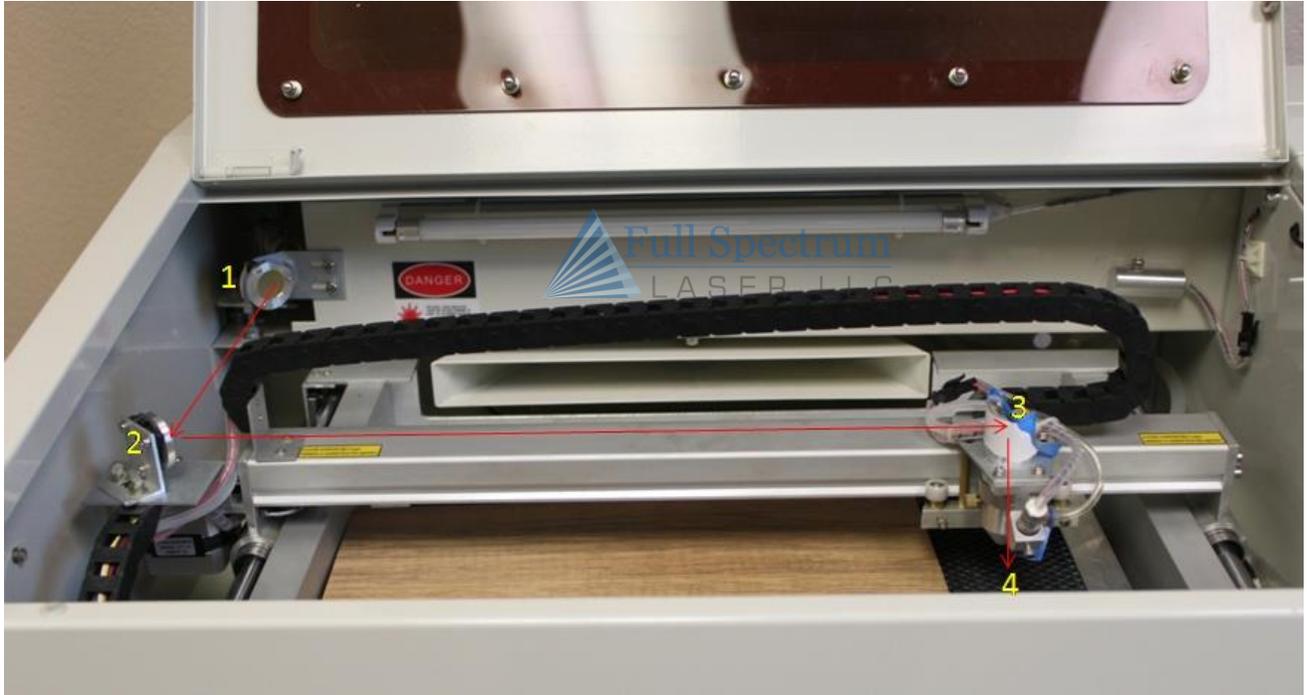
Often times when the laser does not produce an even burn over the entire workspace, the laser is out of alignment. Usually this is characterized by uneven burning with the left side of the image darker than the right side (see image below). If the laser is extremely far out of alignment, no spot through the lens may appear at all. One can always verify the laser is working by placing a small piece of paper near the stationary mirror (Mirror One in the rear next to the laser tube) and pressing **both** green laser test switches. If the current meter is moving, the laser is working.



Your laser is carefully aligned at the factory but may come out of alignment during shipping or unpacking. This procedure will explain to you how to align the laser for optimal cutting.

The laser path is shown below. The invisible beam bounces off the stationary mirror (not shown) behind the optional beam combiner (normally not included). Then the beam passes through the beam combiner (1) and bounces off the moving Y axis mirror (2). The beam proceeds to bounce off the flying X axis mirror (3) down the laser tube and through the lens (4). If any of the mirrors is off by even 0.1 degrees, the results will not be good.

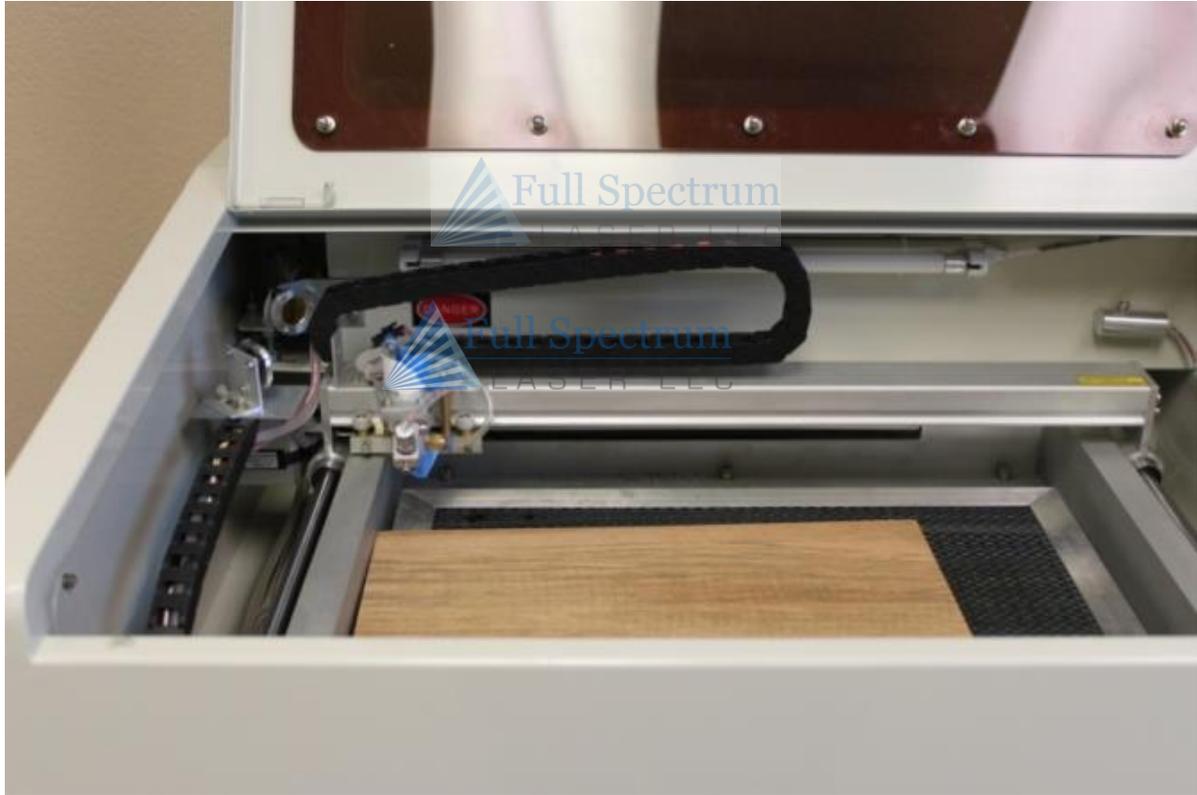
HOW TO OPERATE YOUR LASER



We recommend the following procedures and tests:

1. Usually only the Stationary Mirror (1) needs to be adjusted. Your laser was carefully tested at the factory. It is very unlikely you will need more than a few turns of the bolts.
2. Obtain some thermal receipt paper (almost all credit card printers use thermal receipt paper - used paper is ok) and tape it to the Y-Axis mirror (2).
3. When aligning the laser, do not worry about hitting the center of the mirrors. The invisible CO2 beam diameter is around 5mm and the mirrors are 20mm in diameter so all the collected energy will be reflected even if off center. You should only be concerned about where the laser beam hits the thermal paper when taped over the laser head.
4. Move the gantry closest to the Stationary Mirror (1). Any alignment errors are magnified when the Y Axis Mirror is farther away from the Stationary Mirror.

HOW TO OPERATE YOUR LASER



5. Fire the Test laser beam from the software after settings the test fire duration to 5ms.
6. Adjust the screws on the Y axis mirror in **small** increments. A quarter turn will put the laser out of alignment. Tighten screws 1 and 2 to tilt the laser beam up. Tighten 2 to shift it right. Tighten 3 to shift it down. Tighten 1 to shift it left.



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7. Adjust the bolts so that the dark spot produced on the thermal paper are over the mirror.
8. Move the laser head down about 2 inches. Now press the laser test buttons again and see where the spot is. The further away you move the laser head the more amplified any angle alignment errors in the laser beam will be. Adjust it until the dark spot produced is centered on the laser head even with the laser head all the way down.
9. It is not necessary to have exact dead center of the mirrors for all locations. As long as the laser beam goes down the hole at Mirror Three, it will reflect off the mirror and the focusing lens will correct any small errors. If the mirrors are aligned and the beam is off to either the left or right, you can adjust the laser head by loosening the 3 screws holding the laser head plate in place. Then sliding the laser head in the direction to have the beam oriented closer to the center of the entrance hole. Again the beam does have to hit dead center from all locations but the better aligned you have the laser, the better your results will be for detailed work.
10. Aligning the laser should only need to be done once unless you bump the lens or the mirror.

Connecting the Water Pump

You will need to pump water through the laser tube to prevent the tube from overheating.

- 1) First, screw on the grey adapter to the top of the waterpump as shown in the picture below.



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- 2) Next, connect the clear adapter to the grey adapter you just screwed into the top of the water pump. This is done by pushing the clear adapter into the grey adapter until it is firmly seated.



- 3) Next, connect one end of the clear tubing coming from the back of the laser unit, the water inlet labeled 6 on page 4, to the clear adapter. Slide the tubing over the innernipple on the clear adapter, as shown in the picture below.

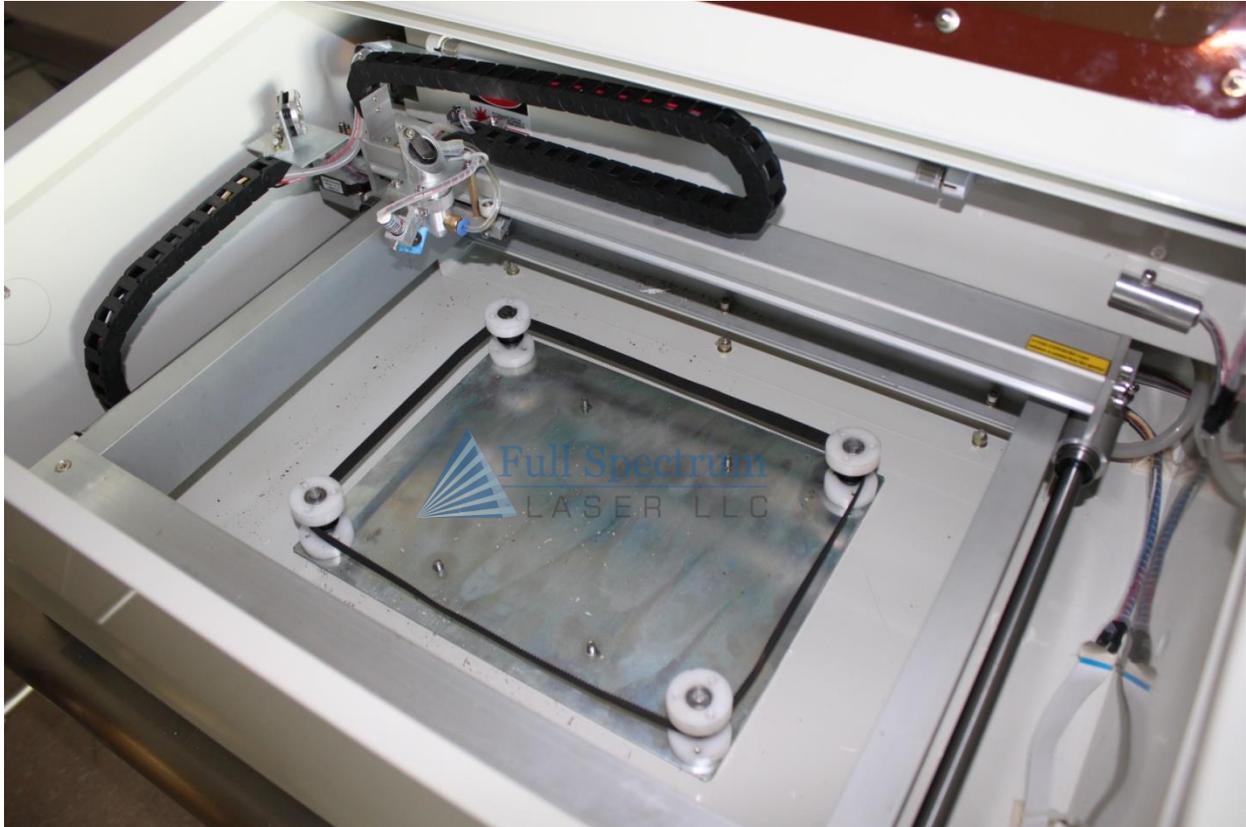


- 4) Verify the water is cycling through the tube. Fill a 5gallon bucket half way with distilled water. Put the water pump into the bucket and plug it in. Grab the non-connected end of tubing, the water outlet labeled 7 on page 4 of this manual, and verify the water is being pumped through.



Adjusting the Z-Plate

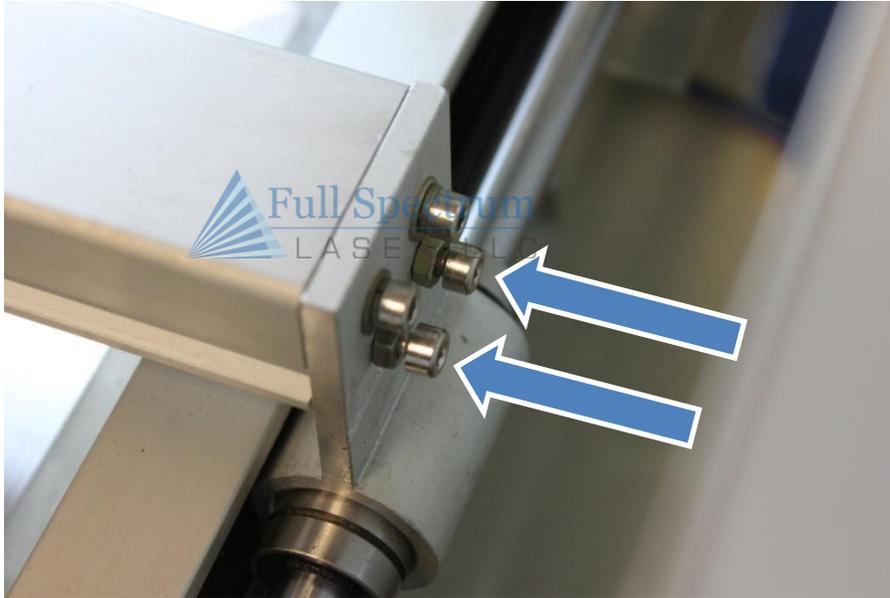
The Z-axis is raised or lowered with a belt that connects 4 screws. Under some circumstances the belt can slip on one of the screws and cause the Z axis table to become uneven. If the Z-axis is not flat, remove the sets of screws holding down the Z-table. A belt connects all the screws which raises or lowers the Z table. Adjust each of the screws until they are level by holding the belt and twisting the screws independently. The easiest way to do this is to remove the belt and drop all the screws as low as they can go then reattach the belt.



Adjusting the Belt Tension: X-Axis

In some cases, the belt tension might need adjustment on initial receipt. Movement should be smooth and not grainy or overly difficult. If the laser engraves at lower speed but at 100% speed the laser seems to jerk or stall, the belt tension should be loosened. If engraving lines do not appear straight, the belt tension should probably be increased. Adjust the bolts shown in the picture with a 3mm hex key. Purchase a long hex key and there is an access hole on the right hand side of the machine. Turning clockwise increases the belt tension.

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If the belt tension has been adjusted correctly and the movement of the laser head still moves with grainy or overly difficult motion then you may also need to adjust the wheels attached to the laser head. Turning the screw clockwise will tighten the wheel. However we recommend against adjusting it from on top because you can only turn it one way.

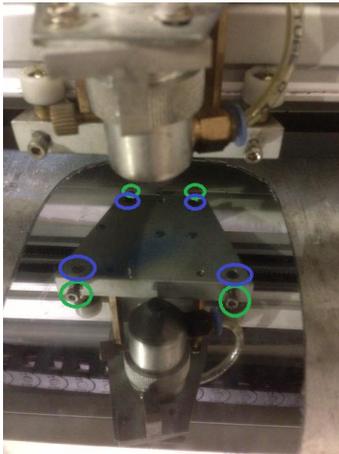


HOW TO OPERATE YOUR LASER

Instead use a short eyeglass type flat head screwdriver like this and adjust from the bottom of laser carriage:



Once you have the right screwdriver it is very easy to turn the eccentric pin through the hole underneath circled blue (after loosening the set screw circled green). You can use a mirror to view from the bottom:



- 1) Loosen the 4 eccentric pins by using the short screwdriver from the bottom. The laserhead will not be clamped to the X axis gantry anymore.
- 2) Adjust the top 2 eccentric screws so they that the laserhead is straight with the X axis. Since they are eccentric you want the laserhead platform straight otherwise the belt will be pulled at a angle.
- 3) Adjust the bottom 2 eccentric screws so that the laserhead is as loose as possible but all 4 wheels are just barely still rolling.
- 4) Insert the 4x set screws with the hex heads back and tighten. Note that by putting the set screws back in it will tighten the eccentric pins slightly so that is why we say adjust as loose as possible but still rolling in step 3.
- 5) Test it out and ensure the X axis is not binding during rastering. If you would like you can insert some WEAK thread locking glue on the screws.

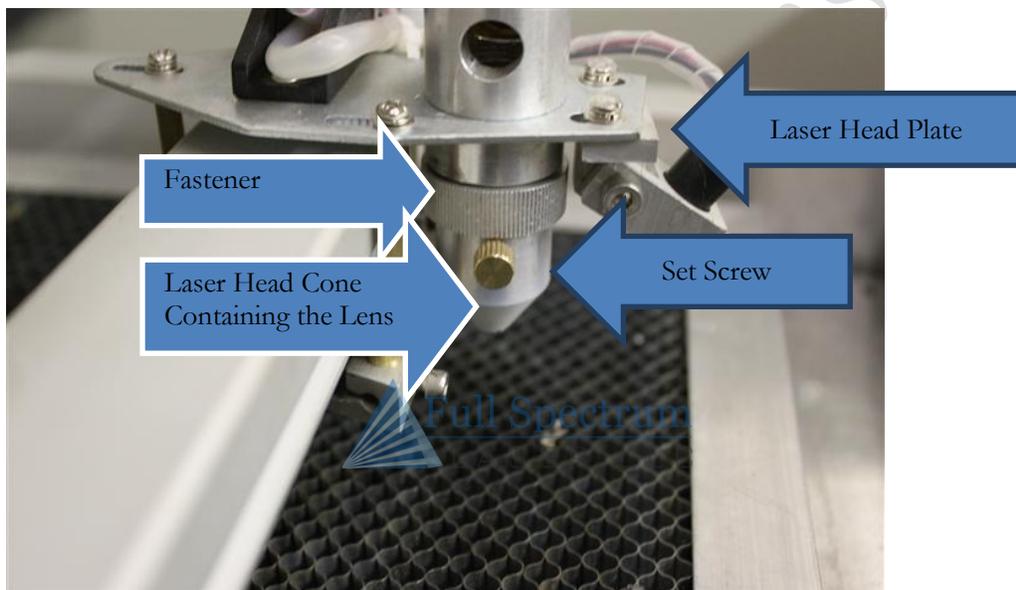
6) We sell replacement wheels for low cost so email support@fslaser.com if your wheels develop flat spots on them.

By adjusting the eccentric pins we have found we can tighten the X axis belt as much as we want (we recommend a bit less tight than a guitar string) but still have no binding.

The eccentric pins will slip over time so adjusting them is the key to optimal engraving performance on the hobby laser. Thread locking glue will hold it in longer but may make it harder to adjust.

Removing the Lens

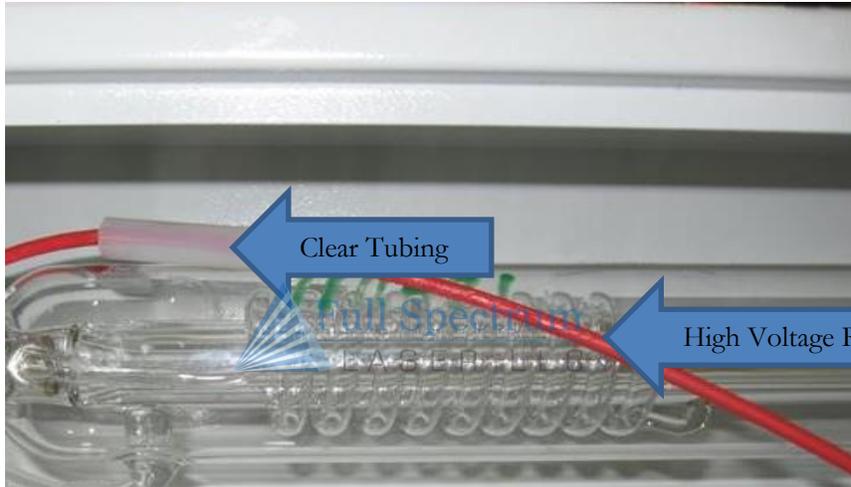
When removing the lens, first loosen the gold set screw holding the head in place. Next, loosen the fastener holding the cone to the plate. When looking down on the laser head, the fastener can be loosened by turning it clockwise. If the cone is pushed against the x-axis arm, then the laserhead plate will have to be loosened and slid towards the front of the unit. Notice in the picture below how the cone cannot be removed due to the cone being pushed against the x-axis arm. To overcome, this loosen the 3 screws holding the laser head plate in place and slide the head towards the front of the unit.



Replacing the Laser Tube

1) First make sure you have fast drying silicone glue and Teflon tape, the tape plumber's use. Open the laser tube cabinet. Locate the red high voltage wire. Disconnect the high voltage red wire from the back plate.

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Warning: Pulling on the wire will break the laser tube at the neck.

Alternatively, using one hand, grasp the white insulation. Using your other hand, support the neck of the laser tube where the red wire is connected to the laser tube. Attempt to pull the insulation up the red wire to expose the soldered connection point. Do **not** pull on the red wire because it is connected to the laser tube. Pull only on the insulation to move it up the wire sheath. Cut the copper wire off after pulling the insulation back.

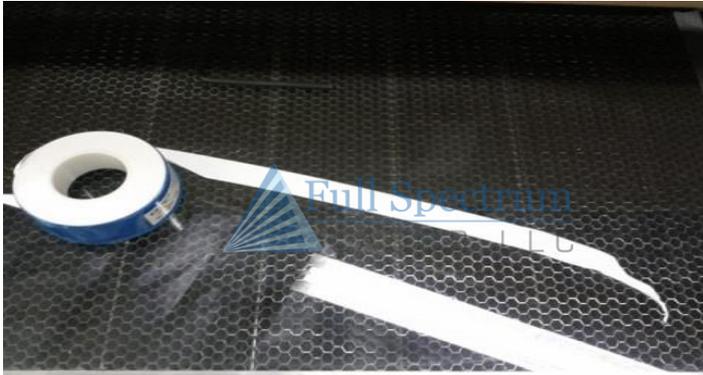
2) Unclamp the tube using a 3mm hex key.



3) Put in the new tube.

1) Take approximately 12 inches of Teflon tape, the same tape plumber's use.

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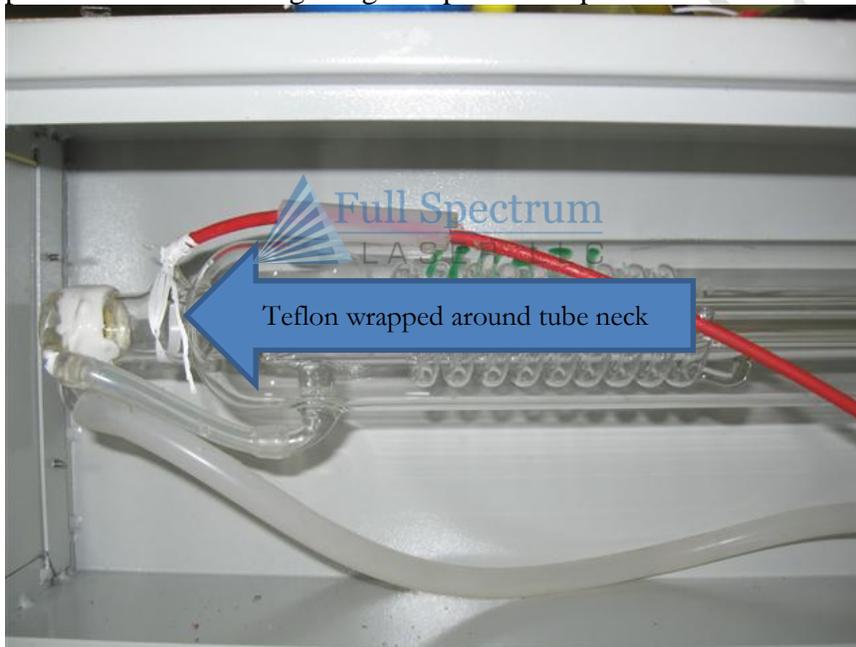
5) Wrap the Teflon tape around the wire and the connector and tie it in a knot. Make sure the clear tubing is pulled back up the wire.



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Next wrap the Teflon tape around the neck of the tube and again tie it in a knot. This will help prevent the wire from getting bumped out of place.



6) Finally slide the clear tubing back down the wire over the Teflon tape. Next fill the clear tubing with fast drying silicone glue.

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That's it, you're all finished!

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RetinaEngrave USB Software installation

Your laser has 2 control options: Mach3/EMC2 control card/motor driver via a parallel cable (Basic Laser) and RetinaEngrave USB (requires optional RetinaEngrave USB Controller, included in Deluxe Laser).

Mach3/EMC2

- ❖ Connect the laser to the parallel port with a DB25 Male to Female cable (not included) no longer than 6 ft.
- ❖ If connecting through the parallel port, download applicable drivers and the Mach3 application from: www.machsupport.com. A free demo version is available, limited to 500 lines of G-Code or less.
- ❖ For Linux systems, EMC2 is available free of charge from www.linuxcnc.org
- ❖ Mach3/EMC2 software is not produced or sold by Full Spectrum Laser LLC and software support must be handled directly by directly contacting the respective software authors listed above. Mach3/EMC2 are not trivial programs to use and Full Spectrum Laser LLC recommends our own software package and control system RetinaEngrave USB

RetinaEngraveUSB

RetinaEngrave USB is the easiest to use, most accurate and most powerful laser control program, written by Full Spectrum Laser LLC. As RetinaEngrave USB is written by Full Spectrum Laser LLC, we provide support using this software package through our support forums at <http://www.fullspectrumengineering.com/forums>. Download the appropriate software installation package at <http://fslaser.com/resources/software-manual-downloads>. Consult the paperwork included with your laser for login credentials. Consult our RetinaEngrave Software Manual for more information.

APPENDIX A: TROUBLESHOOTING

Problem	Try
<p>The laser does not turn on.</p>	<ol style="list-style-type: none"> 1. Turn the key to the on setting and make sure the big red E-stop button is depressed. 2. Check the fuse inside the 3 prong power plug (it is located in the receptacle and is a 220V 6Amp fuse). 3. Check the fuse on the power supply.
<p>The current meter does not move when pressing the "Test Laser" button.</p>	<ol style="list-style-type: none"> 1. Ensure that you are pressing both the Test Laser button and the unmarked green button above the key switch. 2. Make sure the key switch is turned to the ON position. 3. Make sure the red emergency button is in the out position (rotate clockwise) to turn the unit on. This should also activate the side-fan and red positioning laser. 4. Make sure the red "Laser Switch" button is switched ON (this controls the actual CO2 laser, not the red positioning laser) 5. Make sure the lid is closed and the magnet is contacting the magnet switch. 6. Make sure the unit is plugged in and nothing else is plugged into the same outlet if you have less than a 20amp breaker. 7. Try a different outlet in the house.
<p>The current meter moves when pressing the "Test Laser" button but no laser beam is present.</p>	<ol style="list-style-type: none"> 1. Put a piece of paper near the stationary mirror (mirror 1, located in the rear of the laser chassis) and press the laser test buttons again with the lid closed. 2. If there is a hole in the piece of paper then your laser is working but the mirrors are out of alignment. Align your laser according to the provided instructions.
<p>RetinaEngrave USB shows "write errors" or "disconnected" anomalies when communicating with the laser.</p>	<p>In some cases, especially when using non-brushless motors, EMI can disturb the communication between your system and the RetinaEngrave USB card.</p>

	<p>To isolate this problem, disconnect the RetinaEngrave card from the Mach3 card and connect it only to your computer.</p> <p>With the laser, Exhaust Fan, air compressor and water pump all powered off, press "Go" within the software. Because the software is able to communicate with the isolated RetinaEngrave card, this test will determine if another device is causing the disturbance.</p> <p>The solutions are:</p> <ol style="list-style-type: none"> 1. Ensure the power plug is pressed as firmly as possible into the power plug. We have noticed sparking occurs when the power plug is loosely put into the socket which causes EMI problems. 2. Replace the power plug with another power plug and inspect the contacts are tight. 3. Move the computer away from the motors and retest. 4. Do not plug in anything else besides the laser into the same electrical circuit. Turn off all external fans/pumps/etc. 5. Try a computer that runs Windows 7. We have not encountered any problems with modern systems and have tested Windows XP, Windows Vista and Windows 7. If the system comes preloaded with Windows 7, this is a good indicated of fitness for use with RetinaEngrave USB and the Hobby Laser. If your computer runs Windows XP, try it on a computer that has Windows 7. Windows XP is over 10 years old and Microsoft has stopped selling it. Old computers may have buggy USB chipsets.
<p>Vector Lines appear incorrect in RetinaEngrave USB</p>	<p>Import all your drawings into CorelDraw X5 (free 30 day trial at www.corel.com). Reduce all lines to hairlines. (see tutorial section below) Different colors (such as red/blue) will appear on different layers when printed and allow for different.</p>

HOW TO OPERATE YOUR LASER

Vector Lines are cut twice	Use CorelDraw X5 and reduce all curves to hairlines . Non-hairline curves will cut the outline instead of the center of the curve.
Vector Lines are not printing or laser only raster engraves (no cutting).	You are not using a vector program. Try CorelDraw X5.
Bitmaps are absent from printing of combined vector+raster.	Make sure the DPI of your dithered image is greater than 250 dpi x250 dpi. You can export to 1-bit BMP files if you require higher resolution and use File\Open in RetinaEngrave instead of direct printing.
While engraving at high speed or jogging, the laser head appears to stall but works fine at lower speeds.	Loosen the X belt tension of the laser through the access hole with a long 3mm hex key as described in the Hardware Setup section.
Unable to utilize the entire work area when raster engraving.	During raster engraving, the laser head proceeds horizontally across the work area, coming to a complete stop at either side of the work area before returning. The laser head requires a distance of 0.8" – 1.0" to accelerate to effective lasing speed. Therefore, ensure that margins of at least 1" are present on either side of the work area. These limitations do not apply when vector cutting.

APPENDIX B: SPECIFICATIONS

Outside Dimensions (LxWxH): 31.5"x20"x12"

Boxed Dimensions (LxWxH): 38"x27"x17"

Net Weight: 70lbs

Gross Weight (boxed): 80lbs

Maximum material size: 13"x16"

Maximum engrave-able area: 9.5"x14.5"

Standard Lens: ZnSe 2" FL

Maximum material thickness: 2.75" (with Z table removed and 2" FL lens, 3.25" with optional 1.5" FL lens)

CO2 Laser Wavelength: 10.6um

Maximum Laser Power: 40W Peak (30-35W Average)

Maximum Power Requirements: 660W (main laser unit only; excludes water pump/fan/computer/accessories)



Important: The current meter is used to tell how much power is going to the laser. Keep the current **under** 15mA for maximum laser tube life.

APPENDIX C: WARRANTY STATEMENT

Full Spectrum Laser LLC warrants to the original purchaser of 40w Hobby Laser that this product will be free from defects in material or workmanship when purchased, and under proper, normal use within 60 days from the original date of purchase unless an extended warranty option is purchased.

Full Spectrum Laser will replace or, at its option, repair the defective part(s). Normally, Full Spectrum Laser will supply a replacement part for the customer to replace. Once the replacement has been performed, the replaced part must be returned to Full Spectrum Laser.

In the case where repair is required, Full Spectrum Laser requires that the defective part, or machine, be returned to the Full Spectrum Laser facility.

Full Spectrum Laser will be responsible solely for the cost of parts only. All other costs for replacement or repair, including, but not limited to, packaging and shipping both to and from Full Spectrum Laser, shall be paid by the owner. A “Core” charge may be required by Full Spectrum Laser to insure the return of replacement and repair parts.

This warranty excludes any damage from abuse (including, without limitation, incorrect voltages, power surges, fires, improper or insufficient ventilation, cutting of corrosive gas producing materials such as PVC or ABS, “acts of God” or other situations out of the control of Full Spectrum Laser), failure to operate in accordance with instructions provided in the Owner’s Manuals for the Full Spectrum Laser 40w Hobby Laser, including specific safety and operational warnings contained therein, cosmetic damage sustained in use, and damage caused by unauthorized modifications of any equipment. All warranties to original purchasers are non-transferable. The registered owner must initiate warranty claims within the warranty period.

THE ABOVE AND FOREGOING IS THE ONLY WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED; INCLUDING BUT NOT LIMITED TO ANY WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE THAT ARE MADE BY FULL SPECTRUM LASER ON THE 40W HOBBY LASER. ANY WARRANTIES IMPLIED BY LAW ARE HEREBY EXPRESSLY DISCLAIMED.

No oral or written information or advice given by Full Spectrum Laser, its dealers, its distributors, agents, officers, or employees shall create a warranty or in any way increase the scope of this warranty. Neither Full Spectrum Laser nor anyone else who has been involved in the creation, production, or delivery of the Full Spectrum Laser 40w Hobby Laser shall be liable for any direct, indirect, consequential, or incidental damages, including but not limited to damages for loss of business profits, business interruption, loss of business information, adverse health impacts, fire, and the like, arising out of the use or inability to use these products.

Full Spectrum Laser LLC provides no warranties whatsoever on any software used in connection with Full Spectrum Laser LLC products.