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Laser Alignment

For the Epilog Fusion Pro Dual Source Machines

11/14/2021

Requirements:

Tools:

- 5/32" Allen Wrench
- 3/32" Allen Wrench
- Masking Tape (white)
- Flat head Screwdriver
- Alignment Target (provided with engraver)
- Safety Glasses (Lexan or Polycarbonate)

Overview:

This document illustrates the procedures required to align the CO2 & Fiber lasers inside of Fusion Pro engraver. Please read the entire document before proceeding with the alignment. **It is important that the CO2 laser and red dot pointer are aligned first, before the fiber laser.** Safety glasses are required to be worn throughout the entirety of the following procedures. Never fire the fiber laser without the side panels installed

SAFETY WARNING:



DO NOT PROCEED UNLESS YOU HAVE READ, AND UNDERSTAND THE FOLLOWING SAFETY WARNINGS.

WARNING:

While performing the CO2 laser alignment all persons present in the room during the performance of this procedure must be equipped with adequate eye protection (Lexan safety glasses, eyeglasses or goggles), and that no one looks or places any part of his or her body into the path of the laser beam.

During the **Fiber Laser** alignment, safety glasses are not required, as the laser **WILL NOT** be fired or operated during the alignment procedure other than to turn on the Red Dot Pointer.

WARNING:

This procedure requires that during the CO2 portion of this alignment process, the laser be operated with the engraver's door safety interlocks defeated or with protective covers removed. While the laser power levels are reduced from those of normal operation, they are sufficient to inflict eye injury or burns.

During the **Fiber Laser** portion of this alignment process, the laser **WILL NOT** be "fired" or operated in any manner other than to turn on the Red Dot Pointer.

When to align the laser:

The Laser Alignment Procedure can be performed if any of the following apply to you.

- You are experiencing a general Loss of Power.
- You are experiencing 'Fading' in one of the corners of the table.
- You are losing power in certain positions on the table.
- You have replaced the X-Axis Rail.
- You have replaced a Laser Tube.
- You have replaced a Mirror.
- The engraver has been moved or transported.

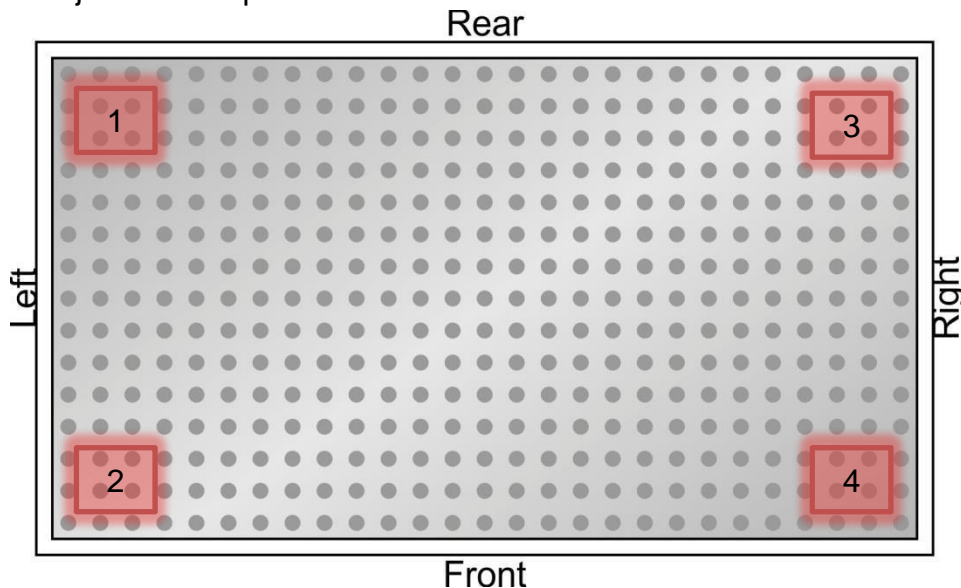
Before you start...

Direction

Many of the instructions provided in this procedure will have a direction given, such as left-hand side or right-hand side. Unless otherwise stated, these are all provided as though you were facing the machine from the front.

Table Positions


For the following procedures, the table will be broken into four (4) positions. Each position is identified by its relative distance to the laser source and corresponds with the mirror to adjust for that position.

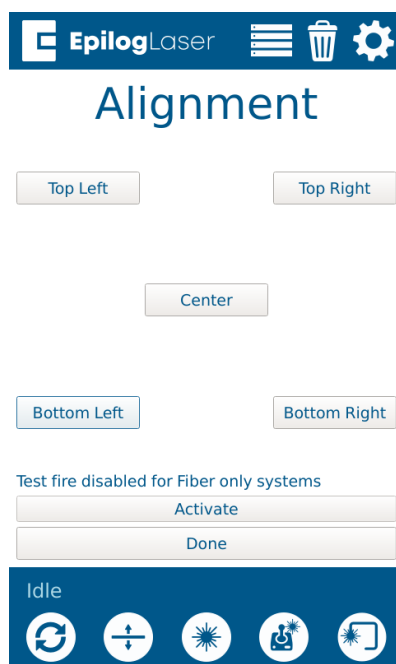
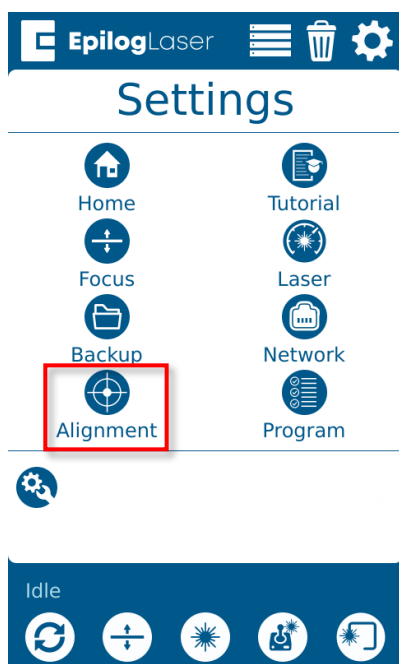


Mirrors

Three of the four adjustment mirrors used for the CO2 alignment are on the left side of the engraver. The mirror numbers correspond directly with the positions on in the bed; for example, if the lens carriage is in Position #1 than you will only adjust Mirror #1. The final adjustable mirror is located on the carriage. The alignment process for the carriage mirror will be addressed last.

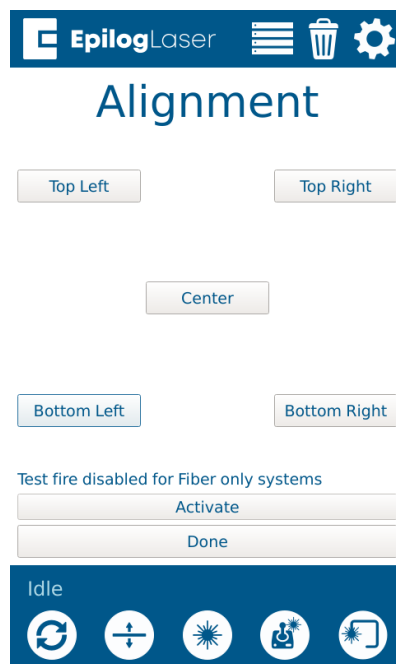
Moving the lens carriage

The Fusion Pro has an Alignment mode that may be accessed from the settings menu. To access the Menu, tap the  Icon, and press **Alignment** to access the Alignment menu.



Alignment Menu

The Alignment menu has 5 buttons that will move the carriage to their corresponding locations when pressed. It also has a button labeled “**Activate**” that will allow you to fire the laser for the purpose of alignment. We will use these commands to align the laser in each corner of the engraver to ensure that there is even power throughout the table.



Fiber Laser Red Dot Pointer:

The Fiber Lasers Red Dot Pointer is aligned to the laser beam inside the laser assembly. There are no customer or field service technician accessible adjustments for the Fiber Lasers Red Dot Pointer.

The Red Dot pointer used with the Fiber Laser is quite large, on the order of 3/8's of an inch in diameter when seen on the alignment target. This is normal for a Fiber laser assembly. When aligning the Fiber Laser, do your best to center the Fiber Lasers Red Dot pointer on the alignment target.

Fiber Laser Alignment:

If you are aligning only the Fiber Laser and you are satisfied with the alignment of your CO2 laser, you can move directly to Procedure D to complete the Fiber Laser portion of this alignment procedure.

Procedure A: Pre-alignment

It is crucial that you align the red dot pointer and CO2 laser before adjusting the mirrors for each corner. **This step is necessary to ensure that the 2 lasers are following the exact same path through the engraver.** If the Red dot pointer and the CO2 laser are not aligned to each other before starting Procedure B, the alignment procedure will fail.

Step 1: Align the Red Dot Pointer to the Cutting Beam

Locate and remove the 5/32" Allen screws which secure the bottom rear panel to the engraver. Remove the bottom rear panel from the engraver to expose the Red dot Pointer diode.

Note: If you are performing the alignment due solely because you have replaced Mirror 3 or the X-Axis Rail, please move on to **Procedure B**. For all other alignments this procedure must be completed!



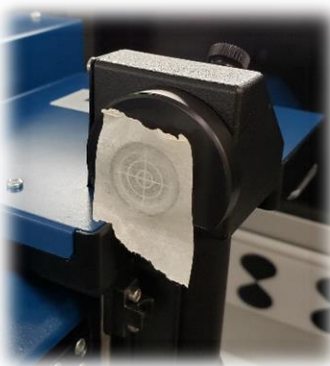
Step 2: Attach alignment target

Locate the alignment target and place it into the left side of the lens carriage. It should fit over the optic as show below.



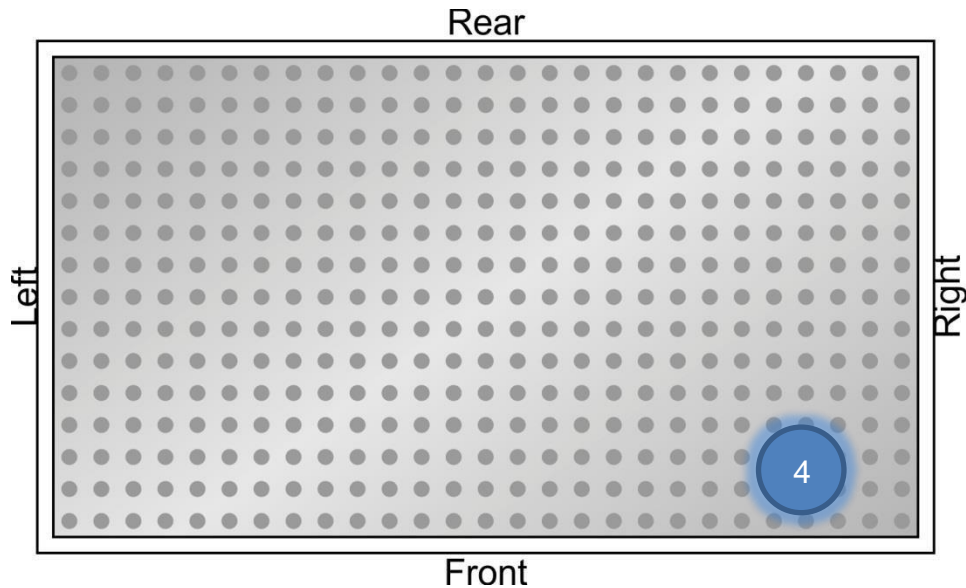
Step 3: Attach tape

Place a square of masking tape over the alignment target to protect it from melting. This will also allow us to see the burn mark from the CO2 laser.




Step 4: Make burn

With the target covered, press the “**Bottom Right**” button to move the carriage to Position 4. You can then use the “**Activate**” button to fire the laser.



Note: If you are unable to produce a burn mark on the tape, Try setting the power to 20% and ensure that the lid is closed. If that does not work, skip ahead to the [Troubleshooting](#) section for additional steps.

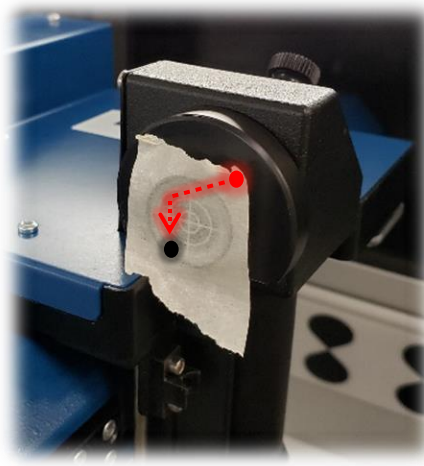
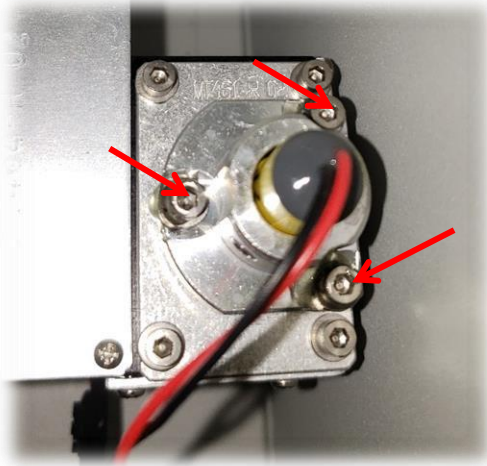
Step 5: Activate red dot pointer

Now that there is a burn mark on the masking tape, press the  icon on the engraver's display to activate the Red Dot Pointer. The pointer should appear on the tape covering the Alignment Target.

Step 6: Align the red dot pointer to burn mark

Use the three adjustment screws on the Red Dot Pointer Mount, to move the Red Dot Pointer to the burn mark on the tape. This concludes the Pre-alignment.

NOTE: If the burn mark is not in the center of the target, **do not worry!** You only need to align the red dot to the burn mark in the step, we will center everything to the bullseye in the following steps.



Marks simulated for photo

Procedure A Complete

Once the Red Dot Pointer is aligned with the burn mark on the tape in Position 4, it will accurately represent the path of the Cutting Laser for the rest of the alignment. You may now remove the masking tape from the Alignment Target.

Procedure B: Aligning the laser in each corner

Step 1: Remove the left-hand panel and mirror panels.

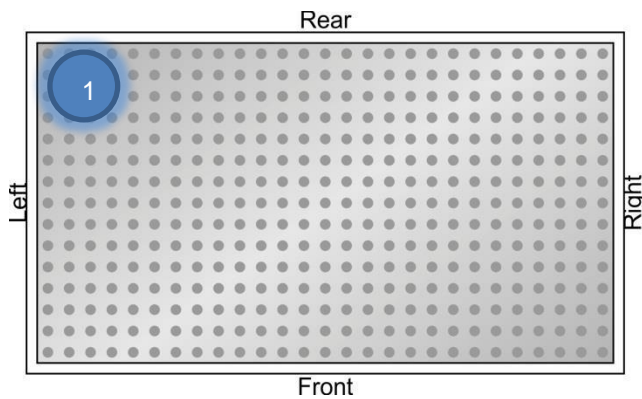
With the engraver powered on. Remove the Left side Access Panel, as well as the access panels for Mirrors 1 and 2.

- 1) There are two black Panel Locks on the large panel holding it in place. Loosen these with a 5/32" Allen wrench to remove the large panel. The large panel will need to be removed to Access Mirror 3.
- 2) The access panels for mirrors 1 and 2 have are secured using a 5/32" Allen screw. Remove that to access the adjustment screws for Mirrors 1 and 2



Step 2: Align mirror 1

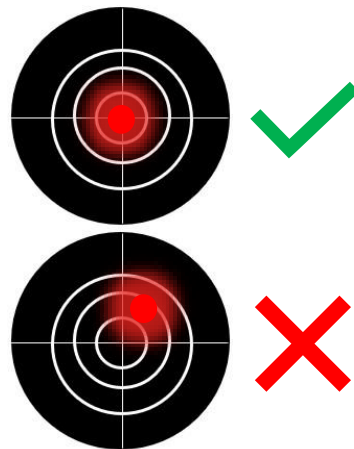
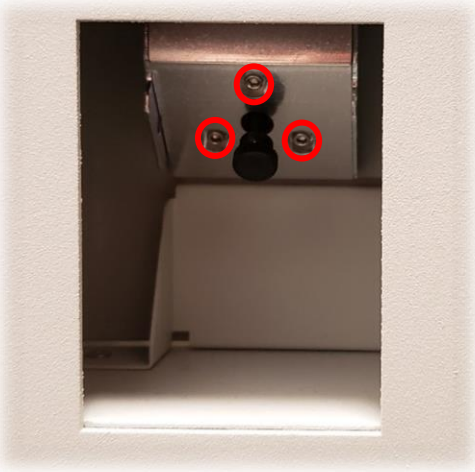
Ensure that the engraver is on and that the Red Dot Pointer is active. Next on your engraver's touchscreen. Navigate to the **Alignment** menu in **Settings** and tap "Top Left" to move the carriage to position 1.



Quick Tip!

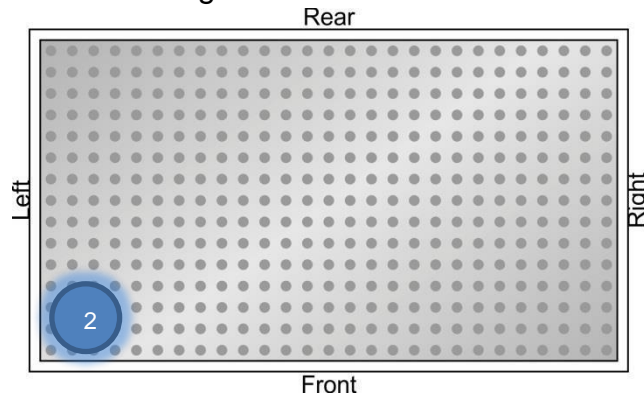
The key to a good alignment is repetition and patience. For the best results take your time and dial it in.

Locate Mirror #1 under the bottom mirror access panel. Using a 3/32" Allen wrench, adjust the screws on Mirror #1 so that the Red Dot Pointer is in the center of the alignment target while the carriage is in Position 1.



Step 3: Align mirror 2

Once red dot pointer has been centered in the first corner, tap “Bottom Left” on the touchscreen to move the carriage to Position 2.



Locate Mirror #2 underneath the upper mirror access panel. Using the 3/32” Allen wrench, adjust the screws on Mirror #2 so that the Red Dot Pointer is in the center of the alignment target in Position 2.

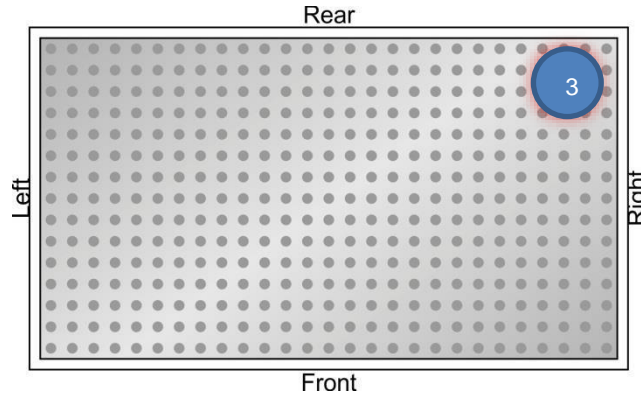


Once complete return to [Step 2] and re-adjust Mirror 1 until it is aligned again in Position 1. Once you are done, move back to Position 2 and adjust Mirror 2 as outlined in [Step 3].

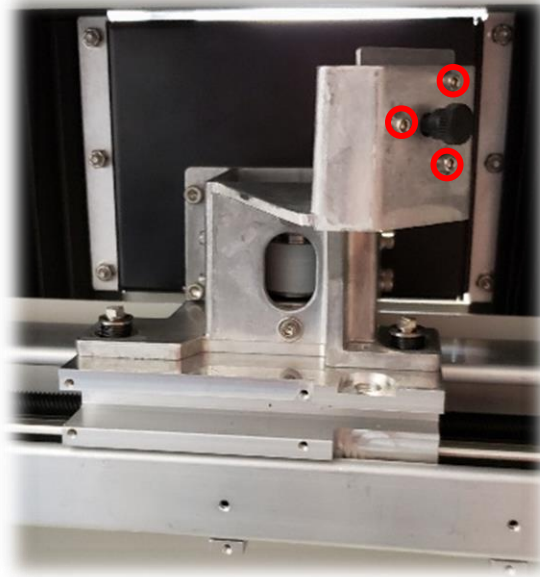
Note: You may have to go back and forth between positions 1 and 2 multiple times before the red dot is perfectly centered in both corners. Each time that you re-adjust the mirrors, the red dot should move closer and closer to the center and will drift apart less when moving back and forth between positions 1 and 2.

Step 4: Align mirror 3

Once Positions 1 and 2 have both been centered and no longer drift apart, you can adjust mirror #3. Using your touch screen display, tap “Top Right” to move the carriage to Position 3.



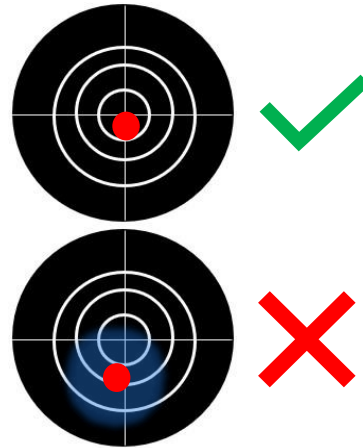
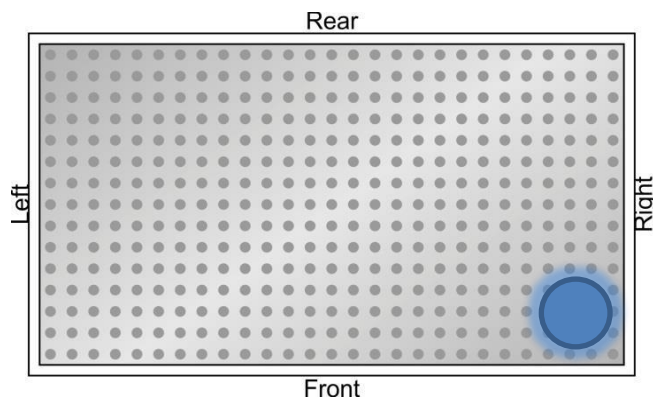
Mirror #3 is located on the far left-hand side of the X axis rail. Using the 3/32" Allen wrench, adjust the screws on Mirror #3 so that the Red Dot Pointer is in the center of the alignment target.



Once complete return to [\[Step 2\]](#) and then [\[Step 3\]](#). Continue to align Mirrors #1, #2 and #3 until you can move between the 3 positions without the Red Dot leaving the Center of the Alignment Target.

Step 5: Check Position 4

Once you are confident that you are aligned between Positions #1, #2 and #3, jog the lens carriage to Position #4.

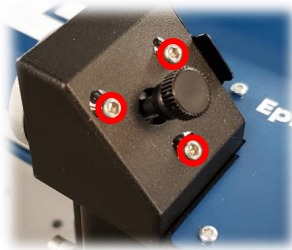


If all the mirrors are aligned correctly, the red dot pointer should appear within the center ring on the alignment target. If so, you may remove the alignment target, replace the panels and run a test engraving file. If not; please return to [\[Step 2\]](#) and continue alignment.


Procedure C: Perpendicular Alignment

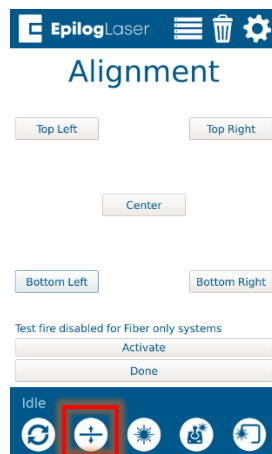
Step 1: Reset the carriage mirror

For this step, you will want to tighten each of the three screws for the carriage **mirror 1 rotation at a time per screw**, until they are all hand tight. Once they have all been evenly tightened down, you can loosen them 1 turn at a time, until they are loosened 2 full turns. This should set all of the screws to the same height, making the next steps easier.



Step 2: Opening the Focus Menu

Ensure that the engraver is on and that the Red Dot Pointer is active as shown in [the previous steps](#). Press the  button on your touch screen to bring up the **Focus menu**.



Step 4: Remove the Lens and Place Target

Remove the lens assembly so that the pointer doesn't go out of focus as we move the bed and Position the target with the Red dot in the center of the bullseye.



Step 5: Lower the Engraving Table

Using the joystick to lower the engraving bad until it is near the bottom of the machine.

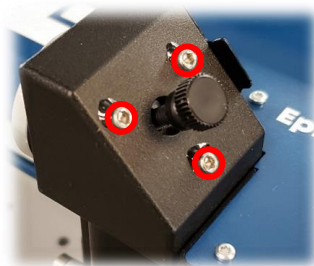
Step 6: Check Red Dot Location

Check the location of the Red Dot Pointer and see if it has moved off center of the alignment target.



Step 7: Adjust the Carriage Mirror

Use the adjustment screws on the Carriage Mirror to move the Red Dot Pointer back onto the center of the target.



Step 8: Raise the Engraving Table

Using the Joystick, bring the table back up until the focus gauge is touching the bed again.

Step 9: Does the Red Dot Move?

If the red dot has moved, continue to adjust the screws between the 2 bed heights until it stops moving. If you are having difficulty then repeat the first step.

This concludes the CO2 laser alignment. If you do not have a fiber laser then you may now run a test Job. If you do have a fiber laser then please continue to the next page.

Procedure D: Aligning the Fiber Laser:

SAFETY WARNING:



DO NOT PROCEED UNLESS YOU HAVE READ, AND UNDERSTAND THE FOLLOWING SAFETY WARNINGS.

WARNING:

Never attempt to operate the Fiber laser with the side covers removed or with the Safety Interlocks defeated.

WARNING:

During the **Fiber Laser** alignment, safety glasses are not required, as the laser **WILL NOT** be fired or operated during this alignment procedure other than to turn on the Red Dot Pointer.

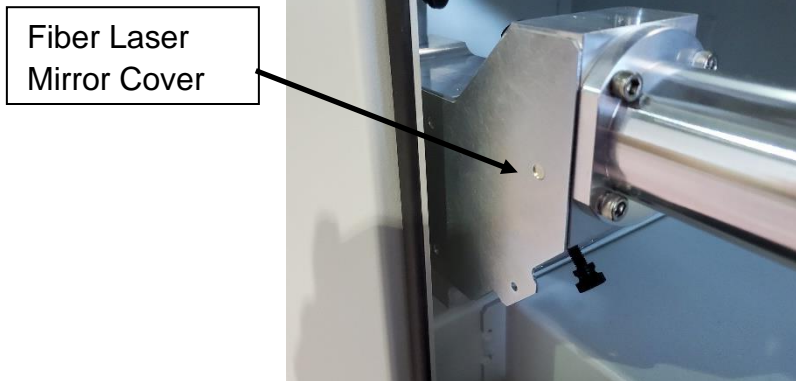
Overview: Since the CO2 laser has been previously aligned, the Fiber laser only needs to be aligned to the CO2 lasers beam path. If the CO2 Laser has not been previously aligned, it is strongly recommended that you do this prior to aligning the Fiber Laser.

Step 1: Remove the side covers to gain access to the Fiber Laser Mirror Mounts.

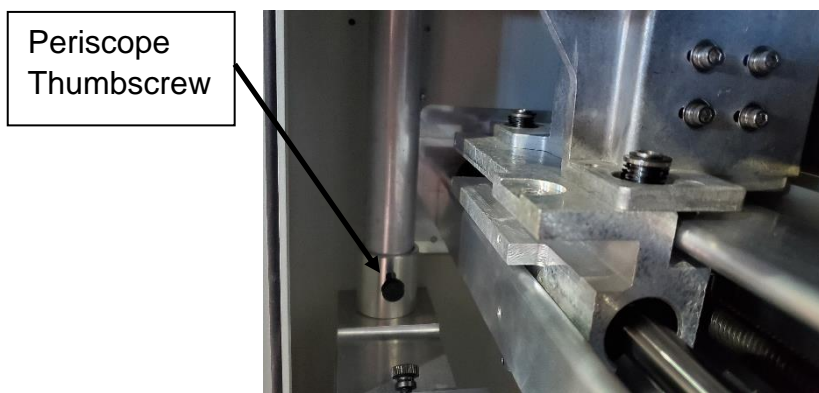
- 1) There are two black Panel Locks on the large panel holding it in place. Loosen these with a 5/32" Allen wrench to remove the large panel. The large panel will need to be removed to Access Fiber Mirror 1 and 2.
- 2) The upper access panel, on the left-hand side of this image indicated by the small arrow, for mirror 2 is secured using a 5/32" Allen screw. Remove that to access the base of CO2 Mirror.



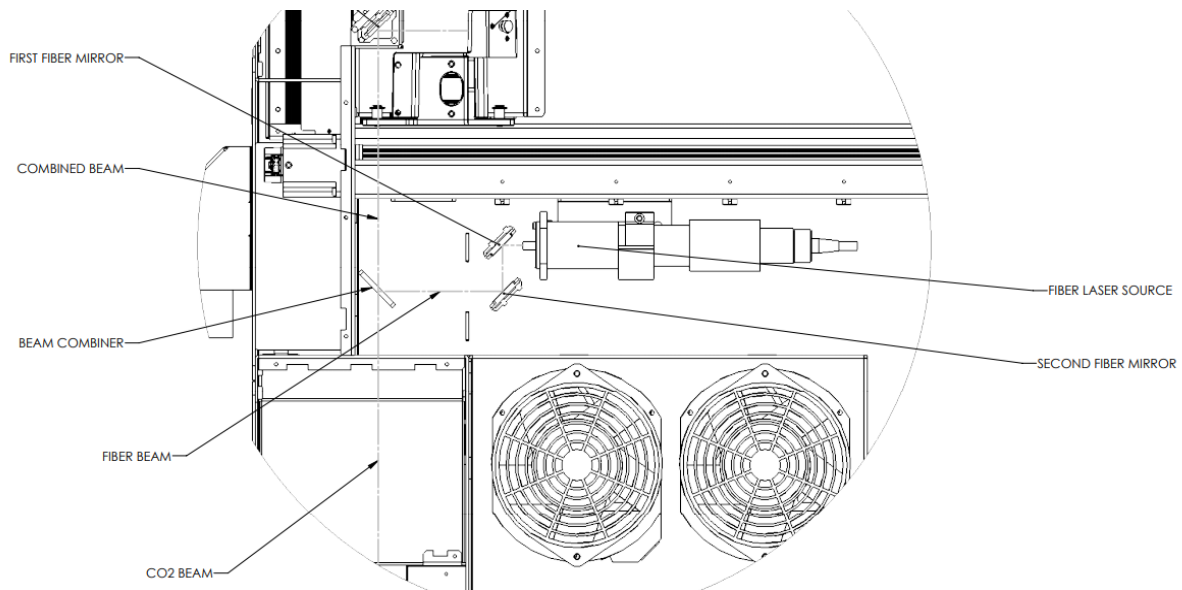
- 3) Once inside, you will find a cover over Fiber Mirrors 1 and 2 held in place by small magnets, remove this cover to access and view the surface of these mirrors.



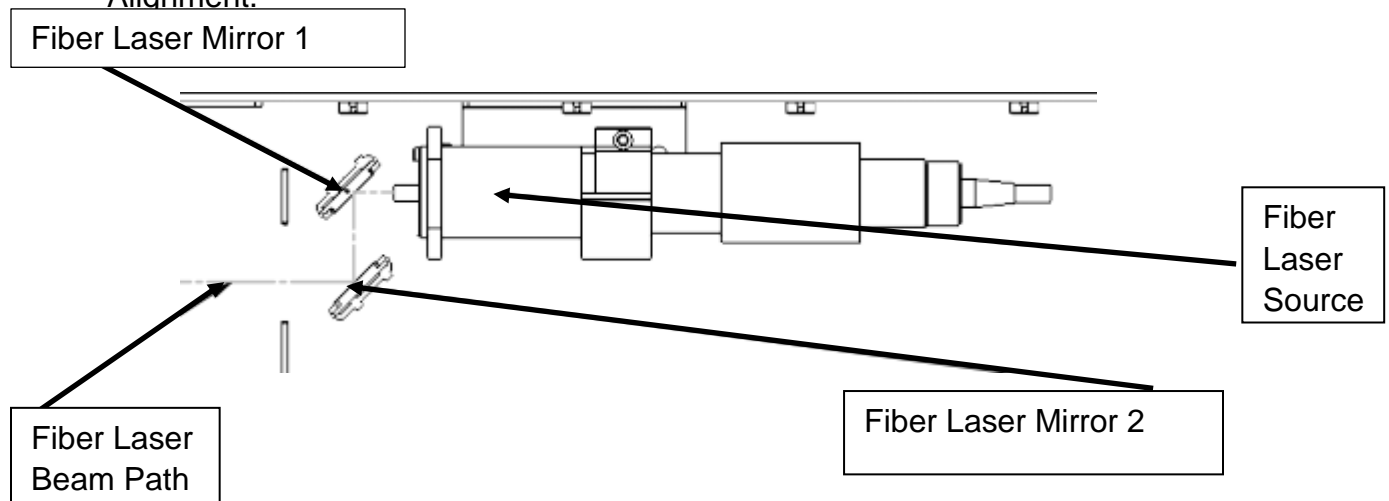
- 4) Remove the Periscope: The periscope and its thumbscrew are shown in the image below. Loosen the thumbscrew and the periscope tube will drop down far enough that the periscope can be removed from the system.



- 5) The image below shows the location of Fiber Laser Mirror 1 and 2.




6) Close up of Fiber Mirror 1 and 2: These will be used to adjust the Fiber Lasers Alignment.



Step 2: Enable the Fiber Laser

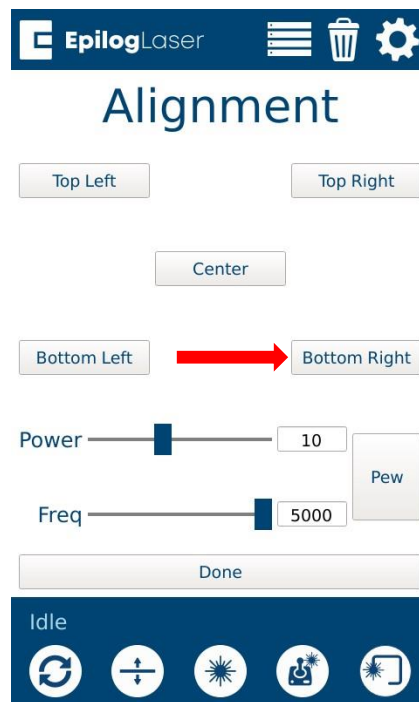
This is done by preparing a Fiber Laser only job and sending it to the engraver. Until this is done, the Fiber Laser Red Dot Pointer will not come on when the Red Dot Pointer button is selected.

Step 3: Activate the Red Dot Pointer

Press the  icon on the engraver's display to activate the Red Dot Pointer.

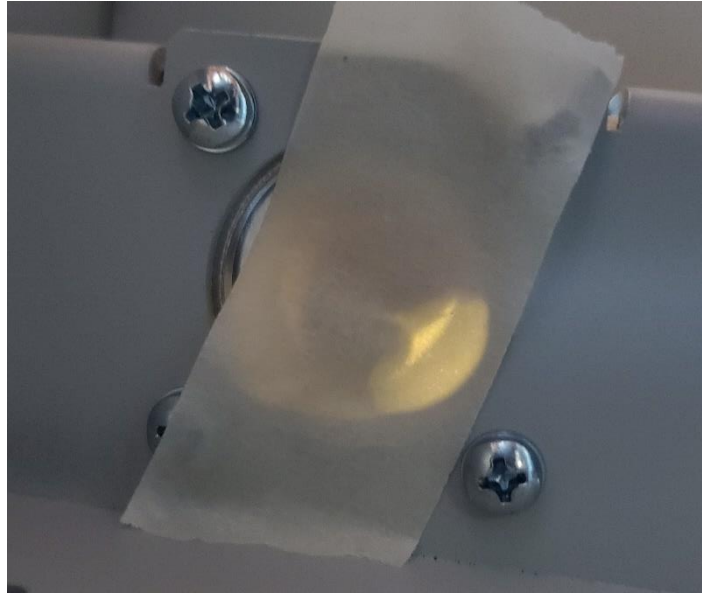
Step 4: Move the Lens Carriage to Position 4 on the Table.

With the engraver on and the Red Dot Pointer active. Navigate to the **Alignment** menu in **Settings** and tap "Bottom Right" to move the carriage to position 4.



Step 5: Place masking tape over the entry or bottom of CO2 Mirror Mount 2.

- 1) Place a piece of masking tape over the entry of CO2 Mirror mount 2 as shown in the image below.

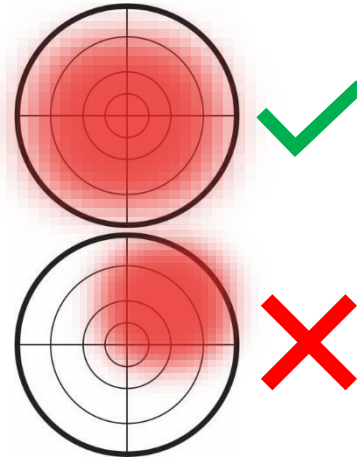
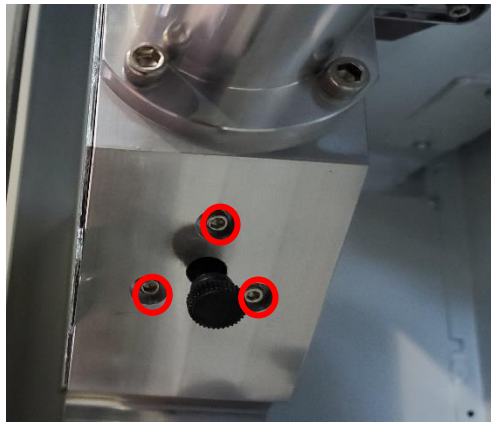


Step 6: Inspect the position of the Red Dot on the Alignment Target:

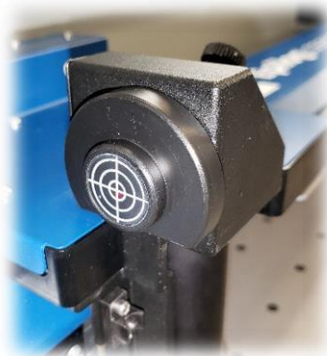
Note: Reminder: Due to the size of the Red Dot Pointer used in the Fiber Laser, the pointer image needs to be centered on the target as best you can. It will fill nearly the entire target when properly aligned.

If the Red Dot pointer is NOT centered on the tape over the opening in the bottom of the CO2 laser mirror mount, please take the following steps.

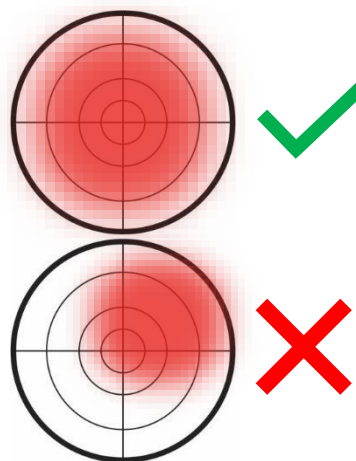
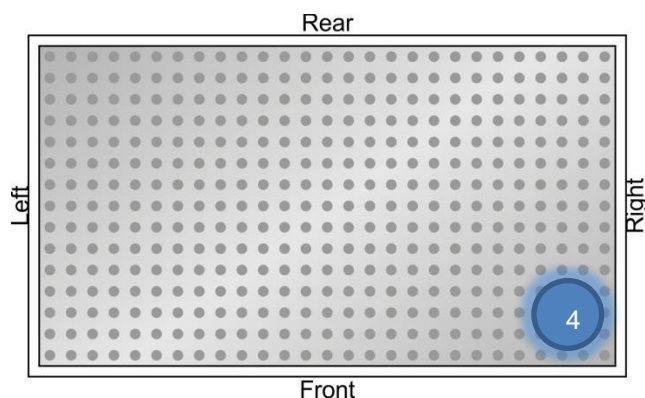
- 2) Observe the location of the Red Dot pointer on the surface of Fiber Mirror 2, it should be very close to the center of the mirror. If it is not centered on the lower mirror, use Fiber Mirror 1 to move the Red Dot Pointer to the center of Mirror 2.
- 3) Once the Red Dot Pointer is centered on Mirror 2 look up at the tape on the entry to CO2 Mirror's mount. If the Red Dot Pointer is not centered, use the adjustment screws on the rear of Fiber Laser Mirror 2 to move the Red Dot Pointer to the center of the tape. Shown in the image below.



- 4) Once you are satisfied that the Red Dot is centered on the tape, remove the tape from the CO2 mirror mount and install the alignment target on the lens carriage as shown below.



- 5) While in position 4 Observe the location of the Red Dot Pointer on the lens carriage. If the Red Dot Pointer is not centered as the image below shows, move back to Fiber Laser Mirror 2 and continue to make adjustments until the Red Dot Pointer is centered on the target in Position 4 on the table.
- 6) Repeat this process until the Red Dot Pointer is centered on the alignment target installed on the lens carriage.
- 7) Remove the alignment target from the lens carriage.
- 8) Press "Done" at the bottom of the Alignment Menu to return the lens carriage to its home position.



Step 7: Replace all panels removed during this process.

It is very important to replace all panels removed during this process to maintain the proper classification of your laser system. These include the following:

- 1) Periscope
- 2) Fiber Mirror Cover
- 3) Upper Access panel
- 4) Side Panel.

Once these are in place, you are ready to use

Conclusion

This concludes the Fiber Laser Alignment procedure. If you encounter any problems, please contact Epilog Tech Support at (303) 215-9171.

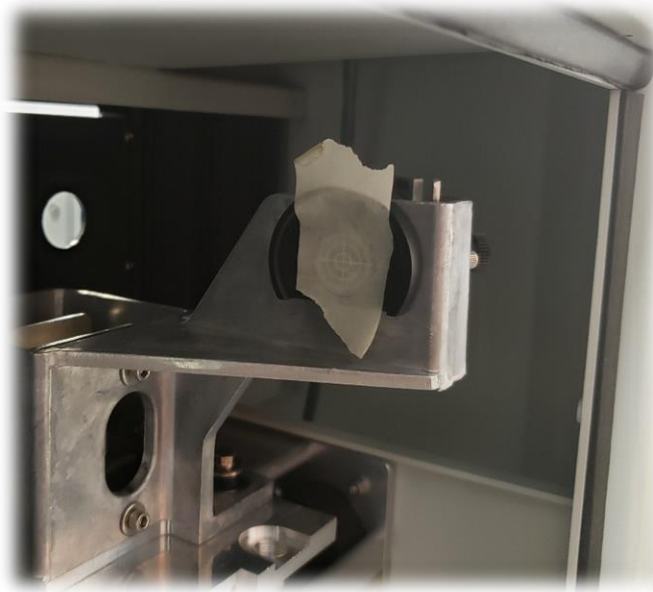
Troubleshooting

If you are unable to get a burn mark in Position 4 during procedure A, or if you see a scattered red dot or burn marks, then additional steps may be required. We will start by ensuring that the laser is aimed at the center of Mirror 3 from Mirror 2. To do this, we will make additional burn marks on the left side of the engraver and adjust the mirrors or pointer when specified.

Procedure A: Troubleshooting Mirrors 2 and 3 (CO2)

Step 1: Placing the target


Start by placing your alignment target into the hole behind mirror 3, on the left side of your engraver. Place a piece of masking tape over the target to protect it.



Step 3: Create a burn mark

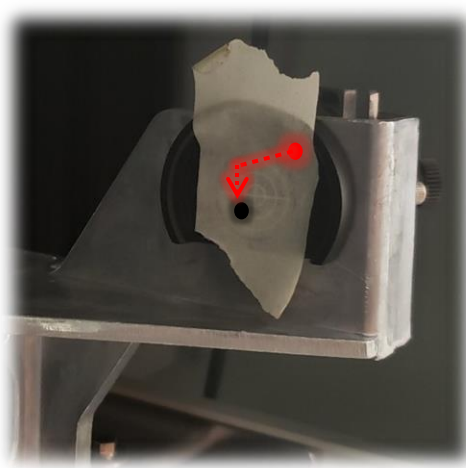
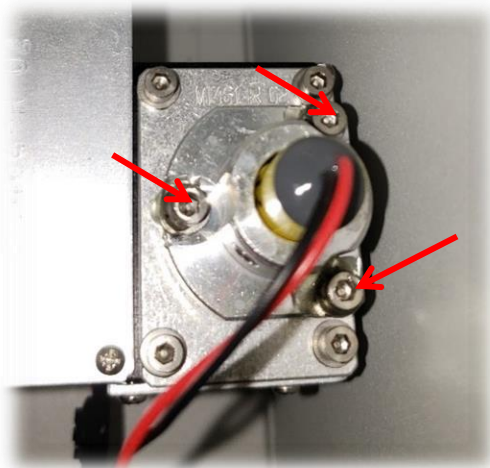
Using the “**Activate**” button from the Alignment menu, we will make a burn on the target in this location. Press the pause button shortly after the job starts to prevent the tape from over burning, or the target from melting.

Step 4: Check alignment of pointer

Now that there is a burn mark on the masking tape, press the  icon on the engraver's display to activate the Red Dot Pointer. The pointer should appear on the tape covering the Alignment Target

Step 5: Align the red dot pointer to burn mark

If the burn and red dot are off, use the three adjustment screws on the red dot pointer to move the red dot to the burn mark on the tape.



Marks simulated for photo

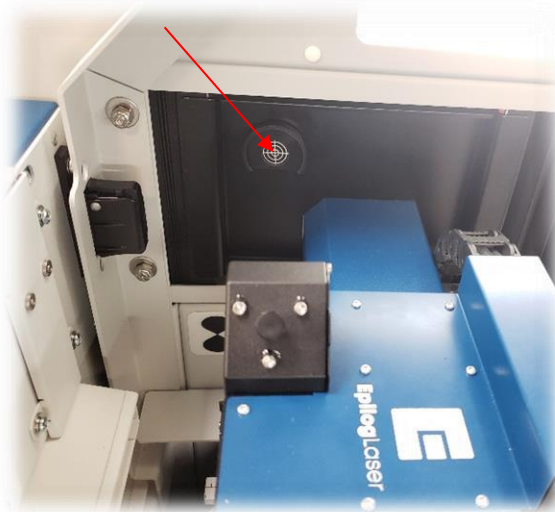
Step 6: Align Mirror 2

Now that the red dot pointer and burn mark are aligned in this position, adjust the alignment screws on Mirror 2 until the red dot pointer is in the center of the target.



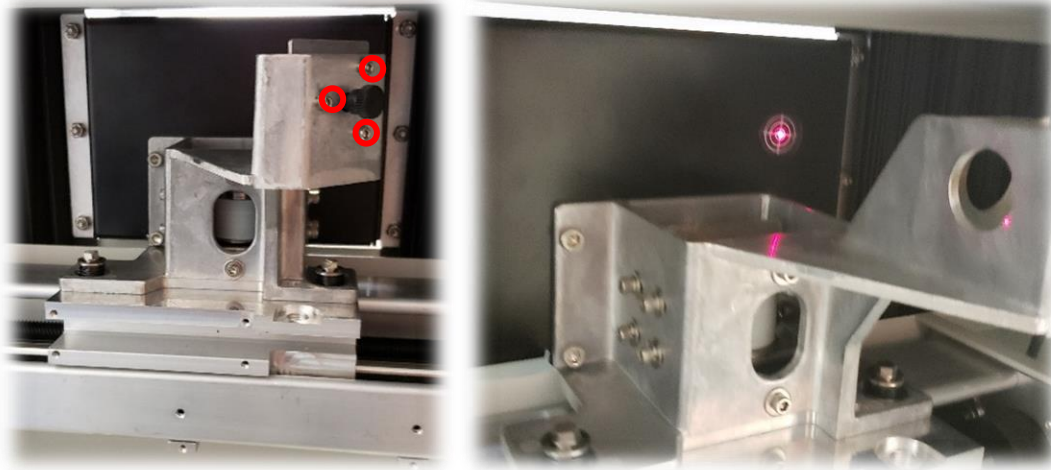
Step 7: Move target

Next, place the target in the hole after mirror 3 as shown below. Place the target into the hole from the inside of the engraver.



Step 8: Align Mirror 3

Adjust the alignment screws on Mirror 3 until the red dot is in the center of the target as shown below.



The laser should now be traveling through the center of both holes, if you are still unable to get a burn mark in Position 4 Move onto the next step.

Procedure B: Troubleshooting Periscope (CO2)

The Periscope is in the back-left corner of the machine. It is possible for the lasers to reflect off of the inside wall of the metal tube. To correct this issue, you can align the laser using mirror 1 so that the beam is traveling through the center of the hole below mirror 2.

Step 1: Remove Periscope Tube

Loosen the black thumbscrew on the periscope tube to separate the 2 pieces. Lift the top part of the periscope up and then out to remove the tube.



Step 2: Place masking tape

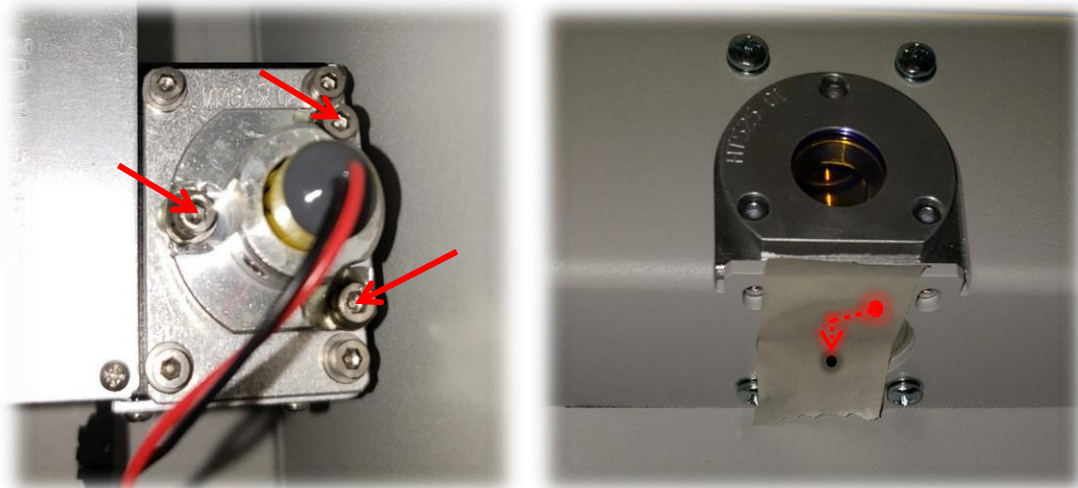
Place masking tape over the hole that the top of the periscope connects to as shown in the image in [Step 4](#)

Step 3: Create Burn

Using the “**Activate**” button from the Alignment menu, we will make a burn on the target in this location. Only press the button for a few milliseconds to prevent the tape from over burning.

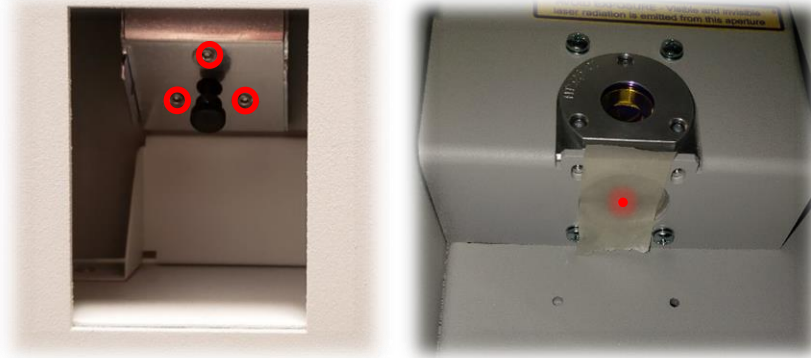
Step 4: Align red dot to burn mark

Use the three adjustment screws on the Red Dot Pointer Mount, to move the Red dot to the burn mark



Step 5: Align Mirror 1

Using the adjustment screws on Mirror #1, move the pointer to the center of the tape as shown below.



Conclusion

This concludes the alignment procedure troubleshooting. If you encounter any problems or if the issue is not resolved, please contact Epilog Tech Support at (303) 215-9171.

