VLS Service Manual

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Performing VLS Service Procedures

Safety

When performing the procedures in this manual, always be sure to read and understand the entire procedure before operating the machine. Follow each step carefully. Pay special attention when steps require the VLS to be unplugged.

Do not attempt to perform any of the procedures outlined in this manual until you have read and thoroughly understand the *Safety* section.

Difficulty

The VLS is a very easy machine to maintain and repair. Most service procedures are simple to perform and require minimal time and tools.

Tools

Nearly all the procedures described in this manual can be performed with a minimum of simple hand tools:

- Hex Key Set, Standard (SAE) including sizes:
- 9/64, 1/8, 7/64, 3/32, 5/64, 1/16, .050
- Screwdrivers, including Phillips #1, #0
- Lens Cleaning Solution, Cotton Swabs and/or Lens Tissue
- Needle Nose Pliers
- Bubble Level
- StaplerPerforming VLS Service Procedures

Discription of Appropriate Use

This device is designed for laser cutting and engraving of the materials listed in the VLS printer driver. Materials to be processed must fit completely inside the system for proper operation. Use of the equipment in a manner other than that described in this manual may result in injury to yourself and others and may cause severe damage to the equipment and your facility.

***CAUTION**: This device is not designed, tested, intended or authorized for use in any medical applications, surgical applications, medical device manufacturing or any similar procedure or process requiring approval, testing or certification by the United States Food and Drug Administration or other similar governmental entities.*

General Safety

Use of the equipment in a manner other than described in this manual or failure to follow the operational instructions and safety guidelines listed in this manual can result in personal injury and may cause damage to the equipment and surrounding property.

	EXPOSURE TO THE LASER MATERIAL PROCESSING BEAM CAN RESULT IN BURNS TO THE SKIN AND CAN CAUSE SEVERE EYE DAMAGE. Proper use and care of this system are essential to safe operation. Use of controls or adjustments or performance of procedures other than those specified herein may result in exposure to hazardous laser radiation.
	Never operate the laser system without constant supervision of all cutting, marking, and engraving processes. Exposure to the laser beam may cause ignition of combustible materials which can lead to a fire. A properly maintained fire extinguisher should be kept on hand at all times.
	Never leave materials in the laser system after laser material processing. Always remove all material including scrap material from the machine after use. Scrap material left in the laser system, including materials that collect in the removable Flow-Through Cutting Table, can be a fire hazard. Materials can be hot after laser material processing so caution should be used when handling material immediately after laser material processing. A properly maintained fire extinguisher should be kept on hand at all times.
	A properly configured, installed, maintained and operational particulate and fume exhaust system is mandatory when operating the laser system. Fumes and smoke from the laser material processing must be extracted from the laser system and filtered or exhausted outside. SOME MATERIALS, WHEN ENGRAVED, MARKED OR CUT WITH A LASER, CAN PRODUCE TOXIC AND CORROSIVE FUMES. Obtain the Material Safety Data Sheet (MSDS) from the manufacturer of every material to be processed. The MSDS discloses all of the hazards when handling or processing a particular material. DISCONTINUE processing any materials that cause chemical deterioration of the laser system such as rust, metal etching or pitting, peeling paint, etc. Damage to the laser system from corrosive fumes is NOT covered under warranty.

	Do not attempt to move or lift the laser system by hand. It is recommended to use a fork lift or other mechanical assistance when moving the laser system. If unsure about how to move the equipment please consult a professional rigging company or Universal Laser Systems Customer Support.
	DANGEROUS VOLTAGES ARE PRESENT WITHIN THE ELECTRONICS ENCLOSURES OF THIS SYSTEM. Access to these areas (marked with warning labels) is not necessary during normal operation. If it becomes necessary to open one of these enclosures for any reason, the power cord must first be disconnected from the electrical supply. NEVER REMOVE THE GROUND LEAD TO THE ELECTRICAL CORD AND PLUG THE SYSTEM INTO A NON-GROUNDED OUTLET. A laser system that is not properly grounded is hazardous and can result in severe or fatal electrical shock. Without proper grounding, the laser system may exhibit sporadic or unpredictable behavior. Always plug the system into a properly grounded (earthed) outlet. The power supply cord is the main disconnect device; the equipment should be located close to an easily accessible power outlet. To disconnect the equipment from the supply main, the power cord should be unplugged from the power outlet or main power inlet (appliance coupler) of the unit. The laser system is designed as a Class I, Group A, pluggable device. It is also designed for connection to IT power systems. The equipment should be connected to an AC power supply with Zmax = 0.049 Ohms or lower impedance. The end user should consult with their power supply authority to ensure the AC line impedance requirement of EN 61000-3-11:2000 Annex B compliance is met.

THIS DEVICE IS SPECIFICALLY DESIGNED TO COMPLY WITH CDRH PERFORMANCE REQUIREMENTS UNDER 21 CFR 1040.10 AND 1040.11 AND TO COMPLY WITH EUROPEAN LASER SAFETY REGULATIONS UNDER EN60825-1.

CDRH is the Center for the Devices of Radiological Health division of the Food and Drug Administration (FDA) in the USA. No guarantees of suitability or safety are provided for any use other than those specified by Universal Laser Systems, Inc.

CO2 Laser Safety

ULS Laser systems are designed to support a sealed carbon dioxide (CO2) laser cartridge that produces intense invisible laser radiation at a wavelength of 9.3 microns and 10.6 microns in the infrared spectrum. For your protection, the laser is contained within a Class 1* enclosure designed to completely contain the CO2 laser beam.

***CAUTION**: Use of controls or adjustments or performance of procedures other than those specified herein may result in exposure to hazardous levels of invisible laser radiation.*

- Laminated safety glass is employed in the viewing window to block 10.6 and 9.3 micron laser radiation from CO2 lasers. This viewing window will block transmission of CO2 laser radiation allowing safe observation of laser processing. Do not operate the laser system if the view port is damaged, with any of the doors removed or if any of the safety interlocks are defeated.
- The intense light that appears during the engraving or cutting process is the product of material combustion or vaporization. **DO NOT STARE AT THIS INTENSE LIGHT FOR LONG PERIODS OF TIME OR VIEW DIRECTLY WITH OPTICAL INSTRUMENTS SUCH AS BINOCULARS OR MICROSCOPES**.
- This device contains a visible Red Diode Pointer (Class 2) to aid in positioning material to be cut or engraved. **DO NOT LOOK DIRECTLY INTO THE RED LASER BEAM OR USE A REFLECTIVE SURFACE TO REDIRECT OR VIEW THE RED LASER BEAM. NEVER ATTEMPT TO VIEW THE RED LASER BEAM USING OPTICAL INSTRUMENTS SUCH AS BINOCULARS OR MICROSCOPES**.
- The user door(s) are safety interlocked which will prevent the CO2 laser beam from firing when the user door(s) are opened. The Red Diode Pointer is NOT safety interlocked and can be automatically activated with the door(s) either open or closed.
- **DO NOT OPERATE THE LASER SYSTEM IF ANY SAFETY FEATURES HAVE BEEN MODIFIED, DISABLED OR REMOVED**. This may lead to accidental exposure to invisible CO2 laser radiation which may cause severe eye damage and/or severe burns to your skin.
- Always use caution when operating a laser system.

Tamper Proof Labels

All laser cartridges are equipped with tamper proof labels. There are NO field serviceable parts inside a Universal Laser System, Inc. (ULS) laser cartridge. If your laser cartridge needs service, please contact the Customer Service Team at 480-609-0297 (USA), +43 1 402 22 50 (Austria), +81 (45) 224-2270 (Japan) or e-mail us at support@ulsinc.com.

*An enclosure which does not permit human access to laser radiation in excess of the accessible emission limits of Class 1 for the applicable wavelength and emission duration.

Computer Power Management Configuration

Power management is an option on computers and monitors to reduce engergy comsuption when not in active use. However, the computer is a critical component in the operation of the VLS. Active Power Management can cause interruption of communication between the PC and the VLS, resulting in failure of operation; so it is recommended nthat this feature be disabled.

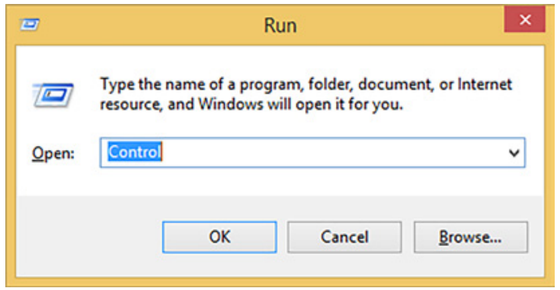
Windows XP and Windows Vista:

From the **Windows XP** home screen, right-clight on the desktop. Be sure you do not click on any icons as that will open a different program.

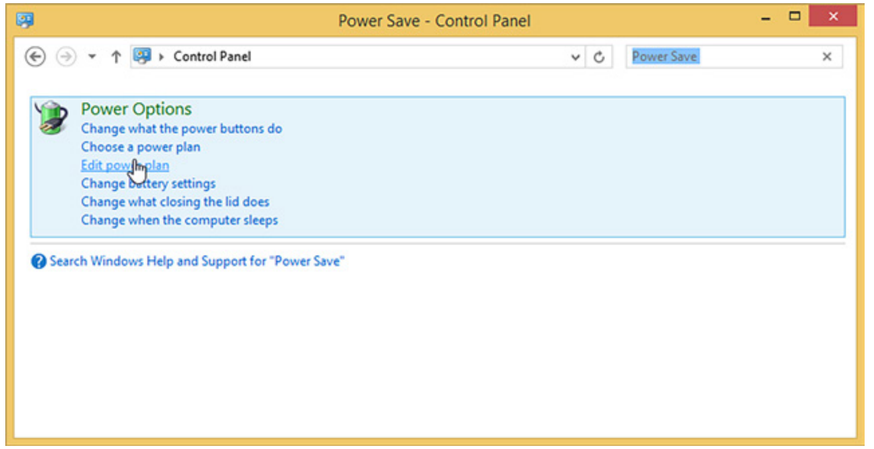
1. From the list of options, select **Properties**. The **Display Properties** box will open.
2. In **Display Properties**, select the **Screen Saver tab**. Set the Screen saver to (None).
3. In the **Monitor Power** field, select **Power…**
4. Select the tab **Power Schemes**.
5. From the **Power Schemes** tab, in the **Settings for Home/Office Desk Power Scheme**, select **Never** for all the setting options (Turn OFF monitor, Turn OFF hard disks, System standby, and System hibernates).
6. Click **Apply**, then click **OK** on both open windows.
7. The configuration is complete.

Windows 7 and Windows 8:

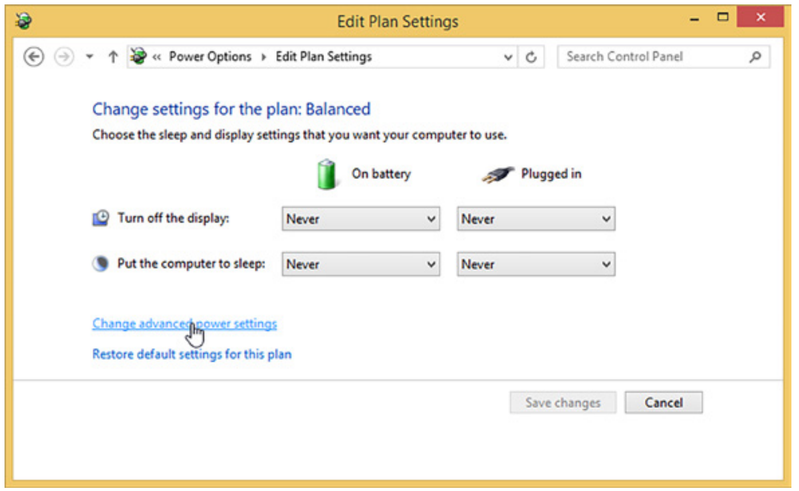
1. Open the **Control Panel** by pressing the Windows Key + R. The **Run** box will open. Type *Control* and click **OK**.
2. In the **Search Control Panel** box, located in the upper right-hand corner of the windows, type *Power Save*. The Power Options are displayed.



3. Click the **Edit power plan** link.

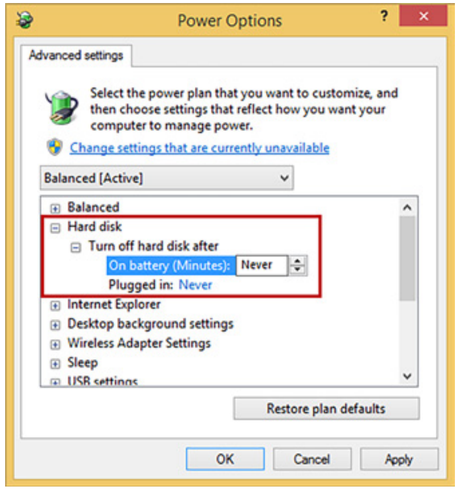


4. Set every option to **Never**.

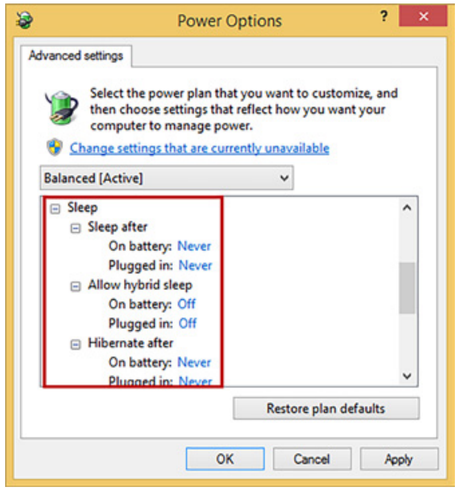


5. Click **Change advanced power settings**.
6. On the **Power Options** dialog box, click the **Hard disk +** symbol and the **Turn off hard disk after +** symbol to expand the folder.

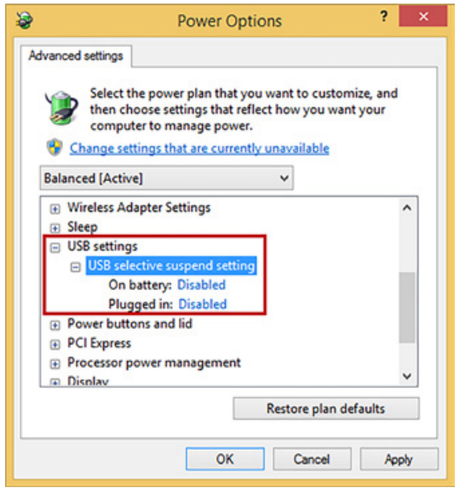
7. Set all **Turn OFF hard disk** after options to **Never**.



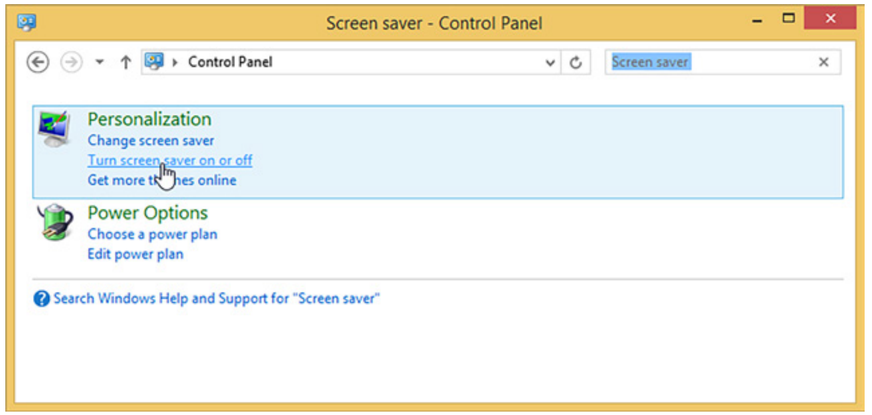
8. Click **Apply**.
9. Scroll to the **Sleep** settings and click the **+** symbol.
10. Set all **Sleep** options to **Never** or **OFF**.



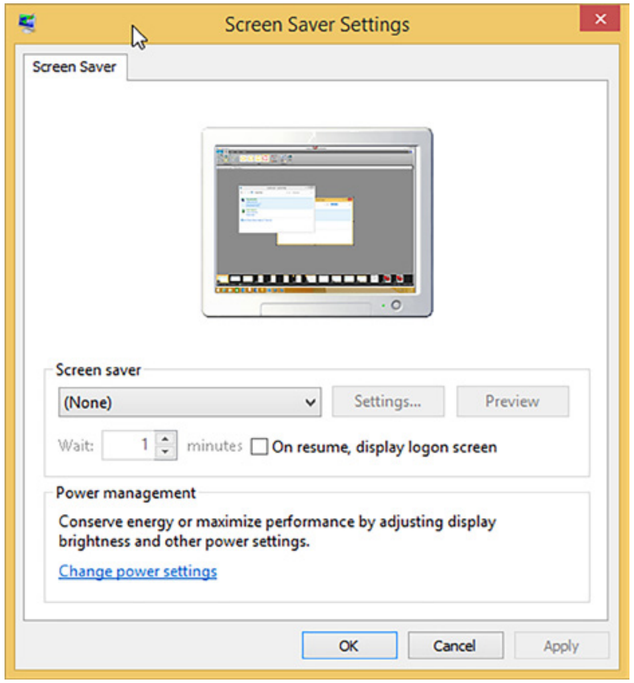
11. Click **Apply**.
12. Scroll to **USB settings** and click the **+** symbol.
13. Set all **USB selective suspend settings** to **Disabled**.



14. Click **Apply**.
15. Click **OK** to close this window, then click **Save Changes** to close the Edit Plan Settings window.
16. In the still open **Search Control Panel** window type *Screen Saver* in the search box.



17. Click **Turn screen saver on or off**.
18. Set the Screen saver drop-down to **None**.



19. Click **Apply** to save the changes.
20. Click **OK** to exit.

Laser Power Upgrading

The VLS3.60, VLS4.60, and VLS6.60 are capable of upgrading to a maximum of 60 watts. When upgrading either system, the VLS internal software (firmware) will automatically reflect the change. No changes are required to the laser system for it to function properly.

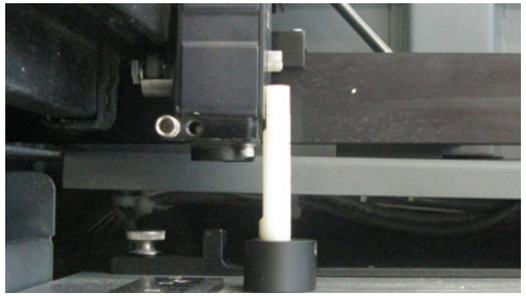
CPU Initialization / Auto-Z Calibration

NOTE: *This procedure must be performed with the aluminum Engraving Table installed. Do not use the honeycomb Cutting Table for this procedure. Make sure that there are no accessories, materials, or pieces of material on the table when doing the calibration.*

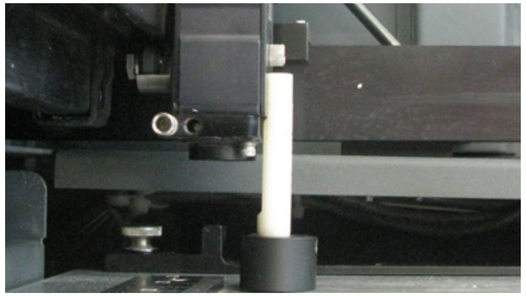
Power up both the computer and the VLS. Home the Z-Axis by clicking the HOME Z button on the VIEWER tab of the UCP.

1. Using the UP and DOWN arrow buttons, either on the machine (on the front keypad) or in the UCP, bring the Z-axis table up.

2. Using the appropriate Focus Tool for the lens installed, focus directly on the surface of the table.



Out of Focus: The table is to low.



Correct Focal Height

NOTE: *If you are unable to focus to the surface of the Engraving Table due to the system preventing you from raising the table. You may be able to address this in the calibrate window. Use the UP or DOWN arrows to move the table as needed.*

3. In the UCP, click the **System** tab and choose the appropriate lens size from the **Lens Size** list.
4. On the **System** tab, under **Lens Size**, click **Calibrate**. The following window appears:

5. Click Save to accept the new Z Position, then click Yes when asked if you are sure you want to override the value.
6. The Lens is now calibrated.

NOTE: *if you have purchased additional lens kits, calibrate the lens kit according to steps 1 through 4. Be sure to select the proper lens size from the list before calibrating.*

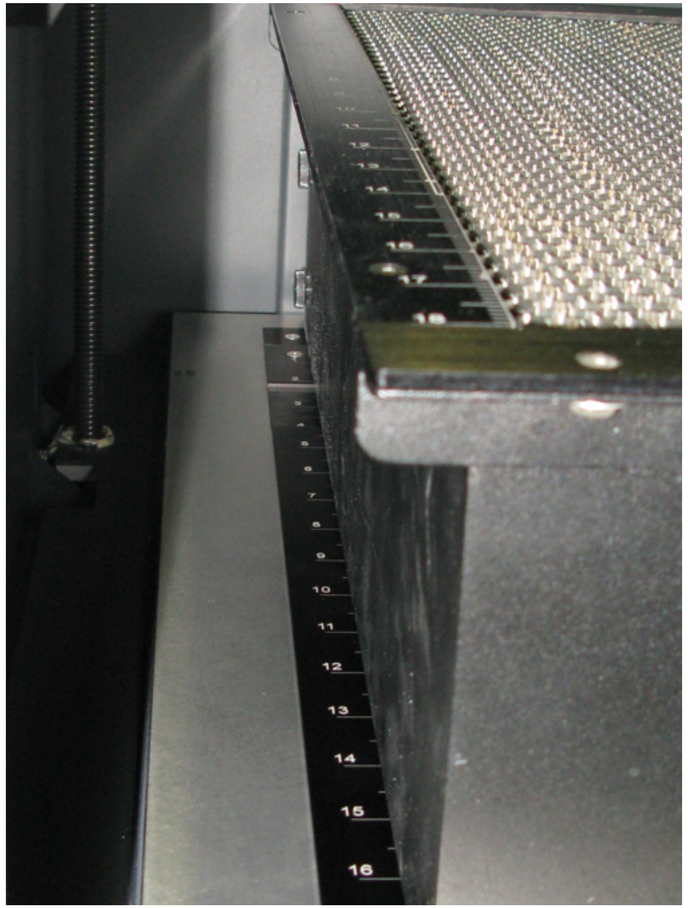
7. Calibration of the Lens Size and the Auto Z feature is now complete on the standard engraving table.

Cutting Table Calibration

NOTE: *Even with multiple lens kits, calibration on the Cutting Table is only required for one of them; the calculation will be done automatically for all other optics sizes as long as they have been calibrated properly to the engraving table.*

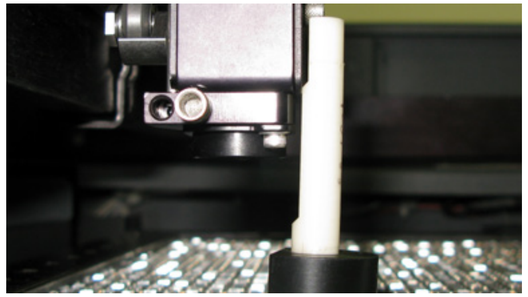
1. Turn the VLS ON and lower the engraving table all the way down by using the **Home Z** feature.
2. Open the front door of the laser system and carefully slide the cutting table into the laser system so that its rear feet are squarely pushed up against the engraving table rulers on the top and left side of the table.

3. The rulers of the cutting table should overlap the rulers on the engraving table.

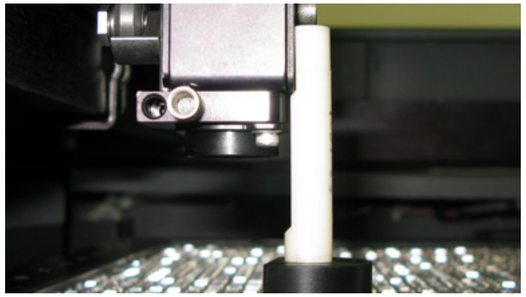


NOTE: *The front left foot of the Cutting Table is offset. If you try to press both the front and rear left feet against the Y-Axis ruler, the Cutting Table will not be square to the engraving table.*

4. Manually focus the lens to the Cutting Table surface using the appropriate focus tool. Bring the table up using either the UCP or the arrows on the keypad.

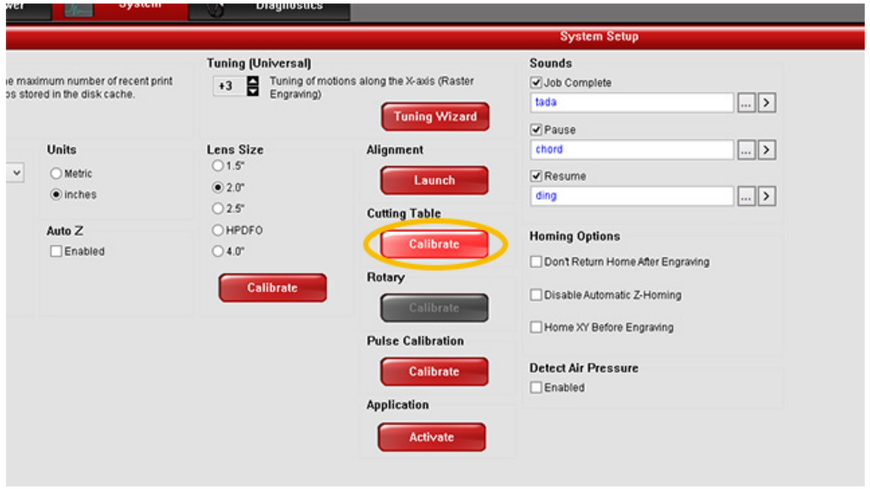


Out of Focus: The table is to high.



Correct Focal High

5. Go to the **System Tab**. Notice that the red CALIBRATE button for the **Cutting Table** box is activated.
6. Click CALIBRATE. The **Calibrate** dialog box will appear.

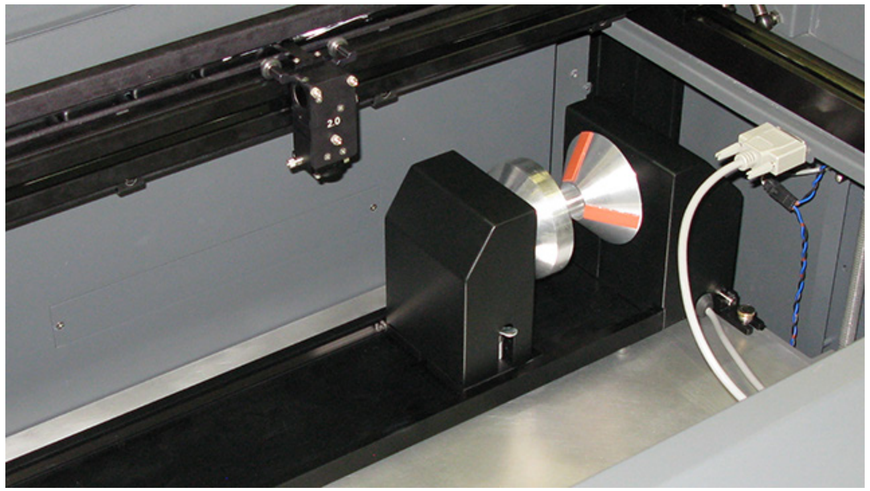


7. Accept the new Z-height by clicking SAVE, then click YES when asked if you are sure you want to override the value.

8. Calibration of the Z-height for engraving or cutting on the Cutting Table is complete for this lens.

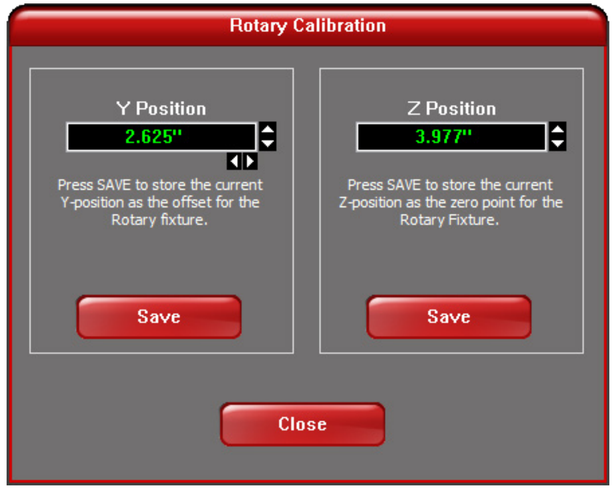
Rotary Calibration

1. Turn ON the UCP and the VLS.
2. Open the Top Door.
3. Lower the table about halfway down using the arrows on the UCP or the laser system keypad.
4. Turn OFF the VLS.
5. Properly mount the Rotary on top of the engraving table, making sure that it is seated properly in the bracket.



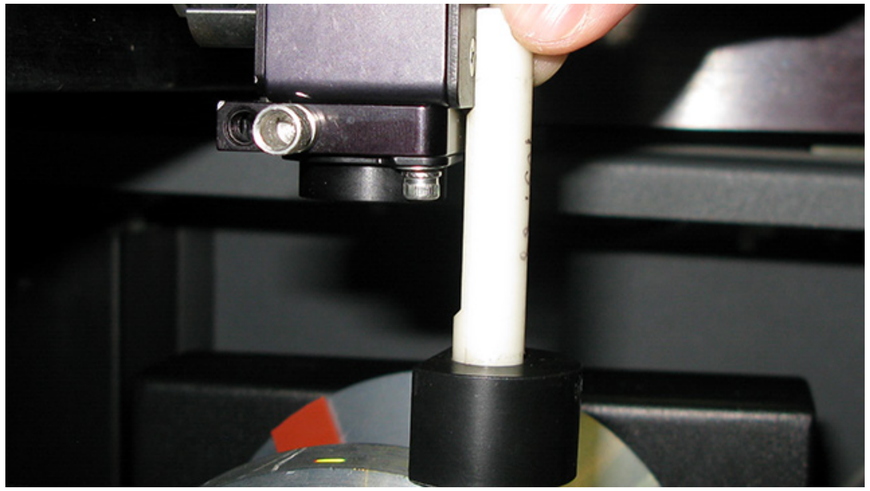
NOTE: *If this is your first time installing the Rotary fixture. Please refer to the User Guide to install the Rotary mounting bracket.*

6. Turn ON the VLS.
7. The rotary automatically rotates to indicate it is properly connected.
8. Select the **System** tab in the UCP. In the Rotary field click CALIBRATE.
9. The Rotary Calibration window will appear with Y Position and Z Position boxes. In the Y Position box uses the Y-axis buttons to move the focus carriage back and forth. Place the focus carriage at exactly 2.625”.



10. Adjust the X-axis using the buttons to move the focus carriage left and right and place the red LED over the flat part of the concave metal fixture. This is normally located on the left side when the Rotary is installed.
11. Adjust the Z-axis using the buttons or the Z-axis Menu on the keypad (recommended) to move the table up and down.

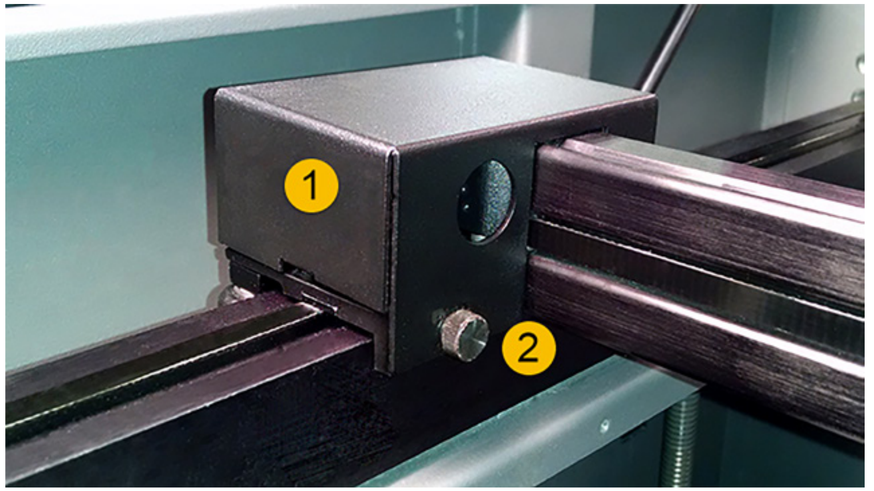
12. Use the Focus Tool to focus on the top of the flat part of the concave metal fixture. DO NOT focus on top of the black metal cover that is located on the left side of the rotary.



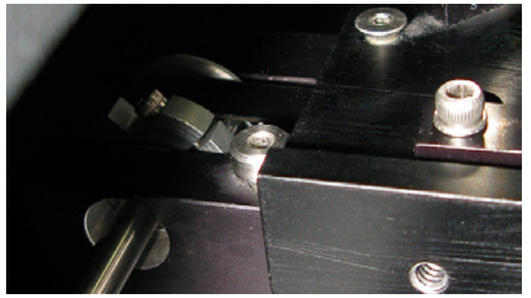
13. When finished, click **Save** on the **Rotary Calibration** window.
14. When the **Confirmation** message displays, click **Yes** to accept the new values.
15. Click **Close**. The focus carriage will re-home automatically on exiting the window.
16. Calibration is complete.

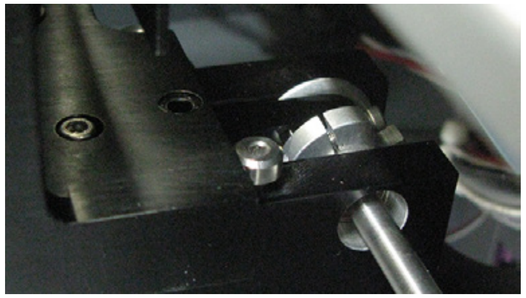
X-Axis Arm Alignment Check and Adjustment (Squaring)

1. Power OFF the VLS and unplug it.
2. Remove the #2 mirror cover (1) by removing the thumbscrew (2), sliding the cover to the right and then off the rail.



3. Pull the X-axis arm toward the front of the stage until it stops.
4. Observe if the left side and right side of the X-axis arm make contact with the left and right side shoulder screws, at the same time, respectively.

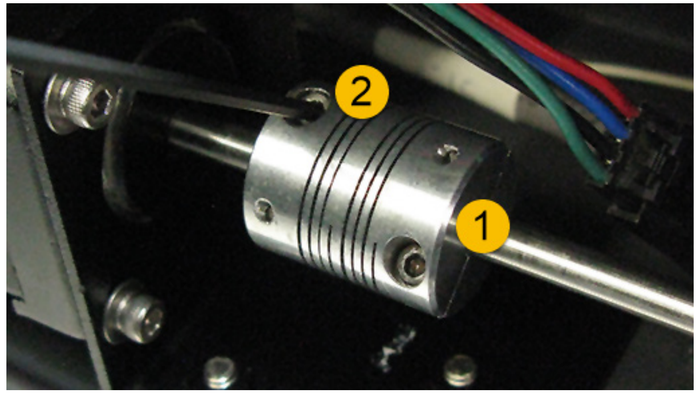




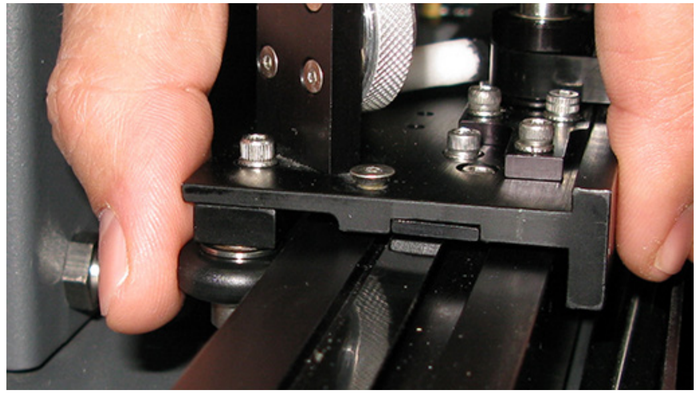
5. If there is a gap between the shoulder screw and the contact point on either the left or right side of the arm, square the arm by making the following Adjustments.

Adjustments

6. Locate the Y-axis couplers (1). On both couplers there are two screws that mount the coupler to the Y-motor and the Y-axis shaft. Using a 3/32 inch Allen wrench, choose only ONE of those screws (2) and loosen it ½ turn.

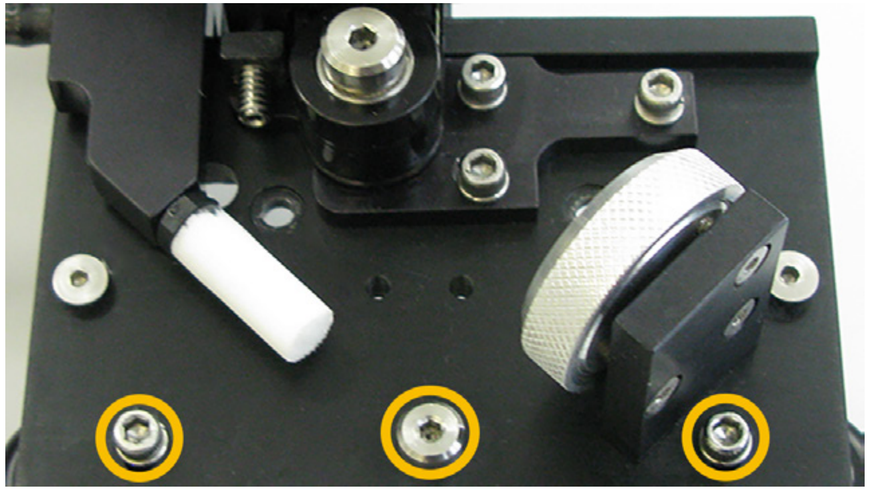


7. Grasp the center of the X-axis arm and pull it forward to contact the shoulder screws. While holding the arm against the two shoulder screws, tighten the screw loosened in the previous step.
8. Push the arm into the approximate center of the engraving field. With your left thumb and forefinger, touch the two Y-axis bearings and attempt to turn or rotate them.



NOTE: *You should feel an equal turning resistance for each bearing. If one bearing spins freely and the other has a turning resistance, or the turning resistance is unequal, then adjustment is necessary.*

9. Using an Allen wrench, loosen the three highlighted screws ¼ turn. Then, re-tighten them. This procedure automatically equalizes the force on both Y-axis bearings. Re-check the turning resistance once again and re-adjust if necessary.

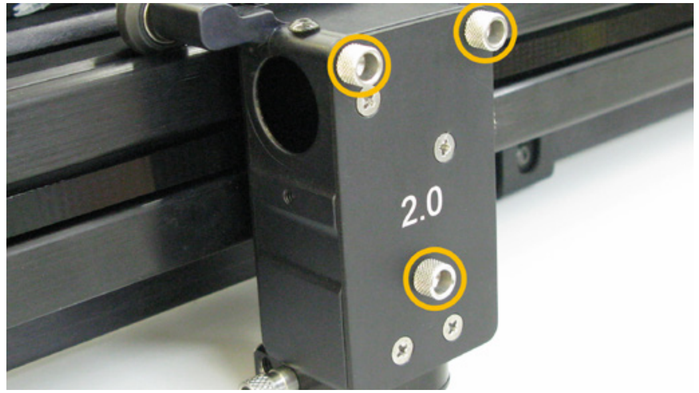


10. Re-install the #2 mirror cover.

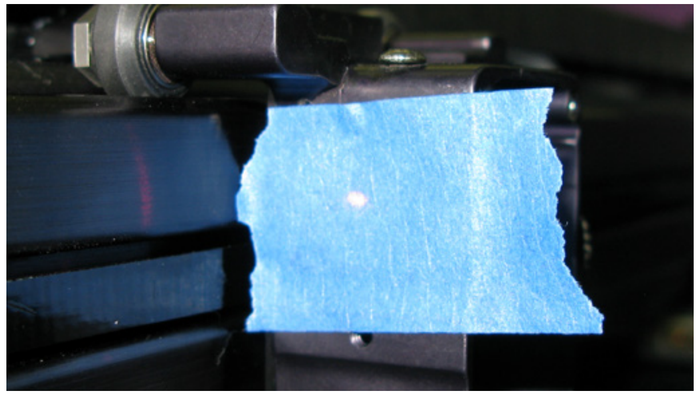
Laser Beam Check and Alignment

NOTE: *Make sure the table is clear of any objects that could obstruct the movement of the motion system.*

1. Power ON the VLS and let it home or re-home it by clicking the **Home XY** button on the **Viewer** Tab of the UCP.
2. Remove the Lens Kit from the Focus Carriage. Unscrew all 3 thumbscrews and pull the face plate out. Place the Lens Kit in a clean, safe place.



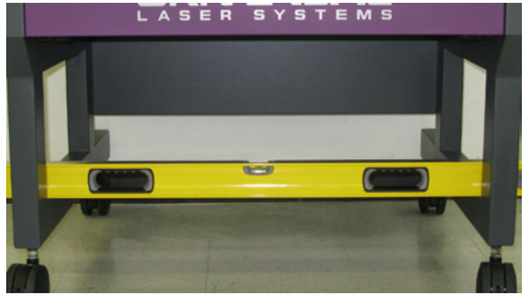
3. Place a strip of masking tape over the hole on the left side of the Focus Carriage. The red diode beam should appear on the tape. The red diode beam should be fairly centered over the hole.



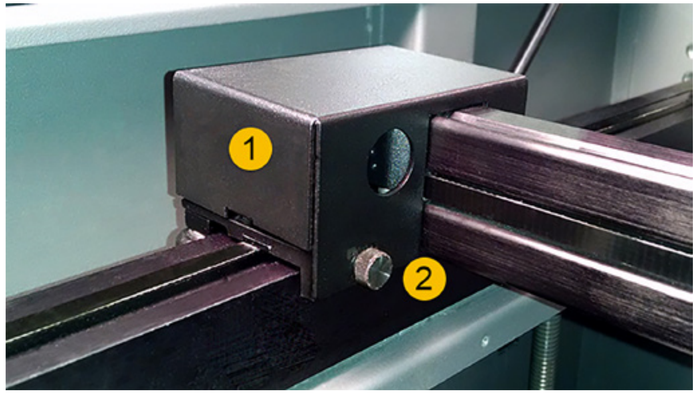
NOTE: *THE RED DIODE IS ONLY A GUIDE. The red diode may be slightly off-center compared to the burn mark you will make in the following steps, we recommend you make a burn mark for best results.*

4. Using the Focus Feature on the Viewer Tab of the UCP, verify the position of the red diode beam relative to the hole in the focus carriage in the top left-hand corner of the table (closest to the beam window). If the diode is fairly centered, within 1/8 of an inch to the center of the hole in the focus carriage, proceed to step 10. If not, continue at step 5.
5. Turn OFF the VLS system and unplug it.
6. Open the rear cover to its resting position to have access to the laser.

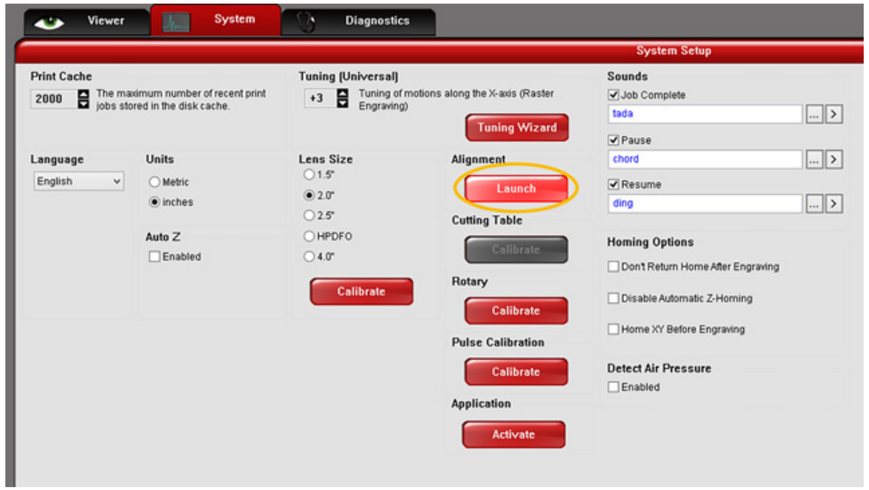
7. Verify that the Laser is installed properly by following the *Laser Removal* procedure.
8. Make sure the system is level by placing a bubble level on the frame of the cart across the two front casters, then on the two rear casters. Adjust the level if necessary by loosening the locknut and turning the adjustment nut. Retighten the appropriate locknuts against the leg of the cart.



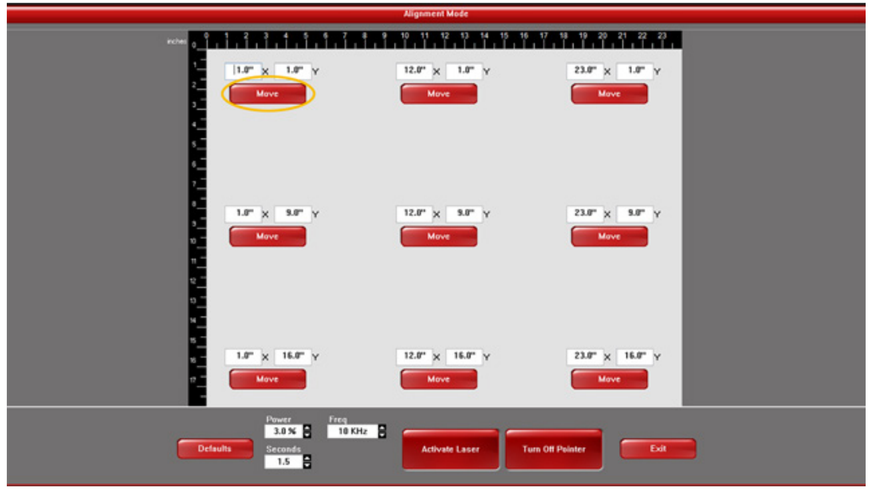
9. Plug the system to power and turn ON the VLS. Let the system Home.
10. On the **Viewer** Tab of the UCP select the Focus Feature. Move the carriage to the top left part of the system (closest point to the beam window/collimator) and check that the red diode is fairly centered to the hole in the focus carriage and continue to the next step. If the diode is still out of center, contact the service department.
11. Remove the #2 mirror cover (1) by removing the thumbscrew (2), then sliding the cover to the right and then off the rail.



12. On the System Tab click **Alignment Launch**. The **Alignment Mode** window will appear.



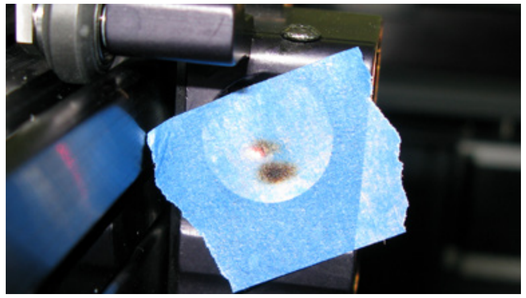
13. On the Alignment Mode Window, click on the Top Left button to move the carriage to the table position closest to the beam window.



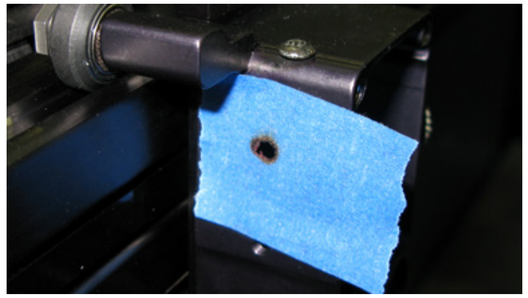
NOTE: *To create a small burn mark on the tape in the next step, adjust the Power and Seconds settings in the Alignment Mode screen (see picture). Lower power laser systems require higher power settings and higher power laser systems require lower power settings to make the burn mark on the tape.*

14. Adjust the Power and Seconds settings as indicated to 5% power and 1 second.
15. Close the top door if not already closed and click **Activate Laser**.
16. If a burn mark is not made continue to modify the Power settings, increasing in 1% increments for each attempt.
17. With a burn mark now on the piece of tape, keep the piece of tape on the focus carriage.
18. Click on the lower right-hand Move button. The Focus Carriage will move to the indicated X, Y position (point farthest from the Beam Window).

19. Close the top door if not already closed and click **Activate Laser**. Take note of the burn mark. The burn marks should overlap each other. If they do not, continue to step 20, if they do, proceed to step 21.



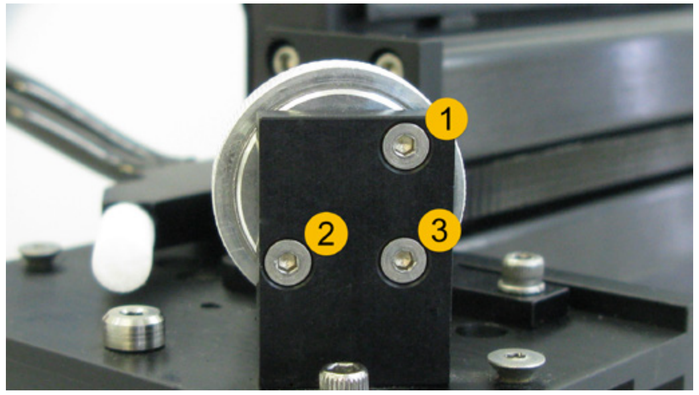
Incorrectly Alignment Beam



Correctly Aligned Beam

20. Locate the three adjusting screws on the #2 Mirror mount on the left-hand side of the X-axis arm. Turn these screws to center the red dot diode, as necessary.

NOTE: *The top screw (1) will adjust your beam up and down. The lower left screw (2) will adjust the beam left and right. The bottom right screw (3) will adjust the beam diagonally.*



NOTICE: *DO NOT loosen the screws completely as the mirror is spring loaded.*

21. Once aligned, Exit the **Alignment Mode** Window, remove the masking tape from the Focus Carriage, and reinstall the Lens Kit.
22. Reinstall the cover on the #2 mirror mount.

Z-Axis Leveling

NOTE: *Make sure the table is clear of any objects that could obstruct the movement of the motion system including any accessory—like the Downdraft Cutting Table—from the Engraving Table.*

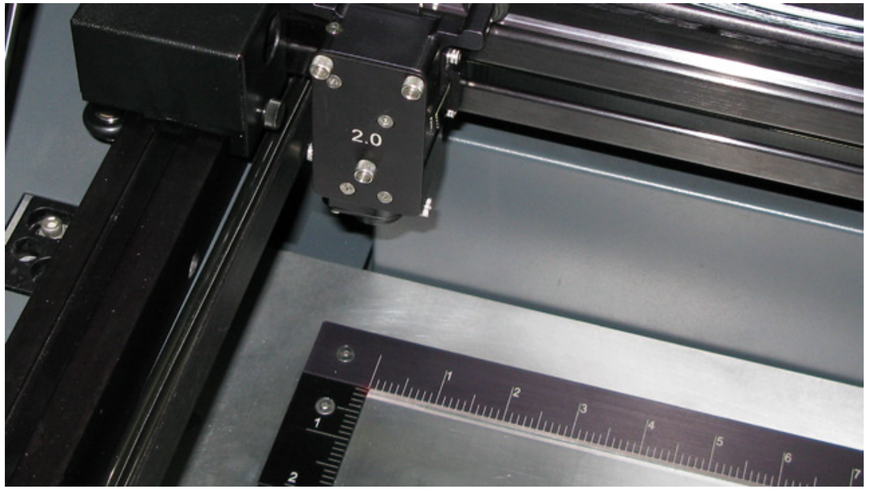
1. Check if the system is level by placing a bubble level on the frame of the cart across the two front casters, then the two rear casters. Adjust the level if necessary loosening the locknut and turning the adjustment nut. Once complete, retighten the appropriate locknuts against the leg of the cart. This must be completed prior to leveling the table.

Setting the Table Height

2. If you can raise and lower the table while the system is powered on, continue to step 2. If you can not move the table, proceed to step 6.
3. Using the Focus Feature on the Viewer Tab of the UCP, relocate the focus carriage to the top left-hand corner of the table inside the rulers.
4. Using the UP and DOWN arrow buttons, either on the machine (on the front keypad) or in the UCP, bring the Z-axis table up.
5. Using the appropriate Focus Tool for the lens installed, focus directly on the surface of the table. Proceed to step 13.

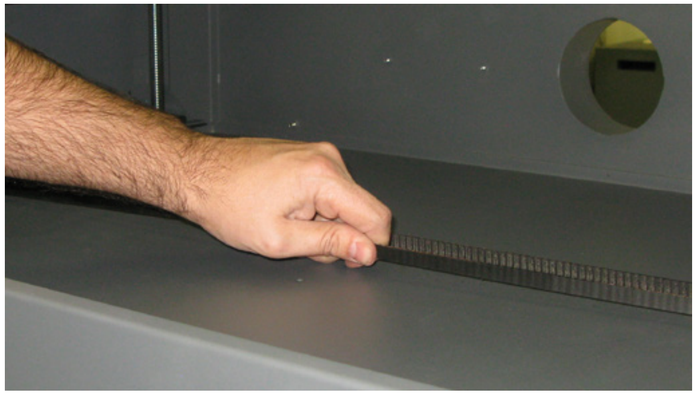
Manually Setting the Table Height

6. Turn OFF the system and unplug it.
7. Move the Focus Carriage by hand to the upper left position of the table, inside the rulers.

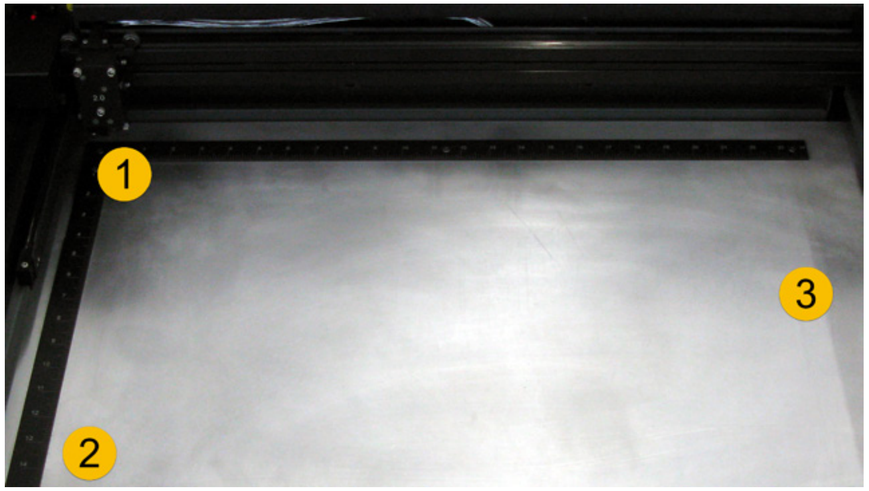


8. If the table is too low it will be necessary to move the right lead screw by hand. Turn the lead screw until the table raises high enough that you can access the long cover plate that covers the middle portion of the Z serpentine belt.
9. With an Allen wrench, remove all the screws that hold down the center plate and set it aside with the screws. Be careful not to lose any of the screws.

10. With the cover removed, the center portion of the Z belt is exposed. Move the table by pulling on the Z belt (This will move the table much faster than by moving the lead screw).

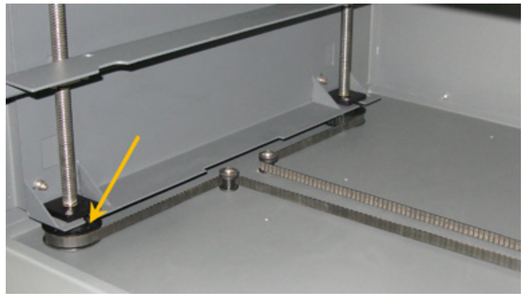


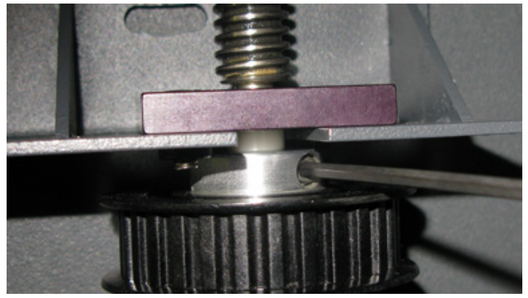
11. Move the table up to the correct height to focus the Upper Left Corner of the system.
12. Once the table height is set, as measured in the Upper Left-Hand Corner (1), do not move the Z belt again as this will throw off the alignment and the procedure will need to be restarted.



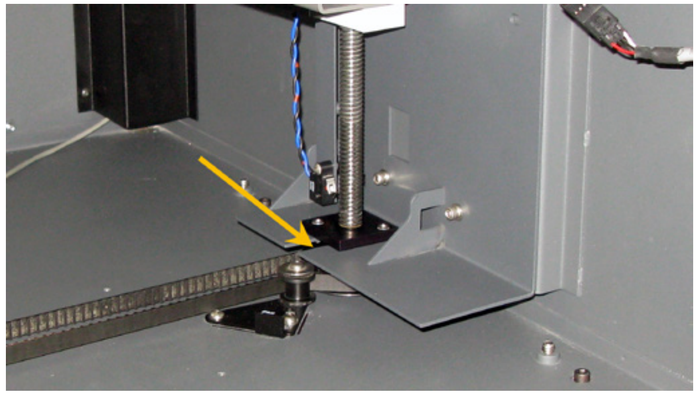
Checking and Adjusting the Table Level

13. Move the arm and focus carriage to the Lower Left-Hand Corner (2) of the table. Using the Focus Tool, determine whether the table needs to be raised or lowered.
14. To adjust the Lower Left-Hand Corner of the Table, loosen the belt pulley Lockdown Screw. This releases a clamping mechanism that attaches the Belt Pulley to the Lead Screw.





15. Grasp and rotate the threads of the Lead screw and adjust the Table until the focus is the same as for the Upper Left-Hand Corner. Once the left-hand corner is in focus, retighten the Lockdown Screw on the Belt Pulley.
16. Move the arm to the Center Right-Hand Side (3) of the table. Make sure that the Focus Tool is at the far right side of the table and centered vertically. Determine whether the Table needs to be raised or lowered. If the table is in focus, the procedure is finished. If table height is incorrect, continue with Step 17.
17. Loosen the Belt Pulley Lockdown Screw. Grasp and rotate the threads of the Lead screw and adjust the Table until it is focused. Retighten the Lockdown Screw on the Belt Pulley.

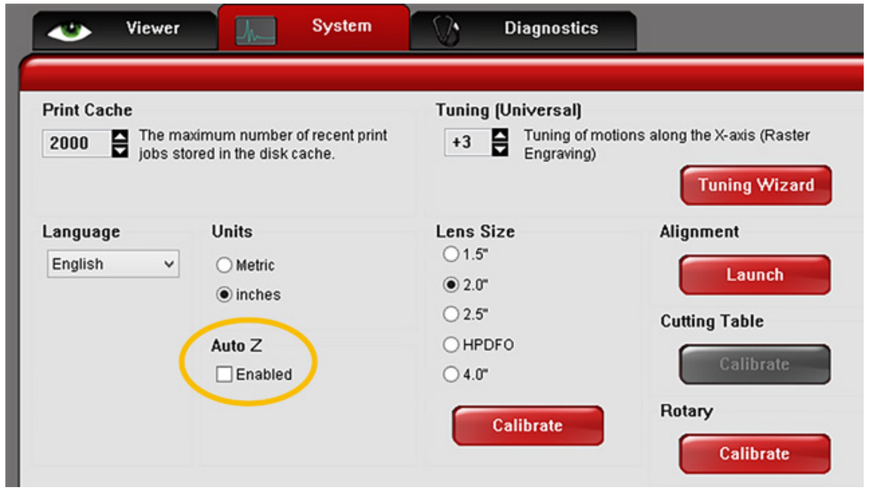


18. Install the Belt Cover with the 6 Buttonhead Screws. Apply fresh white lithium grease to the 3 Lead Screws making sure there is an even coating of grease on the Lead Screws throughout the entire length of travel for the Z-axis Table.

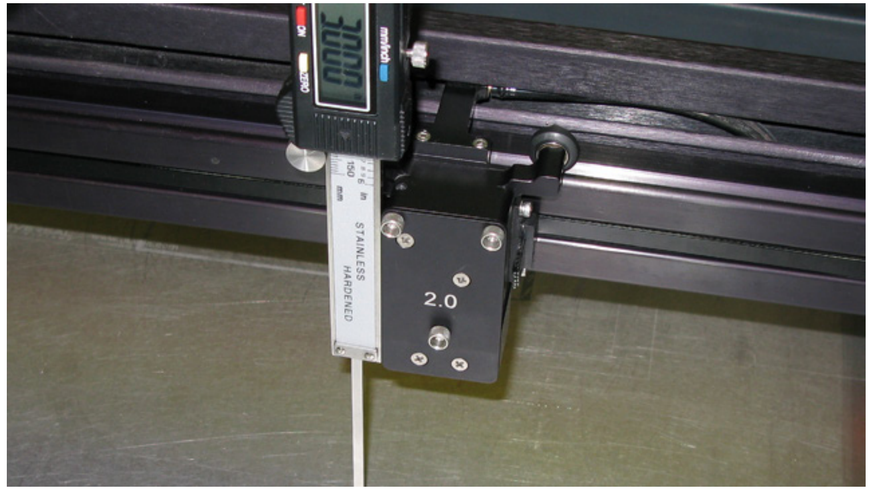
19. Plug in and turn the system ON. Run the Table up and down to work in the grease. Once the table is running smoothly, re-home the Z-axis.
20. Leveling is complete.

Focus Tool Calibration

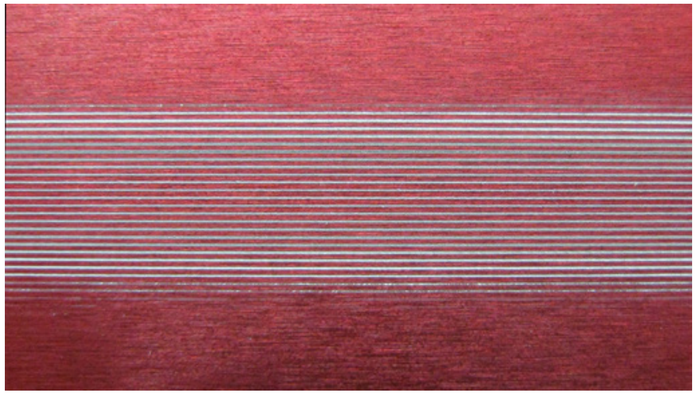
1. Install the Lens Kit of the focus tool to be calibrated (i.e., to calibrate the 2.0 Focus Tool ensure the 2.0 Lens Kit is installed in the focus carriage).
2. Remove everything from the engraving table (stage), including any currently installed accessories (Cutting Table, Rotary, or Pin Table).
3. With the system ON, open the UCP and click **System Tab**. Make sure the Auto Z box does not have a checkmark.



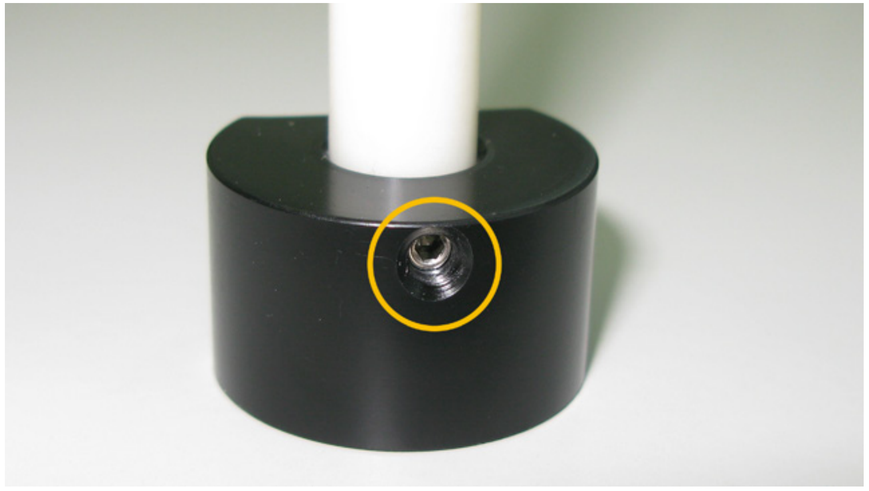
4. Using a ruler, lower the stage one inch below the estimated focal distance of the installed optics.
   - 3 inches for a 2.0
   - 2.5 inches for a 1.5
   - 3 inches for an HPDFO
   - 4 inches for a 3.0
5. In the graphic software, create a blue vector line roughly 2 inches long. Position the line in the middle of the table. Print to the UCP using the Materials Database. Select Anodized Aluminum and decrease the Vector Engrave Intensity to -50%.
6. Place a piece of anodized aluminum on the Engraving Table in the marking area.
7. Process the job. Repeat, raising the Z-axis height by .01 each time the job is run until the card is lightly marked.
8. Using a caliper, measure the distance from the top of the card to the bottom of the Lens Kit in the focus carriage.



9. Continue to repeat step 7, moving the card slightly each time so the laser marks on a clean surface, until a line is created that matches the first line.



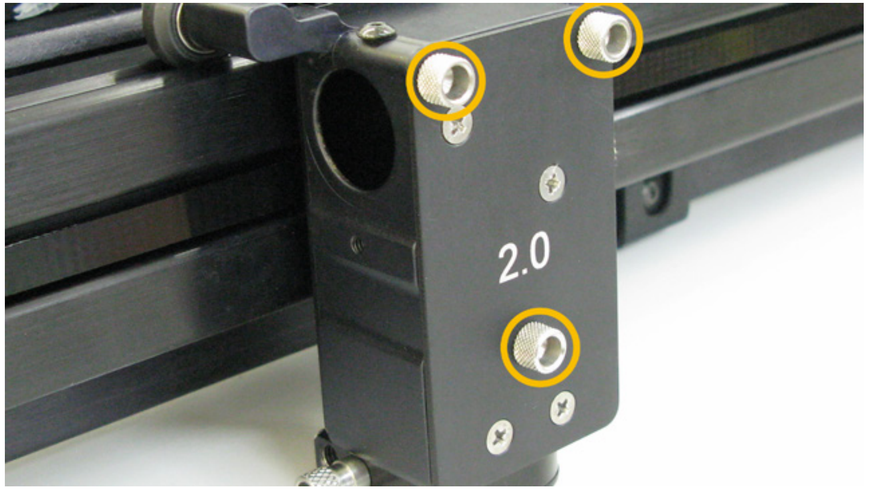
10. Once the lines match, measure from the top of the card to the bottom of the Lens Kit on the focus carriage.
11. Add the two distances together and divide the resulting distance by two.
12. This number is the distance to set the focus carriage from the engraving table.
13. Slightly loosen the setscrew located on the base of the focus tool.



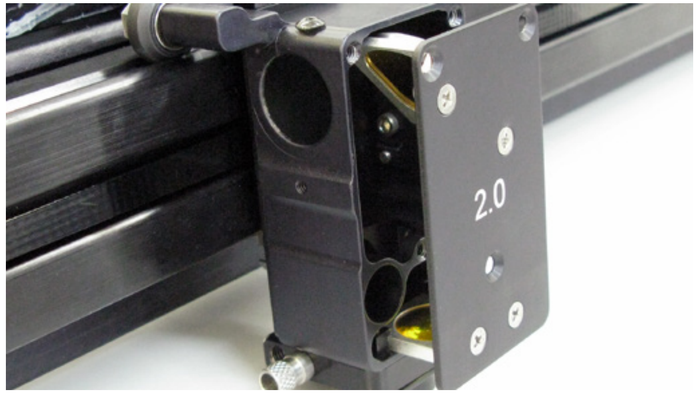
14. Raise and/or lower the shaft of the focus tool until the distance between the base of the tool and the notch is in perfect focus with the carriage as it was set in step 12.
15. Tighten the setscrew and check the distance to ensure the shaft of the tool did not slip.
16. The Focus Tool is calibrated.

Focusing Lens

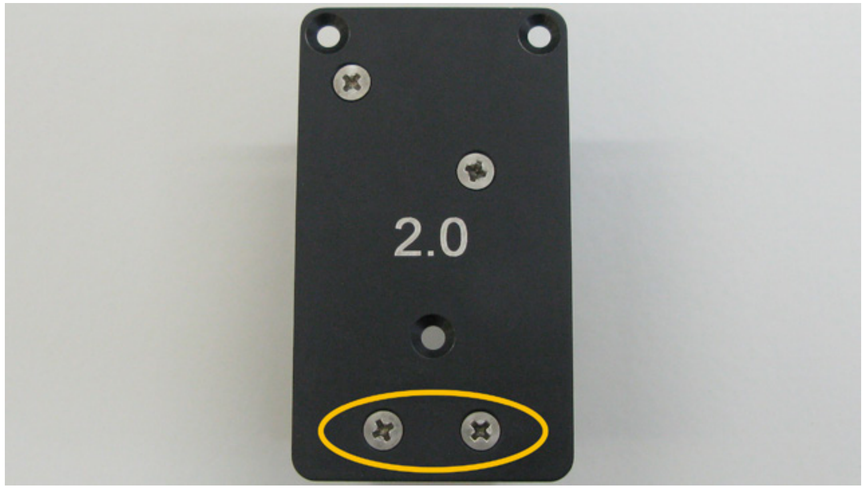
1. Make sure the VLS is powered OFF and unplugged.
2. Open the Top Door and pull the X-axis Arm forward.
3. Locate the Focus Carriage.
4. Remove the three thumbscrews from the Focus Carriage. Set them aside in a safe place.



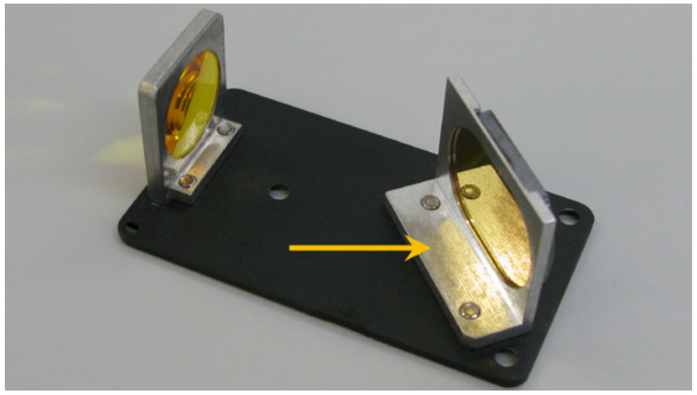
5. Slide the Lens Kit out of the Focus Carriage.



6. Set the Lens Kit on a soft, non-abrasive cloth.
7. Remove the two Phillips head screws that attach the Focusing Lens to the Front Cover Plate and remove the optic.



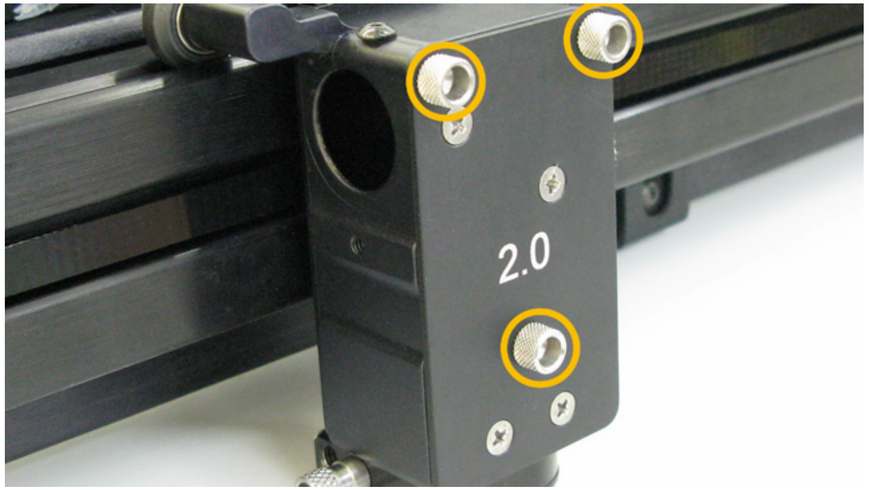
8. Attach the new Focusing Lens to the Front Cover Plate. Leave the Phillips head screws slightly loose.
9. Clean the #3 Mirror and Focusing Lens if necessary.



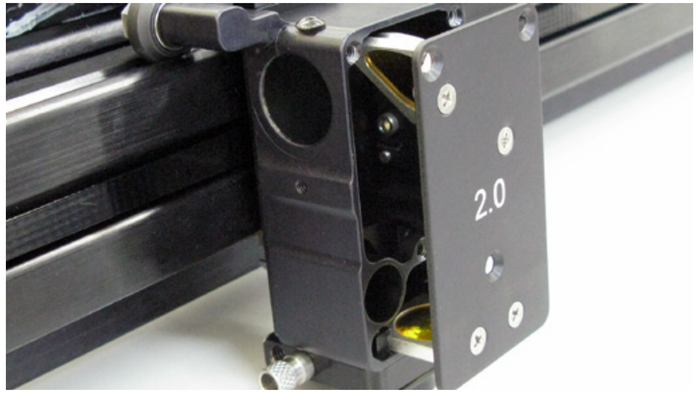
10. Carefully reinstall the Lens Kit using the thumbscrews removed earlier.
11. Tighten the Phillips head screws to secure the Focusing Lens to the front cover plate.

Replace Mirror #3

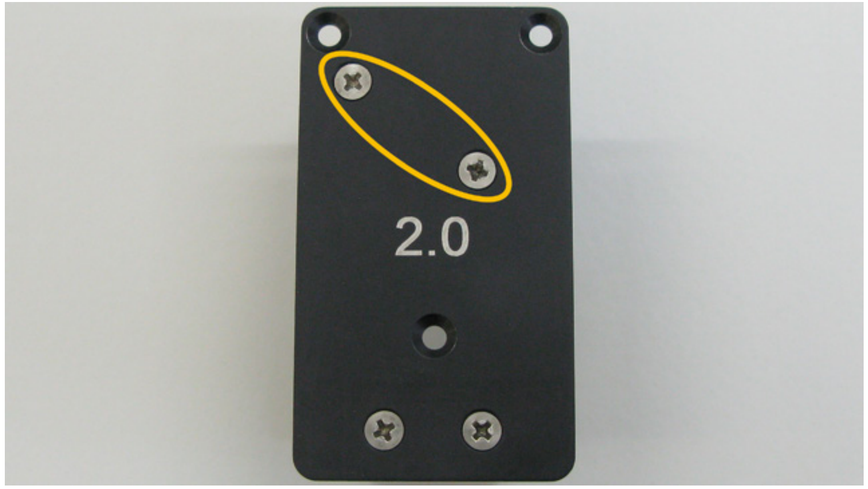
1. Make sure the VLS is powered OFF and unplugged.
2. Open the Top Door and pull the X-axis Arm forward.
3. Locate the Focus Carriage.



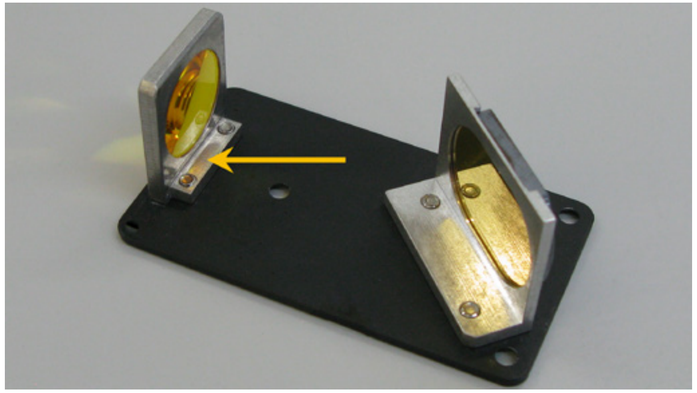
4. Remove the three thumbscrews from the focus carriage. Set them aside in a safe place.
5. Slide the Lens Kit out of the Focus Carriage.



6. Set the Lens Kit on a soft, non-abrasive cloth.
7. Remove the two Phillips head screws that attach the #3 Mirror to the Front Cover Plate and remove the optic.



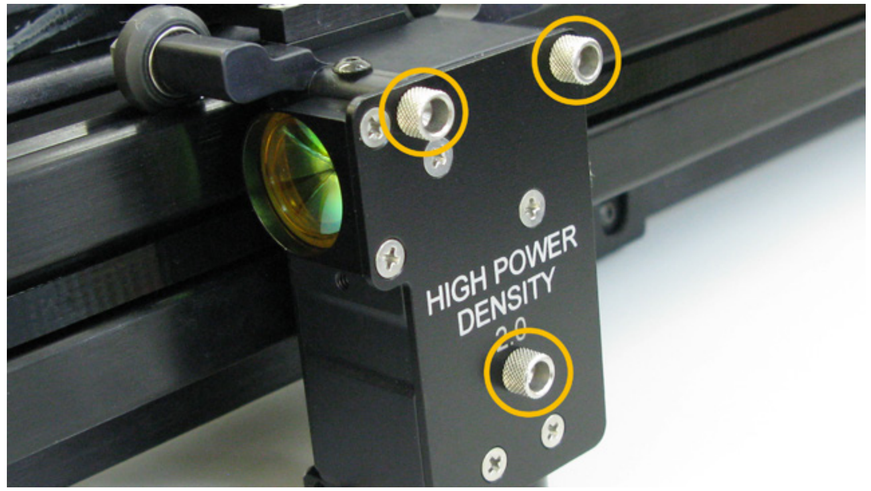
8. Attach the new #3 Mirror to the Front Cover Plate. Leave the Phillips head screws slightly loose.
9. Clean the Focusing Lens and #3 Mirror if necessary.



10. Carefully reinstall the Lens Kit using the thumbscrews removed earlier.
11. Tighten the Phillips head screws to secure the #3 Mirror to the front cover plate.

Replace Beam Shaper (for HPDFO lens kit)

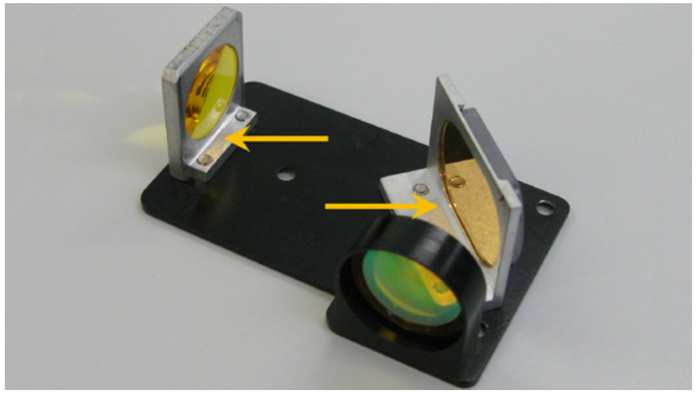
1. Make sure the VLS is powered OFF and unplugged.
2. Open the Top Door and pull the X-axis Arm forward.
3. Locate the Focus Carriage.
4. Remove the three thumbscrews completely. Set them aside in a safe place.



5. Slide the Lens Kit out of the Focus Carriage.

6. Place the Lens Kit on a soft, non-abrasive cloth.
7. Remove the two Phillips head screws that attach the Beam Shaper to the Front Cover Plate and remove the optic.

8. Attach the new Beam Shaper to the Front Cover Plate.
9. Clean the #3 Mirror, Focusing Lens, and Beam Shaper if necessary.

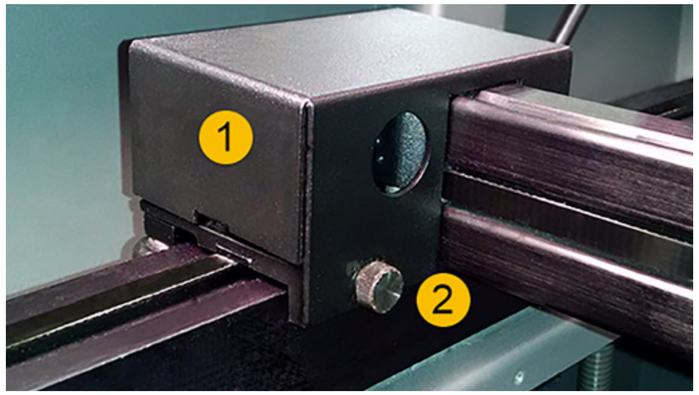


10. Reinstall the Lens Kit in the Focus Carriage.

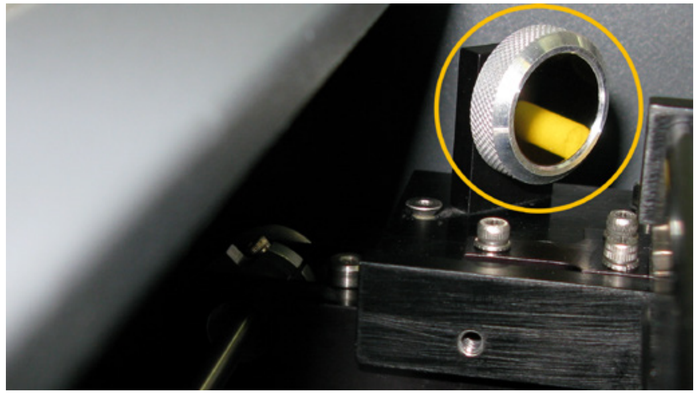
Replace Mirror #2

NOTE: *Be careful not to touch the #2 Mirror.*

1. Make sure the VLS is powered OFF and unplugged.
2. Open the Top Door and slide the X-axis Arm forward.
3. Locate and carefully remove the large thumb screw (2) securing the cover (1) on the left-hand side of the X-axis arm. Once the thumbscrew is removed slide the cover to the right and up and set it aside.



4. Grab hold of the Bezel Mirror Holder and turn it counter-clockwise to remove it. Place it in a safe place.

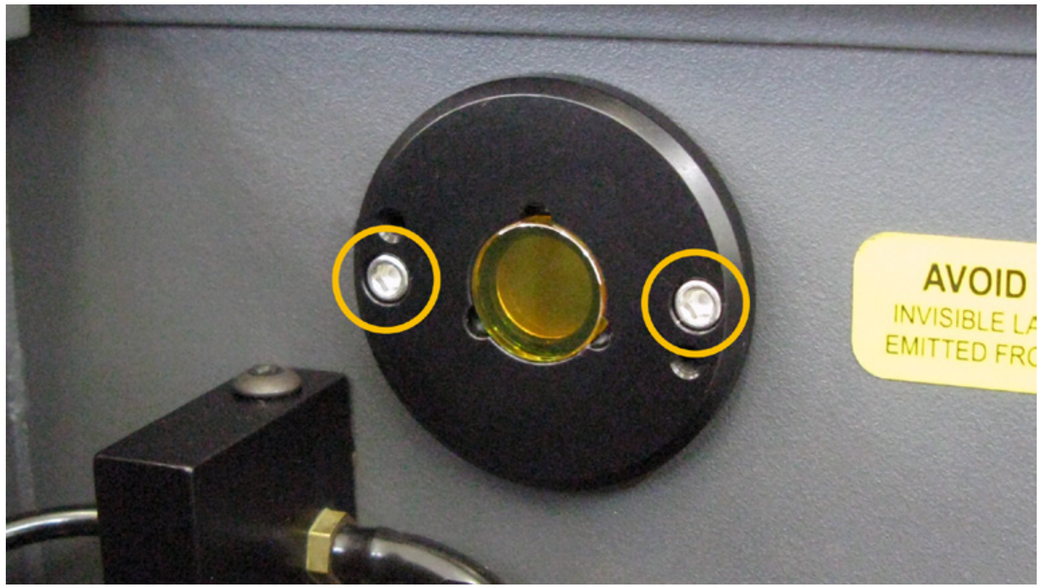


NOTE: *DO NOT remove the screws behind the mirror. This assembly is spring loaded.*

5. Replace the #2 Mirror with the new mirror. Verify that the reflection side is facing inside the laser machine. Installing the mirror backward within the bezel will destroy the mirror once the laser beam penetrates the backside of the mirror, so be sure that you re-install the mirror correctly.
6. Once the mirror has been installed perform a *Laser Beam Check and Alignment*.

Beam Window

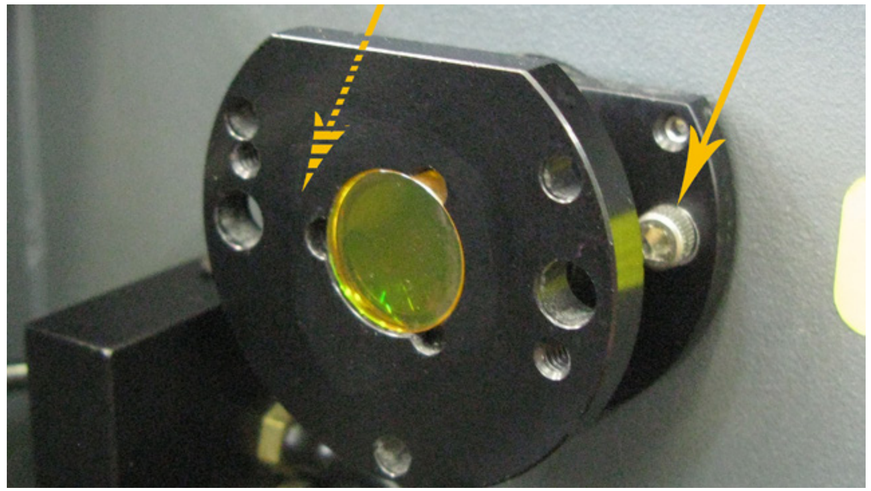
1. Make sure the VLS is powered OFF and unplugged.
2. Open the Top Door and pull the X-axis Arm completely forward.
3. Remove the two screws holding the Beam Window in place.



4. Carefully remove the Beam Window.
5. Installation is opposite of removal.

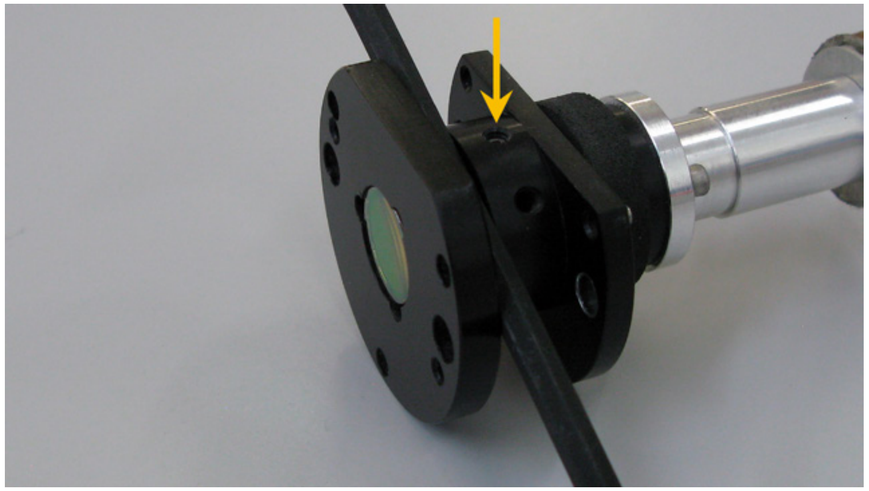
Collimator

1. Make sure the VLS is powered OFF and unplugged.
2. Open the Top Door and pull the X-axis Arm completely forward.
3. Remove the two screws holding the Collimator in place.

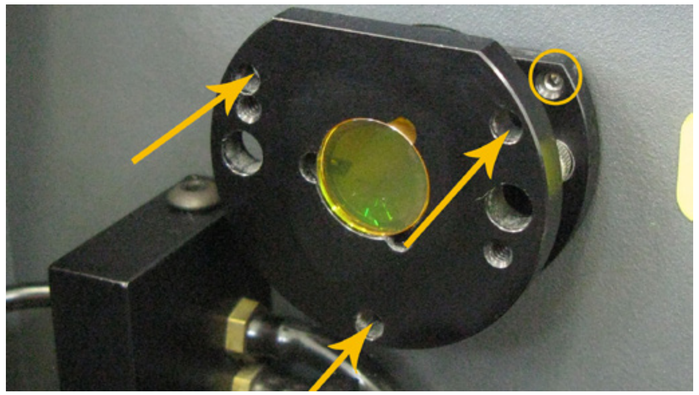


4. Carefully remove the Collimator and place in a safe location.
5. With the Collimator uninstalled, perform a *Laser Beam Check and Alignment*.
6. Once the Laser Beam Check and Alignment is complete install the Collimator using the screws removed earlier.

7. Using a 9/64” Allen wrench, check to ensure the new Collimator has the correct gap. The width of the Allen wrench is approximately the correct gap.



8. Perform a *Laser Beam Check and Alignment*, however, instead of adjusting the #2 mirror adjust the Collimator using the three small setscrews by rotating them in extremely small increments, one at a time until the beam is aligned.

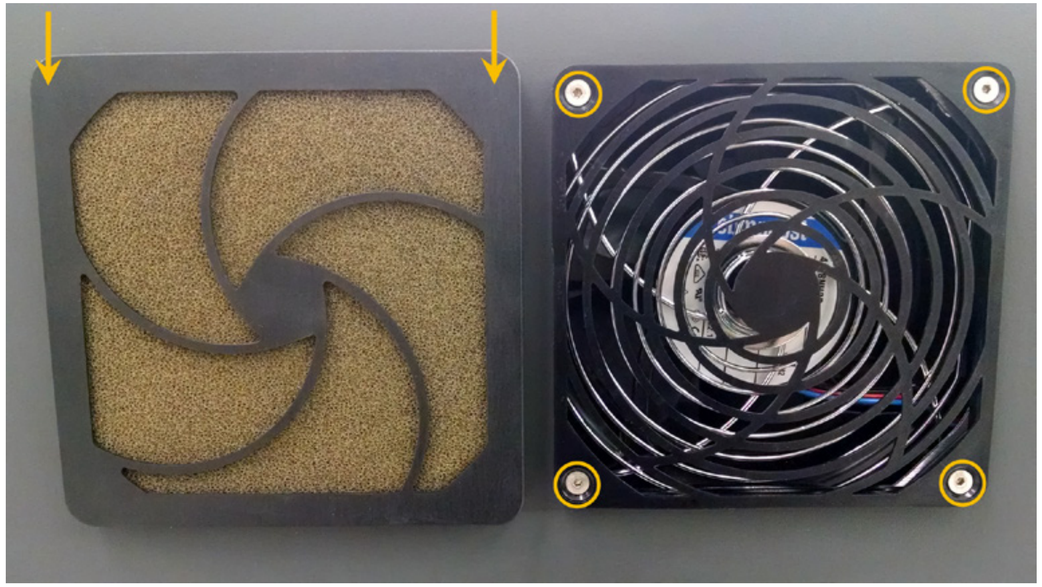


NOTE: *Access the setscrews through the holes on the front of the collimator.*

9. Installation is complete.

Rear Cover Filter Media and Fan Guard

1. Power OFF and unplug the VLS.
2. Firmly grip the top two corners of the fan cover and pull away. The cover will pop off.
3. Remove the fan media.
4. Remove the screws holding the fan grilles in place.

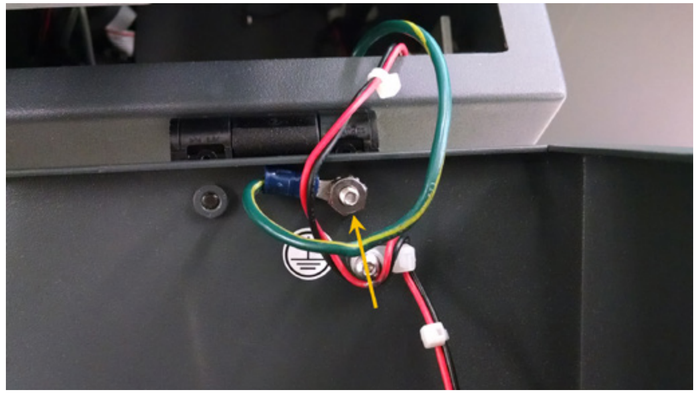


5. Installation is opposite of removal.

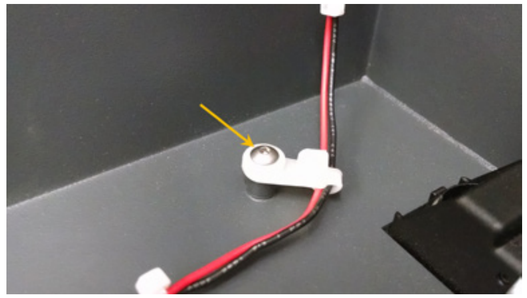
Enclosure and Cart
Rear Cover Hinges

NOTE: *The assistance of one or two people is recommended.*

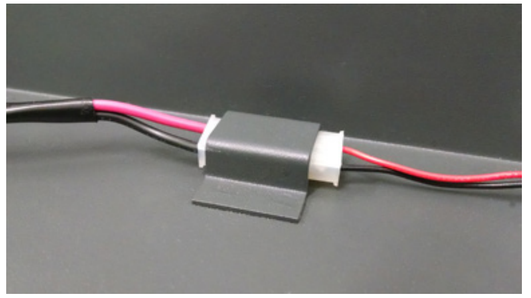
1. Power OFF and unplug the VLS.
2. Open the rear cover by pulling the latches toward the back of the system or by pressing down on the button part of the latches until the latches pop up.
3. Fold the rear cover down to a resting position.
4. Disconnect the ground wire from the rear cover by removing the nut securing it in place.

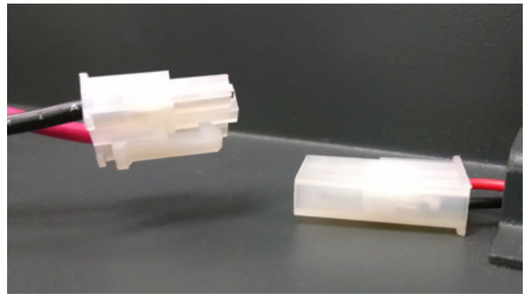


5. Remove the screw holding the wire tie that secures the exhaust fan power cable.

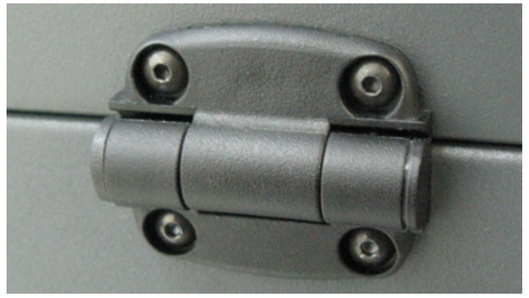


6. Disconnect and remove the power cable. Set the cable aside.





7. Raise the rear cover to its closed position.
8. Remove the hinge screw cover plate by using a soft tool to pry it off the hinge.
9. Remove the two screws attaching each of the three hinges to the rear shelf.



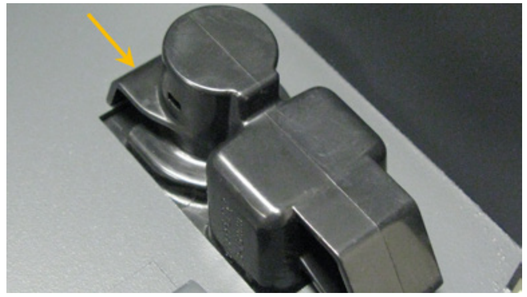
10. Remove and rest the rear cover in a safe working location and remove the two screws attaching each of the three hinges to the rear cover.
11. Installation is opposite of removal.
12. Plug in and power ON the VLS. Open and close the door. Check to see if the door open light on the keypad turns on and off (red flashing light) when you open and close the cover. Or check the UCP to see if the system is indicating that a door is open.

Rear Cover Latches and Cover Latch Catch

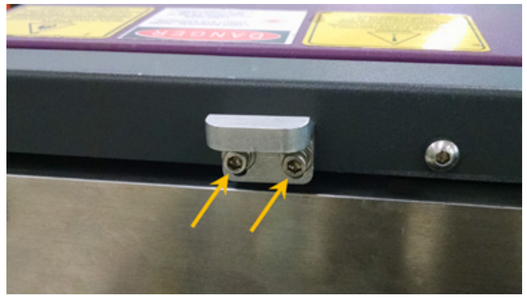
VLS3.60 and VLS4.60

NOTE: *The assistance of one or two people is recommended.*

1. Power OFF and unplug the VLS.
2. Open the rear cover by pulling the latches toward the back of the system.
3. Fold the Rear Cover to its resting position.
4. Depress the small plastic flange holding the latch.
5. While depressing the flange push the latch out of the cover.



6. Installation is opposite of removal. Continue to step 7 if replacing the Rear Cover Latch Catches.
7. Fold the cover down to a resting position.
8. Remove the two screws and two washers holding each of the cover latches in position.



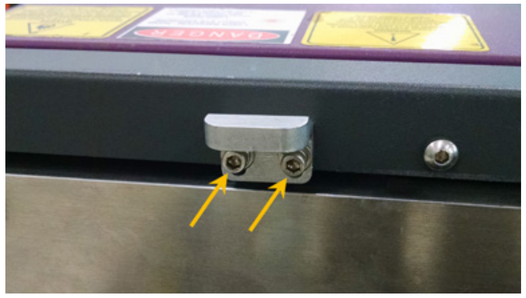
9. Installation is opposite of removal.

VLS6.60

NOTE: *The assistance of one or two people is recommended.*

1. Power OFF and unplug the VLS.
2. Open the rear cover by pressing down on the button part of the latches until the latches pop up.
3. Fold the Rear Cover to its resting position.
4. Remove the latch retaining bracket by removing the screw holding it in place. The latch will be removable.

5. Installation is opposite of removal. Continue to step 6 if replacing the Rear Cover Latch Catches.
6. Fold the cover down to a resting position.
7. Remove the two screws and two washers holding each of the cover latches in position.



8. Installation is opposite of removal.

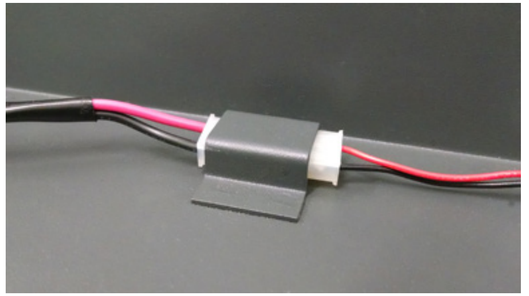
Rear Cover Proximity Sensor Magnets

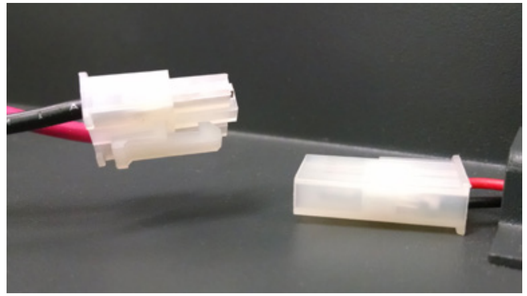
1. Power OFF and unplug the VLS.
2. Open the rear cover by pulling the latches toward the back of the system or by pressing down on the button part of the latches until the latches pop up.
3. Fold the cover down to a resting position.
4. Locate the two proximity sensor magnets located on the right-hand side (VLS3.60 and 4.60) or the left-hand side (VLS6.60) of the rear cover.
5. Remove the two screws holding each proximity sensor magnet in place.

6. Installation is opposite of removal. Ensure that the proximity sensor magnet is flush with the rear cover.
7. Plug in and power ON the VLS. Open and close the door. Check to see if the door open light on the keypad turns on and off (red flashing light) when you open and close the cover. Or check the UCP to see if the system is indicating that a door is open.

Rear Cover Cooling Fan

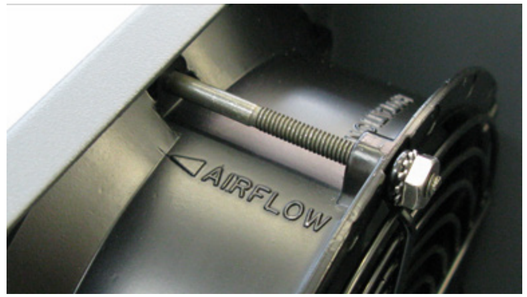
1. Power OFF and disconnect the VLS.
2. Open the rear cover by pulling the latches toward the back of the system or by pressing down on the button part of the latches until the latches pop up.
3. Fold the cover down to a resting position.
4. Locate and disconnect the rear cover exhaust fan from the wiring harness.





NOTE: *You may need to temporarily remove the cable tie to gain access to this connection.*

5. Remove the two bolts and nuts holding the rear cover cooling fan in position.



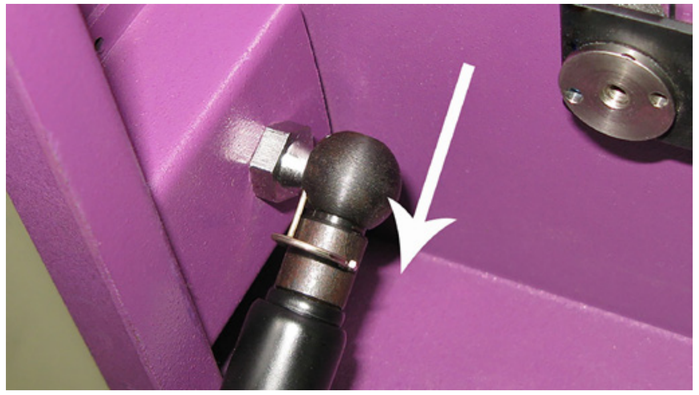
6. Installation is opposite of removal.

Top Door and Window

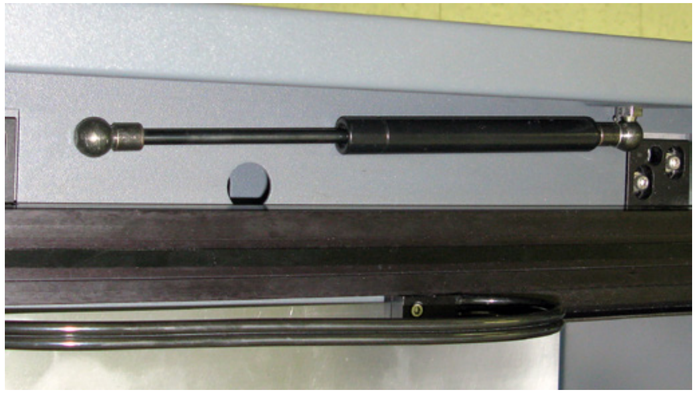
NOTE: *Obtain assistance from 1 or 2 additional people when removing the top door.*

1. Make sure the VLS is powered OFF and unplugged.
2. Open the Top Door and locate the 2 hydraulic pressure cylinders on each side of the door. Remove the retaining clip from the hydraulic pressure cylinders by flipping the clip off the cylinder.

3. Pull the retaining clip down to remove it. Once the retaining clip has been removed the hydraulic pressure cylinder can be removed by pulling outward from the door/system.



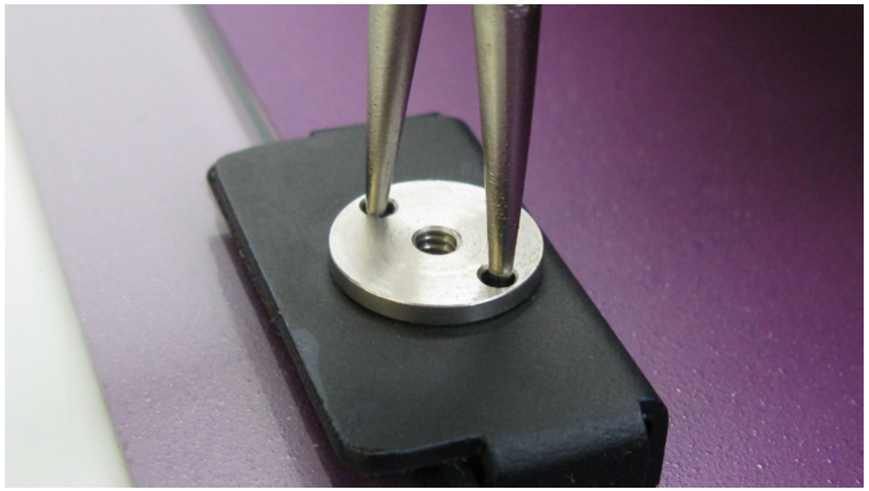
4. Move the hydraulic pressure cylinder out of the way by gently laying it inside the system.



5. Have another person hold the top door and unscrew the 4 screws and washers that hold the top door in place with the hinges. Place the screws and washers in a safe place.

6. Place the top door on a soft, flat, sturdy surface (such as a table covered with a cloth) with the top side face down.

7. Locate the 12 window nuts and remove them with a needle nose pliers, as shown. Set the window nuts aside in a safe place.



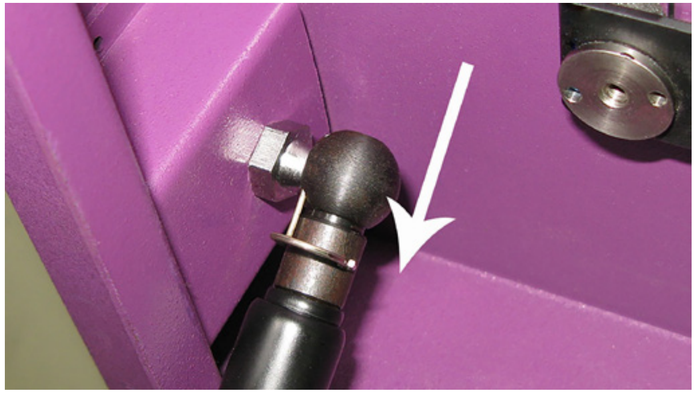
8. With the top door still on a flat surface, carefully remove all four Glass Window Mounts by gently prying them with your fingers. The Glass Window Mounts may stick on the top door window.
9. Remove the glass window from the top door frame.
10. Installation of the Top Door is opposite of removal.
11. Plug in and power ON the VLS. Open and close the door. Check to see if the door open light on the keypad turns on and off (red flashing light) when you open and close the door. Or check the UCP to see if the system is indicating that a door is open.

Top Door Hinges

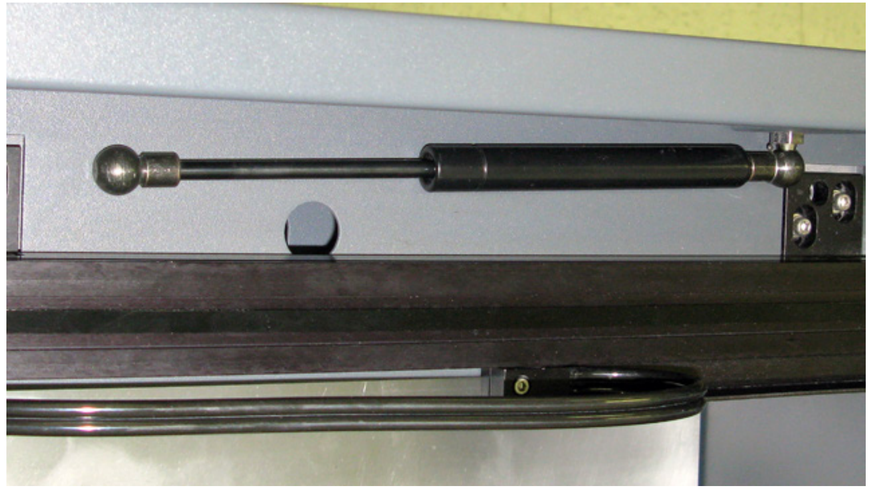
NOTE: *Obtain assistance from 1 or 2 additional people when removing the top door.*

1. Make sure the VLS is powered OFF and unplugged.
2. Open the Top Door and locate the two hydraulic pressure cylinders. Remove the retaining clips from the top of each.

3. Once the retaining clip has been removed the hydraulic pressure cylinder can be removed by pulling outward from the door.

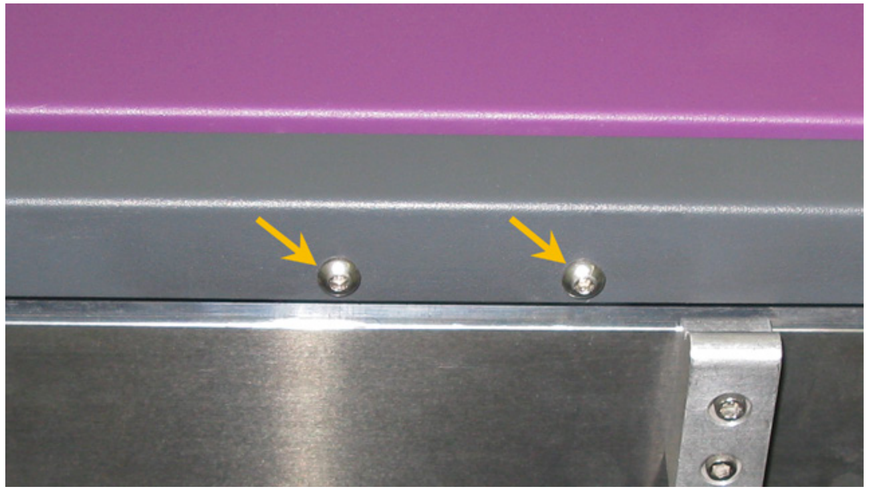


4. Move the hydraulic pressure cylinder out of the way by gently laying it inside the system.



5. With another person holding the top door remove the four screws and washers that hold the top door in place. Set the top door in a safe location and set the screws and washers safely aside.

6. Open the rear cover by pulling the latches toward the back of the system or by pressing down on the button part of the latches until the latches pop up.
7. Fold the Rear Cover down to its resting position.
8. Locate the top door hinges and remove the screws and washers holding them in place. Store them in a safe location. Remove the hinges.



9. Installation is opposite of removal.
10. Plug in and power ON the VLS. Open and close the door. Check to see if the door open light on the keypad turns on and off (red flashing light) when you open and close the door. Or check the UCP to see if the system is indicating that a door is open.

Hydraulic Pressure Cylinder

NOTE: *Obtain assistance from 1 or 2 additional people when replacing the pressure cylinders.*

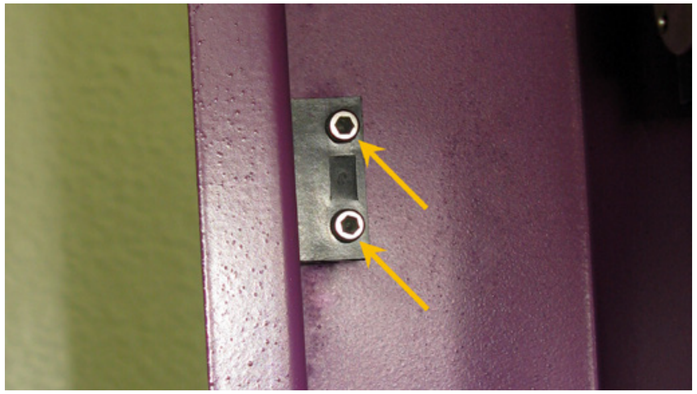
1. Make sure the VLS is powered OFF and unplugged.
2. Open the Top Door and locate the two hydraulic pressure cylinders on each side of the door. Remove the retaining clips from both the top and bottom of both. Take special note of how the retaining clips slide into a small hole located on the back side of the hydraulic pressure cylinder.

3. Once the retaining clips have been removed the hydraulic pressure cylinders can be removed by pulling outward from the door/system.
4. Ensure the ball joints attached to the top door and the machine are securely in place by tightening them with a wrench.

5. Installation is opposite of removal.

Top Door Proximity Sensors

1. Make sure the VLS is turned OFF and unplugged.
2. Open the Top Door and locate the two proximity sensor magnets located along the front edge of the top door.
3. Remove the two screws holding each proximity sensor magnet in place and set them aside. Remove the magnets.



4. Installation is opposite of removal. Ensure the magnet is flush with the top door frame or slightly sticking out.

5. Plug in and power ON the VLS. Open and close the door. Check to see if the door open light on the keypad turns on and off (red flashing light) when you open and close the door. Or check the UCP to see if the system is indicating that a door is open.

Front Door Hinges

CAUTION: *It is recommended that an additional person assist you with this process.*

1. Make sure the VLS is turned OFF and unplugged.
2. Slightly open the door giving the person assisting you something to hold on to.
3. While one person holds the door, remove the three screws holding each of the two (VLS3.60 and VLS4.60) or three (VLS6.60) hinges to the frame of the system at the bottom. Set the screws aside.

4. Set the door on a safe working surface.
5. Remove the remaining screws holding the hinges on the door.
6. Installation is opposite of removal. Leave the screws slightly loose when reattaching them to the frame. Close the front door and ensure it is centered in its opening. Tighten the screws.

7. Plug in and power ON the VLS.Open and close the door. Check to see if the door open light on the keypad turns on and off (red flashing light) when you open and close the door. Or check the UCP to see if the system is indicating that a door is open.

Front Door Latch

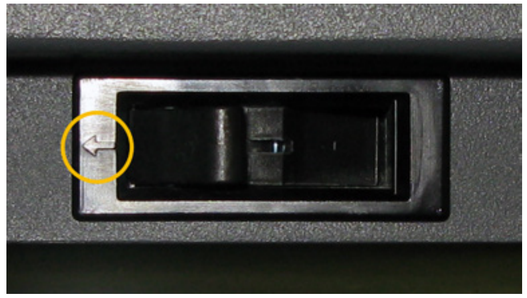
1. Make sure the VLS is turned OFF and unplugged.
2. Open the front door and locate the latch (VLS3.60 and VLS4.60) or the two latches (VLS6.60). Note the direction of the imprinted arrows on the latch(es).

3. Remove the screws holding the latch(es) in position.
4. Installation is opposite of removal. Ensure that the imprinted arrows are pointing the same direction as when they were removed.

Front Door Latch Catch

1. Open the front door all the way to its resting position.

2. Locate the front door latch catch(es) noting the direction the imprinted arrows are pointing.

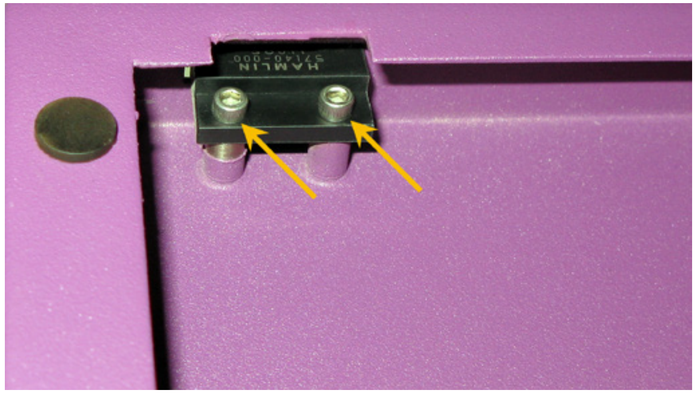


3. Remove the latch catch(es) by pressing the sides of the latch catch together and pushing it out of the opening.

4. Installation is the opposite of removal. Ensure the imprinted arrows are pointing the same direction as when removed.

Front Door Proximity Sensors

1. Open the front door and locate the two proximity sensor magnets located along the left and right edges of the door.
2. Remove the two screws holding each proximity sensor magnet in place and set them aside. Remove the magnets.

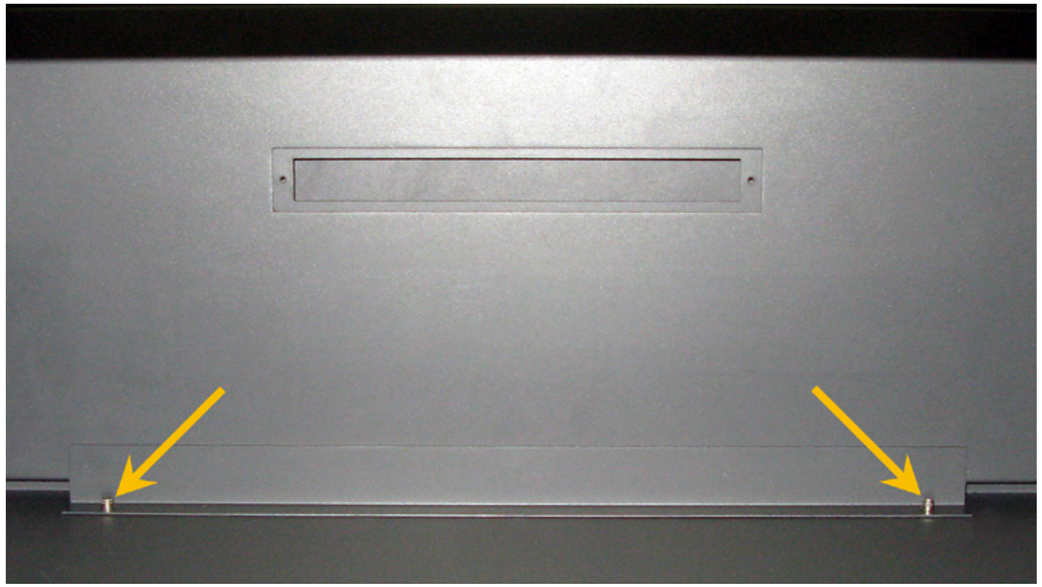


3. Installation is opposite of removal. Ensure the magnet is flush with the front door frame or slightly sticking out.

4. Plug in and power ON the VLS. Open and close the door. Check to see if the door open light on the keypad turns on and off (red flashing light) when you open and close the door. Or check the UCP to see if the system is indicating that a door is open.

Exhaust Plenum

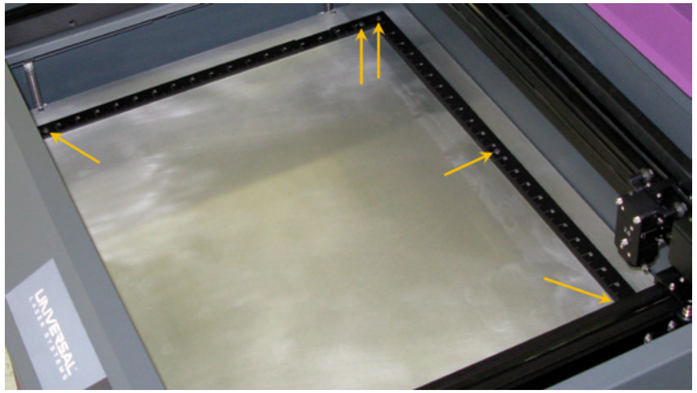
1. Power ON the laser system and the UCP.
2. Remove any material or accessories from the engraving table.
3. Using the Z-axis buttons on the keypad or UCP, raise the Z-axis table as high as possible.
4. Power OFF and unplug the system. Open the front door to its resting position.
5. Locate and remove the two (VLS3.60 and VLS4.60) or four (VLS6.60) socket head cap screws found inside the laser system at the bottom back of the Frame.



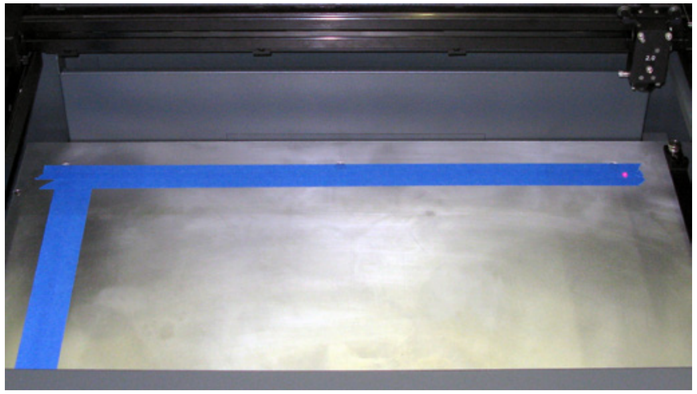
6. Using both hands, reach in and grasp the exhaust plenum.
7. Lift the plenum clear of the two flat head screws on which they are resting. Tilt the bottom of the plenum toward you and remove it from the system.
8. Installation is opposite of removal. Verify that the plenum is resting correctly on the two flat head screws.

Rulers

1. Remove all 5 screws securing the rulers to the engraving table and set them aside.

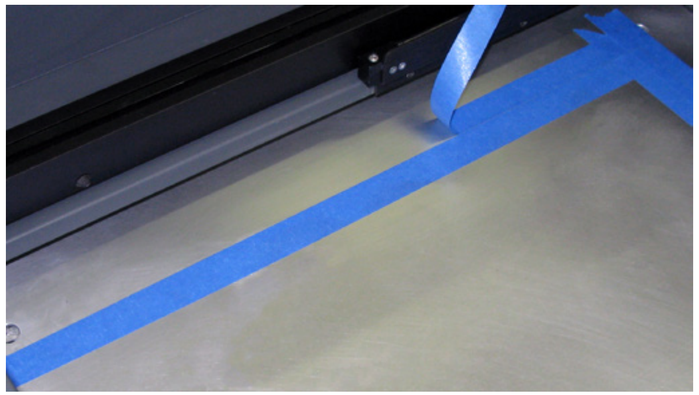


2. Use solvent cleaner to remove any debris left over from the removed rulers.
3. Place masking tape on the table over the approximate location of the ruler positions extending the full length of the table on both axes.

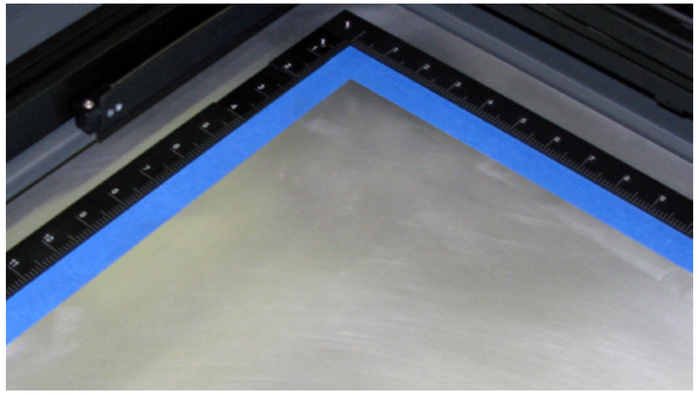


4. Using your graphic software, create a red line box that outlines the page size perfectly.
5. Run that cut file (using paper settings) to determine the exact location for the edges of the rulers.

6. After the cut file has been run, peel the outside masking layer off leaving the inside portion. This will be the guideline to set the rulers.



7. Gently set the rulers against the remaining masking tape.



8. Once the rulers are correctly located, reinstall the screws removed in step 1 to secure the rulers to the engraving table.
9. Remove the remaining masking tape.

Cart
VLS3.60 and VLS4.60

NOTE: *Leave all the screws slightly loose except for the casters.*

1. Screw the 4 casters onto each leg, 2 per leg, as far as possible.

2. Attach the back panel to the legs using the 4 socket head screws, 4 locking washers, and 4 flat washers.

3. With the assistance of another person, place the system on top of the cart, aligning the pins on the cart with the alignment holes on the bottom of the system, and loosely install the 4 socket head screws, 4 locking washers, and 4 flat washers attaching the system to the cart. These screws will go through the cart legs into the bottom of the system.

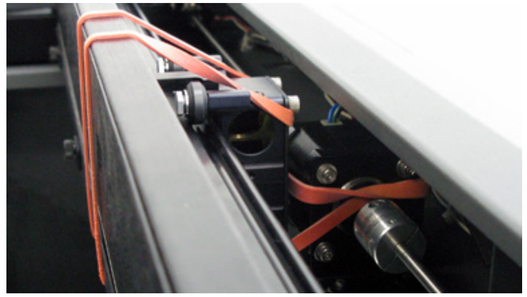
4. Using the two remaining screws, flat washers, and locking washers, attach the back panel to the rear of the system.

5. Open the front door of the system all the way down ensuring that the door does not rub or interfere with the cart legs. If the door should come in contact with the cart legs gently pull the cart legs away to ensure there is no contact between the door and the cart legs.

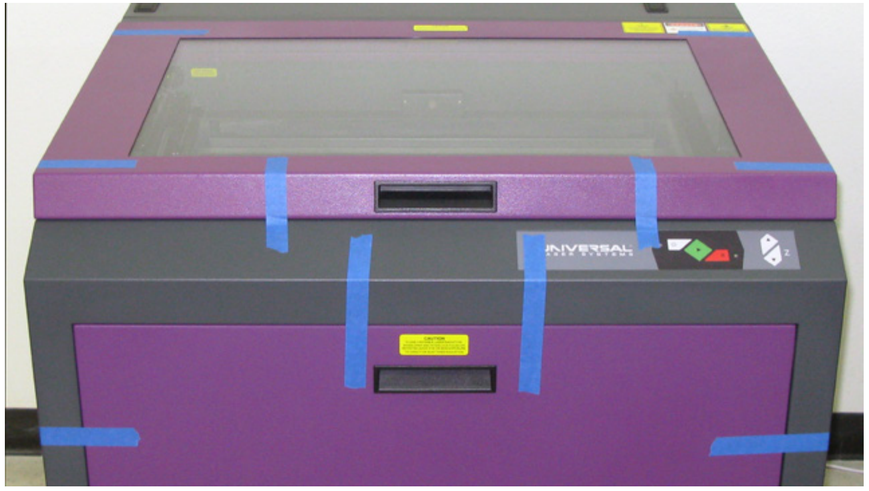
6. Securely tighten all the screws.
7. Disassembly is opposite of installation.

VLS6.60

1. Secure the X-axis Arm inside the system. This is normally done by wrapping a rubber band around the arm and securing it to the Y-axis Motor.



2. Using strong shipping tape or rope, secure the top and front doors so they do not open when the system is tilted.



3. Remove the eight screws that attach the cart stand to the laser system, two per leg and four securing the back panel to the bottom of the system, be careful with the washers that contain each screw as these are very important for reassembly.

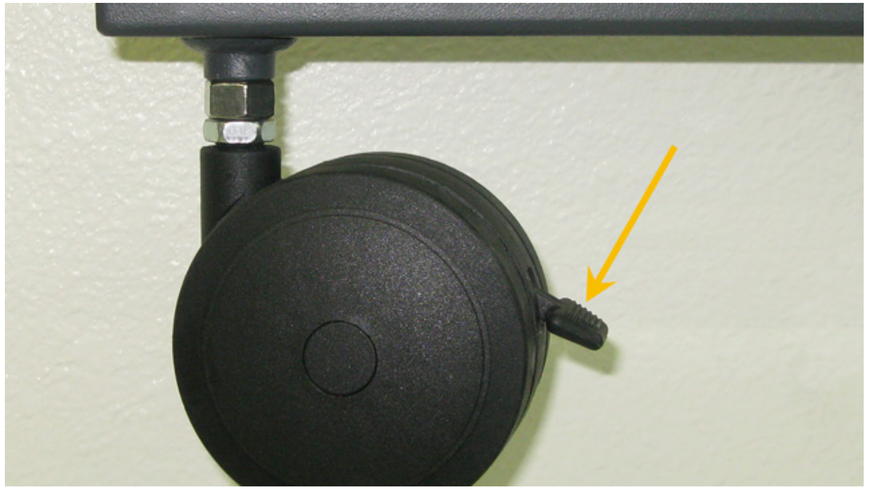
4. Lift the system straight up and carefully tilt to set it on its side on a dolly or furniture cart. Relocate as necessary.

5. Assembly is opposite of disassembly.

Cart Casters

CAUTION: *It is recommended that you obtain the assistance of another person when replacing a caster on this system.*

1. Turn OFF and unplug the VLS.
2. Place each caster in its locked position.



3. Slightly lift the corner of the cart where the caster will be removed.
4. Place a block large enough to provide working clearance slightly behind or in front of the caster being removed.
5. Using a wrench loosen the locknut and remove the caster by turning the adjustment nut in a counter-clockwise direction.
6. Installation is opposite of removal.
7. When installing a new caster ensure the locknut is screwed all the way down on the caster.
8. Check if the system is level by placing a bubble level on the frame of the cart across the two front casters then the two rear casters. Adjust the level if necessary by turning the adjustment nut.

9. Once the system is level tighten the appropriate locknuts.

Front Door Interlocks

1. Turn the VLS ON and move the table to its lowest position using the keypad or the UCP.
2. Turn the VLS OFF and unplug the system.
3. Open the front door and fold it to its resting position.
4. Locate the two front door interlocks on the left- and right-hand side on the frame of the system.

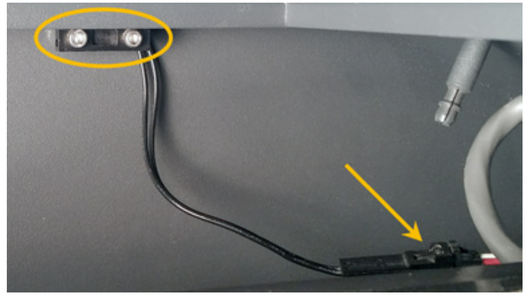
5. Disconnect the proximity sensor from the wiring harness.

6. Remove the two screws holding the interlock in position.
7. Installation is opposite of removal. Ensure the interlock is flush with the frame of the system.
8. Plug in and power ON the VLS. Open and close the door. Check to see if the door open light on the keypad turns on and off (red flashing light) when you open and close the door. Or check the UCP to see if the system is indicating that a door is open.
9. If adjustment is necessary loosen the two screws holding the proximity sensor in position and slide the sensor in or out. Retighten the screws and repeat Step 8 until complete.

Top Door Interlocks

1. Turn the VLS OFF and unplug the system.
2. Open the Top Door.
3. Locate the two top door interlocks located on the left-hand and right-hand side on the frame of the system.

4. Disconnect the interlock from the wiring harness.
5. Remove the two screws holding the interlock in position.

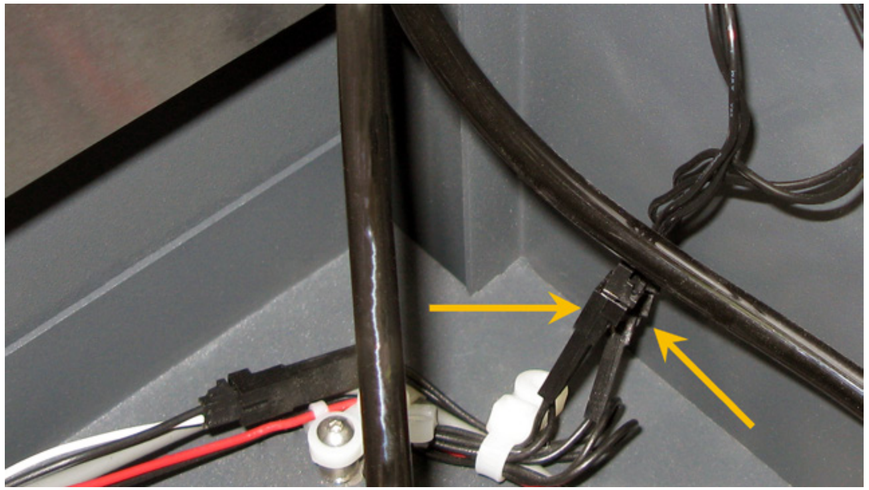


6. Installation is opposite of removal. Ensure the interlock is flush with the frame of the system.
7. Plug in and power ON the VLS. Open and close the door. Check to see if the door open light on the keypad turns on and off (red flashing light) when you open and close the door. Or check the UCP to see if the system is indicating that a door is open.
8. If adjustment is necessary loosen the two screws holding the interlock in position and slide the sensor in or out. Retighten the screws and repeat Step 7 until complete.

Rear Cover Interlocks

1. Turn the VLS OFF and unplug the system.
2. Open the rear cover to its resting position.
3. Locate the two interlocks on the right-hand side (VLS3.60 & 4.60) or the left-hand side (VLS6.60) of the system frame.

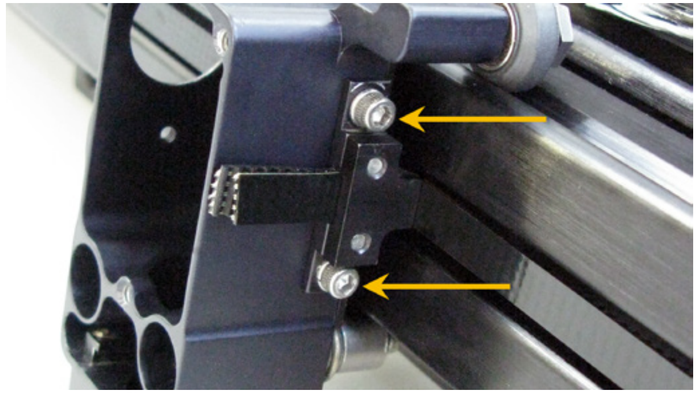
4. Disconnect the interlocks from the wiring harness.



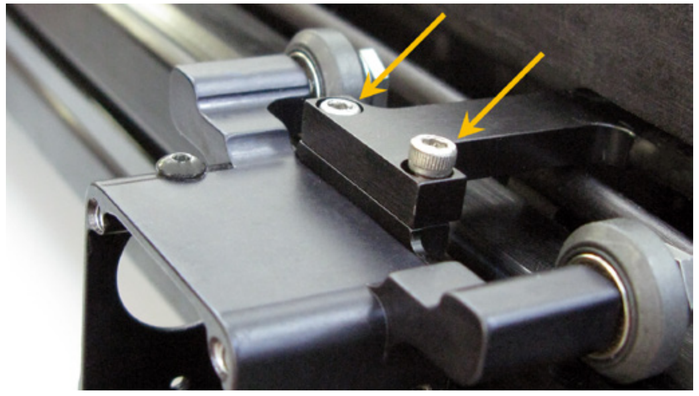
5. Remove the two screws holding the interlocks in position.
6. Installation is opposite of removal. Ensure the sensor is flush with the frame of the system.
7. Plug in and power ON the VLS. Open and close the rear cover. Check to see if the door open light on the keypad turns on and off (red flashing light) when you open and close the cover. Or check the UCP to see if the system is indicating that a door is open.
8. If adjustment is necessary loosen the two screws holding the interlock in position and slide the sensor in or out. Retighten the screws and repeat Step 7 until complete.

X-Axis Bearings

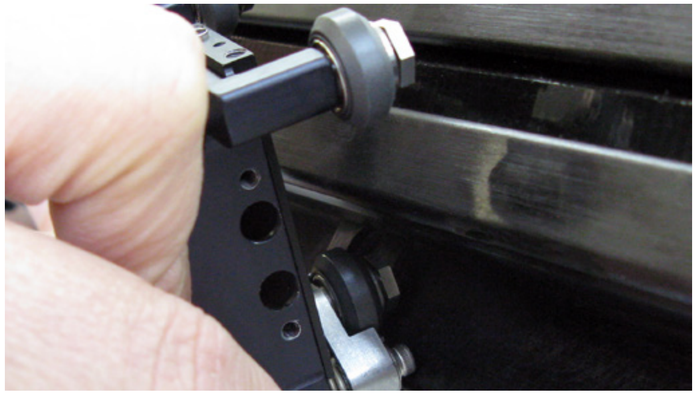
1. Power OFF and unplug the VLS.
2. Open the Top Door and bring the X-axis Arm forward.
3. Bring the Focus Carriage to the middle of the X-axis Arm.
4. Remove the 2 screws located to the right of the Focus Carriage on the belt clamp. Be careful not to lose the washers.



5. If Air Assist is installed, unscrew the two screws that hold the Hook Manifold in place and set the screws aside. DO NOT pull the Air Assist hoses out of the Air Assist Track.



6. Keeping in mind that the bottom bearing in the carriage is spring loaded, grab hold of the Focus Carriage and gently push up, then tilt forward to remove the Focus Carriage from the X-axis Arm.

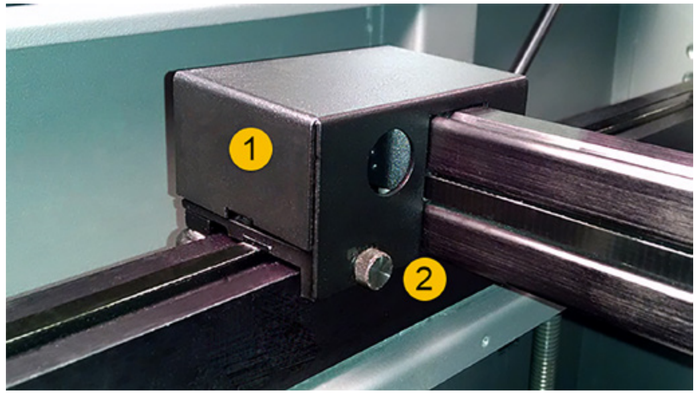


7. Hold the Focus Carriage or place it on a flat surface facing down and remove all 3 bearings.
8. Take notice of the Bearing Assembly. There is a small wave washer between the head of the axle and the bearing. Be careful not to lose or damage this washer. The bearing itself has no orientation and can be installed with either surface against the carriage as long as all three are installed in the same direction.

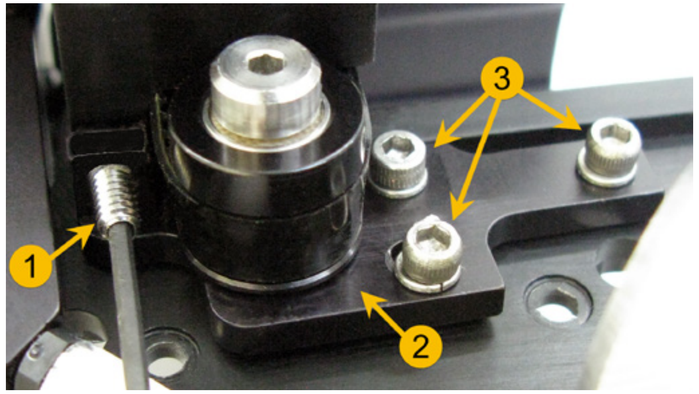
9. Installation is opposite of removal.

X-Axis Belt Replacement

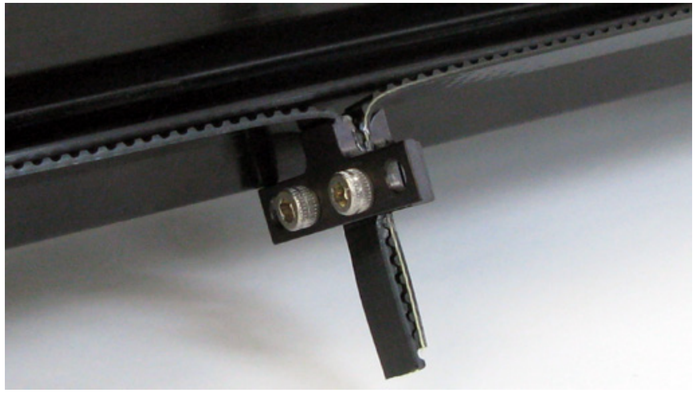
1. Power OFF and unplug the VLS.
2. Open the Top Door and bring the X-axis Arm forward.
3. Bring the Focus Carriage to the middle of the X-axis Arm.
4. Remove the #2 mirror cover (1) by removing the thumbscrew (2), sliding the cover to the right and then off the rail.



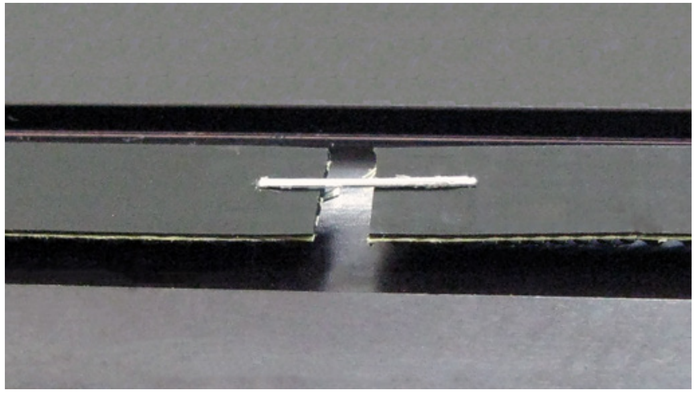
5. Loosen the three screws (3) (1/2 turn) that mount the tensioning bracket (2). Also, back off the setscrew (1) until the tip does not make contact with the side of the arm (this will partially release the tension on the belt) but do not remove the screw completely.



6. Remove the 2 screws located to the right of the Focus Carriage on the belt clamp. Be careful not to lose the washers.
7. Loosen, but do not remove, the 2 screws that attach to the left of the bracket that holds the ends of the belt together. Slide the bracket off the end of the belt. DO NOT PULL THE BELT OUT OF THE X-AXIS RAIL AT THIS TIME. LEAVE IT HANGING LOOSE.

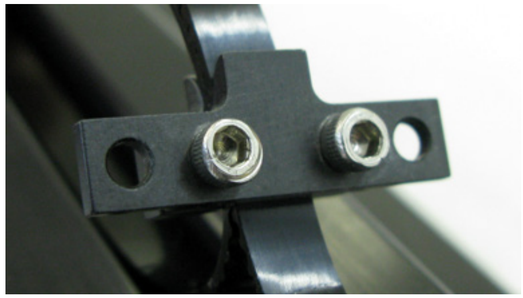


8. Using a stapler, attach one end of the old belt to one end of the new belt. Do not overlap the belt and make sure that the teeth are in the same direction.



9. Slowly pull the other end of the old belt, allowing the new belt to be pulled through the inside of the X-axis arm. Make sure that you do not twist the belt going through the rail. The teeth of the belt should be facing the inside.

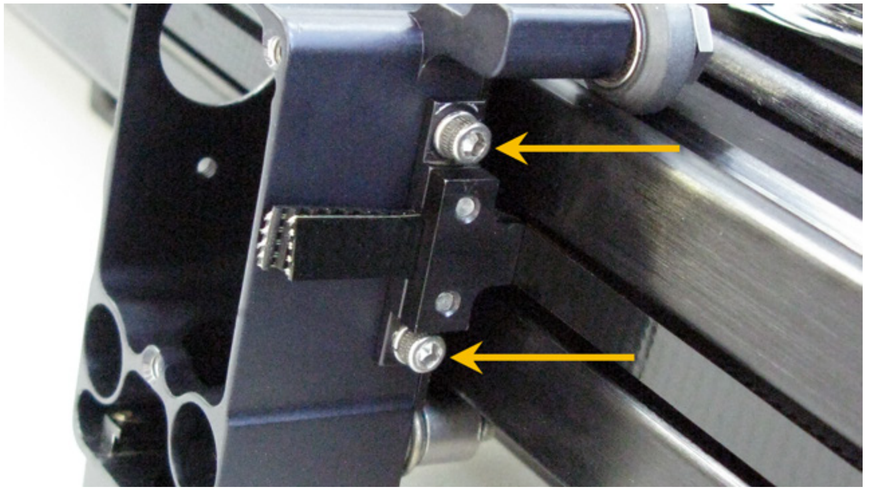
10. Once the new belt is completely through the X-axis rail, remove the staple and discard the old belt.
11. Re-attach the belt clamp to the ends of the belt. Make sure that the rounded side of the clamp faces inward. Gently pull the belt through the clamp until the slack in the belt is reduced. Leave the belt slightly loose because the belt will be tensioned by adjusting the setscrew on the tensioner bracket on the left side of the X- axis rail. Tighten down the screws on the clamp. DO NOT TRIM OFF THE EXCESS BELT AT THIS TIME.



NOTE: *For the next step, you will need a spring scale and a ruler. Make sure the ruler has the 0 point at the end of the ruler. (Some rulers offset the 0 point from the end; do not use that kind of ruler.)*

12. On the X-axis rail, push the focus carriage all the way to the left and push the belt clamp all the way to the right. Place the end of the ruler against the middle of the X-axis arm (NOT inside the belt groove). Hook the spring scale onto the middle of the belt and pull the scale until you reach 1/2 inch. You should read 100 - 125 grams (VLS6.60) or 150 - 175 grams (VLS3.60 and VLS4.60). The belt should still be loose at this point, so the reading should be less than what is required.

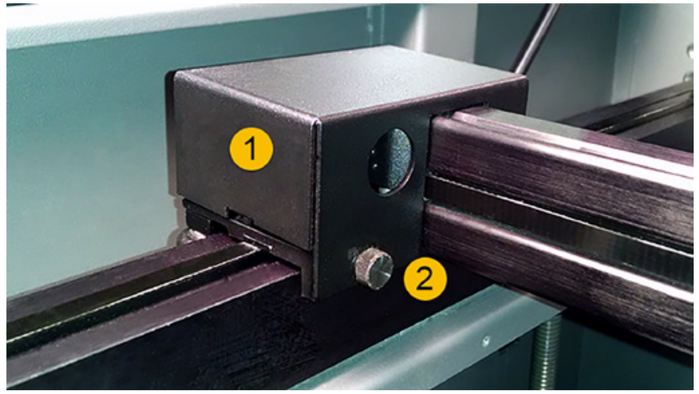
13. Using scissors, trim off the excess belt material but leave at least 1/4 inch of belt protruding out of the belt clamp. DO NOT trim the belt flush with the clamp. Although this may look cleaner, trimming it flush will eventually cause the belt to slip out of the clamp and would require replacement of the entire belt.
14. To tighten the belt, slowly tighten the setscrew on the tensioning bracket that was loosened earlier and keep re-checking the scale until the belt has the proper tension. After proper tension is achieved, tighten the three tensioning bracket mounting screws and re-check the tension to make sure that it has not changed.
15. Re-attach the belt clamp to the side of the Focus Carriage.



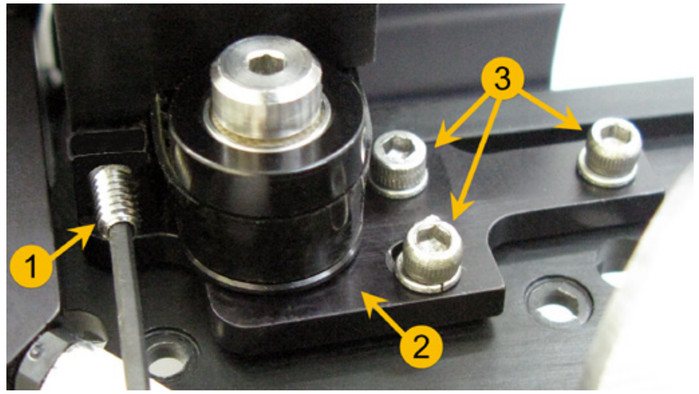
16. Re-install the #2 Mirror Cover and thumbscrew.
17. X-axis belt replacement is complete.

X-Axis Idler Pulley

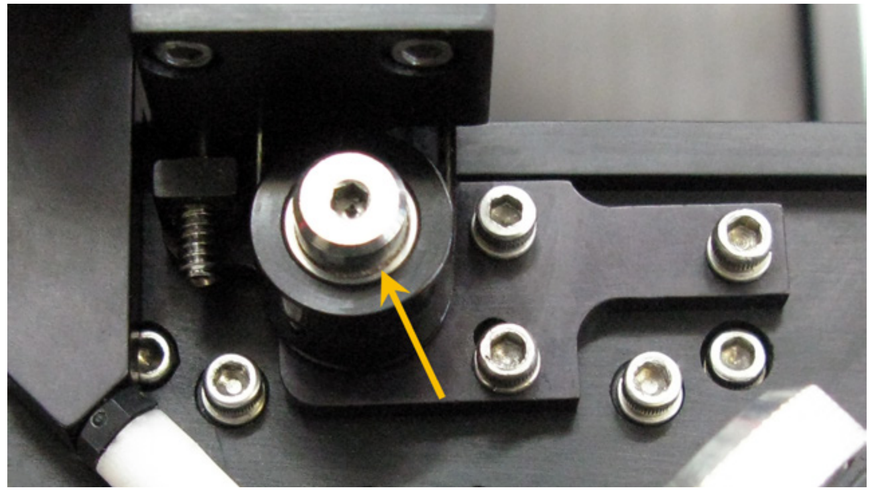
1. Power OFF and unplug the VLS.
2. Open the Top Door and bring the X-axis Arm forward.
3. Remove the #2 mirror cover (1) by removing the thumbscrew (2), sliding the cover to the right and then off the rail.



4. Loosen the three screws (3) (1/2 turn) that mount the tensioning bracket (2). Also, back off the setscrew (1) until the tip does not make contact with the side of the arm (this will partially release the tension on the belt) but do not remove the screw completely.



5. Once the tension has been released remove the screw on the Idler Pulley. Remove the pulley, paying attention to the orientation of it, and replace it with a new one.

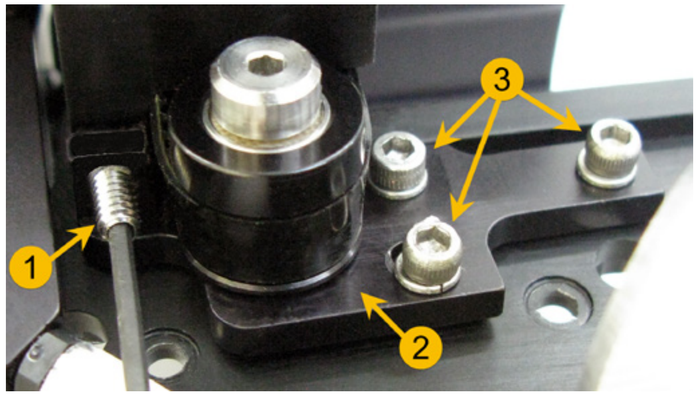


6. When reinstalling the new Idler Pulley insert the pulley at an angle for easier access.
7. Re-tension the X-axis Belt as done in *X-Axis Belt Replacement*.
8. Replace the #2 Mirror Cover and screws.

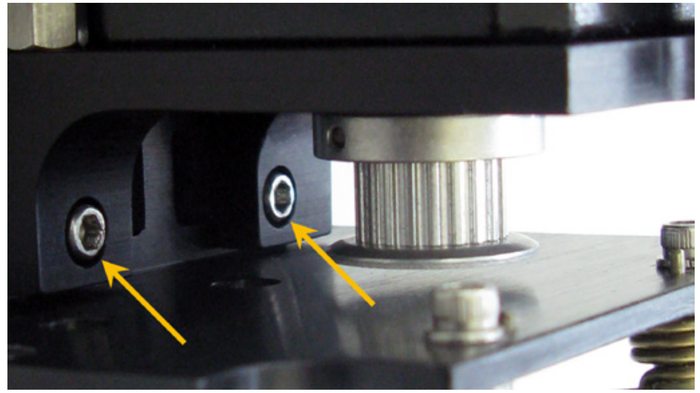
X-Axis Motor and Drive Gear

X-Axis Drive Gear

1. Power OFF and unplug the VLS.
2. Remove the X-axis Arm and place it on a flat working surface by following the instructions in *X-Axis Arm Replacement*.
3. Loosen the three screws (3) (1/2 turn) that mount the tensioning bracket (2). Also, back off the setscrew (1) until the tip does not make contact (this will partially release the tension on the belt) but do not remove the screw completely.

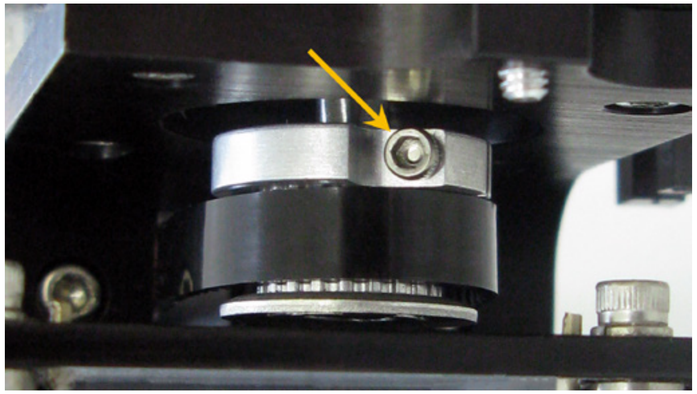


4. On the right end of the arm remove the two screws and the two washers that attach the motor bracket to the X-axis rail. Remove the motor assembly from the arm.



5. Remove the three screws on top of the X-axis Motor Cover and place them aside with the cover.

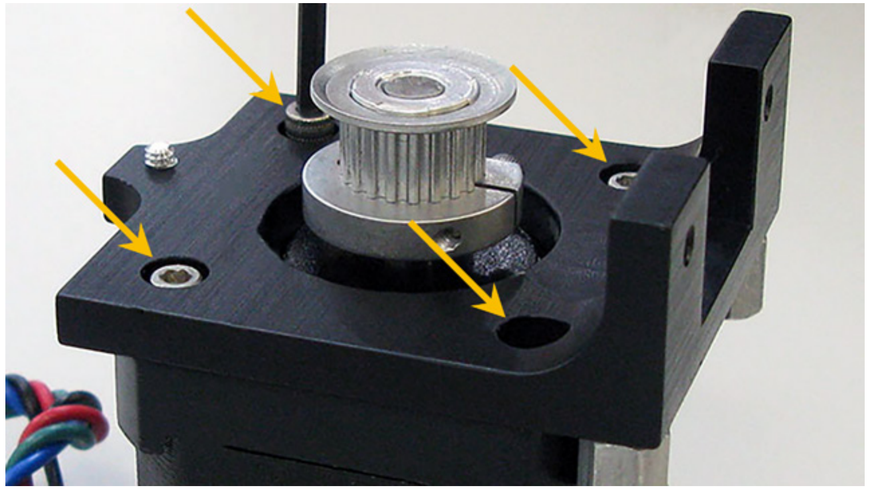
6. Remove the drive gear by loosening the screw on the retaining clamp, notice its position on the motor shaft as it is not completely flush to it and it does not touch the motor.



7. If you are replacing the X-axis Motor continue to step 11, if not continue to the next step.
8. Position the new Drive Gear on the motor shaft so that it is in approximately the same position as the old one. There should be a gap between the motor and the retaining clamp and the retaining clamp and drive gear should be flush with each other.
9. Once the gear and retaining clamp are in place. Tighten the screw.
10. Installation is opposite to removal, once finished tension the belt according to the steps outlined in *X-Axis Belt Replacement*.

X-Axis Motor

11. Disconnect the X-axis Motor wire from the Upper Flex Board.
12. Remove the 4 screws and washers that hold the motor to the motor bracket.
13. Remove motor and set apart.

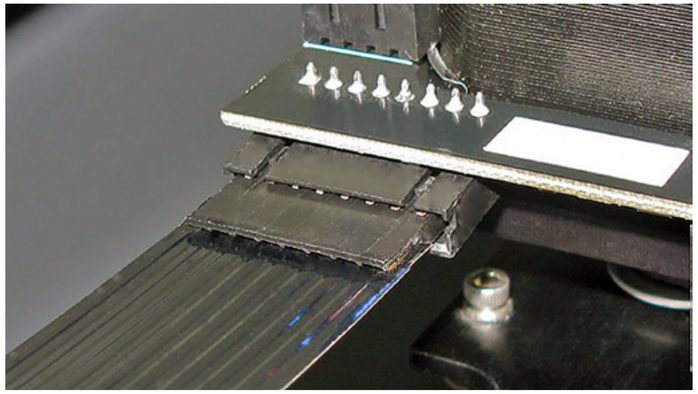


14. Install the drive gear onto the new motor following steps 8 and 9 of X-Axis Drive Gear.
15. Attach the new motor to the motor mount with the 4 screws and washers removed in step 12.
16. Reinstall the motor mount onto the X-axis rail by attaching it with the two screws and two washers removed in step 4. Ensure the X-axis belt loops around the drive gear correctly.
17. Tension the belt according to the steps outlined in *X-Axis Belt Replacement*.
18. Square the arm following the steps outlined in the section *X-Axis Arm Check and Adjust (Squaring)*.

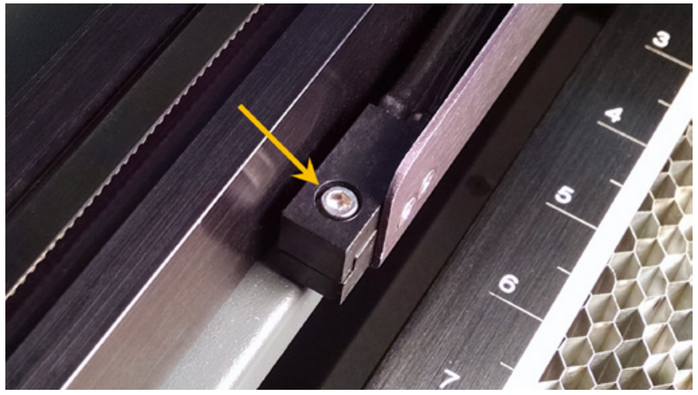
X-Axis Arm Replacement

NOTE: *Place any hardware removed from the laser machine in a safe place.*

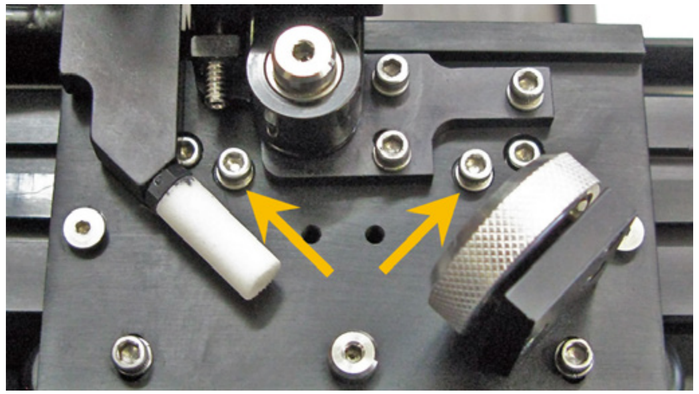
1. Power OFF and unplug the VLS.
2. Open the Top Door and bring the X-axis Arm forward.
3. Locate and unplug the Flex Cable on the right side of the arm connected to the Upper Flex Board near the motor.



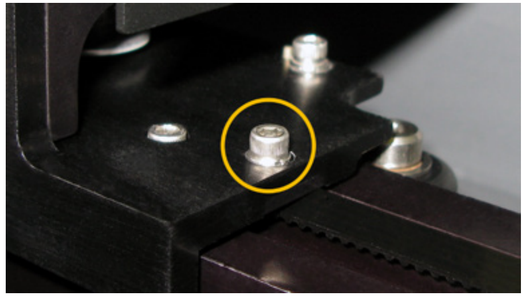
4. If air assist is installed, locate and remove the screw securing the Y-Manifold together.

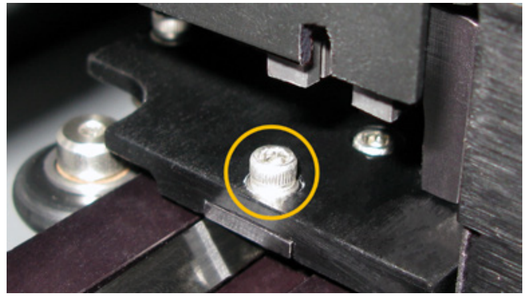


5. Remove the #2 mirror cover (1) by removing the thumbscrew (2), sliding the cover to the right and then off the rail.
6. Unscrew the two protruding screws on the left side of the X-axis Arm near the tensioning bracket. Each screw that is removed has 2 washers. Set those aside in a safe place.



7. Unscrew the two protruding screws on the right side of the X-axis Arm. One screw is located in front of the X-axis motor assembly and the other is located behind the X-axis motor assembly near the Y Sensor. Each screw that is removed has 2 washers. Set those aside in a safe place.



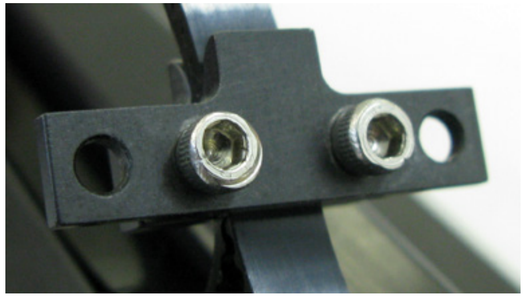


8. Once all four screws are removed grab hold of the right support bracket, not the X-axis motor assembly, and push the X-axis Arm to the left then tilt it toward you.
9. Installation is opposite of removal.

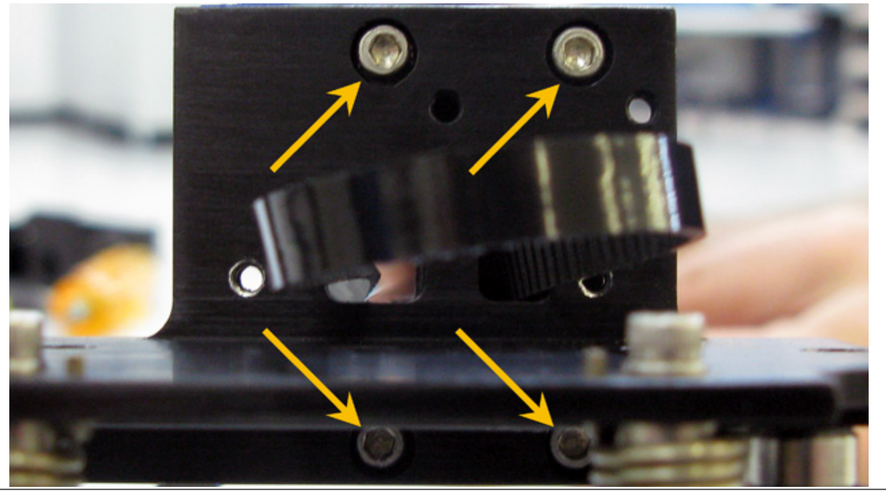
X-Axis Rail

NOTE: Place any hardware removed from the laser system and X-axis arm in a safe place.

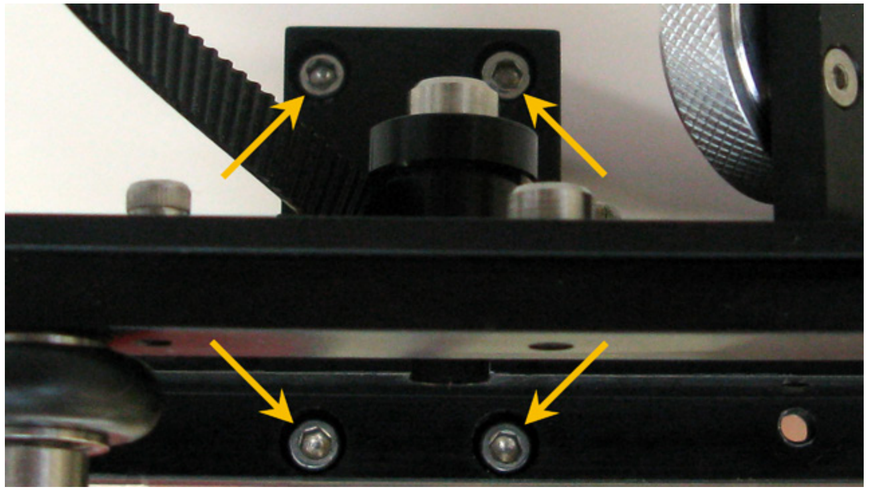
1. Power OFF and unplug the VLS.
2. Remove the *X-Axis Arm* and set it on a safe working surface.
3. Remove the *X-Axis Motor*.
4. Remove the X-axis Focus Carriage as shown in the *X-Axis Bearings* section.
5. Completely remove the X-axis Belt by removing the two screws holding the belt clamp and pulling the belt out of the rail. Please note the path the belt follows through the rail.



6. Remove the right end support by removing the four screws located on the top (2) and bottom (2) of the support.



7. Remove the left end support by removing the four screws located on the top (2) and the bottom (2) of the support.
8. Installation is opposite of removal.

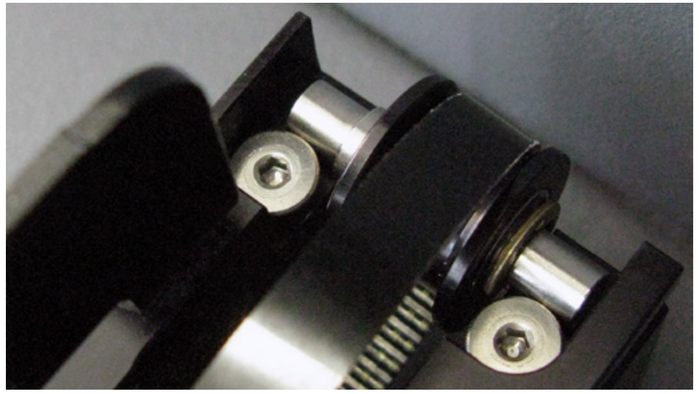


NOTE: During reinstallation It is often easier to feed the belt through the X-Axis rail prior to installing the end assemblies. Ensure that you do not have a twist in the belt. Failure to remove a twist will result in the laser system not functioning correctly.

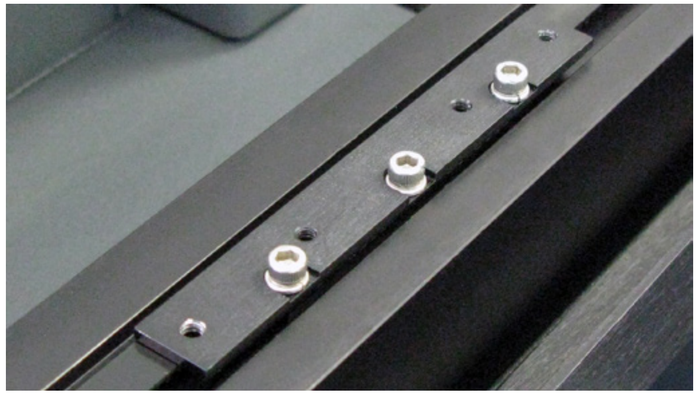
9. Once the *X-axis Arm* has been reinstalled tension the X-axis belt as in *X-Axis Belt Replacement*.
10. To finish the installation make sure perform the *X-Axis Arm Alignment Check and Adjust (Squaring)*.

Y-Axis Belts

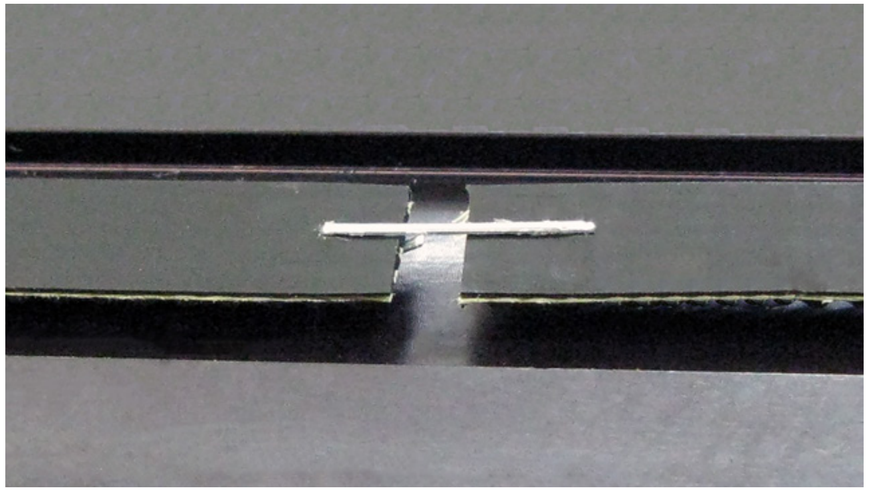
1. Power OFF and unplug the VLS.
2. Remove the *X-Axis Arm*.
3. Locate and loosen the Y-axis Idler Pulleys at the front end of the rails, making sure to take the same number of turns on each screw to loosen completely, DO NOT remove the screws.



4. On both Y-axis Rails is a Y-axis Belt Clamp. Unscrew all 6 screws, 3 on each, and set the screws and clamp aside.



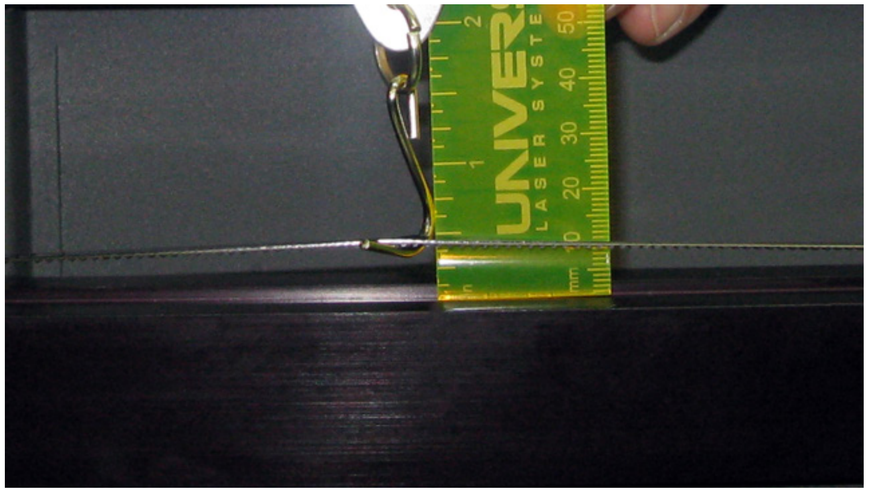
5. After the Y-axis Belt Clamp has been removed staple the new Y-axis Belt to the old belt. Do not overlap the belt and make sure that the teeth are in the same direction.



6. Pull the other end of the old belt, allowing the new belt to be pulled through the inside of the Y-axis Rail. Make sure you do not twist the belt as it goes through the rail. The teeth of the belt should face inward.
7. Once the new belt is completely through the Y-axis Rail, remove the staple and discard the old belt.
8. Insert the new Y-axis Belt ends into the belt clamp with the belt teeth facing inward. Pull the belt as tight as possible by hand.

NOTE: *For the next step, you will need a spring scale and a ruler. Make sure the ruler has the 0 point at the end of the ruler. (Some rulers offset the 0 point from the end; do not use that kind of ruler.)*

9. On the Y-axis rail, push the belt clamp all the way to the top on the Y-axis rail. Place the end of the ruler against the middle of the Y-axis arm inside the belt groove. Hook the spring scale onto the middle of the belt and pull the scale until you reach 1/2 inch. You should read 125 grams for (VLS4.60 and VLS6.60) or 175 grams (VLS3.60). The belt should still be loose at this point, so the reading should be less than what is required.



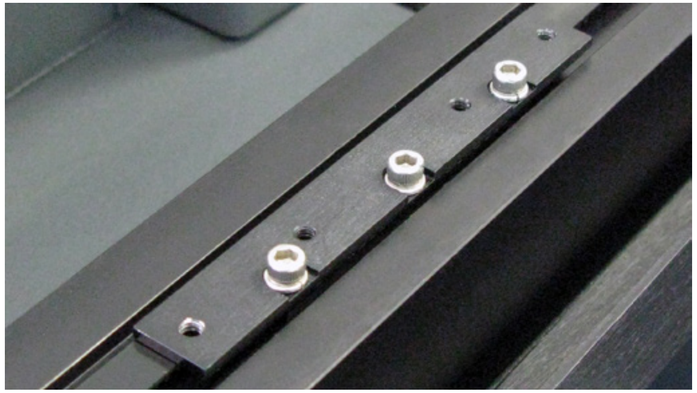
10. Locate the Y-axis Idler Pulleys that were loosened earlier. To tension the Y-axis belt turn BOTH tensioning screws on the Y-axis rail the same amount.

NOTE: *Failure to turn both screws equally will result in uneven wear causing the belt to fail prematurely.*

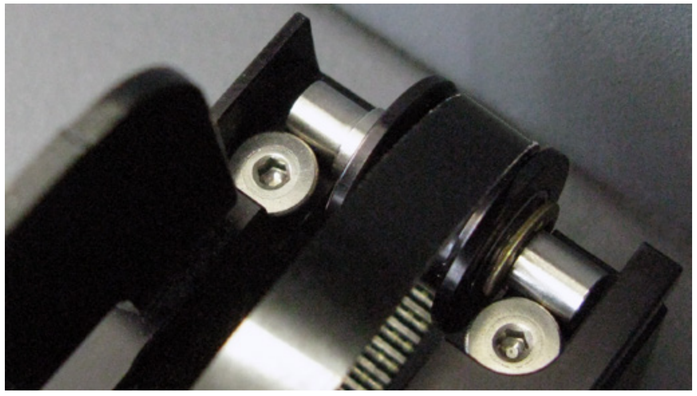
11. Installation is opposite of removal.
12. Once everything is reassembled, perform the *X-Axis Arm Alignment Check and Adjust (Squaring)*.

Y-axis Idler Pulleys

1. Power OFF and unplug the VLS.
2. Remove the *X-Axis Arm*.
3. On both Y-axis Rails is a Y-axis Belt Clamp. Unscrew all 6 screws, 3 on each clamp, and set the screws and clamp aside, DO NOT REMOVE the Y-axis Belt from the rail.



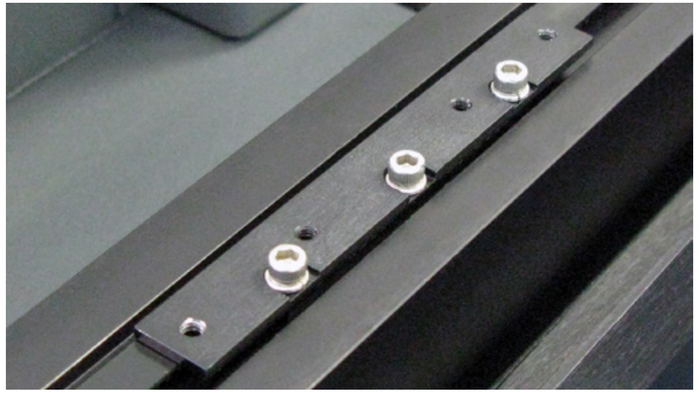
4. Locate and replace the Idler Pulley at the end of the Y-Rail.



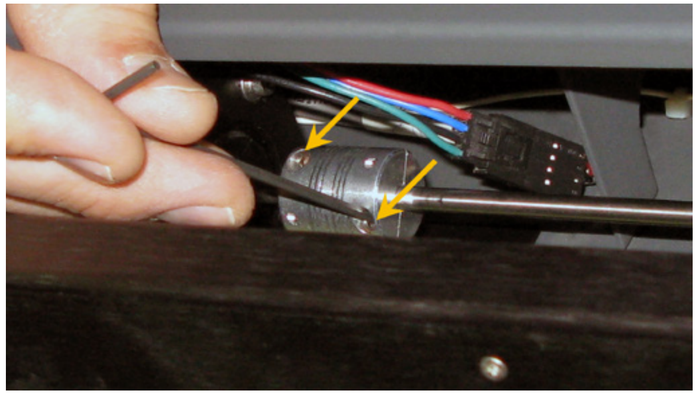
5. Follow the instructions of *Y-Axis Belts*, beginning at Step 5, to finish the installation.

Y-Axis Drive Gears

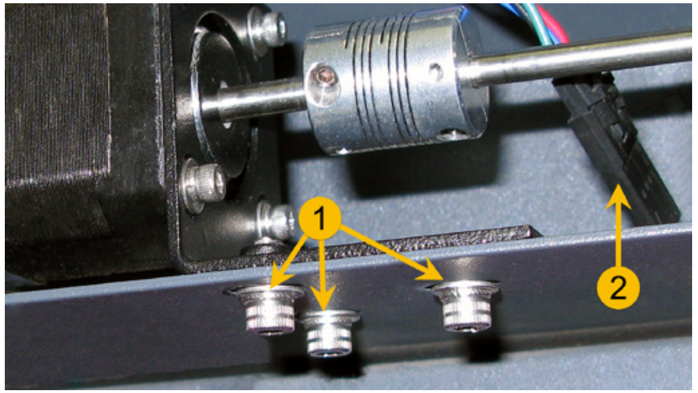
1. Power OFF and unplug the VLS.
2. Remove the *X-Axis Arm*.
3. On both Y-axis Rails is a Y-axis Belt Clamp. Unscrew all 6 screws, 3 on each clamp, and set the screws and clamp aside. DO NOT REMOVE the Y-axis Belt from the rail.



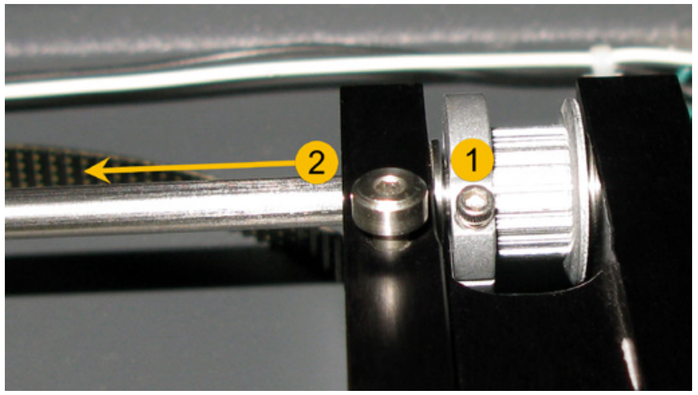
4. Loosen all the Y-axis Coupler screws that are near the Y-axis Motor.



5. Slide the couplers away from the Y-axis Motor.
6. Undo the 3 screws (1) that hold the motor mount in place. Disconnect the motor power cable (2) and set the motor aside.



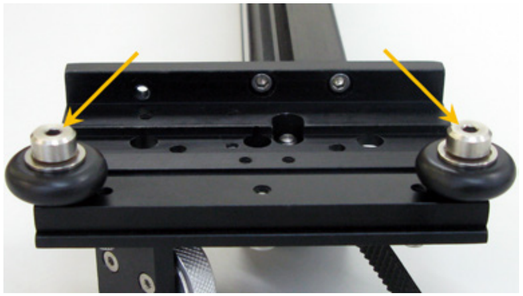
7. Rotate the long shaft with one hand to locate the Y-axis Drive Gear clamp screw (1). Loosen but do not remove the screw.
8. Grab hold of the drive gear with one hand and pull the metal shaft (2) out with the other.



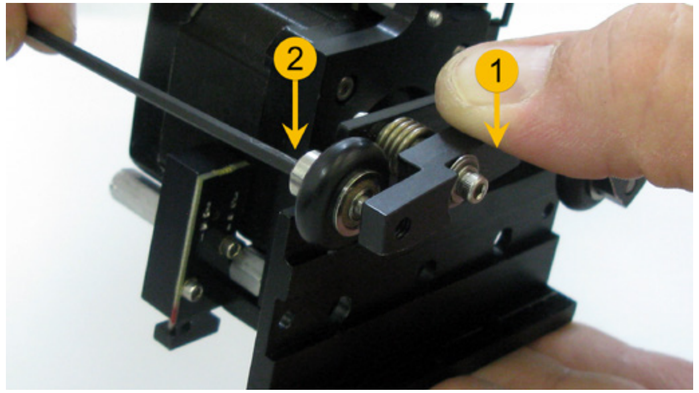
9. Remove the drive gear and replace it with a new one.
10. Follow the instructions of *Y-Axis Belts*, beginning at Step 5, to finish the installation.

Y-Axis Bearings

1. Power OFF and unplug the VLS.
2. Remove the *X-Axis Arm*.
3. Set the X-axis Arm down on a flat surface. To replace the Y-axis Bearings on the left-hand side of the X-axis Arm, turn the arm over and undo the Shoulder Screw.



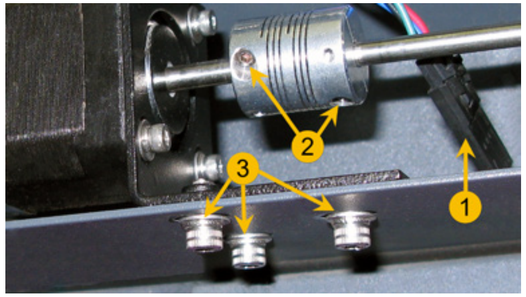
4. To replace the Y-axis Bearings on the right-hand side of the X-axis Arm push the Y Tensioner arms inward (1). Continue pushing the tensioner arm and the Shoulder Screw will be accessible to allow you to replace the Y-axis Bearing (2).



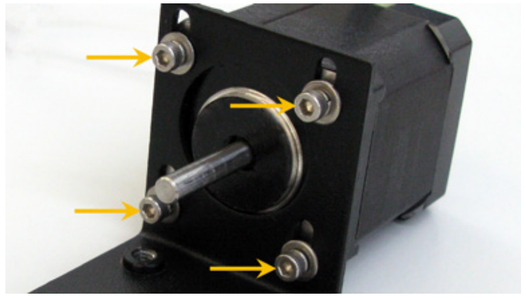
5. Installation is opposite of removal.
6. Once everything is back in place, perform the *X-Axis Arm Alignment Check and Adjust (Squaring)*.

Y-axis Motor

1. Power OFF and unplug the VLS.
2. Open the Top Door and push the X-axis Arm back.
3. The Y-axis Motor is located underneath the frame of the laser system near the keypad.
4. Undo the electrical connector (1) by pressing the locking tab and gently pulling on the connectors.
5. Loosen, but do not remove, the coupler screws (2) that attach the motor to the Y Shafts. Slide the couplers outward, away from the motor.
6. Unscrew the 3 screws (3) that hold the motor to the Y-Motor bracket.



7. Remove the 4 screws securing the motor to the Y-Motor bracket.



8. Installation is opposite of removal.
9. Once the new motor is installed perform the *X-Axis Arm Alignment Check and Adjust (Squaring)*.

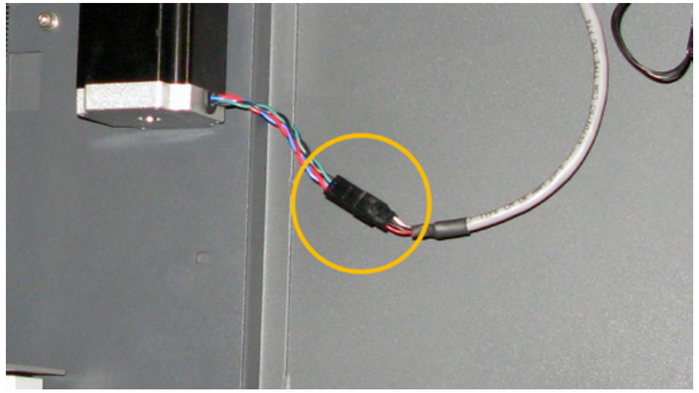
Y-Axis Rail

This is not a field serviceable part as the Y-axis rails have to be completely square for the system to function properly. If the Y-axis rail(s) need to be replaced please contact Technical Support.

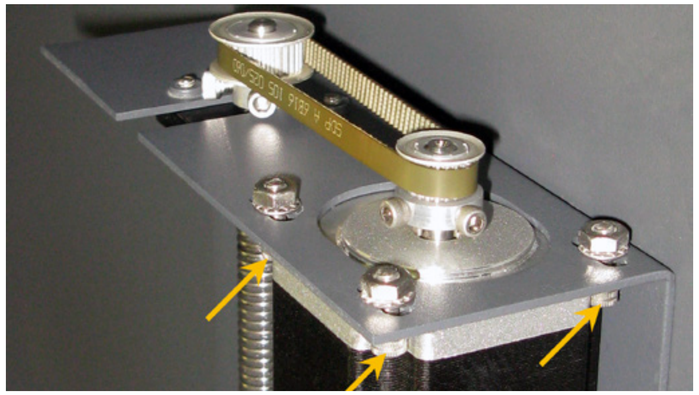
Z-Axis Motor, Drive Gear & Z-Axis Motor Belt

NOTE: *When performing this procedure, make sure that you do not accidentally turn the Z-axis Lead Screws that drive the table up and down; otherwise you will need to re-level the table.*

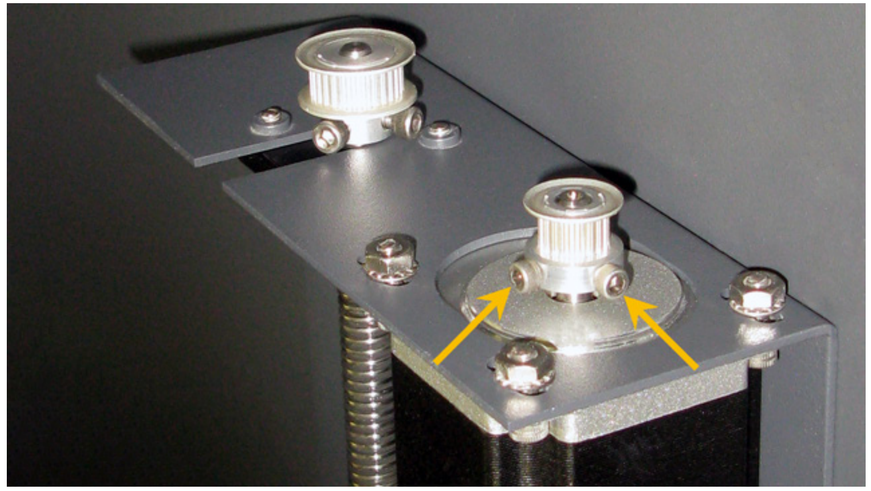
1. Turn ON the VLS and lower the engraving table all the way down by using either the keypad or UCP.
2. Once the engraving table has been lowered power OFF and unplug the VLS.
3. Open the front door to its resting position.
4. The Z-axis Motor is located inside the VLS on the right-hand side. Unplug the white and red electrical connector.



5. Hold the Z-axis Motor while loosen the 3 screws that hold the Z-axis Motor in place.



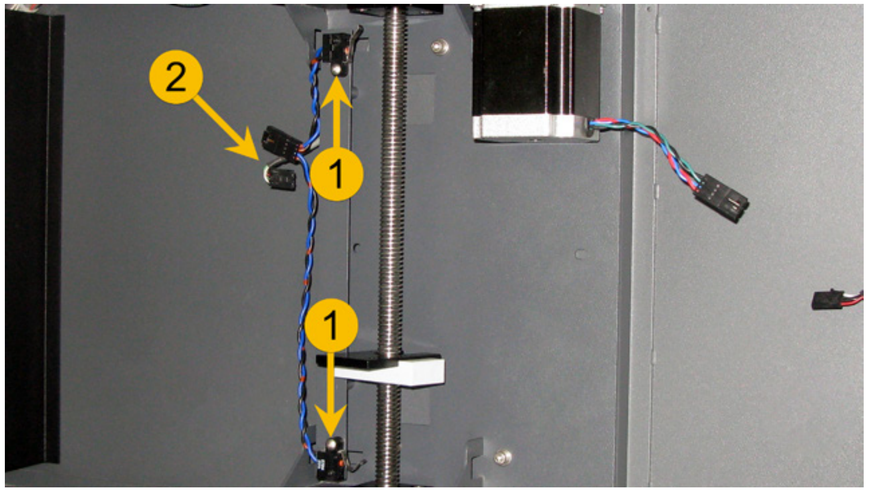
6. With the screws loose, slide the motor toward the lead screw. This will free the small drive belt. Remove the small Z-Axis belt.
7. Grab hold of the Drive Gear with one hand and with the other hand loosen the Drive Gear screws. Remove the Drive Gear and set it aside.



8. Remove the 3 screws loosened in step 5. Remove the motor from the laser system.
9. Transfer the Drive Gear from the old motor to the new motor (or install a new Drive Gear if needed). The Drive Gear needs to sit flush to the top of the Z-Motor drive shaft.
10. Reinstall the motor using the screws and washers removed earlier, leaving the screws slightly loose.
11. Place the small Z-axis Belt onto the lead screw drive gear and the new Z-axis Motor.
12. Pull the motor to the right to re-apply tension to the belt while tightening the 3 screws. Do not over tighten.
13. Installation is complete.

Z-Axis Limit Switch

1. Turn ON the VLS and lower the engraving table all the way down by using either the keypad or the UCP.
2. Power OFF and unplug the VLS system.
3. Locate and remove the two screws holding the cable ties in place on the right side inside the VLS system. Set aside in a safe location.
4. Locate and remove the two screws holding the Limit Switches in place (1). Set aside in a safe location.



5. Locate near the top switch and disconnect the Z Limit Switch (2) assembly connector by pressing the tab on the connection and pulling gently.
6. Installation is opposite of removal.
7. After the Z Limit Switch has been installed, complete the following:
   - *CPU Initialization / Auto-Z Calibration*
   - *Cutting Table Calibration* (if applicable)
   - *Rotary Calibration* (if applicable)

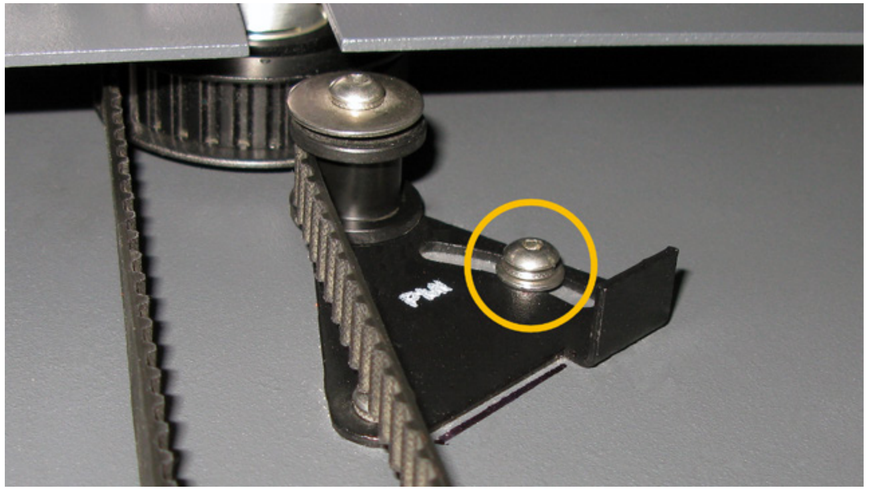
Z-Axis Belt

NOTE: *Unlike other belts on this system, the Z-axis belt is serpentine. Do not cut or modify the belt in any way.*

1. Turn ON the VLS and lower the engraving table all the way by using either the keypad or the UCP.
2. Power OFF and unplug the VLS system.
3. Open the front door to its resting position.
4. Locate and remove the Z-axis Belt Cover by removing all 6 cover screws.

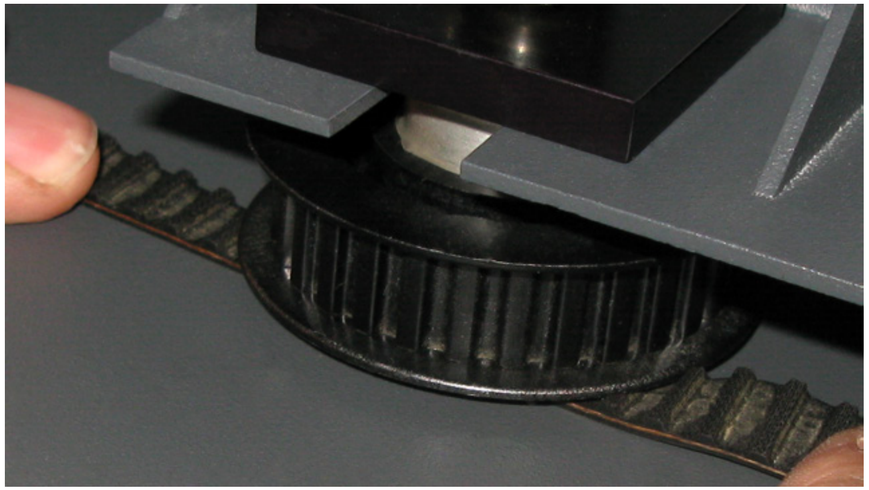
NOTE: *Observe the current tightness of the belt and the belt path (mark the location of the Z-axis belt Tensioner with a marker).*

5. Loosen the Z-axis Belt Tensioner.



6. Slip the old belt off and slide it under the lead screw pulleys.

7. Slip the new belt into position following the path of the previous belt. Ensure the belt is sitting correctly on each of the lead screw pulleys.



8. Push the tensioning idler against the belt until the belt is tensioned correctly according to the marks created. Secure the tensioning mechanism.
9. Complete the *Z-axis Leveling* procedure.

Left Z-Axis Assembly

1. Power off and unplug the VLS system.
2. Make sure that the engraving table is clear of any accessories or materials.
3. Remove the *Engraving Table* from the system.
4. Remove the *Z-Axis belt* by preforming steps 4-6 as outlined in the Z-Axis Belt removal procedure.
5. Remove the 4 socket head screws and 4 washers holding the left stage support in place.

6. Using a permanent marker, draw a square in the four cut outs behind the lead screws. This step critical and will make the installation process much easier.

7. Remove the 4 socket head screws, 4 lock washers, and 4 flat washers holding the Left Z-Axis Assembly in place.

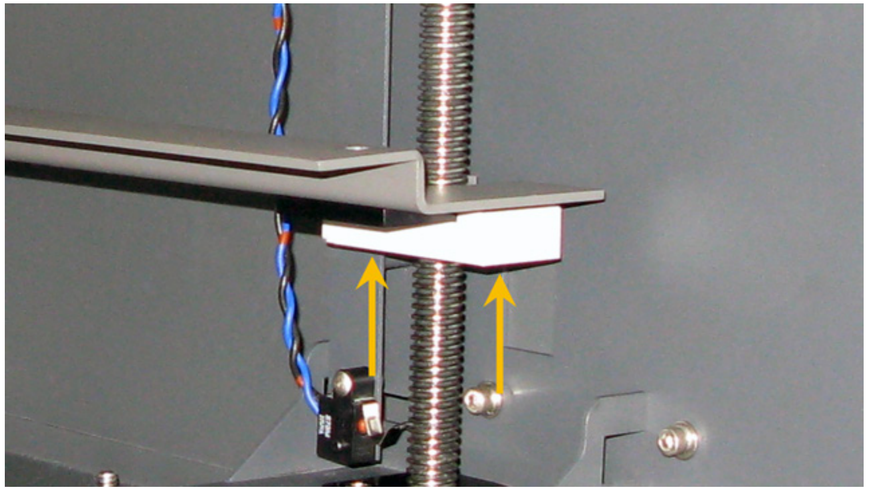
8. Remove the Left Z-Axis assembly from the system.
9. Installation is opposite of removal.

NOTE: *When installing the Left Z-Axis assembly ensure that the lead screw nuts are roughly aligned with the Right Z-Axis Assembly lead screw nut. Then follow the Z-Axis leveling procedure .*

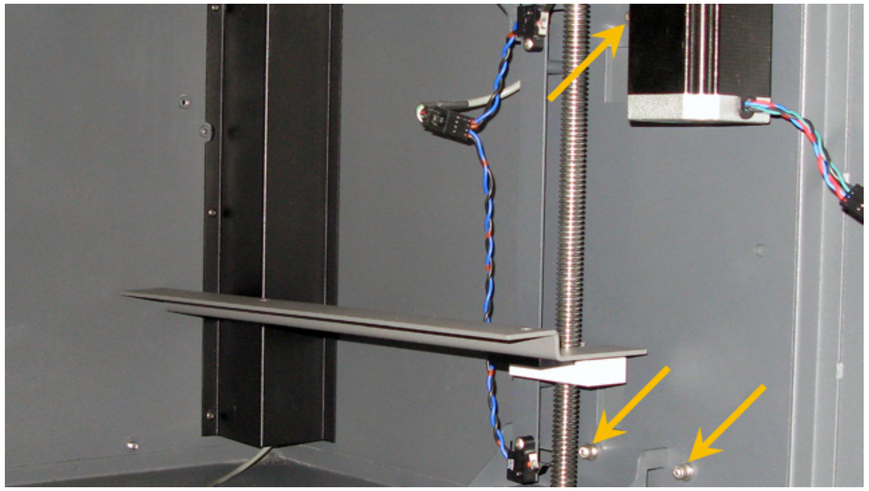
NOTE: *If the stage appears to be binding and the Z-Axis leveling procedure has been completed, loosen the screws holding the bearings blocks in position. Move the stage all the way to the top and all the way to the bottom. Re-tighten the screws and test again.*

Right Z-Axis Assembly

1. Power off and unplug the VLS system.
2. Make sure that the engraving table is clear of any accessories or materials.
3. Remove the *Engraving Table* from the system.
4. Remove the *Z-Axis belt* by preforming steps 4-6 as outlined in the Z-Axis Belt removal procedure.
5. Disconnect the *Z-Axis Motor* from the wiring harness.
6. Disconnect the *Z-Axis Limit Switches* from the wiring harness.
7. Locate and remove the 2 socket head screws securing the Z-Axis Stage Support and Table Support Right.



8. Remove the 3 socket head screws, 3 lock washers, and 3 flat washers holding the Right Z-Axis Assembly in place.



9. Remove the Right Z-Axis assembly from the system.
10. Installation is opposite of removal.

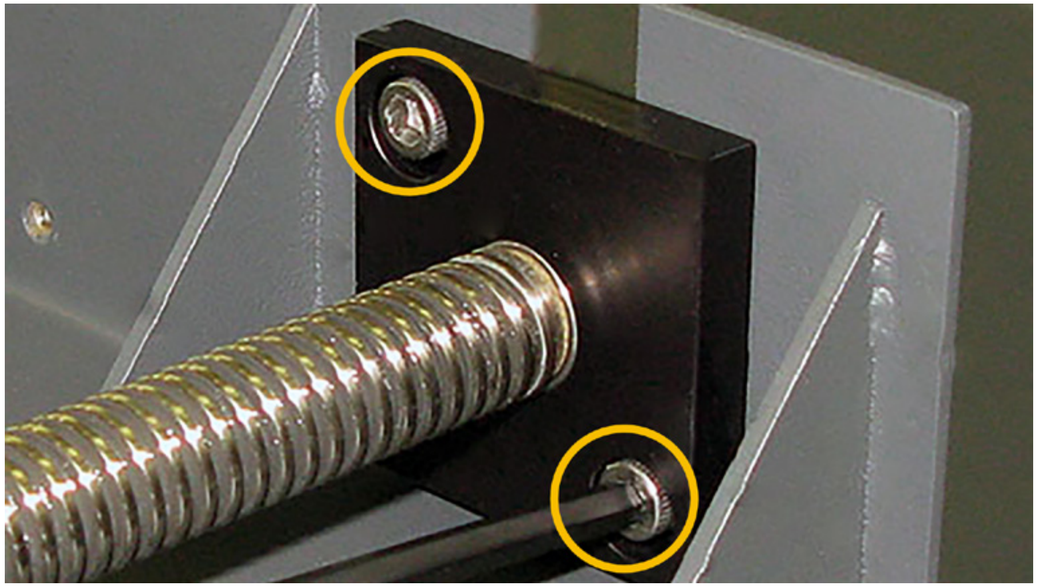
NOTE: *When installing the Right Z-Axis assembly ensure that the lead screw nuts is roughly aligned with the Left Z-Axis Assembly lead screw nuts. Then follow the Z-Axis leveling procedure.*

NOTE: *If the stage appears to be binding and the Z-Axis leveling procedure has been completed, loosen the screws holding the bearings blocks in position. Move the stage all the way to the top and all the way to the bottom. Re-tighten the screws and test again.*

Lead Screw

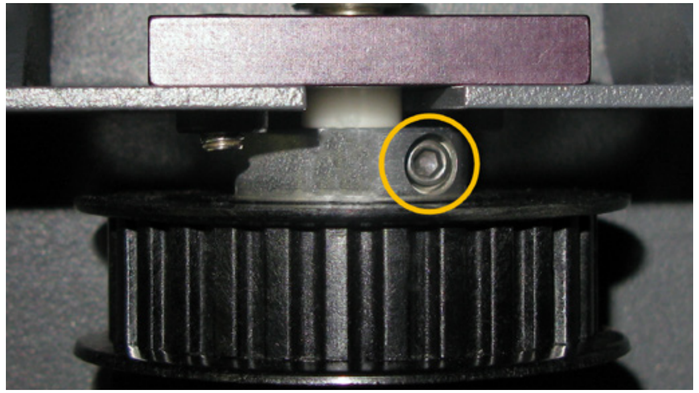
NOTE: *The following instruction describes removing both lead screws. If removing only one lead screw, disregard the instructions for the other lead screw.*

1. Remove the assembly you will be replacing the lead screw on by following the steps outlined in the *Left Z-Axis Assembly* or *Right Z-Axis Assembly* instructions.
2. Remove the 2 socket head screws and washers holding each bearing block in place.



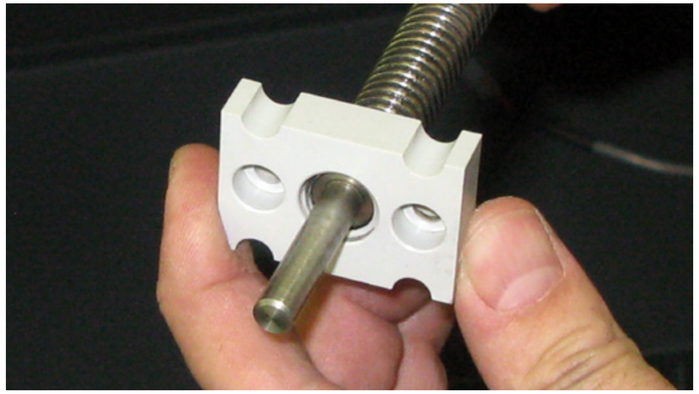
3. Slide the lead screw from the assembly.
4. Remove the top bearing block.

5. Loosen the screw securing the pulley in position and remove the pulley.



NOTE: *When removing the bottom pulley be careful as a white spacer may fall off. Remove the spacer and set it aside.*

6. Remove the bottom bearing block.
7. Gripping the lead screw and the lead screw nut twist until the nut is removed.

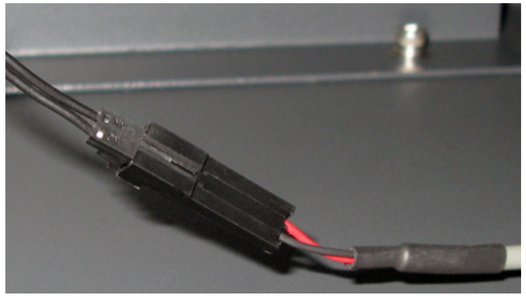


8. Installation is opposite of removal.

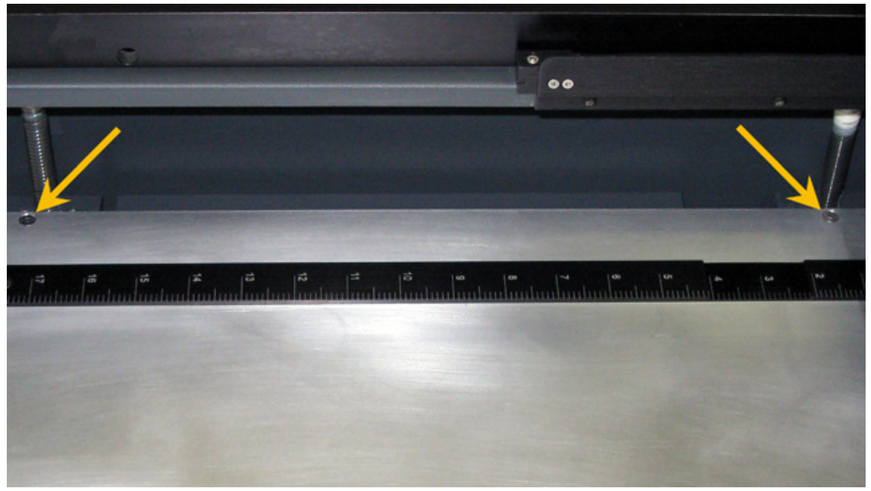
NOTE: *When installation has been completed apply white lithium grease to the new lead screw.*

Engraving Table (Stage)

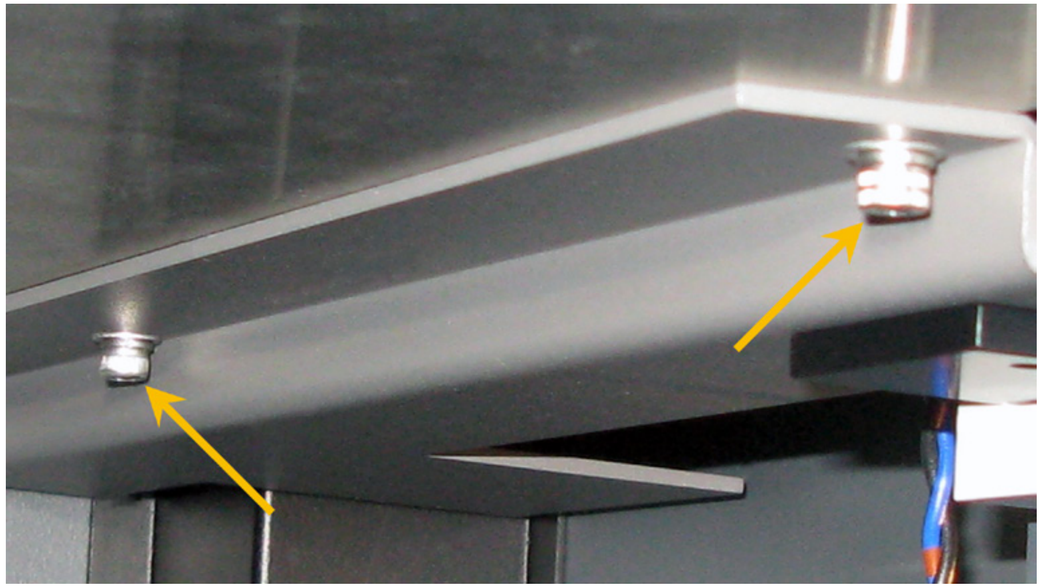
1. Power ON the VLS and remove any accessories or materials that may be on the Stage (i.e. Cutting Table, Rotary, or Pin Table).
2. Raise the Stage roughly ¾ of the way from the bottom of the system using the system keypad or the Viewer Tab of the UCP.
3. Power OFF and unplug the VLS system.
4. Looking underneath the stage locate the proximity sensor and disconnect it from the wiring harness.



5. Locate and remove the two screws holding the left-hand side of the stage to the left stage support.



6. Looking underneath the stage locate and remove the two screws and washers holding the right-hand side of the stage to the right table support. Set the screws aside.



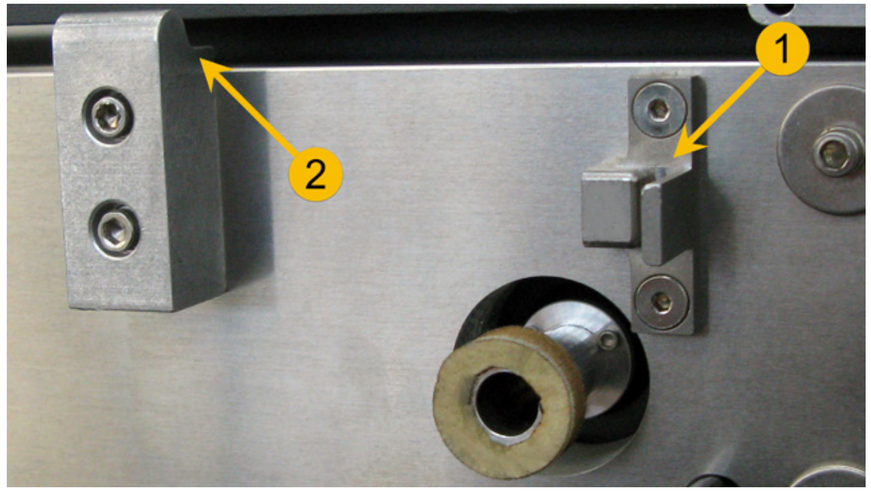
7. Lift the stage out of the system and set it in a safe location being careful not to damage the proximity sensor.
8. Installation is opposite of removal.

Laser Source

NOTICE: *Handle the laser with care! Do not bump or jar it.*

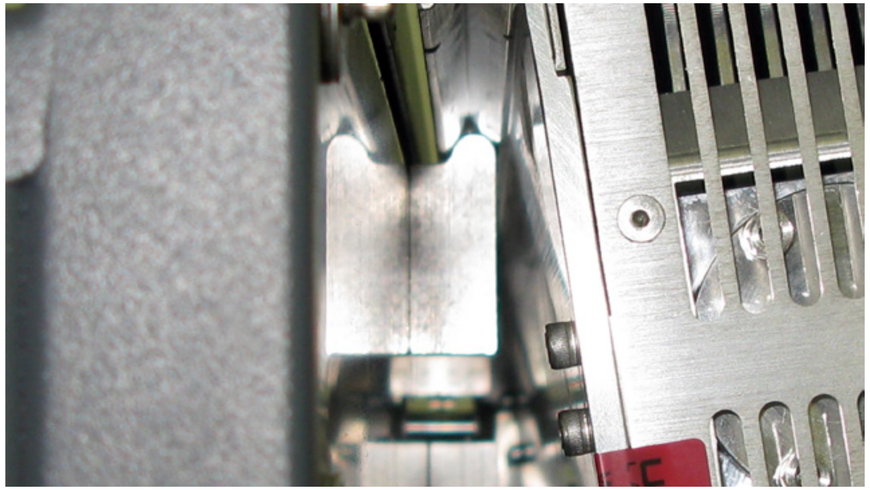
1. Power OFF and unplug the VLS system.
2. Open the rear cover by pulling the latches toward the back of the system or by pressing down on the button part of the latches until the latches pop up.
3. Unplug the electrical connector from the Laser by manually undoing the two thumb screws and gently pulling to the outside.

4. Rotate the laser a few degrees to the outside from the bottom and lift it up and off the mounts. Store the Laser in a safe place.
5. For laser re-installation, locate the alignment fork (1) on the right side of the back of the system as well as the two laser supports (2) on the back of the system.



6. From the optics side of the laser (opposite to the connector) have the frame of the laser rest in the center of the alignment fork with the larger tab exposed to the outside.

7. With the laser at an angle make sure it is hanging correctly on the two laser supports while still seated on the alignment fork correctly.

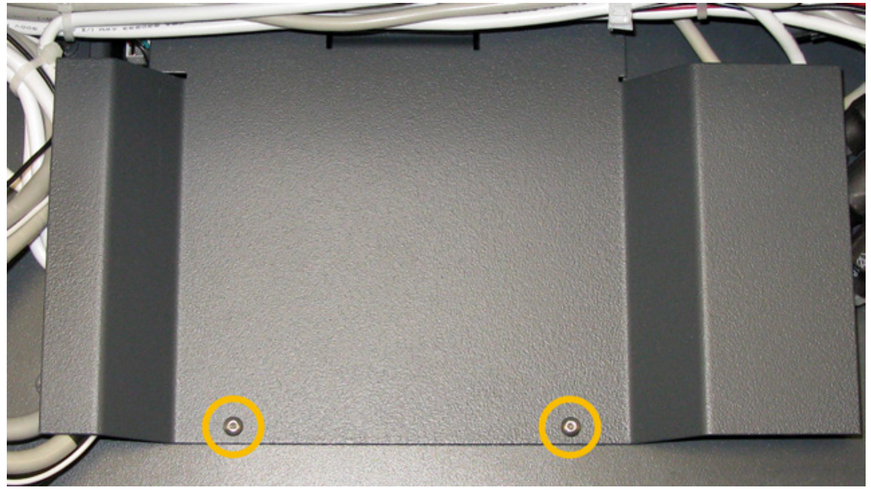


8. When rotating the laser down, make sure there are no obstructions, such as cables that could be pinched. At the end of the rotation you should feel a slight click and the laser should be completely parallel to the back plate of the system.

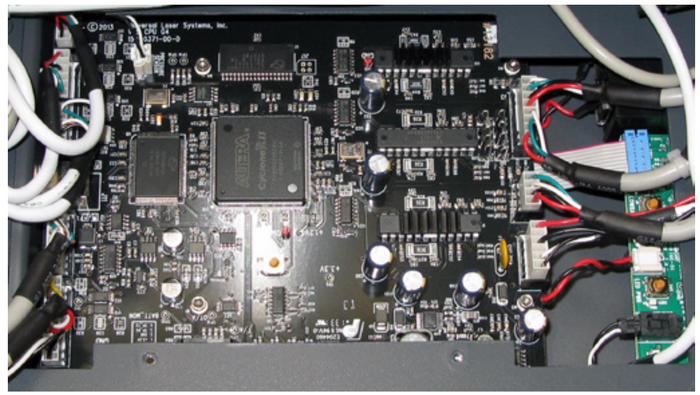
9. Plug the electrical connector to the back of the laser as removed in step 3.

CPU

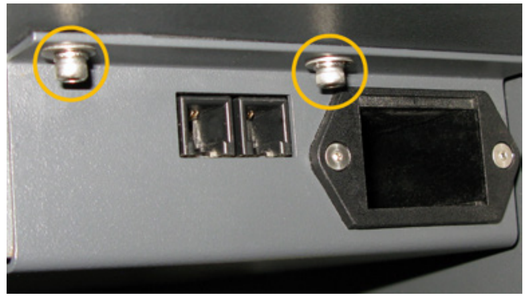
1. Power OFF and unplug the VLS system.
2. Open the rear cover to its resting position.
3. Remove the laser.
4. Locate and unscrew the CPU cover.



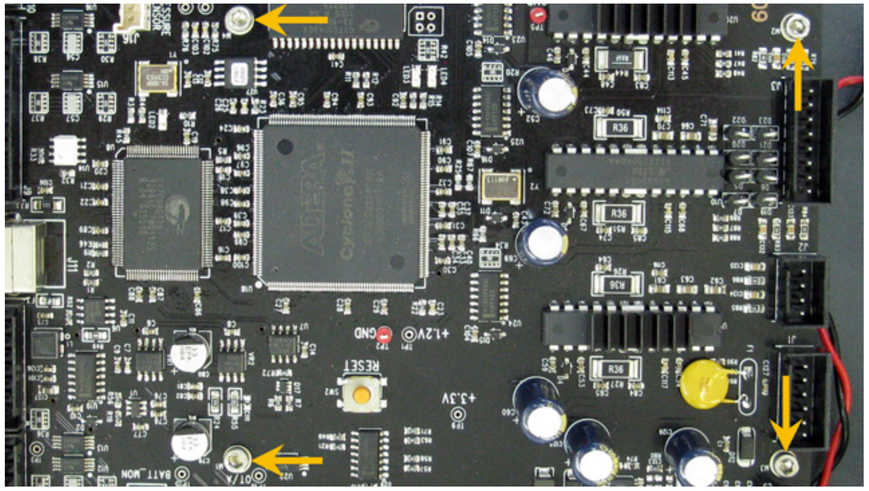
5. Take a picture of the wires of the CPU and label them before continuing.



6. Disconnect ALL the wires on the CPU board, including the thermal sensor board wires.
7. Unscrew all the screws holding the CPU assembly in place. Two on each side of the assembly and three for the bracket.



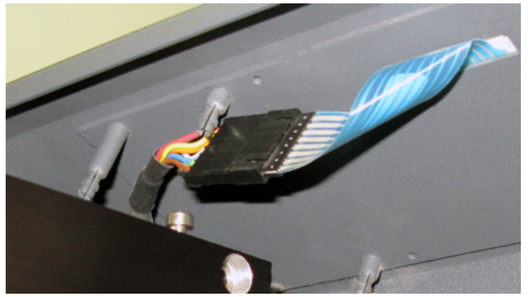
8. Remove the 4 screws holding the CPU in place.



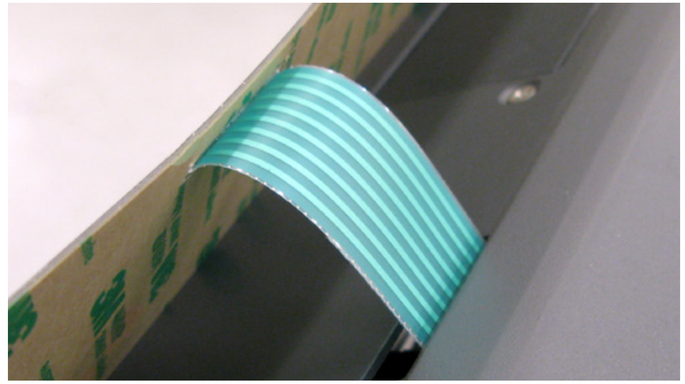
9. Installation is opposite of removal.
10. After the CPU has been installed, complete the following:
    - *CPU Initialization / Auto-Z Calibration*
    - *Cutting Table Calibration* (if applicable)
    - *Rotary Calibration* (if applicable)

Keypad

1. Power OFF and unplug the VLS system.
2. Open the Top Door.
3. Look underneath the front frame and locate the wiring from the keypad to the wiring harness.
4. Disconnect the keypad by pressing the plastic tab and gently pulling the connector.



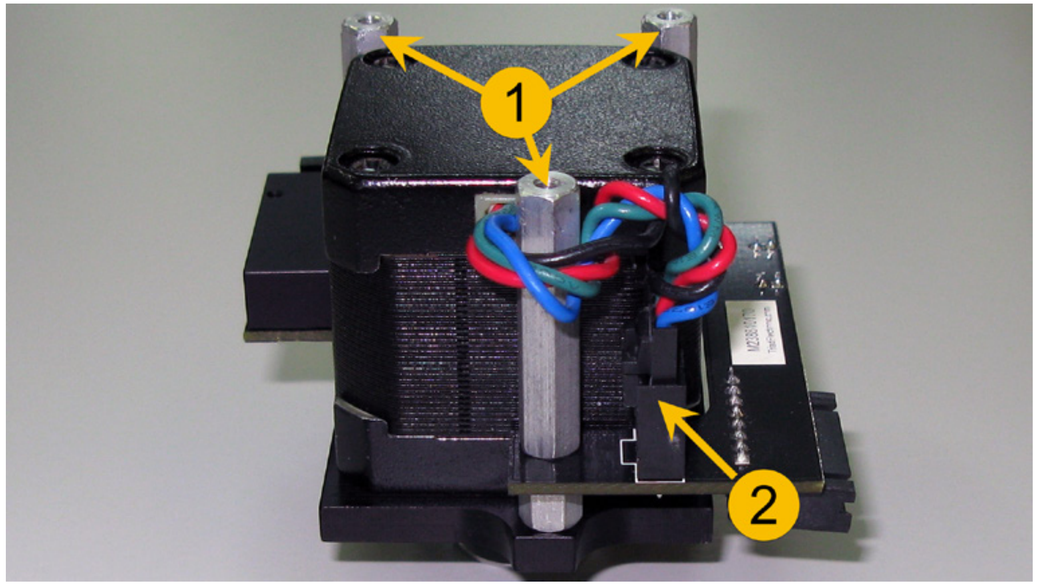
5. Remove the keypad from the front of the machine by slowly peeling it off. Keep in mind that the keypad is an electronic sticker.



6. Remove the protective backing from the new keypad and slowly apply it to the system, making sure the connector goes to the inside of the system.
7. Connect the keypad to the wiring harness.
8. Installation is complete.

Upper Flex Board

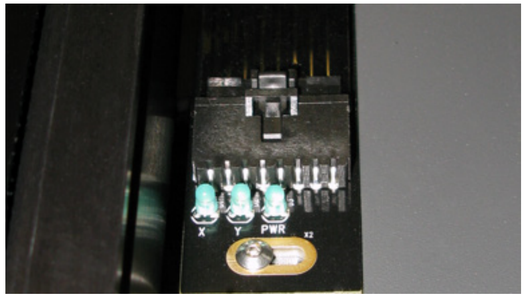
1. Power OFF and unplug the VLS system.
2. Open the Top Door.
3. Move the X-axis arm toward the front of the system.
4. Locate and disconnect the *Flex Cable* from the Upper Flex Board by pressing the plastic tab on the bottom side of the connector and gently pulling the plastic piece.
5. Remove the X-axis Motor Cover by removing the three Phillips head screws holding it. Set aside in a safe place.
6. Remove the 3 standoffs (1) holding the Upper Flex Board in position.
7. Disconnect the X-axis Motor Cable (2) from the Upper Flex Board.



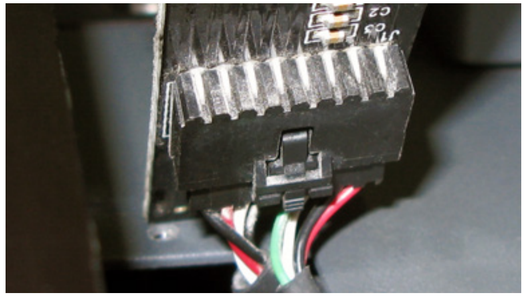
8. Installation is opposite of removal.

Lower Flex Board

1. Power OFF and unplug the VLS system.
2. Open the Top Door.
3. Move the X-axis arm toward the back of the system.
4. The Lower Flex Board is located on the right-hand side near the pressure cylinder. Unplug the Flex Cable from the Lower Flex Board by pressing on the plastic tab and gently pulling the connector.



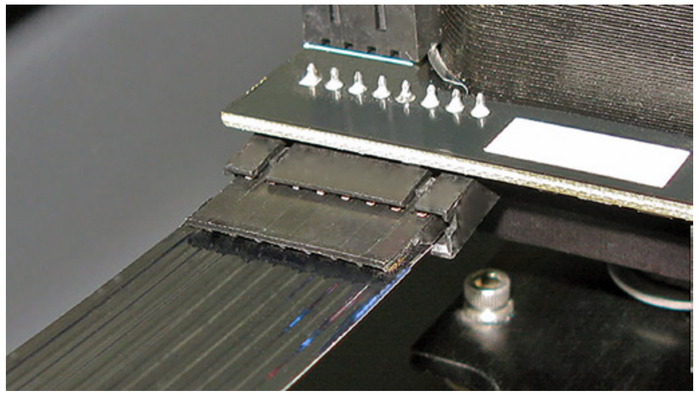
5. Unscrew the 2 screws that hold the board and set side in a safe place.
6. Grab hold of the Lower Flex Board and turn it around slowly. Unplug the cable attached on the back of the board. DO NOT pull on the Lower Flex Board because it is still attached to the VLS.



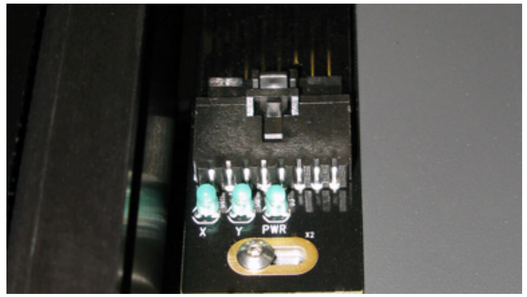
7. Installation is opposite of removal.

Flex Cable

1. Power OFF and unplug the VLS system.
2. Open the Top Door.
3. Move the X-axis arm toward the back of the system.
4. Locate and disconnect one side of the Flex Cable from the Upper Flex Board by pressing the plastic tab on the bottom side of the connector and gently pulling the plastic piece.



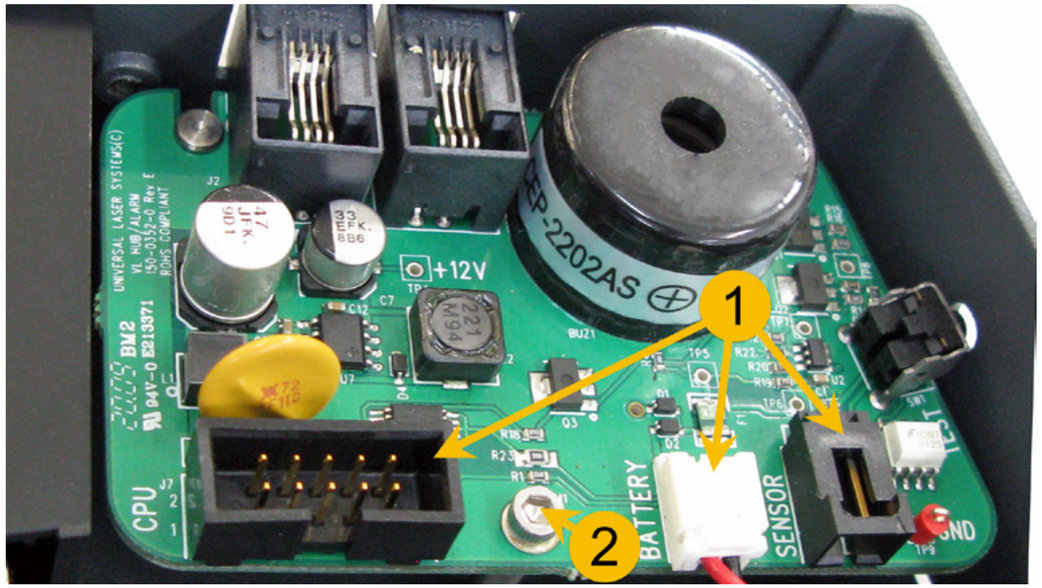
5. The Lower Flex Board is located on the right-hand side near the pressure cylinder. Unplug the other side of the Flex Cable from the Lower Flex Board by pressing on the plastic tab and gently pulling the connector.



6. Installation is opposite of removal.

Thermal Sensor/Com Board

1. Power OFF and unplug the VLS system.
2. Open the Rear Cover to its resting position.
3. Remove the laser and set it aside in a safe place.
4. Follow the *CPU* procedure up to step 7.
5. Locate the Thermal Sensor/Com Board and disconnect (1) the main cable, as well as the battery connection and the sensor cable for the Thermal Snap Switch (sensor).

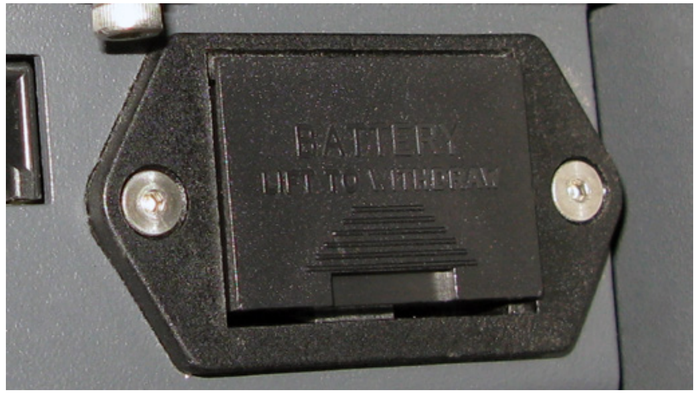


6. Remove the mounting screw (2) from the thermal sensor/com board and slide the board out, being careful not to damage the testing button.
7. Installation is opposite of removal.

Thermal Snap Switch

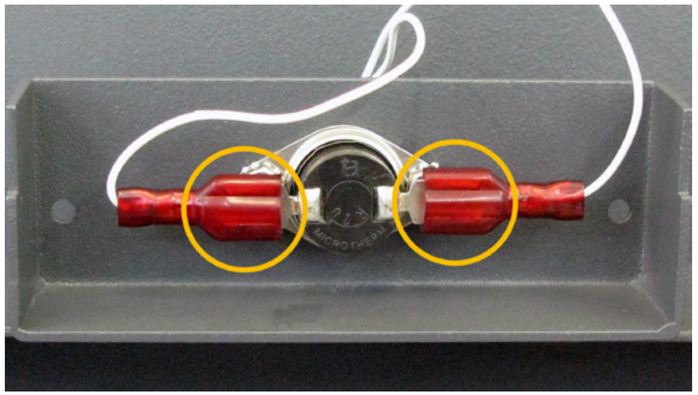
NOTICE: *When installing the new Thermal Snap Switch, do not apply excessive force when bending the Thermal Snap Switch's metal contacts.*

1. Power OFF and unplug the VLS system.
2. Locate the Battery Holder on the back left-hand side of the system and remove the Battery holder by inserting a flat head screwdriver into the slot of the battery holder. Gently push up then pull the screwdriver toward you to remove it and set it aside.

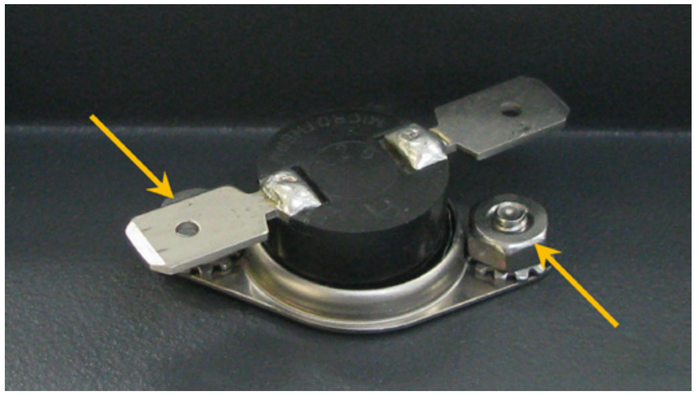


3. Open the Top Door.
4. Pull the X-axis arm all the way to the front of the system.
5. Located to the back wall of the VLS is the Thermal Sensor cover. Unscrew the 2 screws and set them aside.

6. Disconnect the Crimp Lugs that are connected to the Thermal Snap Switch terminals.



7. Rotate the metal contacts to expose the hex nuts.
8. Remove the hex nuts to release the Thermal Sensor Snap Switch and set the hex nuts aside.



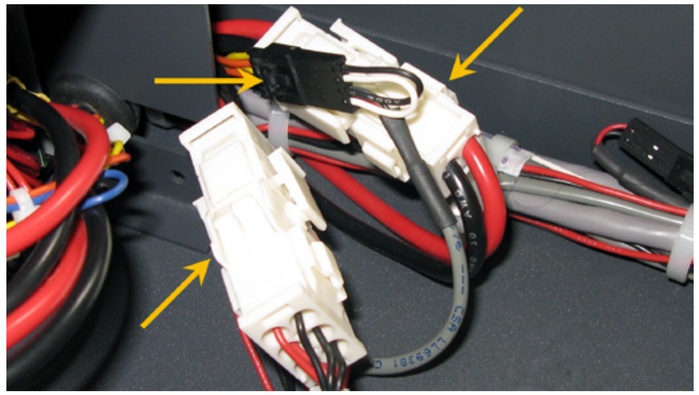
9. Installation is opposite of removal.

NOTE: *Verify that the battery is reinstalled into the VLS in order for the engraver to function properly.*

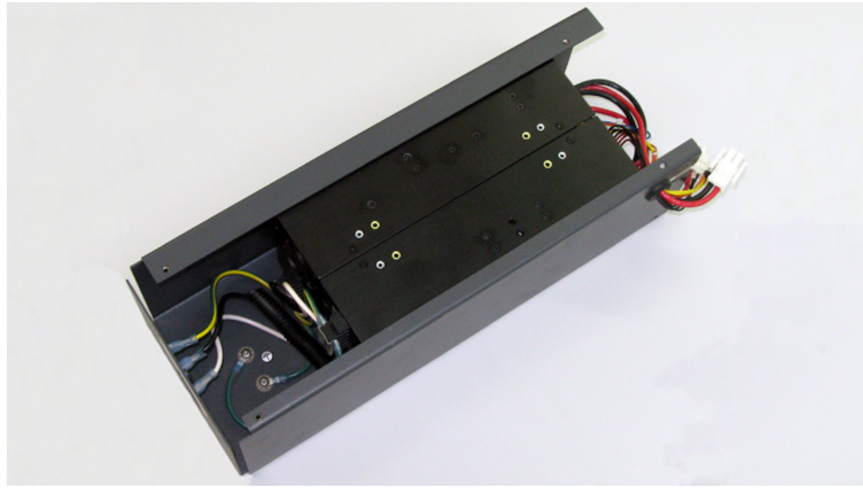
Power Supply Module

1. Power OFF and unplug the VLS system.
2. On the back of the system, unscrew the 4 Button Head Screws located underneath the right Rear Shelf. Set the screws and washers aside.
3. After removing the 4 Button Head Screws, proceed to the left side of the VLS. Located near the power inlet is a small button head screw. Remove the screw and set it aside.

4. Open the rear cover to its resting position.
5. Remove the laser and set it aside in a safe place.
6. The Power Supply connectors are located between the Power Supply Module and CPU Module. Disconnect the 2 large white connectors and the small black connector.



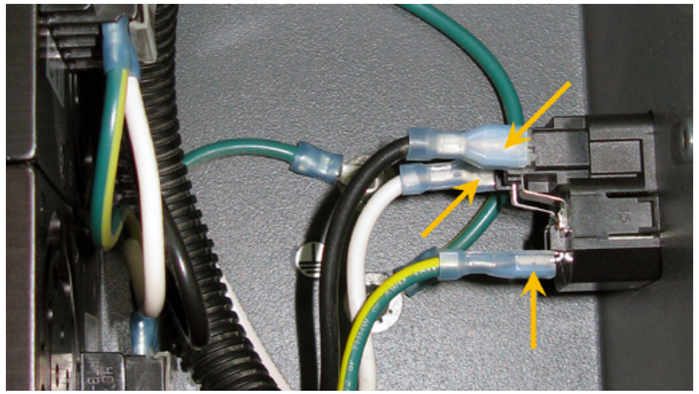
7. Remove the Power Supply Module by carefully lifting up from the Rear Shelf, making sure no cables are pinched in the process.



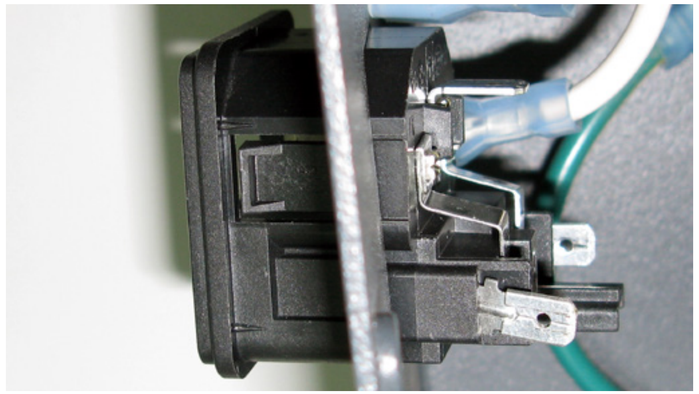
8. Installation is opposite of removal.

AC Power Inlet

1. Power OFF and unplug the VLS system.
2. Remove the *Power Supply module*.
3. Turn the power supply module over and set it on a safe, flat surface.
4. Locate and disconnect the wiring running from the power supplies and the ground to the inlet.



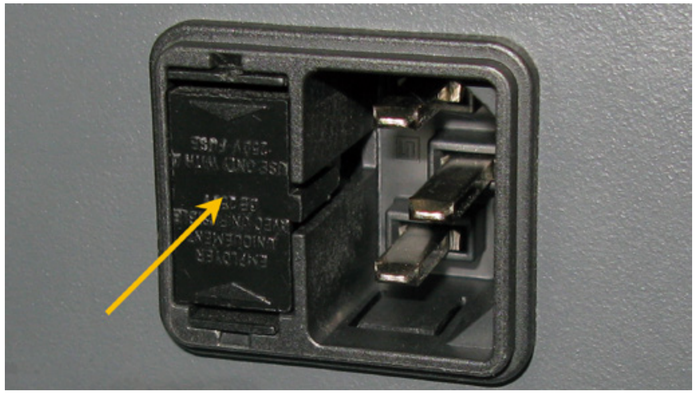
5. Press the tabs on the side of the AC Inlet and push out of the power supply housing.



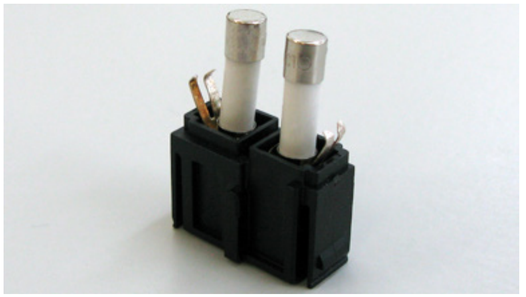
6. Installation is opposite of removal.

Fuse

1. Power OFF and unplug the VLS system.
2. Locate the fuse drawer located on the AC power inlet.



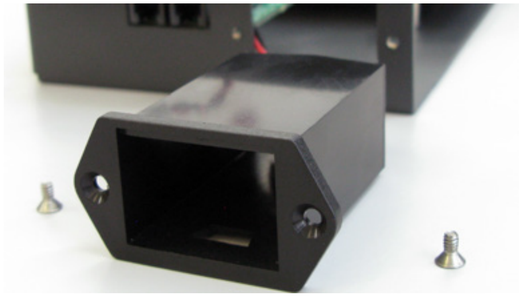
3. Using a small flat head screwdriver remove the fuse drawer.

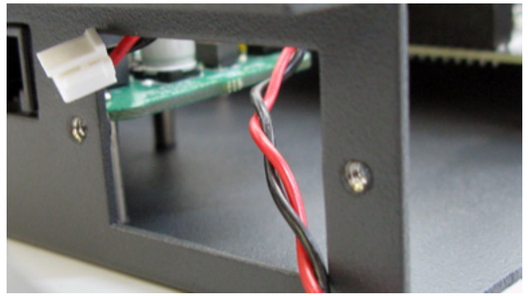


4. Installation is opposite of removal.

9V Battery Holder/Drawer

1. Power OFF and unplug the VLS system.
2. Open the Rear Cover to its resting position.
3. Remove the laser and set it aside in a safe place.
4. Follow the *CPU* procedure up to step 7.
5. Disconnect the battery cable from the thermal sensor/com board.
6. Remove the mounting screws from the 9V Battery Holder and set them aside in a safe location.
7. Remove the 9V Battery Holder, pushing outward. Make sure the cables go through the opening without getting tangled.

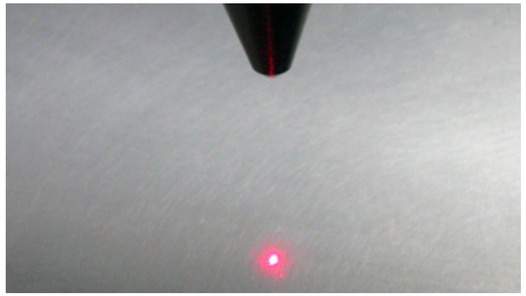




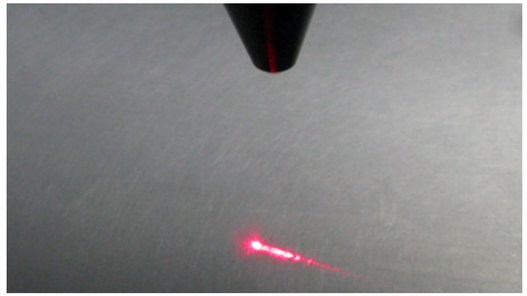
8. Installation is opposite of removal.

Air Assist Cone Alignment

1. Complete the *X-Axis Arm Alignment and Adjustment (Squaring)*.
2. Complete *Laser Beam Alignment*.
3. Power ON the VLS and start the UCP.
4. Open the Top Door.
5. Using the arrows on the Viewer Tab of the UCP, position the focus carriage in the middle of the field.
6. Install the Air Assist Cone if not already installed.
7. Place a piece of paper underneath the cone and observe the position of the red beam in relation to the center of the bottom of the cone.



Aligned



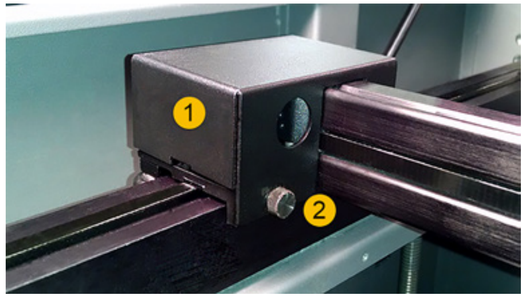
Misaligned

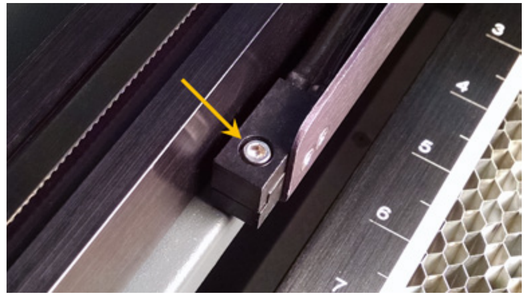
8. If the red beam is not centered, make sure the cone is seated correctly. If necessary, slightly loosen (1/4 turn) the mounting screws for the cone base and adjust the base until the red diode laser comes out of the center of the cone opening.

9. Tighten the base mounting screws gently and re-check the cone's alignment.

Air Track

1. Ensure the air source (compressor) is OFF and disconnected from the system.
2. Power OFF and unplug the VLS system.
3. Open the Top Door.
4. Slide the X-axis arm toward the front of the system.
5. Remove the #2 mirror cover (1) by removing the thumbscrew (2), sliding the cover to the right and then off the rail.
6. Locate and remove the screw securing the Y-Manifold together.





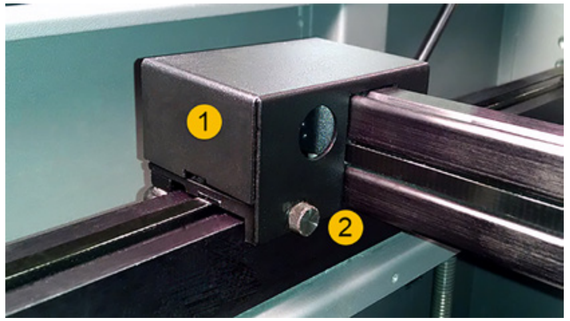
7. Locate and remove the 3 or 4 thumb screws (depending on the size of the system) holding the Air Track to the Air Assist Receiving Brackets.

8. Carefully lift the Air Track out of the receiving brackets.
9. Installation is opposite of removal.

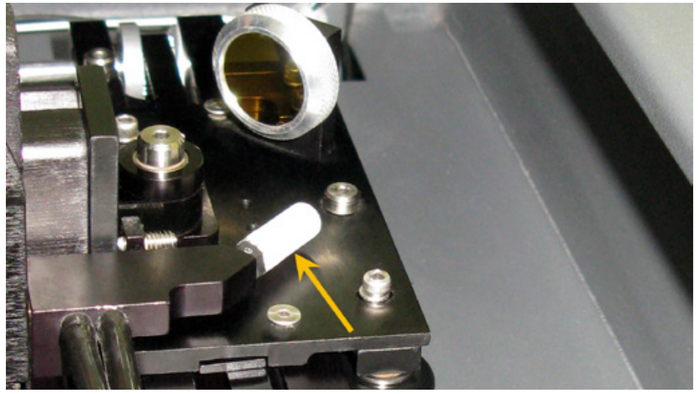
Air Assist Diffusers

#2 Mirror Diffuser

1. Ensure the air source (compressor) is turned OFF and disconnected from the system.
2. Power OFF and unplug the VLS system.
3. Open the Top Door.
4. Slide the X-axis arm toward the front of the system.
5. Remove the #2 mirror cover (1) by removing the thumbscrew (2), sliding the cover to the right and then off the rail.



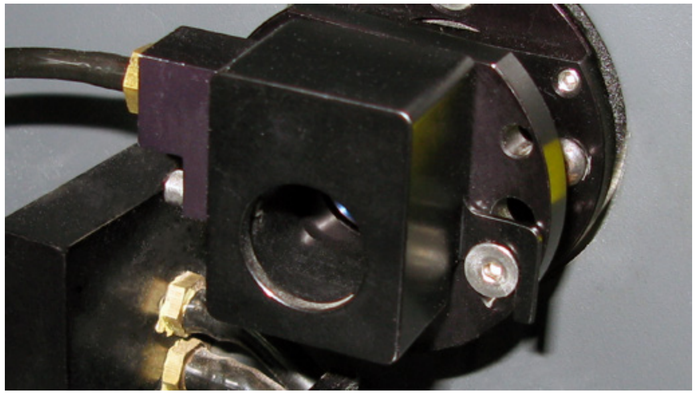
6. Locate and unscrew the diffuser from the Y Transfer Manifold.



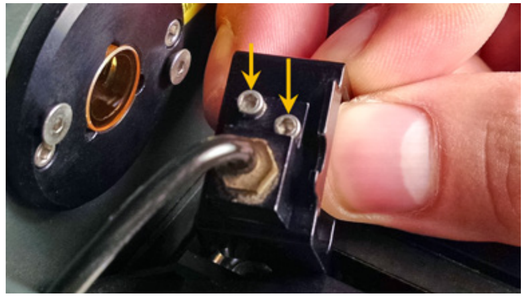
7. Installation is opposite of removal.

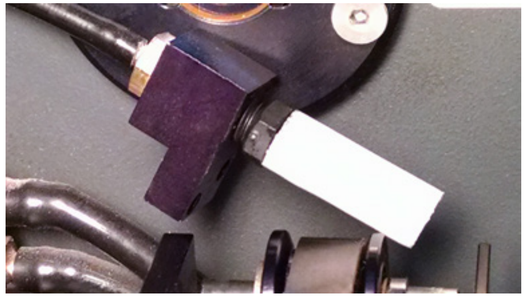
Beam Window Diffuser

1. Ensure the air source is turned OFF and disconnected from the system.
2. Power OFF and unplug the VLS system.
3. Open the Top Door.
4. Slide the X-axis arm toward the front of the system.
5. Locate and remove the Beam Window Protector by turning it slightly counter-clockwise, lifting up at the same time.



6. Remove the two screws securing the Fitting Block to the Beam Widow Protector.
7. Unscrew the diffuser from the Fitting Block.

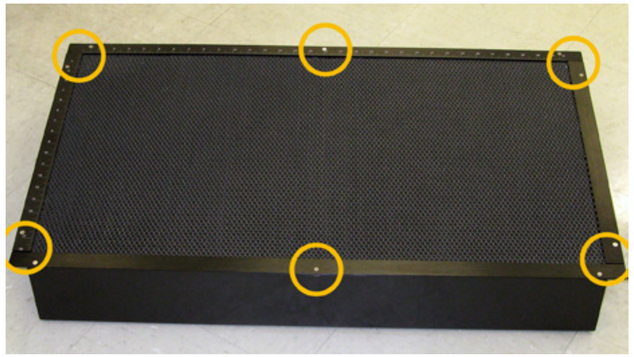




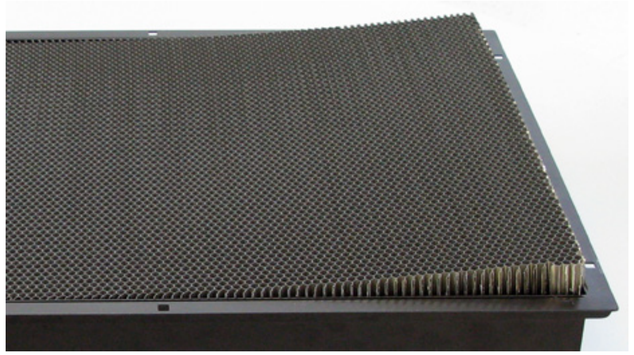
8. Installation is opposite of removal.

Cutting Table Insert

1. Remove the cutting table from the system if currently installed.
2. Set cutting table on a safe and level working surface.
3. Remove the 8 screws holding the rulers and side braces of the cutting table in place and set aside.



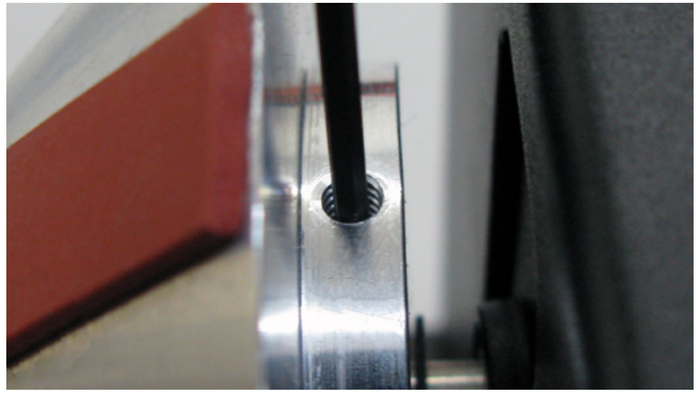
4. Remove the rulers and side braces.
5. Carefully lift the cutting table insert out of the cutting table enclosure.
6. Clean all debris from inside the cutting table enclosure; this will help minimize the possibility of a fire from inside the Downdraft Cutting Table during operation.



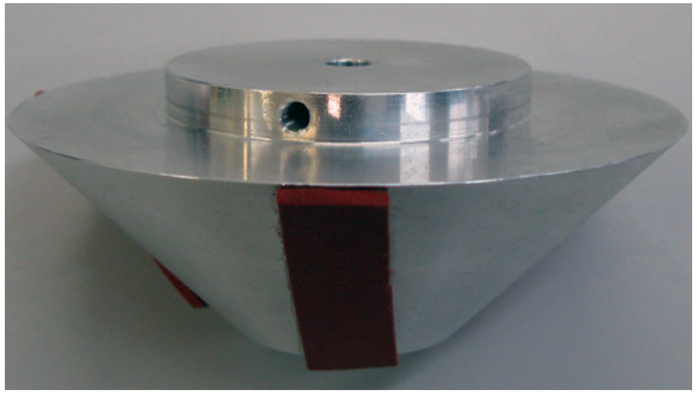
7. Locate the supports where the cutting table insert will be held inside the enclosure.
8. Installation is opposite of removal. Ensure that the new insert lays flat on the supports.

Rotary Cone/Cup

1. Remove the Rotary fixture from the system if installed and place on a flat working surface.
2. Locate and loosen the 8-32 set screw on the cone/cup.



3. Slide the cone/cup off the drift shaft or idler shaft.

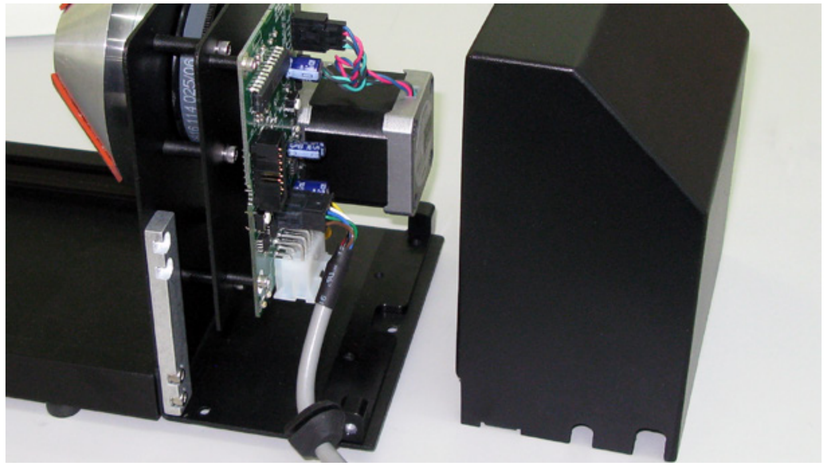


4. Installation is opposite of removal.

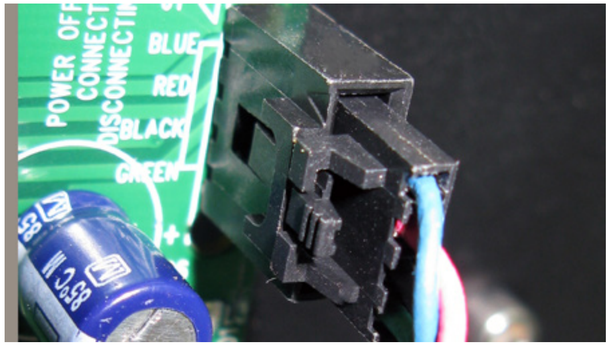
Rotary Belt/Motor

1. Remove the Rotary fixture from the system if installed and place on a flat working surface.
2. Turn the rotary over and remove the three screws holding the motor cover in place.

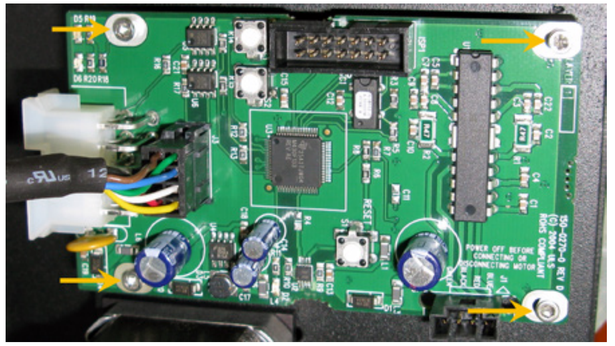
3. Turn the rotary back over and remove the cover by pulling straight up.



4. Remove the *rotary cone/cup* from the motor end.
5. Disconnect the motor cable from the PCB board.

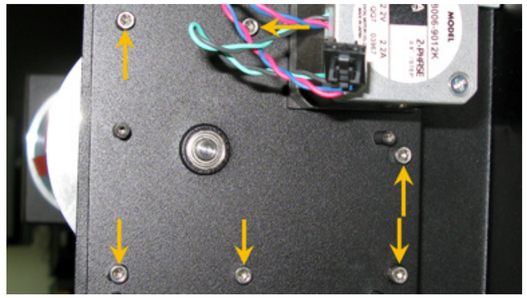


6. Take out the 4 screws holding the PCB board in position. Remove the PCB board and set it aside.

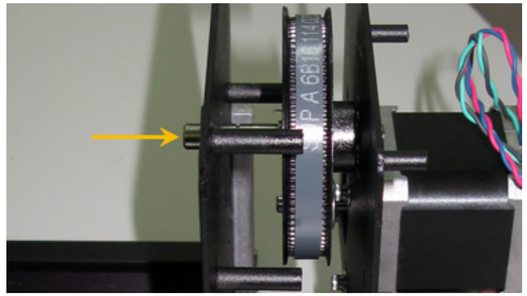


7. Remove the E-Ring from the drive shaft.

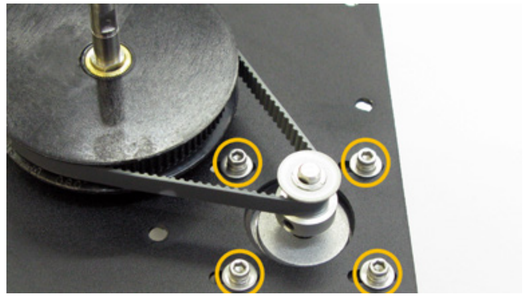
8. Remove the 5 screws securing the rear driver bracket to the front drive bracket.



9. Firmly press the drive shaft out of the front drive bracket. This will free the rear drive bracket from the rotary.



10. Loosen the 4 screws holding the motor in place and shift the motor toward the top of the rear drive bracket. Remove the belt.



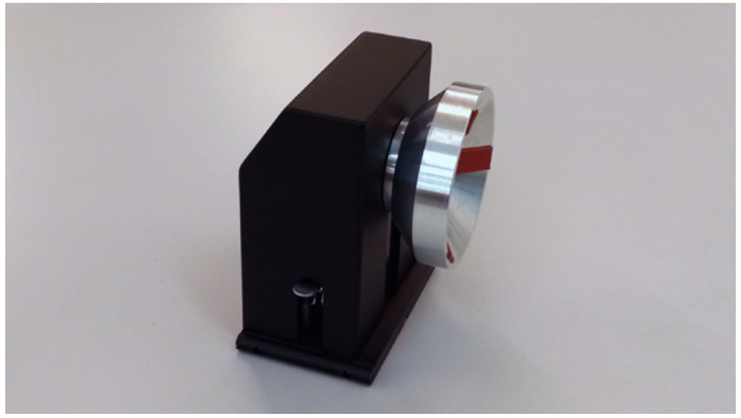
11. Installation is opposite of removal. If replacing the motor, continue to step 13.
12. When reinstalling the belt, slide the motor to the lowest point on the rear bracket to tension the belt.
13. Remove the 4 screws holding the motor in position and carefully remove the motor from the rear drive bracket.
14. If transfering the drive gear, loosing the screw securing the drive gear in place on the drive shaft.
15. Installation is opposite of removal.
16. When reinstalling the belt, slide the motor to the lowest point on the rear bracket to tension the belt.

Rotary Clamp

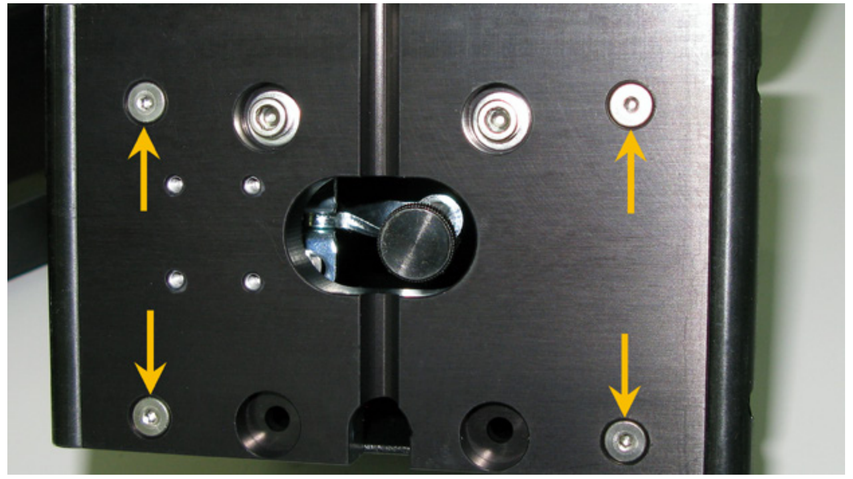
NOTE: *If you are using an extended rotary you will not have the tailstock cover in step 4. All other steps are the same.*

1. Remove the Rotary fixture from the system if installed and place on a flat working surface.
2. Locate and remove the serial tag plate by removing the two screws holding it in position. Set aside.

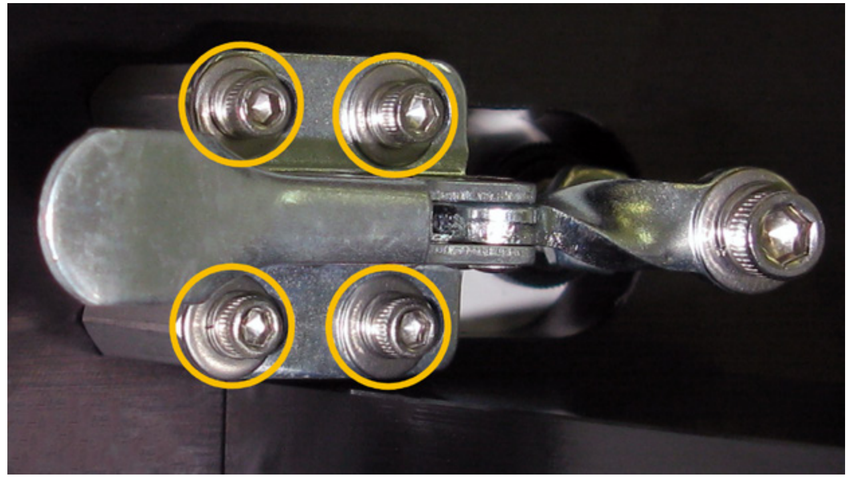
3. Slide the tailstock out of the rotary base plate.



4. Remove the tailstock cover by turning over the tailstock and locating the four screws holding it in place. Remove these screws and set the cover and screws aside.



5. Remove the four screws and washers securing the toggle clamp.



6. Install new toggle clamp with the four screws and washers.

7. Prior to installing the tailstock cover slide the tailstock into the rotary base and test the clamp. If the clamp performs correctly complete the installation. If the clamp does not apply sufficient pressure to stop the tailstock from moving, remove the tailstock from the rotary base.
8. Slightly unscrew the clamp stopping mechanism to elongate the shaft and repeat Step 7 until the clamp performs correctly.

9. Install the tailstock cover using the 4 screws from step 4.
10. Attach the serial tag plate from step 2.