

Beam Alignment Overview

Proper alignment of the beam is an important part of laser preventive maintenance. If the beam is out of alignment it is possible to lose power on the table, which will yield poor engraving quality.

What happens if the beam alignment is off?

If the beam alignment is off, you will see any of a wide variety of problems with the laser. More common problems consist of:

- Low power on various spots on the table.
- Poor letter quality on the table.
- Having to run at slower speeds to achieve acceptable results.

When should I check the beam alignment?

It is best to check the beam alignment after you clean mirrors #1 - #3. This is mainly because when you remove and replace these mirrors, the springs that hold the mounts can move and cause the alignment to be off slightly. This is not always the case but it can happen. In this type of situation, there are only slight adjustments that will need to be made to the beam.

Tools Needed

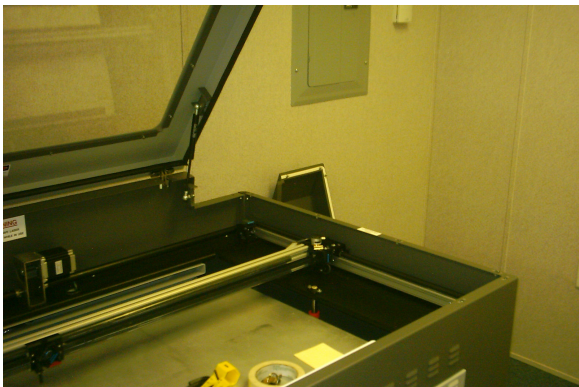
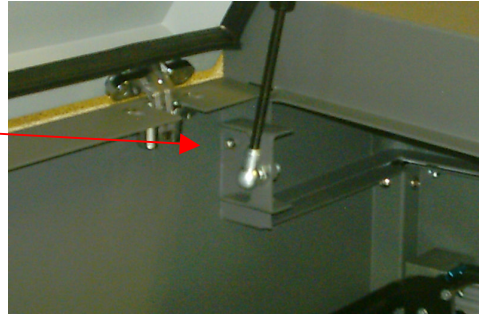
- 3/32 Allen Wrench which is located in your accessory kit
- Masking Tape

Things to remember before getting started

Here are a few tips to remember before getting started. Applying these to this process will make the alignment much easier to do.

- Replace the masking tape on the lens carriage often. Doing this will ensure that you are seeing the correct spot as you make them on the tape.
- Don't use too much power. You only need enough power to mark the tape slightly. Too much power will burn a hole through the tape and will not show if the second shot is hitting that exact spot.
- Use the pointer to your advantage. If you have the pointer and the beam aligned to the center of mirror #2, then wherever the pointer is shining on the masking tape, that is where the beam will mark the tape. You can use this to your advantage when making adjustments as you can watch the pointer move about the tape as you adjust the mirror to be sure you are adjusting in the right direction.
- On the touch screen, set the pointer to ON. This will ensure that the pointer will stay on through the entire process.
- If you have a XLE/XLT 2436, you can remove the right hand cover off of the laser. This will help greatly when doing a beam alignment, as it will enable you to see the marks made by the laser beam easily. To remove the right hand cover, simply remove the retaining screw from the cover. Once it has been removed, push slightly on the lid and pull up on the cover to remove it.

Remove the socket head screw that holds the right hand side to the laser.

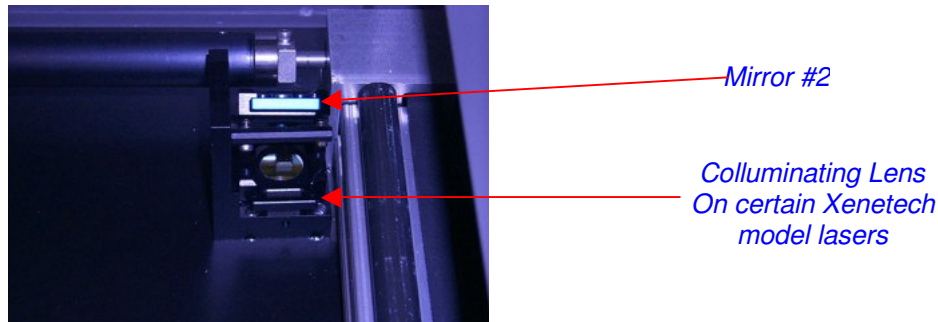


Push up slightly on the lid and at the same time lift up on the right side to release it.

Aligning the Beam and the Pointer To Mirror #2

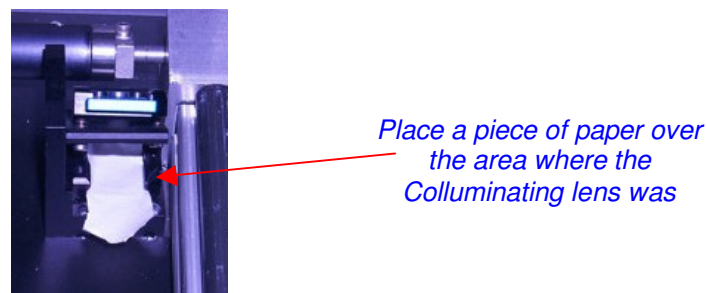
This section should only be followed for major beam alignment issues. For normal preventive maintenance alignments, please skip this section.

Directly under Mirror #2 is an opening where the laser beam fires from. On some model lasers this opening is covered by a lens. This lens is called a Colluminating Lens. If your laser does not have a Colluminating lens, you can take the red lens out of the lens carriage and use it for this section. **Be certain that when you are finished with this section of the alignment process that you return the red lens to its proper location.**



The first step will be to move the red diode pointer into the center of the Colluminating lens. To do this, use **Appendix B** as a guide to move the Combiner Mirror. You will be able to see the red diode pointer move across the lens as you make adjustments to the screws as noted in Appendix B. Adjust the red diode pointer as close to the center of the Colluminating lens as possible.

Once the red diode pointer is in the center of the Colluminating lens, remove the lens and place it to the side. If you are using the red lens, return it to its proper location in the lens carriage. Cut a piece of paper and place it where the lens was. You will still be able to see the red diode pointer through the paper.



1. Use the touchscreen and put the laser into Beam Alignment Mode. See **Appendix A** on how to do this.
2. On the touchscreen, set your laser power to around 10 -13, depending on your tube strength. A higher wattage tube will require less power to mark the masking tape, whereas a lower wattage tube might require more power.

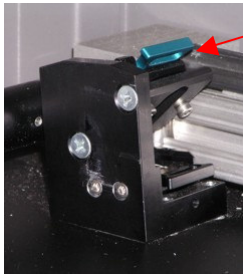
Press the “running man” icon on the touch screen to fire the laser. Look at the paper and compare the mark the laser beam made with the red diode pointer. Your mark should be in the same place as the red diode pointer. If it is not, then use **Appendix C** as a guide to move the laser beam in small increments until the mark made by the laser beam is hitting the red diode pointer.

Summary

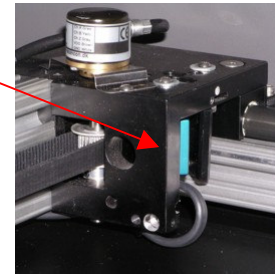
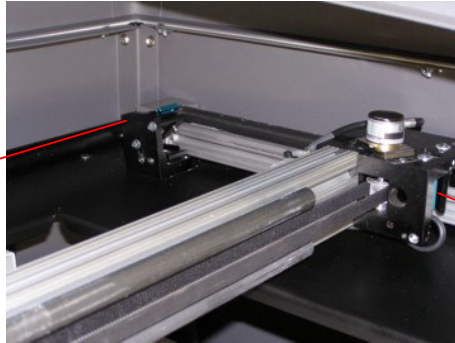
This process of aligning the beam and the diode pointer is only necessary in major alignment issues. This process uses the Colluminating lens as a guide to put the pointer in the center of the lens. From there we can fire the laser and use Appendix C as a guide to move the beam until it fires directly on the diode pointer.

Aligning the Beam Between Mirrors #2 and #3

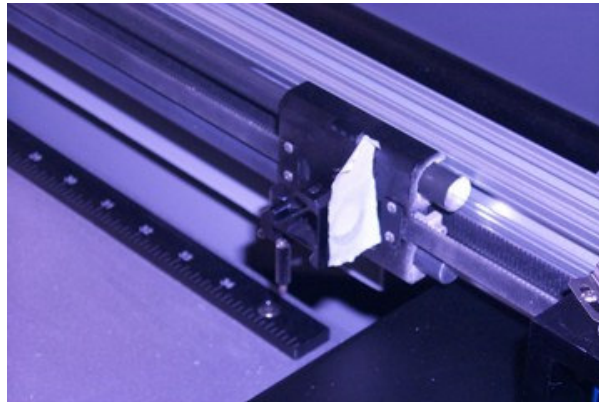
In this section we will align the beam between mirrors #2 and #3. We will align the beam so that it is perfectly straight between the two mirrors. To do this we will use masking tape as a guide. We will fire the beam and mark spots on the tape. We will do this with the bridge at the back of the machine, at the middle of the machine and again with the bridge at the front of the machine. Once the beam is marking the exact same spot from all three positions, our beam will be perfectly straight.



Mirror #2

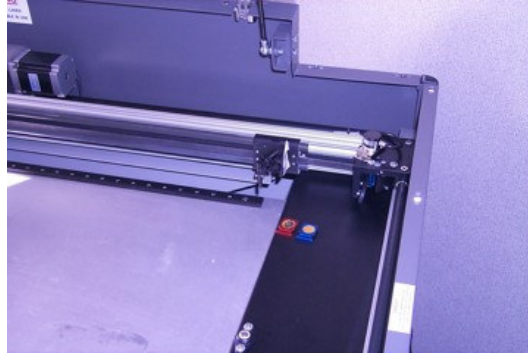


Mirror #3



Place a piece of masking tape over the hole in the lens carriage as shown above. Be sure that you remove the #4 Mirror and the lens as well. Doing this will keep them safe and keep any excess smoke and debris coming from the burned tape off of them

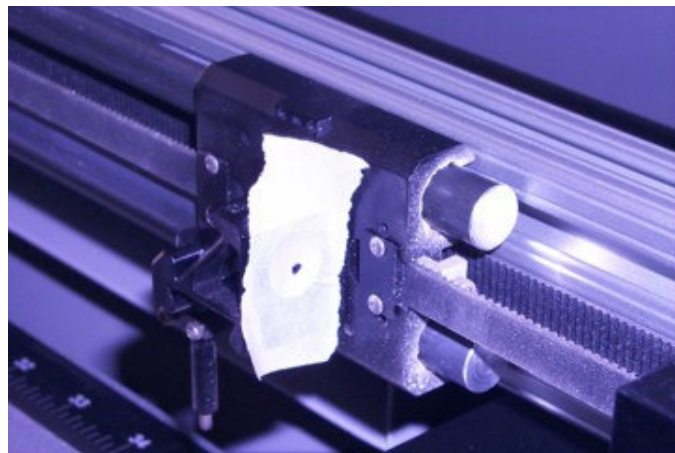
3. Remove the lens and mirror #4 from the lens assembly. We do not want to take the chance of either of them being damaged during this process.
4. Place a piece of masking tape over the hole on the lens assembly as shown above.
5. Use the touchscreen and put the laser into Beam Alignment Mode. See **Appendix A** on how to do this.
6. Use your hands to move the bridge to the back of the machine and move the lens carriage to the far right side, being careful not to slide the lens carriage off of the rails. This will put the mirrors at their closest points to each other.



Move the bridge to the back of the laser and move the lens carriage all the way to the right side of the bridge. This will put all of the mirrors at their closest points.

7. On the touchscreen, set your laser power to around 10 -14, depending on your tube strength. A higher wattage tube will require less power to mark the masking tape, whereas a lower wattage tube might require more power.
8. Fire the beam. Look at the masking tape and see if you made a mark. If you did not, then raise the power slightly and fire it again. Repeat this until you make a mark on the tape. Remember, you only need a small mark. If you burn through the tape completely, replace the tape with a new piece, lower the power slightly and fire the beam again. Your spot might not be in the center of the circle in the lens carriage. If it is not, don't be concerned with that at this point. We are merely trying to get the beam straight between the two mirrors at this point. Once we finish doing this, we will put the beam into the center of the circle.

You only need to fire with just enough power to mark the tape. Replace the tape and burn at a lower power if you burn through the tape.



9. Now move the bridge to approximately the center of the machine and fire the laser beam again.
10. Take note of the location of the second mark on the masking tape. If the second mark is in the exact same spot as the first mark then move on to the next step. If the mark is not in the exact same spot as the first, use **Appendix D** as a guide and adjust the screws on Mirror #2. Once the laser beam is hitting the exact same spot on both marks, move on to the next step.
11. Once you are hitting the same spot at the first and second position, remove the masking tape from the lens assembly and replace it with a new piece of tape.

12. Now move the bridge to the back of the machine once again. Fire the beam to make a mark on the masking tape. Once you mark the tape, move the bridge to the very front of the machine, raise the laser power (1 – 2 percent should be sufficient) and fire the beam again. Once again check the second mark. If your second mark is in the exact same spot as the first mark, then you are finished with this section of the alignment process. If your second mark is not exactly on the first mark, use **Appendix D** as a guide and adjust the screws on Mirror #2 to move the beam.

The last thing you will do before you move on to the next section is put a fresh piece of masking tape on the lens assembly. Fire the beam with the bridge at the back of the machine and once again at the front of the machine. Check the marks at each position and be absolutely certain that the beam is marking the exact same spot.

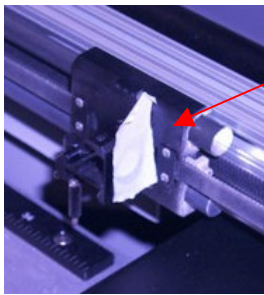
Summary

When aligning the beam between mirrors#2 and #3:

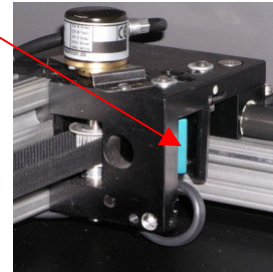
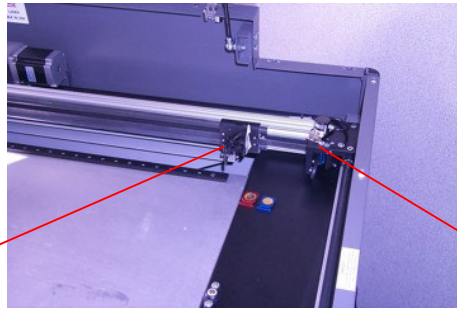
- Always start with the bridge at the back of the machine and the lens carriage at the right side of the bridge. Doing this will put all the mirrors at the closest position.
- Once you make a mark from this point, move the bridge toward the front of the machine before firing again. Doing this will tell which direction the beam is traveling.
- If you make any adjustments to mirror #2, then move the mirrors back to their closest points, put on a new piece of tape and fire the beam again. Once the beam fires on the same spot at the closest and the farthest position and you do not have to make any adjustments to mirror #2, then you will know that the beam is firing straight between the two mirrors.

Aligning the Beam Between Mirror #3 and Mirror #4

In this section we will align the beam between mirrors #3 and #4. We will align the beam so that it is perfectly straight between the two mirrors. To do this we will use masking tape as a guide. We will fire the beam and mark spots on the tape. We will do this with the bridge at the back of the machine, at the middle of the machine and again with the bridge at the front of the machine. Once the beam is marking the exact same spot from all three positions, our beam will be perfectly straight.

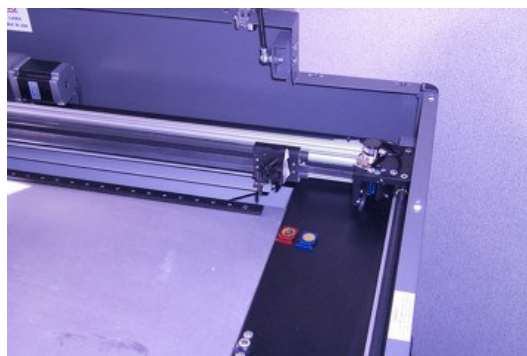


Mirror #4



Mirror #3

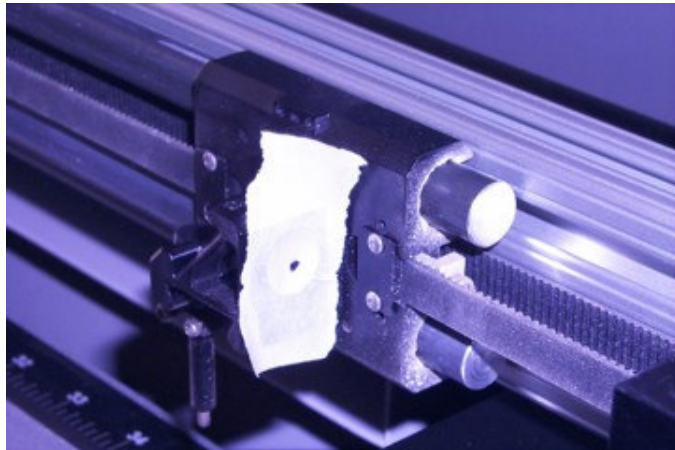
1. Place a piece of masking tape over the hole on the lens assembly as shown above.
2. If you are not in Beam Alignment mode already, put the laser into this mode. See **Appendix A** on how to do this.
3. Use your hands to move the bridge to the back of the machine and move the lens carriage to the far right side, being careful not to slide the lens carriage off of the rails. This will put the mirrors at their closest points to each other.



Move the bridge to the back of the laser and move the lens carriage all the way to the right side of the bridge. This will put all of the mirrors at their closest points.

4. On the touchscreen, set your laser power to around 10 -14, depending on your tube strength. A higher wattage tube will require less power to mark the masking tape, whereas a lower wattage tube might require more power.
5. Fire the beam. Look at the masking tape and see if you made a mark. If you did not, then raise the power slightly and fire it again. Repeat this until you make a mark on the tape. Remember, you only need a small mark. If you burn through the tape completely, replace the tape with a new piece, lower the power slightly and fire the beam again. Your spot might not be in the center of the circle in the lens carriage. If it is not, don't be concerned with that at this point. We are merely trying to get the beam parallel with the mirrors at this point. Once we finish doing this, we will put the beam into the center of the circle.

*You only need to fire
with just enough power
to mark the tape.
Replace the tape and
burn at a lower power
if you burn through the
tape.*



6. Now move the lens carriage to approximately the center of the bridge and fire the laser beam again.
7. Take note of the location of the second mark on the masking tape. If the second mark is in the exact same spot as the first mark then move on to the next step. If the mark is not in the exact same spot as the first, use **Appendix E** as a guide and adjust the screws on Mirror #3. Once the laser beam is hitting the exact same spot on both marks, move on to the next step.
8. Once you are hitting the same spot at the first and second position, remove the masking tape from the lens assembly and replace it with a new piece of tape.
9. Now move the bridge to the lens carriage to the far right side of the machine once again. Fire the beam to make a mark on the masking tape. Once you mark the tape, move the lens carriage to the far left side of the bridge, raise the laser power (1 – 2 percent should be sufficient) and fire the beam again. Once again check the second mark. If your second mark is in the exact same spot as the first mark, then you are finished with this section of the alignment process. If your second mark is not exactly on the first mark, use **Appendix E** as a guide and adjust the screws on Mirror #3 to move the beam.

The last thing you will do before you move on to the next section is put a fresh piece of masking tape on the lens assembly. Fire the beam with the lens carriage at the far right side of the machine and once again at the far left side of the machine. Check the marks at each position and be absolutely certain that the beam is marking the exact same spot.

Summary

When aligning the beam between mirrors#3 and #4:

- Always start with the bridge at the back of the machine and the lens carriage at the right side of the bridge. Doing this will put all the mirrors at the closest position.
- Once you make a mark from this point, move the lens carriage toward the left hand side of the machine before firing again. Doing this will tell which direction the beam is traveling.
- If you make any adjustments to mirror #3, then move the mirrors back to their closest points, put on a new piece of tape and fire the beam again. Once the beam fires on the same spot at the closest and the farthest position and you do not have to make any adjustments to mirror #3, then you will know that the beam is firing straight between the two mirrors.

Appendix A

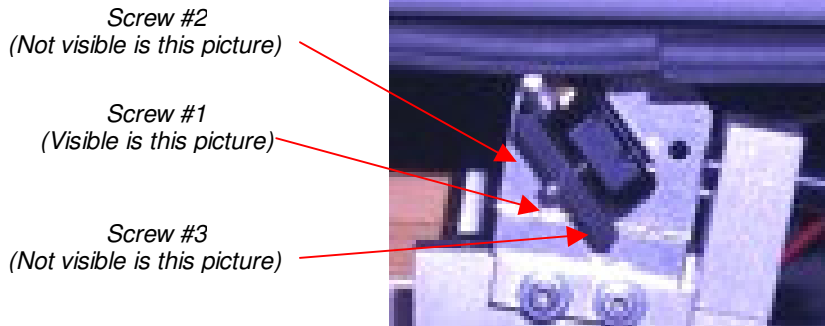
Putting the laser into Beam Alignment mode

1. On the touch screen press "Service".
2. On the touch screen press "Beam Alignment"
3. Set the power to 10 -13 and leave the time set at 1.
4. When you are ready to fire, press the "Running Man" icon on the touch screen

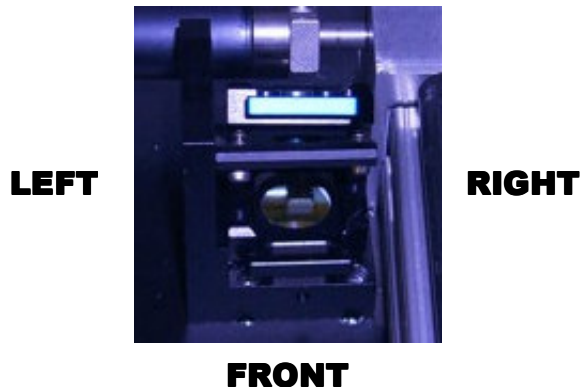
Note: The laser beam will not fire if the lid is raised or the front door is open.

Appendix B

Adjusting the Combiner Mirror



REAR



Screw #1

- Tightening this adjustment screw will move the red diode light to the **right**.
- Loosening this adjustment screw will move the red diode light to the **left**.

Screw #2

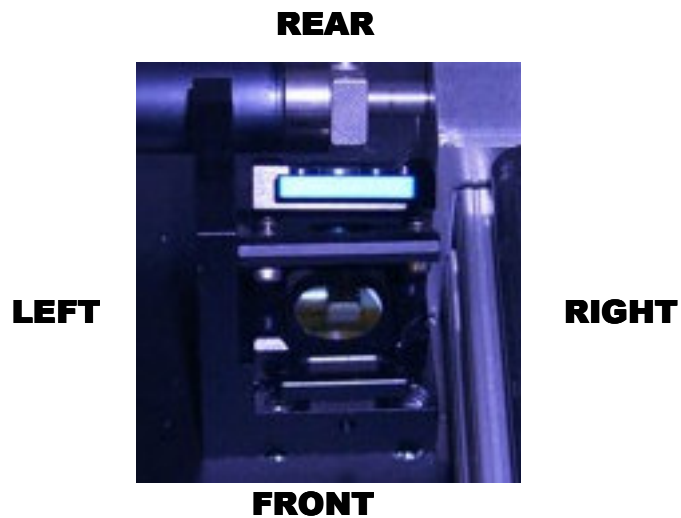
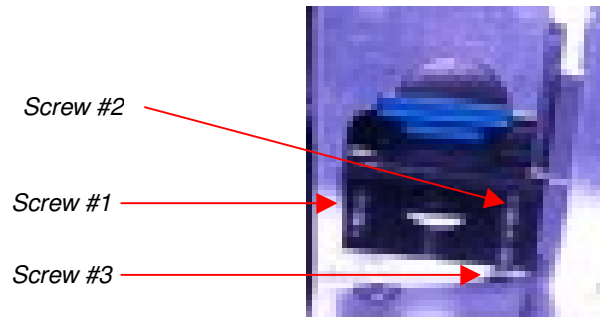
- Tightening this adjustment screw will move the red diode light to the **front and left**.
- Loosening this adjustment screw will move the red diode light to the **rear and right**.

Screw #3

- Tightening this adjustment screw will move the red diode light to the **rear and left**.
- Loosening this adjustment screw will move the red diode light to the **front and right**.

Appendix C

Adjusting Mirror #1 To Align To Mirror #2



Screw #1

- Tightening this adjustment screw will move the beam toward the **front**.
- Loosening this adjustment screw will move the beam toward the **rear**.

Screw #2

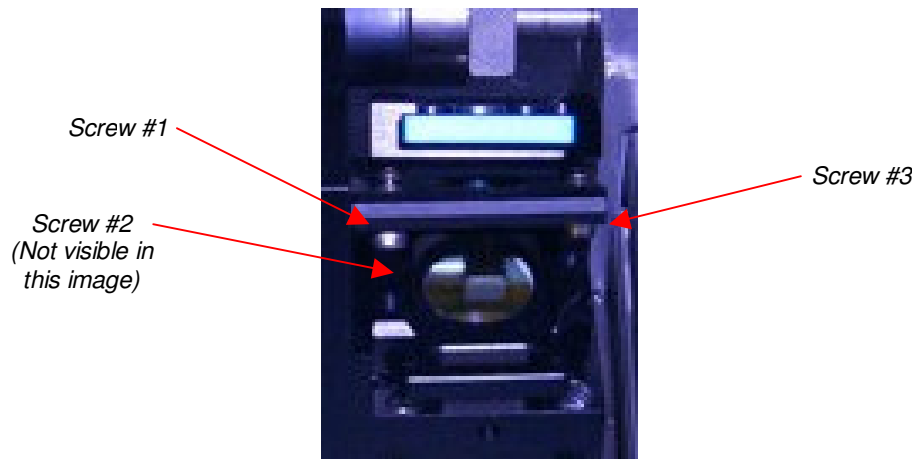
- Tightening this adjustment screw will move the beam toward the **right**
- Loosening this adjustment screw will move the beam toward the **left**.

Screw #3

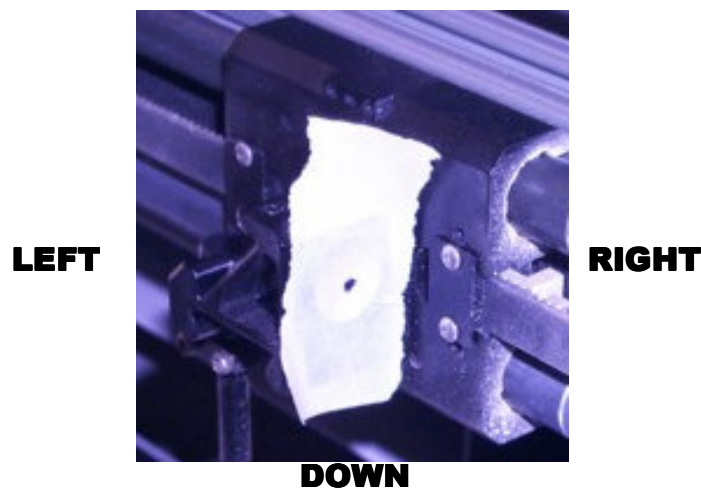
- Tightening this adjustment screw will move the beam toward the **rear and left**
- Loosening this adjustment screw will move the beam toward the **front and right**.

Appendix D

Adjusting Mirror #2 To Align To Mirror #3



UP



Screw #1

- Tightening this adjustment screw will move the beam **down and right**.
- Loosening this adjustment screw will move the beam **up and left**.

Screw #2

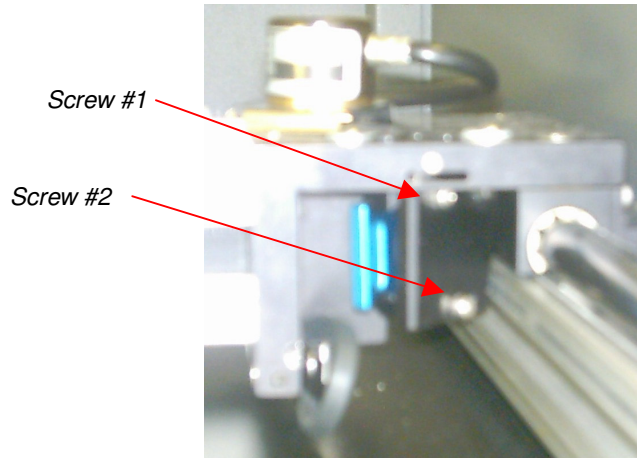
- Tightening this adjustment screw will move the beam **left**.
- Loosening this adjustment screw will move the beam **right**.

Screw #3

- Tightening this adjustment screw will move the beam **right and up**.
- Loosening this adjustment screw will move the beam **left and down**.

Appendix E

Adjusting Mirror #3 To Align To Mirror #4



UP

LEFT

RIGHT

DOWN

Screw #1

- Tightening this adjustment screw will move the beam **left**.
- Loosening this adjustment screw will move the beam **right**.

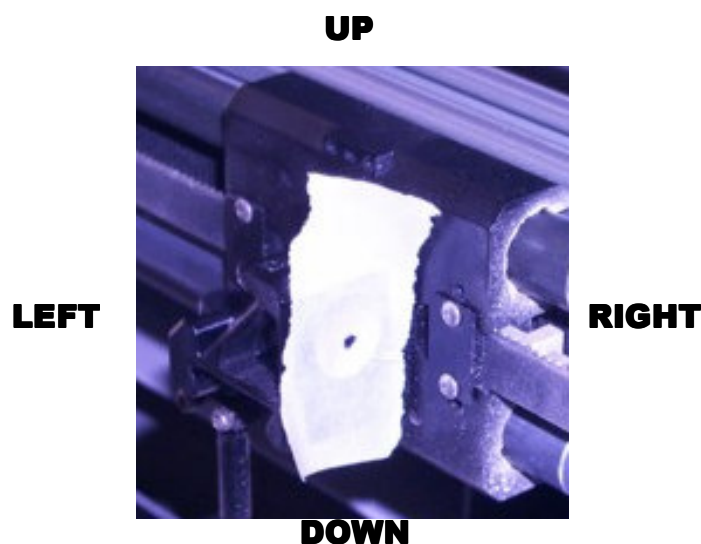
Screw #2

- Tightening this adjustment screw will move the beam **down**.
- Loosening this adjustment screw will move the beam **up**.

The remaining screw on this mount is inaccessible for beam alignment.

Appendix F

Adjusting Mirror #1 To Center In Mirror #4



Screw #1

- Tightening this adjustment screw will move the beam **up**.
- Loosening this adjustment screw will move the beam **down**.

Screw #2

- Tightening this adjustment screw will move the beam **right**.
- Loosening this adjustment screw will move the beam **left**.

Screw #3

- Tightening this adjustment screw will move the beam **down and left**.
- Loosening this adjustment screw will move the beam **up and right**.