



Alignment for BOSSLASER machines

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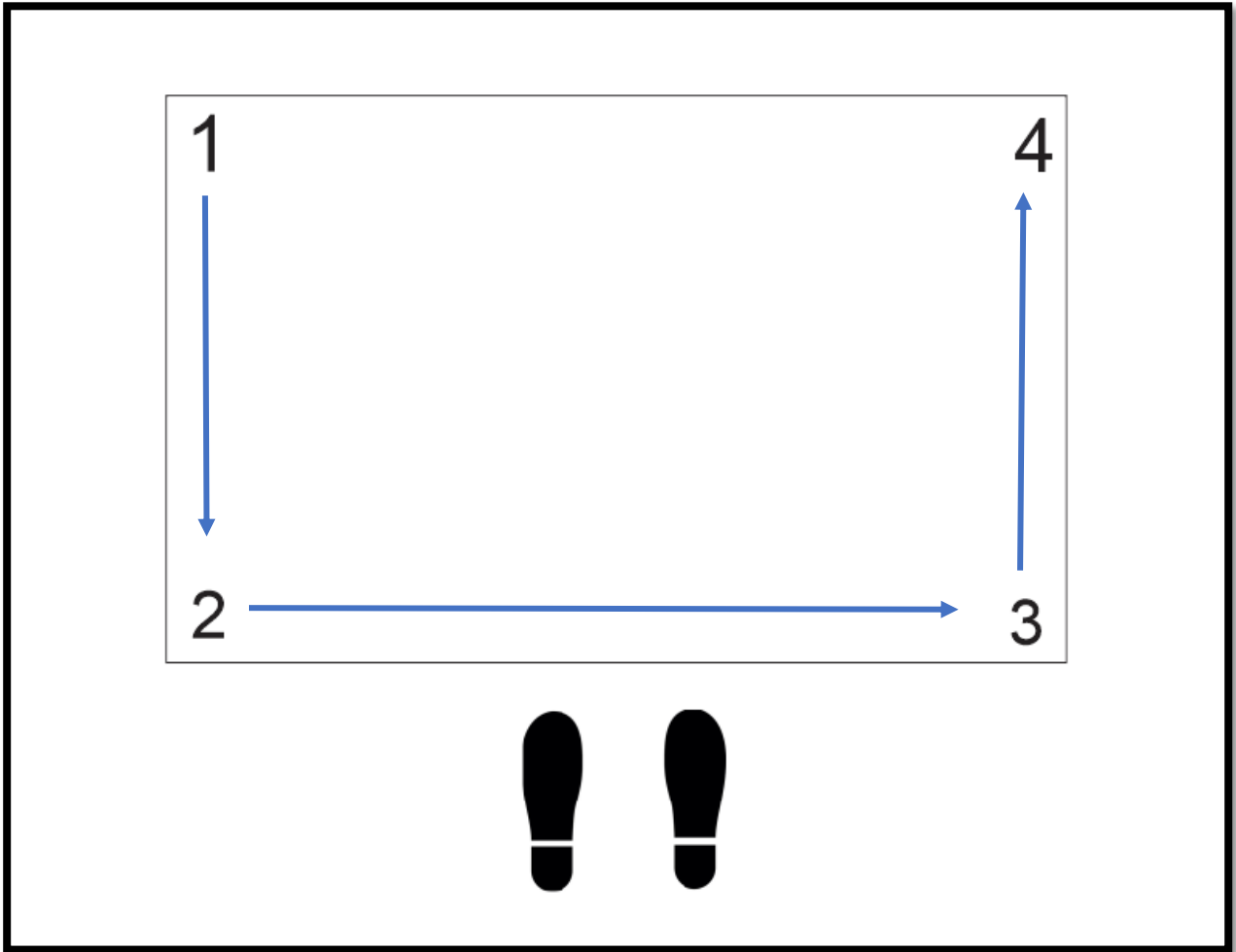
Video Links on Alignment:

<https://www.youtube.com/watch?v=wY5D27TQwZI>

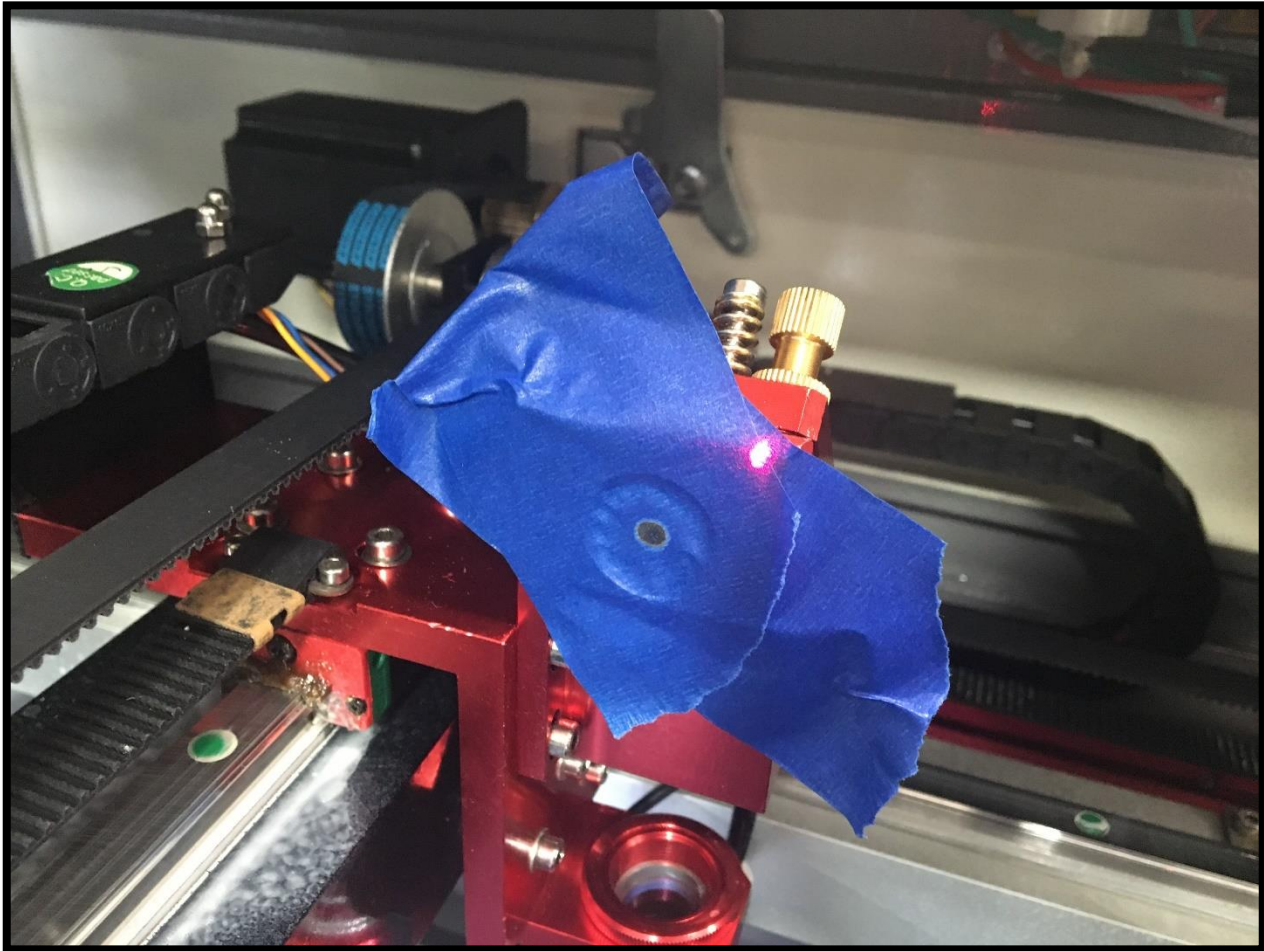
<https://www.youtube.com/watch?v=wdddRNDg3tY>

The first thing that you would do if you think that your alignment is off would be for you to do a four-corner test. To do this test you would,

1. Double up your painter's tape
2. Apply it to the laser head mirror hole making sure you have a nice crease of where the hole is
3. Lower the power for the laser to 25%
4. Move the laser head to the very back left of the machine and hit pulse
5. Move the laser head to the front left and hit pulse
6. Move the laser head to the front right and hit pulse
7. Move the laser head to the back right and hit pulse



After doing the four-corner test you will leave the tape on and look at the results, if every pulse in all four corners lines up one on top of the other, your alignment is good up until that point and it may be an issue with your alignment on the laser head down, aka your vertical alignment. If you feel that your four-corner alignment does not have a single dot size, we will start from page 13. After you have done all the remaining steps you will be able to then come back through pages 3 through 12 checking your four-corner test and your vertical alignment.

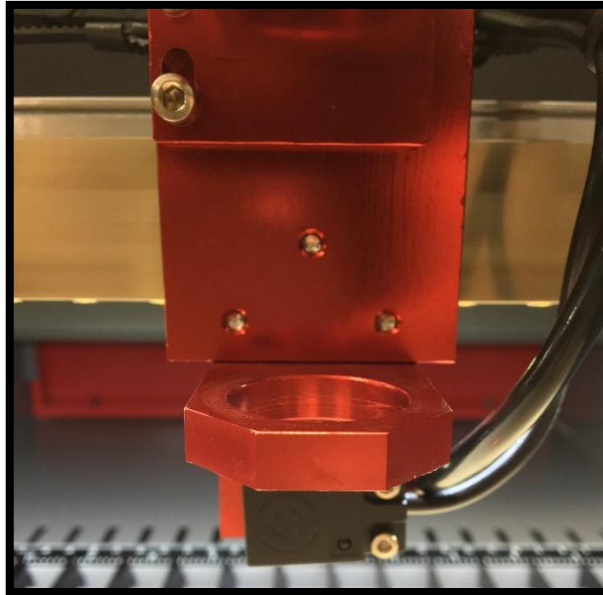


How your four-corner test results should look

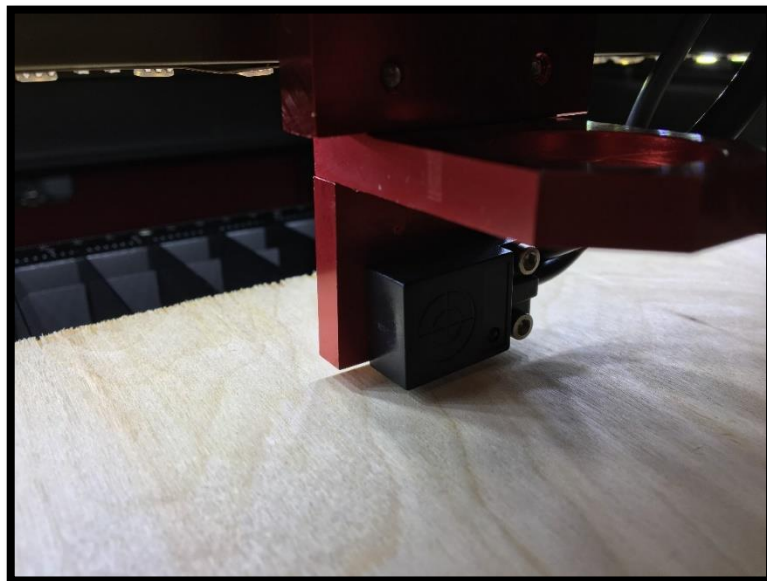
As you can see in the above photo the pulse onto the tape is centered left to right but just a little bit high, this is how we want it to be.

For a proper vertical alignment test you are going to want to:

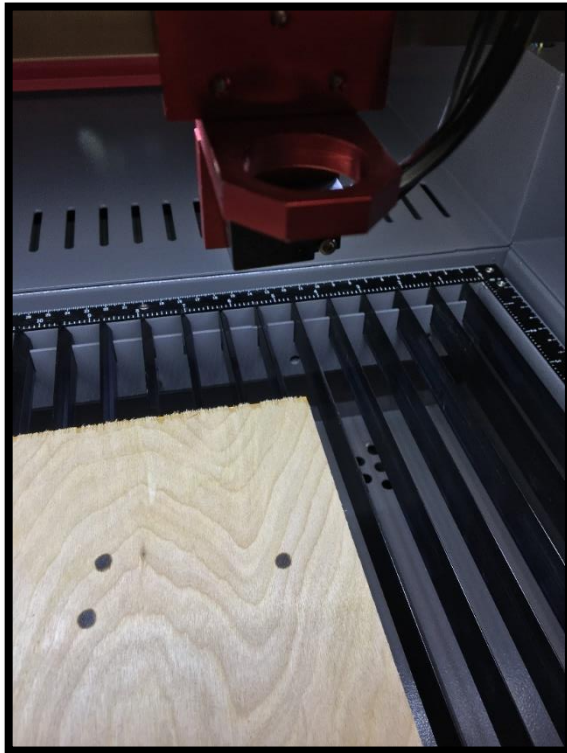
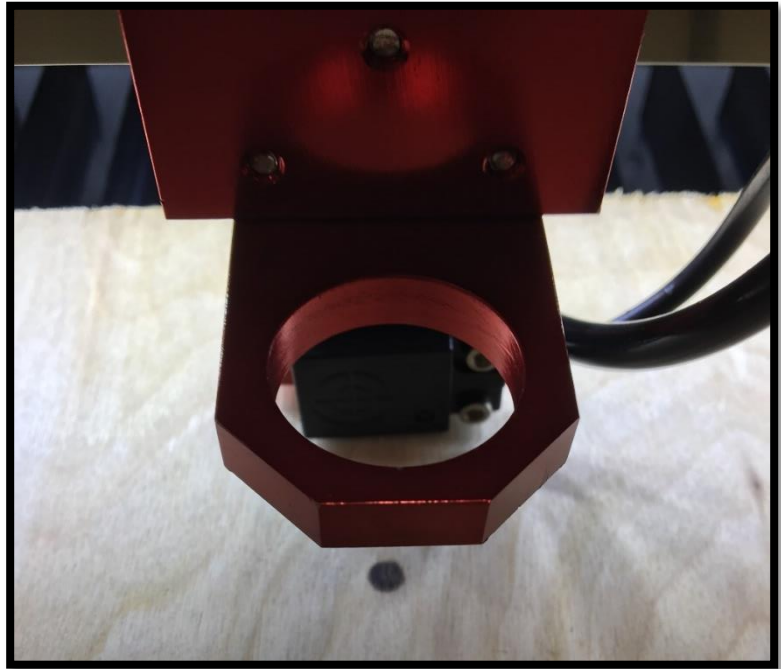
1. Remove the lens housing and the air hose from the laser head bracket.



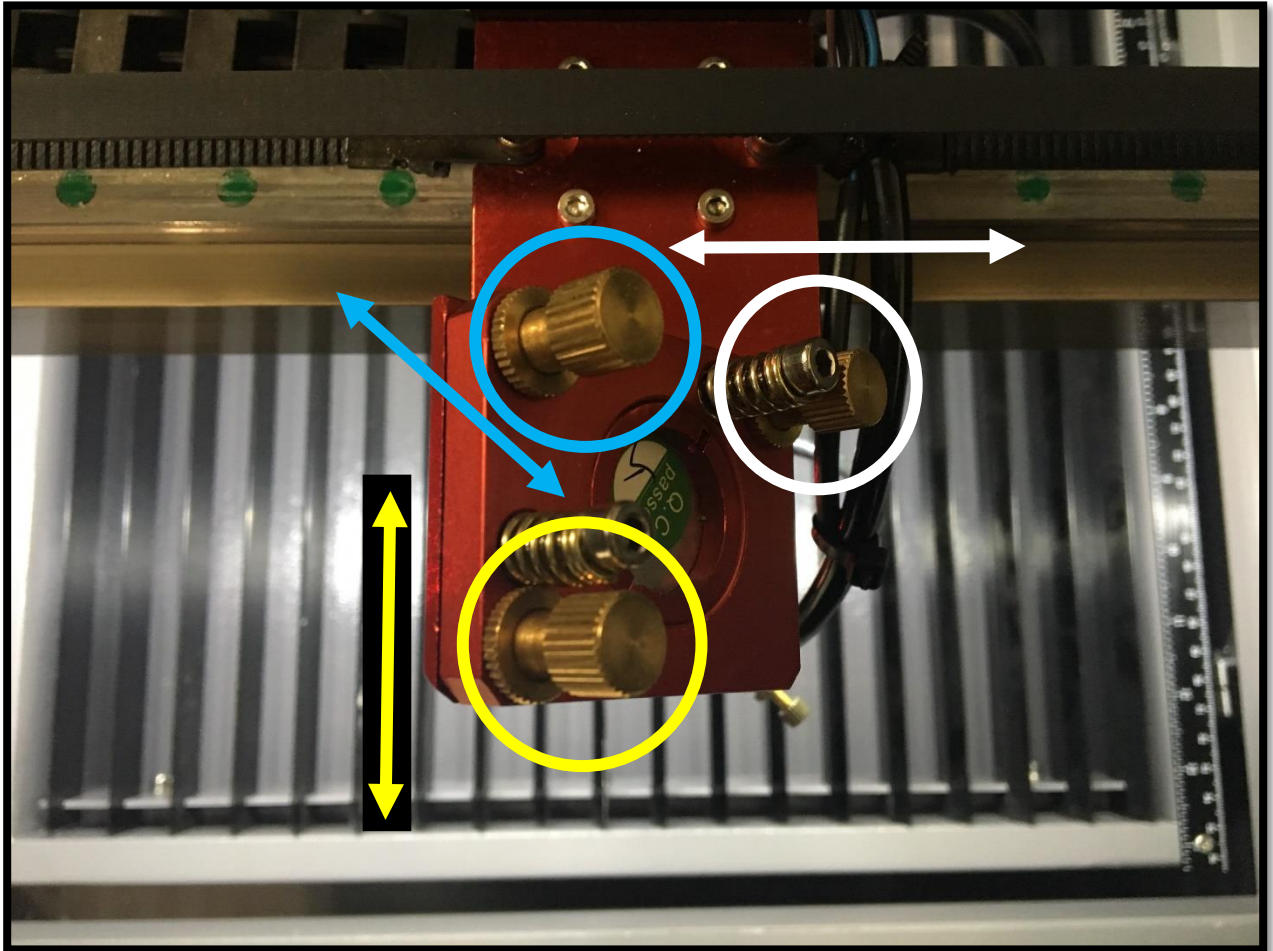
2. With the lens housing removed from the bracket you will bring the work table with a piece of material all the way up as high as it will go to the laser head assembly without hitting. We recommend using wood for this step.



3. With the table and material as close to the laser head assembly as it can get you will pulse into the wood at 95% power, you're looking for a dark, defined pulse mark.
4. With the pulse mark burned into the wood we will use this as our reference point and now move the table down. It should be about 12" away from the laser head assembly and then pulse again, being sure not to move the material left to right, front to back whatsoever.



5. If the two pulses line up directly and look like one solid mark, then this means that the vertical alignment is good to go, and you do not need to make any other adjustments.
6. If the alignment is off a little bit you will adjust the laser head three gold adjustment knobs (Shown below), then repeat the steps on 3 and 4 until it looks like a solid and uniform mark.



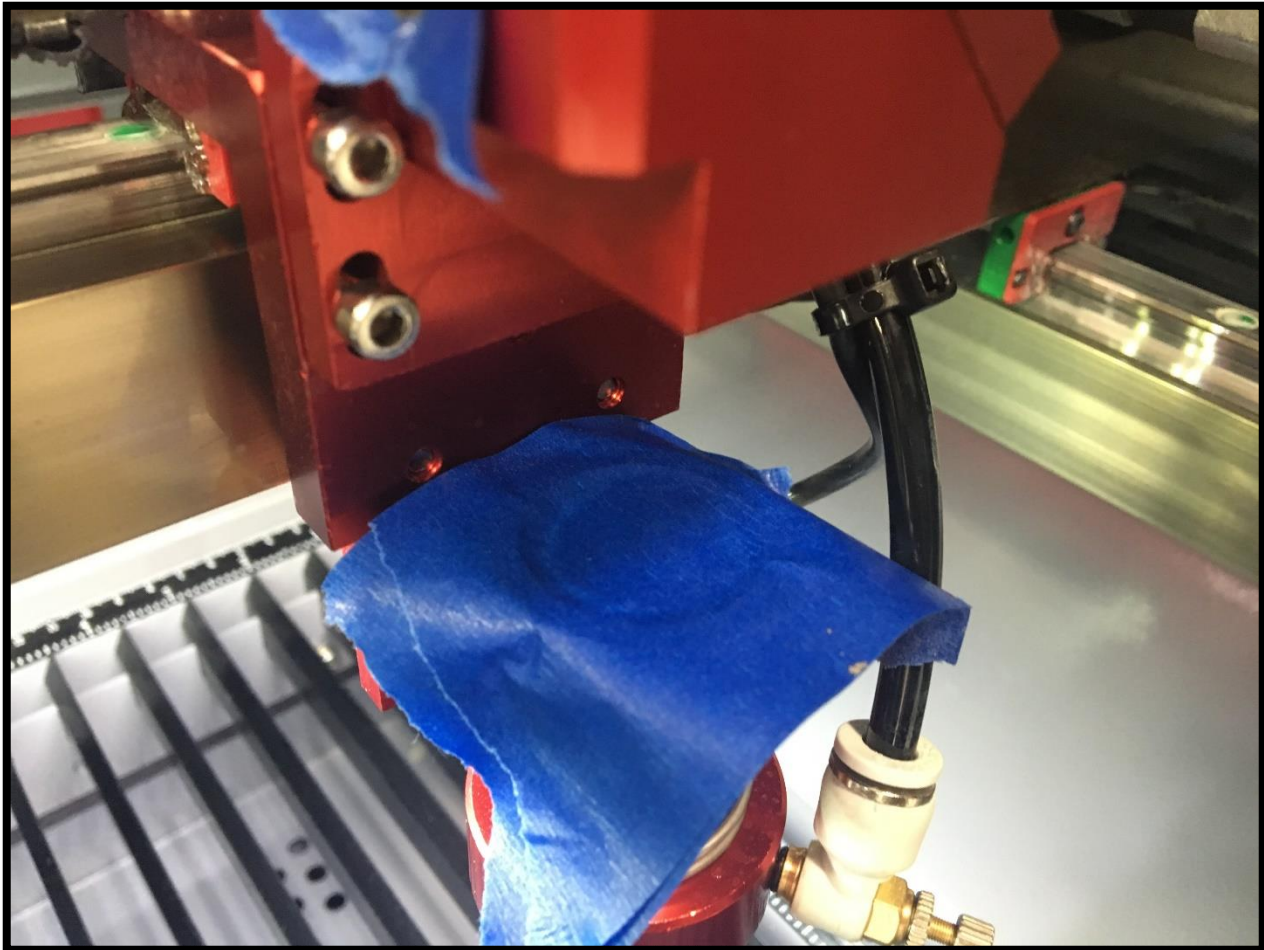
How the adjustment knobs on the top of the laser head work

The adjustment knobs on the top of the laser head function the same way as the other mirrors the only difference is that the laser head goes in different directions. On the laser head the bottom left knob (yellow) goes forward and backward. Counter clockwise being forward and clockwise being backwards.

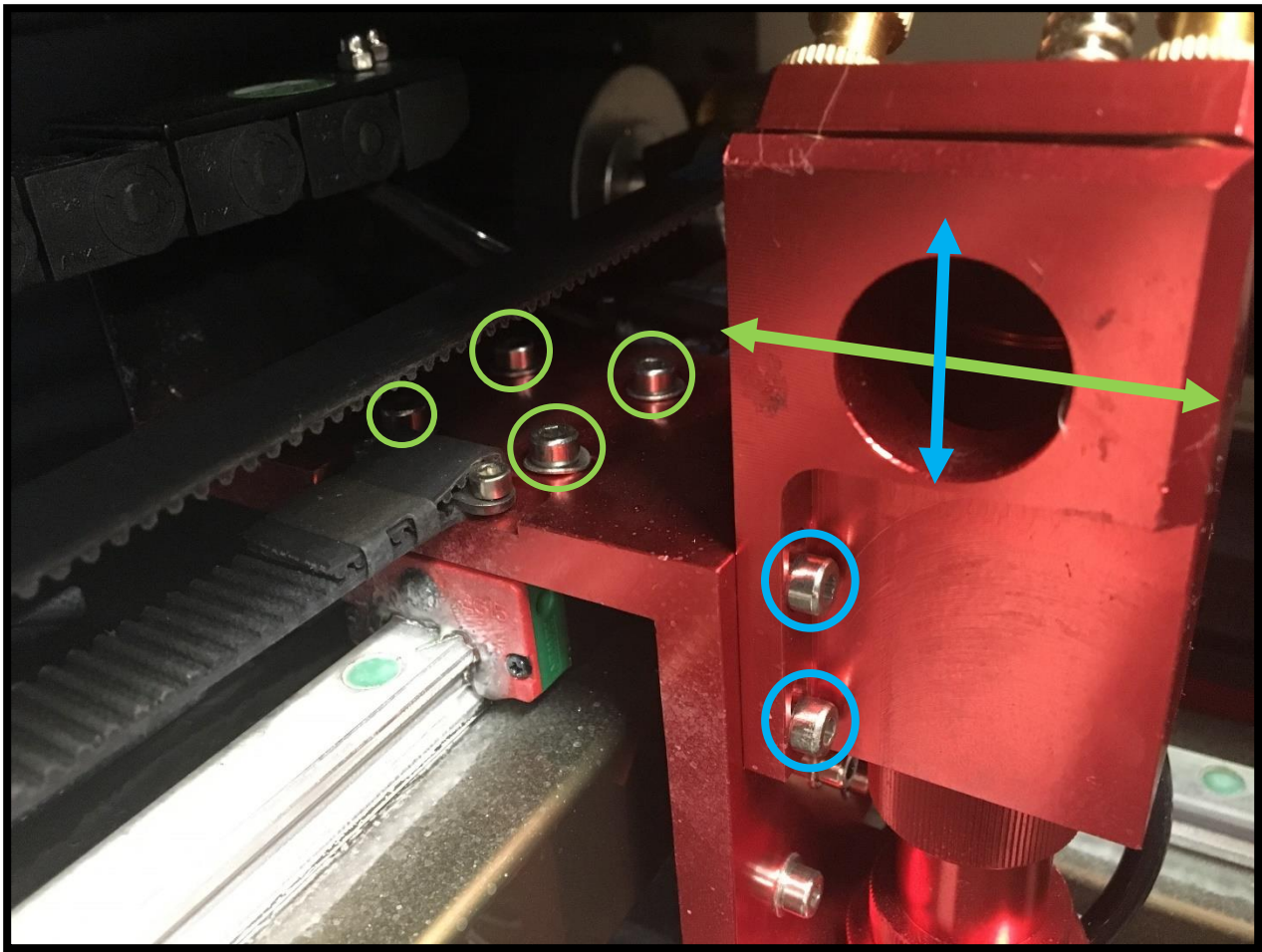
The top left knob (blue) goes diagonal from top left to bottom right. Counter clockwise turns making it go down and to the right, clockwise going up and to the left.

After checking the vertical alignment utilizing the piece of wood pulse test we will have to check and ensure that the pulse is hitting the center of the focusing lens by:

1. You will reinstall the lens assembly and air hose.
2. You will then place tape on the bracket and locking washer for the lens assembly.
3. After you have done this you will pulse into the tape ensure that the mark is directly centered on the bracket.



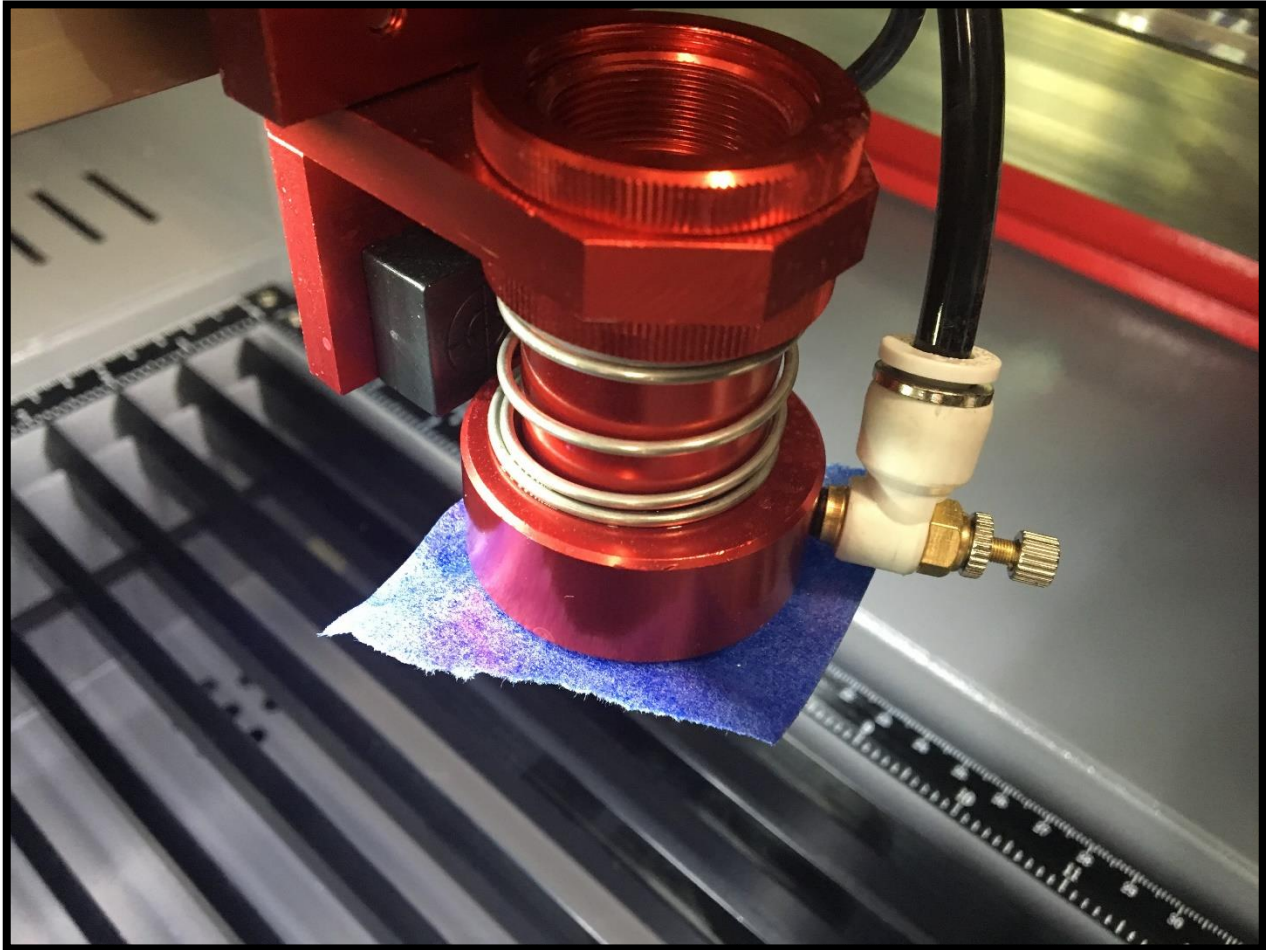
If the pulse onto the tape with it on the bracket is not exactly centered you will need to adjust the laser head **VERY CAREFULLY**, by moving it right to left or up and down.



Adjustments on the laser head

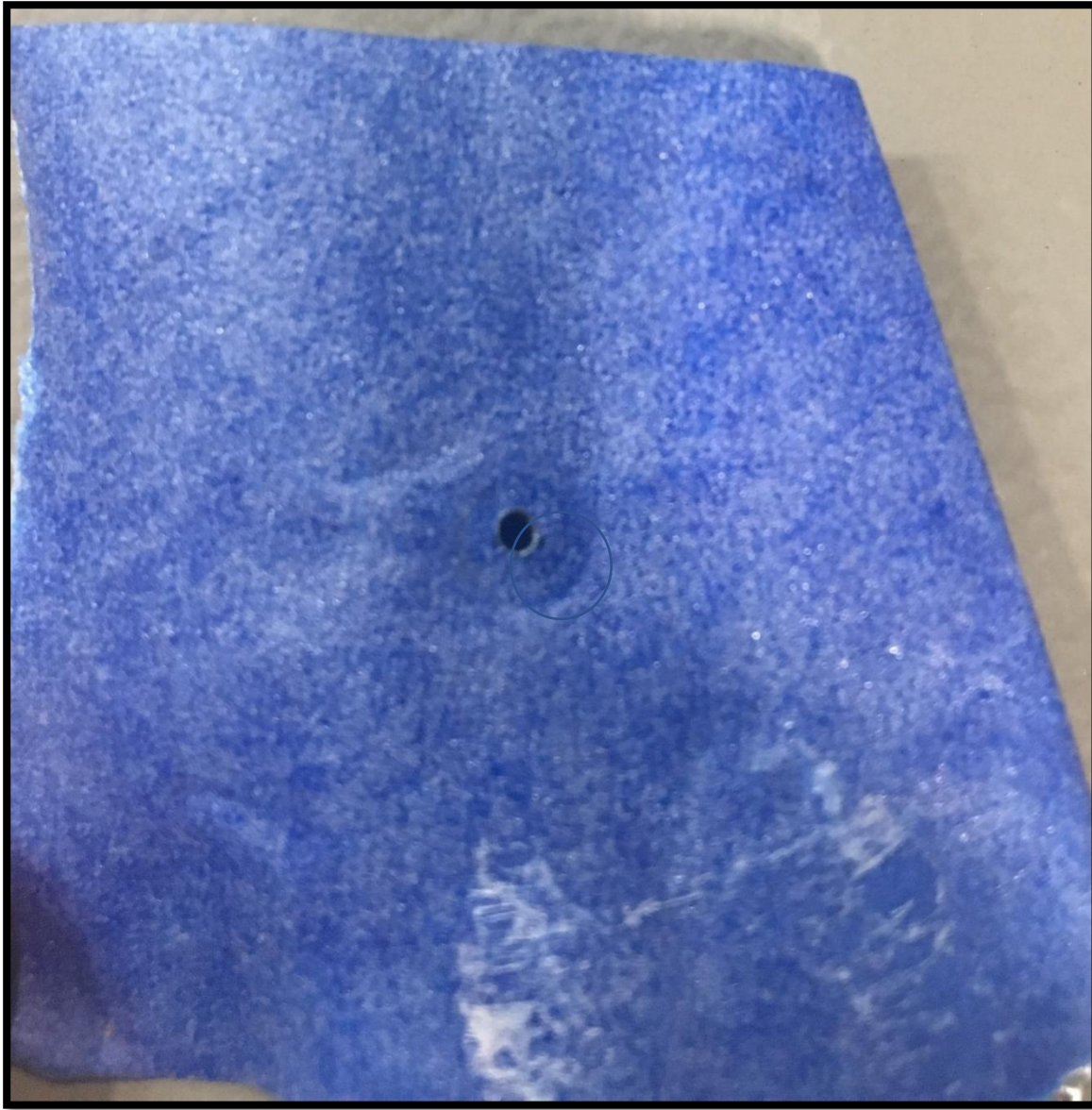
When adjusting the laser head, on the screws circled in green, ensure that it does not go too far to the back of the machine, as it will potentially rub against the gantry rail during full X-axis travel.

After you have made sure that the pulse is dead center of the tape on the bracket, what you are going to want to do is put tape underneath of the nozzle pushing up hard to get the indent of the tape to the bottom of the nozzle.



Tape underneath the laser nozzle

After you have the tape stuck up underneath the nozzle you are going to hit the pulse button on the laser again and what you are making sure of is that the beam coming out of the nozzle is not clipping on the sides of the nozzle on its way out.



Pulse coming out of the nozzle

After you have verified that the pulse coming out of the laser nozzle is not clipping the sides at all the next step would be to do an acrylic test. What this test is going to show is that the beam coming out of the nozzle is going into the material straight up and down without an angle to it. You're going to be looking at the line that the pulse makes through the acrylic. If you pulse down into the acrylic and feel that it is not going straight down, then you would go back and make adjustments on the gold knobs on the top very slightly until the beam is coming exactly straight and where you want it to be.



Pulse into the acrylic from the front



Pulse into the acrylic from the side

As you can see in the picture below, the laser head was not perfectly aligned and the pulse was going into the acrylic at an angle. This is an example of what we don't want to happen.



Alignment process starting at the mirror one and the laser tube

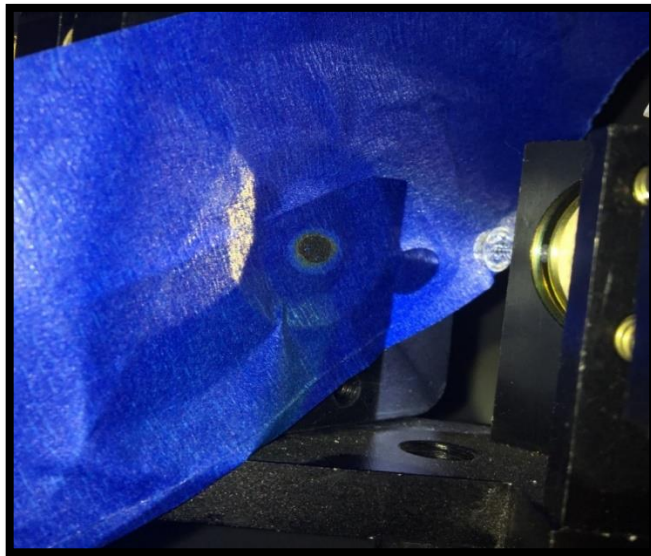
If you have gone through and done the four-corner test and the vertical alignment and feel that the alignment on your machine is still off, the first step that you would take to make your adjustments and see exactly where you are hitting would be to put tape on mirror one and pulse your laser to see where exactly you are hitting on the first mirror.

Your mirror one assembly is going to be right after the laser tube and is at the left-hand side of the machine, to get to this assembly, you are going to have to remove the panel that is on the outside of the mirror, it is held together with four screws.

1. Take the side panel off by removing the four screws
2. Double up your painter's tape
3. Apply the painters tape to mirror one, making a nice outline where the mirror would be
4. Lower power at control panel from 95% down to 25%
5. Hit the pulse button to get a dot burned onto the tape.



The mirror assembly located through the left side laser port

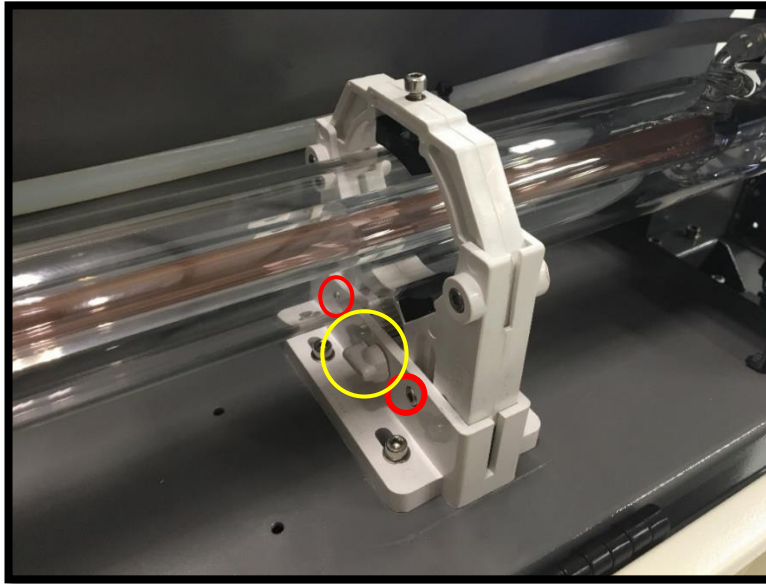


View of burned dot after hitting pulse with tape on mirror one

The picture above is how your pulse should look. It does not need to be perfectly centered but it should not be anywhere near the edges of the bracket at all.

In event that the pulse that has been burned onto the tape for mirror one is not near the middle and is hitting the edges of the bracket you would then have to adjust the glass tube. If the pulse on mirror one is too high or low you would,

1. Loosen the Allen screws on the tube bracket, (circled in red)
2. Turn the knob until the tube goes up or down, depending on your situation (circled in yellow)
3. Pulse onto the tape on mirror one, to verify that adjustments are good
4. Tighten down the Allen keys making sure the tube is exactly where you want it to be



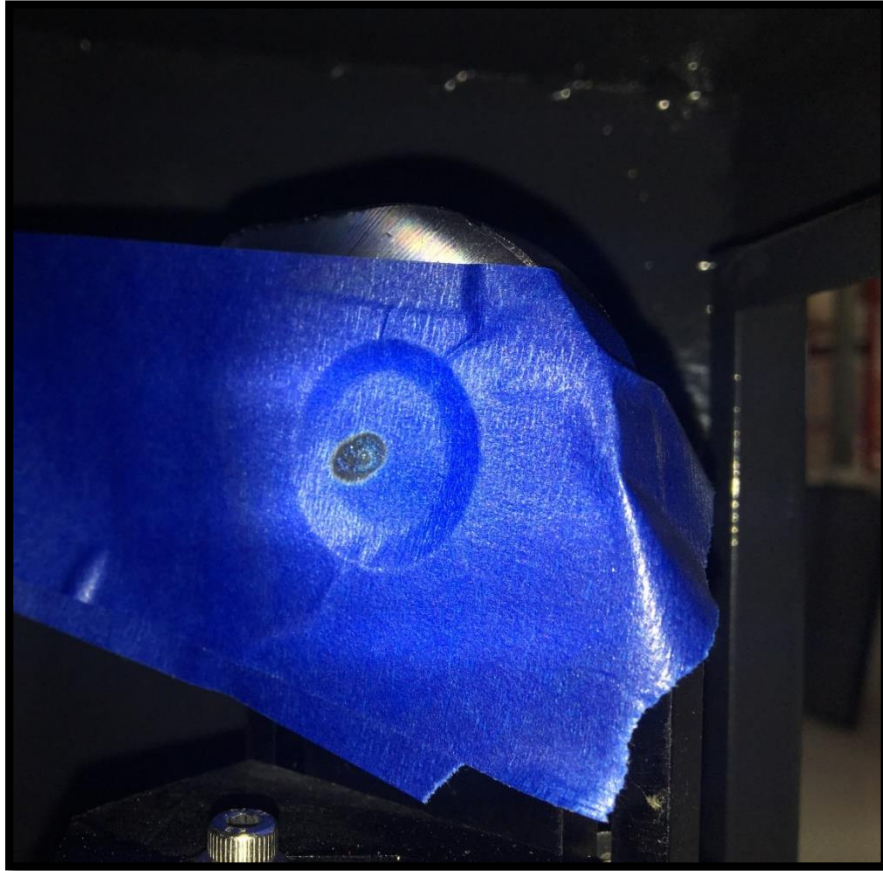
View of the brackets that hold the glass tube down

The next step in the alignment process is to align from mirror one to two, to do this you would,

1. Pull the tape off mirror one
2. Double up the painters tape
3. Stick the tape onto mirror two making sure you get a nice indent of where the mirror is
4. Move the gantry to the back, making mirror two closest to mirror one
5. Pulse onto the tape
6. Move the gantry furthest away from mirror one
7. Pulse onto the tape
8. Make sure that the two pulses line up one on top of the other

Sometimes you may not only have to move the laser tube up or down, you also may have to move the tube from right to left to line up on mirror one better. This would be a matter of loosening up the screws holding down the brackets and sliding the tube and tightening it back down, once satisfied with the results.

If the pulses do not line up one on top of the other you are going to have to adjust the gold knobs on the back of mirror one. Doing this is going to make sure that we have a solid beam profile throughout, no matter where the gantry is located. For help with how these adjustments work, see page 16.

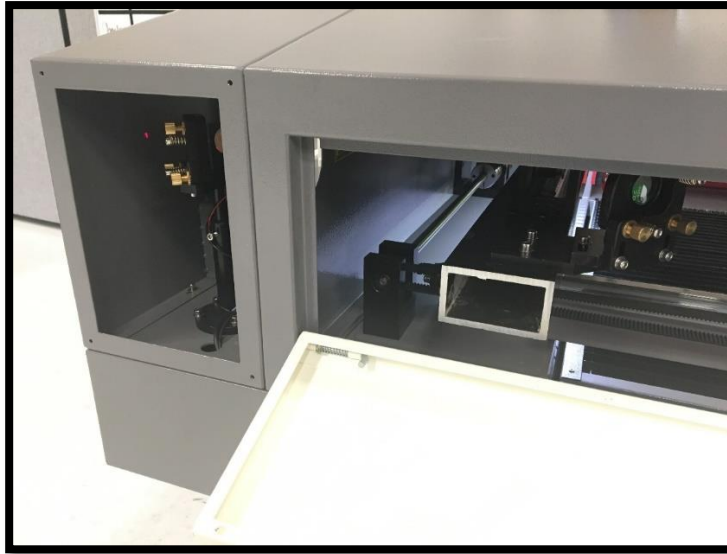


Results of pulsing onto mirror two

In our case the first pulse was centered but a little bit to the left. We are going to want to make the second pulse match the first by making it go up and to the right. To get these two pulses to line up one on top of the other you will need to turn the gold knobs on the back of mirror one. These adjustments will be made with mirror two being furthest away from mirror one.

1. You would loosen the lock washers from the gold knobs on the bracket
2. Turn the top right knob counter clockwise, making the pulse go up, and then pulsing
3. Turn the bottom left knob clockwise, making the pulse go to the right, and then pulsing
4. OR you could move the bottom right knob (diagonal) counter clockwise to make it go up and to the right at the same time.
5. Pulse the laser to assure that one pulse is on top of the other

6. Tighten up the gold lock washers again making sure not to move the adjustment knobs
These adjustments were made in our case and may not necessarily reflect the adjustments that you will need to make



Picture above shows how it should look with mirror two closest to mirror one

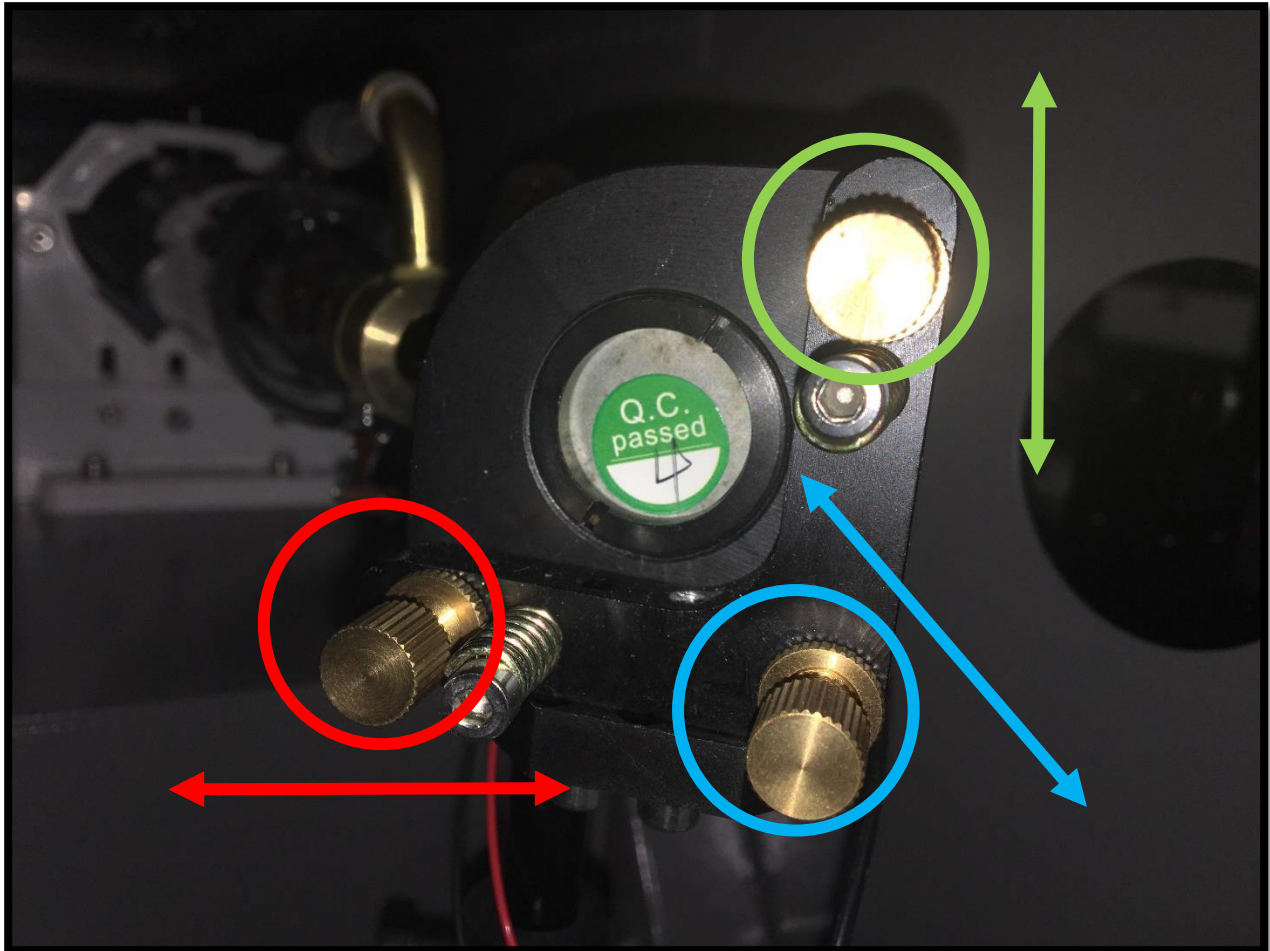


Picture above shows how it should look with mirror two furthest away from mirror one



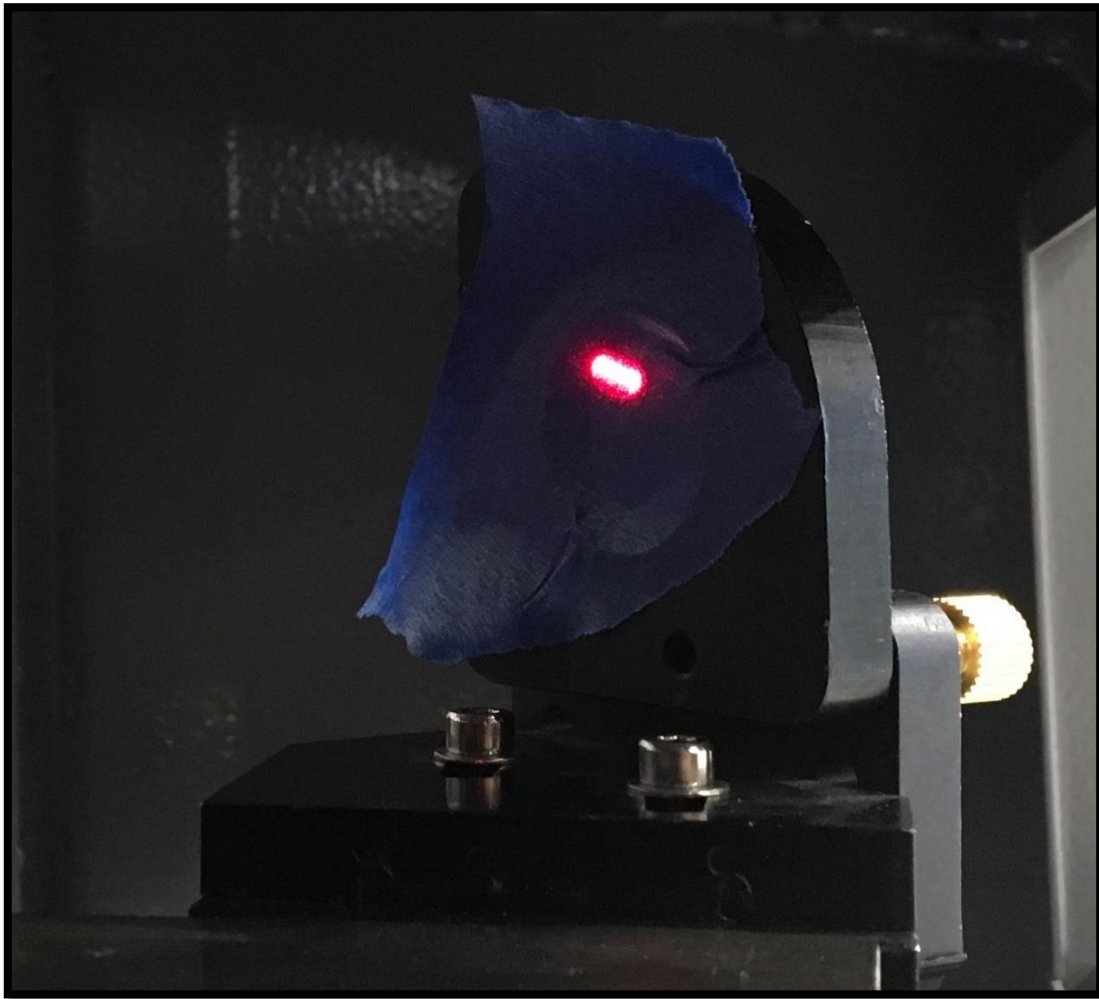
Results of making the adjustments on mirror one, solid beam profile

After you have made the adjustments to the back of mirror one, your dot size should look like the picture above. The two pulses line up exactly on top of each other, which means wherever the gantry is located, the pulse will be the same throughout. When you have the beams lined up one on top of the other it does not need to be centered but it does need to be pretty close to the center. This is because pulsing at 25% power, the beam will be smaller for example, a pulse at 25% power will yield a dot size of maybe 5mm where as a pulse at 95% power will make the dot larger say about 10mm in size. You're going to want to make sure that your close to the center because it is possible that a pulse at 95% power will cause clipping on the edge of the mirror brackets.



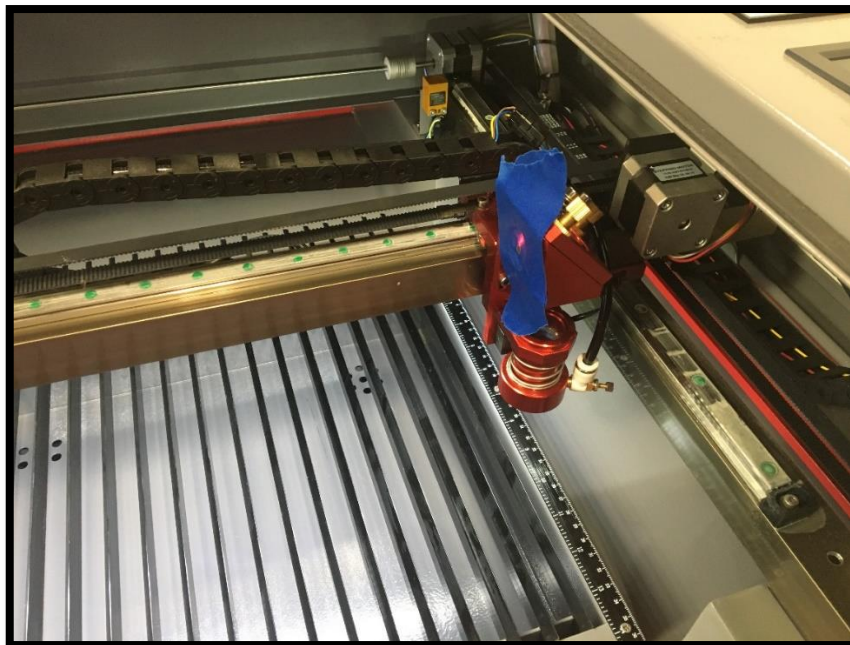
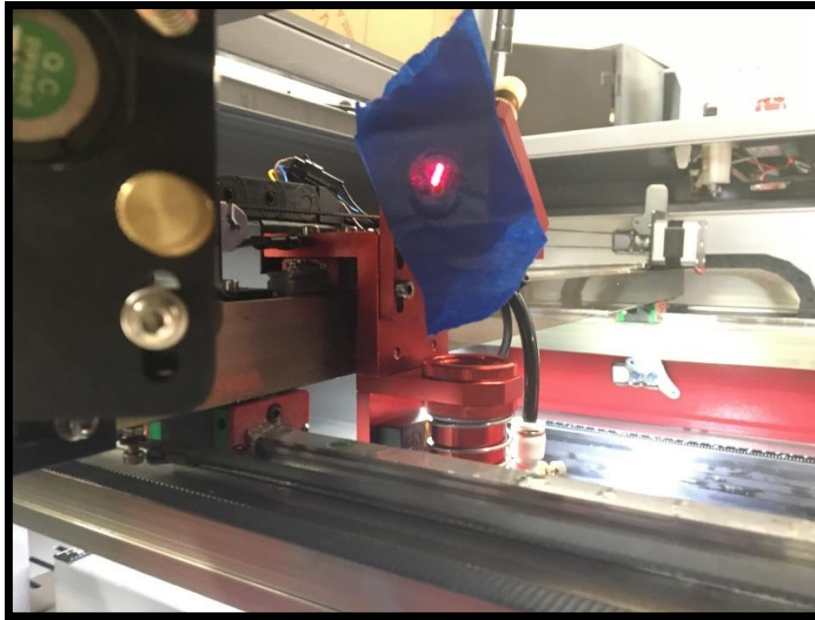
Adjustment knobs for mirror one and mirror two

As you can see in the above photo the top right knob (green) is your up and down adjustments with turning counter clockwise making it go down and clockwise go up. The bottom right knob (blue) is your diagonal adjustment with counter clockwise making it go up and to the left and clockwise down and to the right. The bottom left knob (red) is your left to right adjustment, counter clockwise making it go right, and clockwise making it go left. These adjustments would be the same for the back of mirror two, and will only differ on the laser head itself.

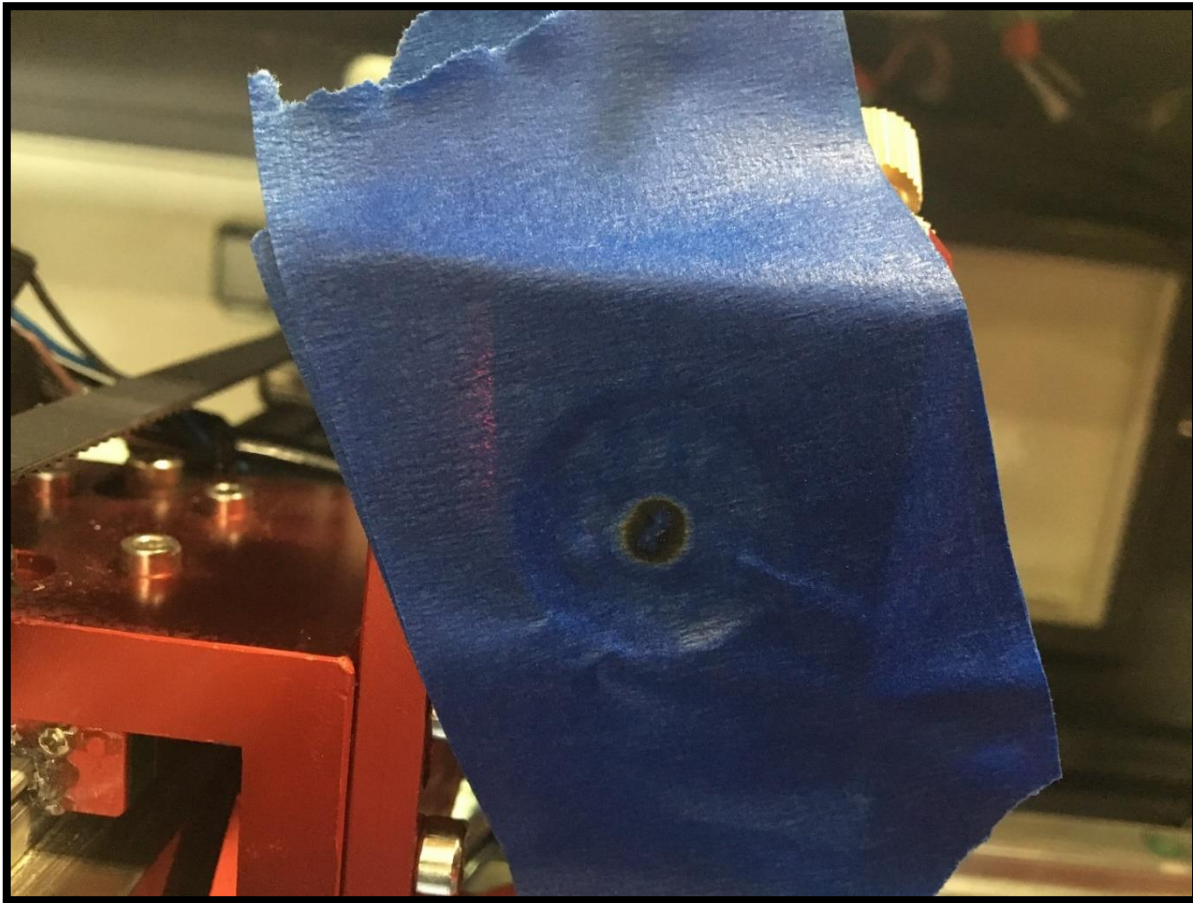


Red dot pointer on the gen3 machines and up

As you can see in the picture the laser has been equipped with a laser light. The laser light is only available on gen 3 and newer machines. Some older model lasers do not have these laser pointers at all. The key thing to remember with having a laser pointer is that if the laser pointer is off alignment it does not necessarily mean that the actual lasers pulse is out of alignment. The red dot pointer is a tool for you to use to make the alignment process easier. For example, if you know that you need your pulse to go to the right by 10mm, if you move the knobs and see that the red dot moved 10mm, the actual lasers pulse will reflect that change as well. Even if you do not have a red dot pointer to use you can still easily align your machine, the only difference being that you must make adjustments and pulse a lot more than what you would with having one.



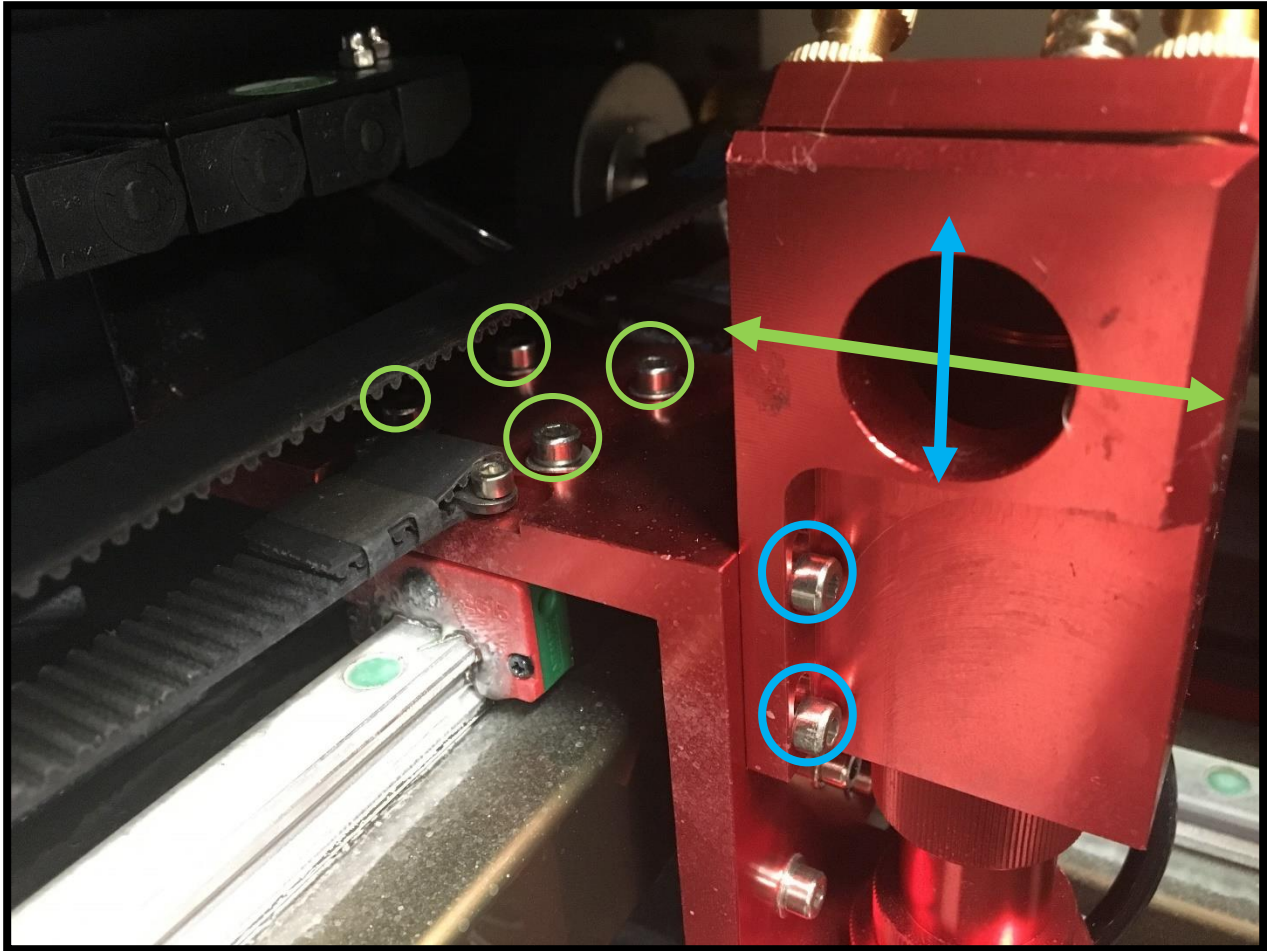
After you pulse with the laser head closest and furthest your looking for a solid beam profile with the beam hitting dead center but a little high by about 1mm on the laser head. If you do not have a single dot size you would use the same steps used for aligning mirror one to two, but this time you would be moving the adjustment knobs on the back of mirror two.



Single dot size going into the laser head

If you have a single dot size that is centered perfectly left to right but not up or down what you are going to do is loosen the two Allen screws and raise or lower the head depending on where the beam needs to go.

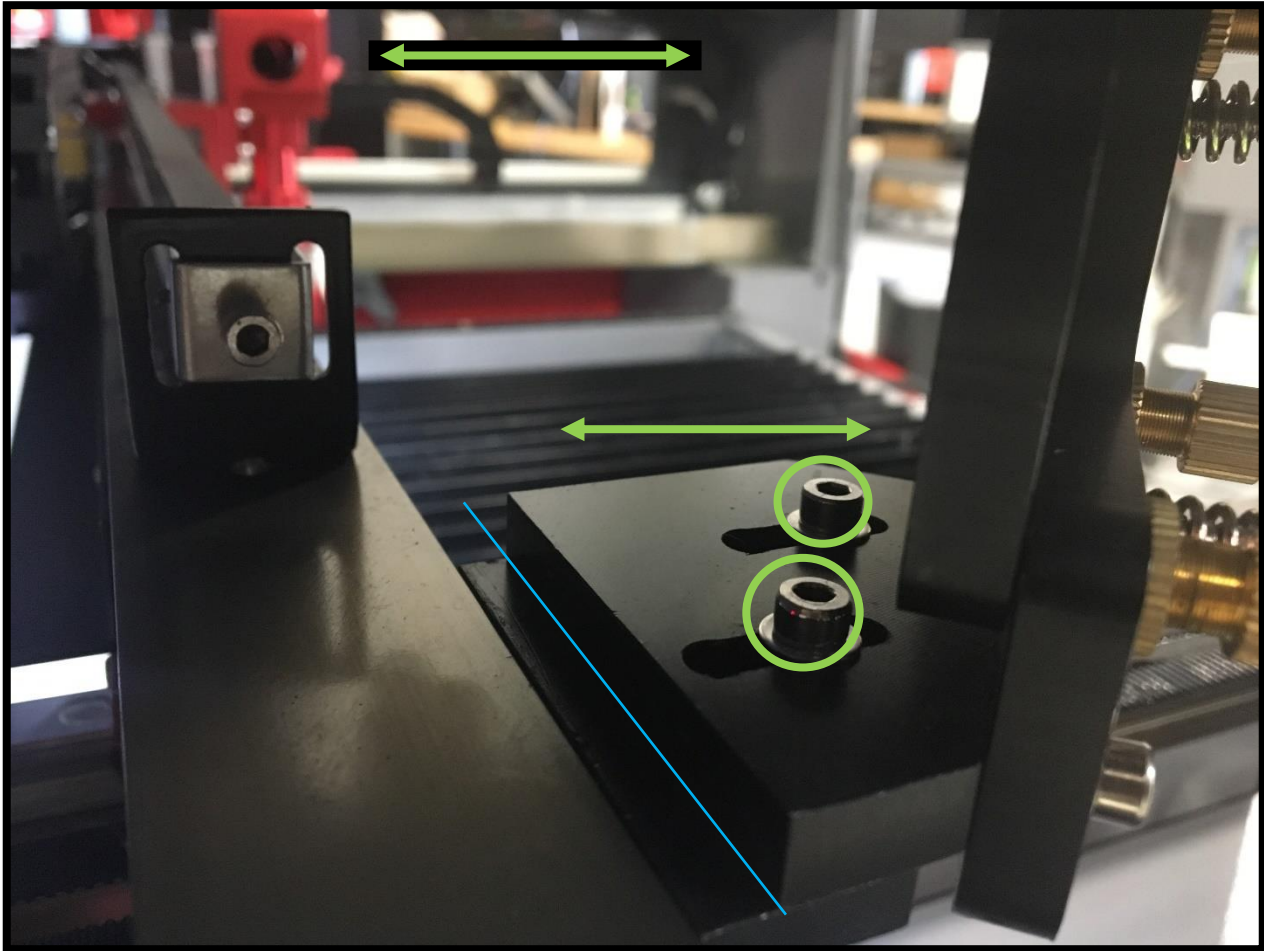
If the beam is centered up and down and only needs to go either right or left you would loosen the four Allen keys on the top of the bracket where it attaches to the gantry and pull it to the left or right depending on the pulse. But remember, as mentioned earlier the beam needs to be a little high at about 1mm or so.



Adjustments on the laser head

In event that your machine does not give you enough adjustment with the four Allen keys on the top of the laser head gantry bracket (green) you would then have to make the adjustment on the bracket of mirror two by loosening the two Allen screws and slide it either to the left or to the right. It is very crucial that you do not lose your 45° angle. To ensure that you can always get back to original position in case something goes wrong, we recommend scoring where the bracket sits so that you can see where it was originally positioned.

Moving mirror two is a last resort and we do not recommend it unless absolutely necessary

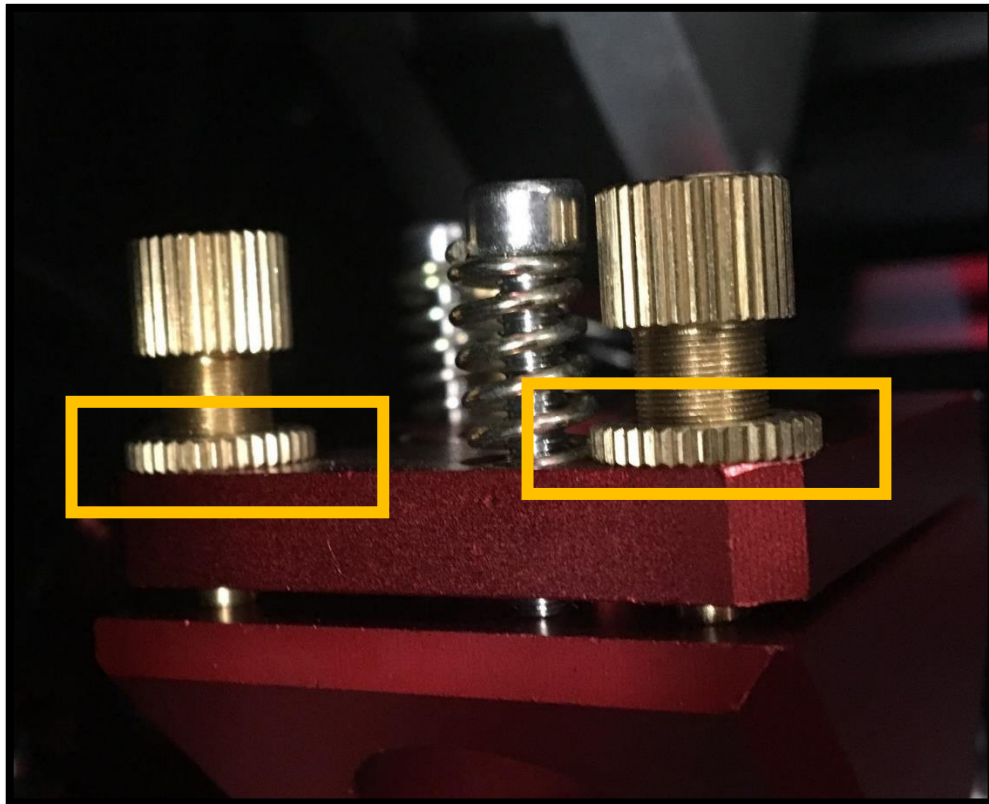


Bracket adjustments on mirror two

Like mentioned on the previous page, we do not recommend making any adjustments to this bracket whatsoever but in event that you must there are a few steps that can be taken to assure that we can go back to original position. The line colored in light blue would be a good place for you to take something sharp and drag across the metal to etch a groove into the metal so that you can see exactly where the original position was. When adjusting on this bracket try to be sure to keep the original 45-degree angle and only slide it either to the left or right by loosening the two screws circled in green.

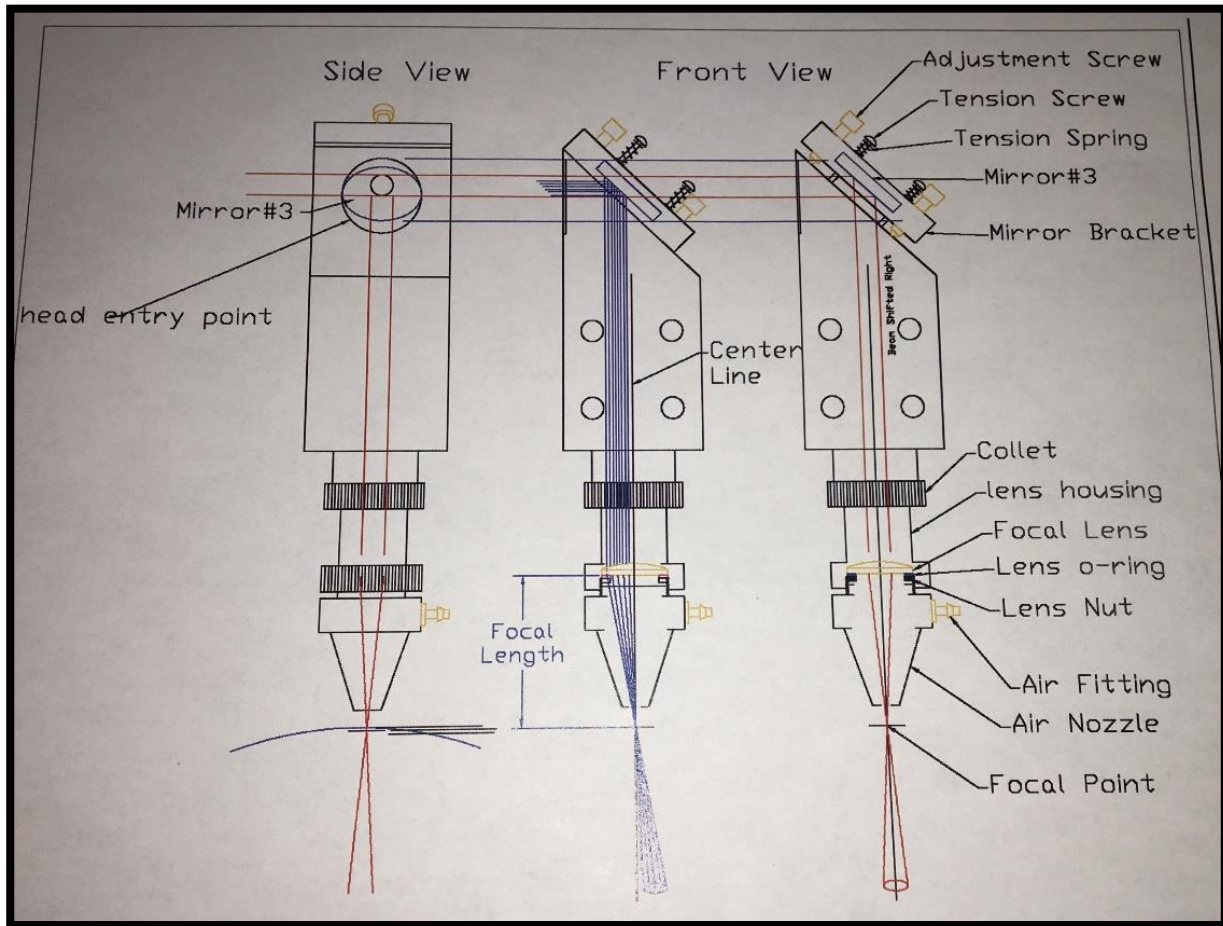
Some useful things for you to remember while doing the alignment process:

1. Go through all the mirrors making sure that all the adjustment knobs have been tightened down using the inside gold lock washer.
2. Make sure that after doing the alignment that you go back through all the mirrors and clean them, including the lens in the laser head itself. Debris will get onto the mirrors while doing the alignment which could cause a loss of power.
3. After aligning your machine go back to your control panel and raise the max power back up to 95%
4. Put lines on all of the adjustment knobs so that you know where they were in event that something happens in the future.



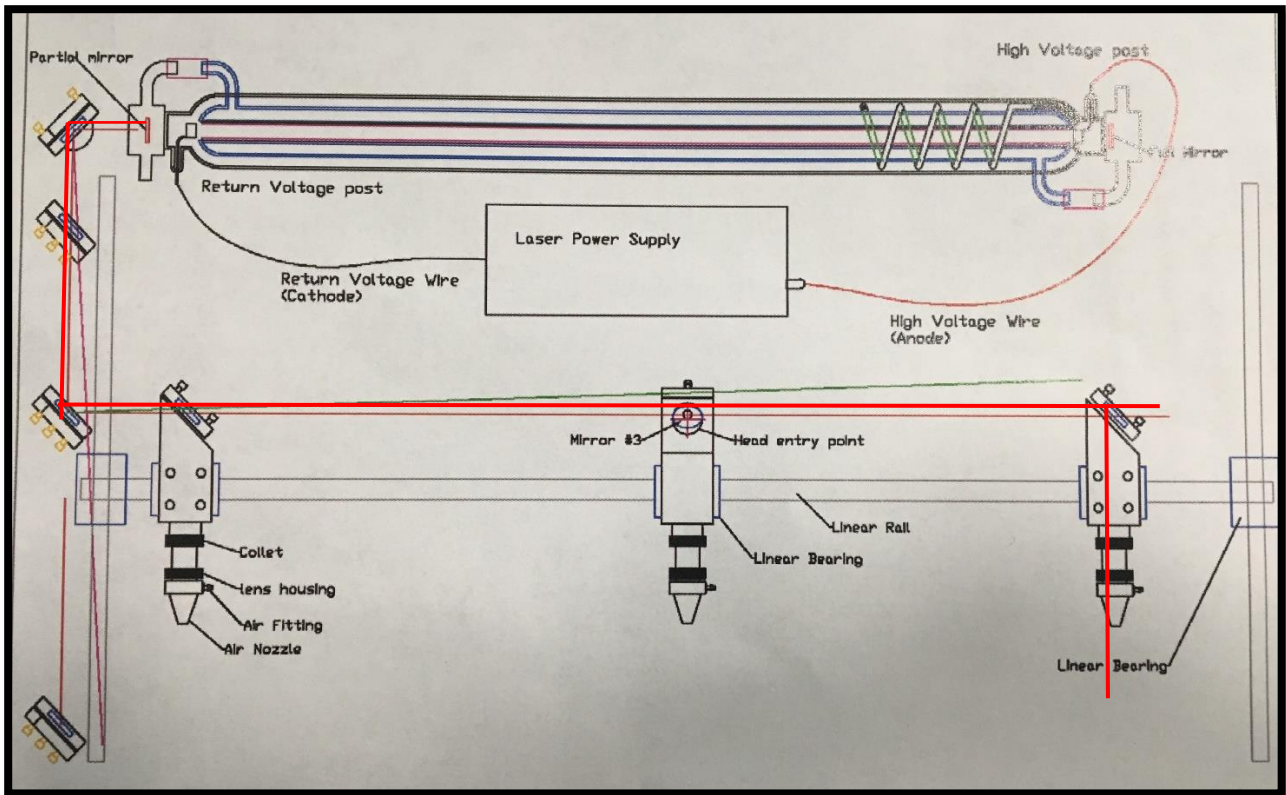
Mirror locking washers for the adjustment knobs

The items highlighted in yellow are the locking washers for the adjustment knobs on the mirrors. Before tightening these down, it is best for you to make marks on the knobs where they are supposed to be set. When tightening these lock washers be sure to hold down on the knob, paying careful attention that the adjustment knob isn't moving by assuring the mark you made on them stays in the position that it is supposed to be in.



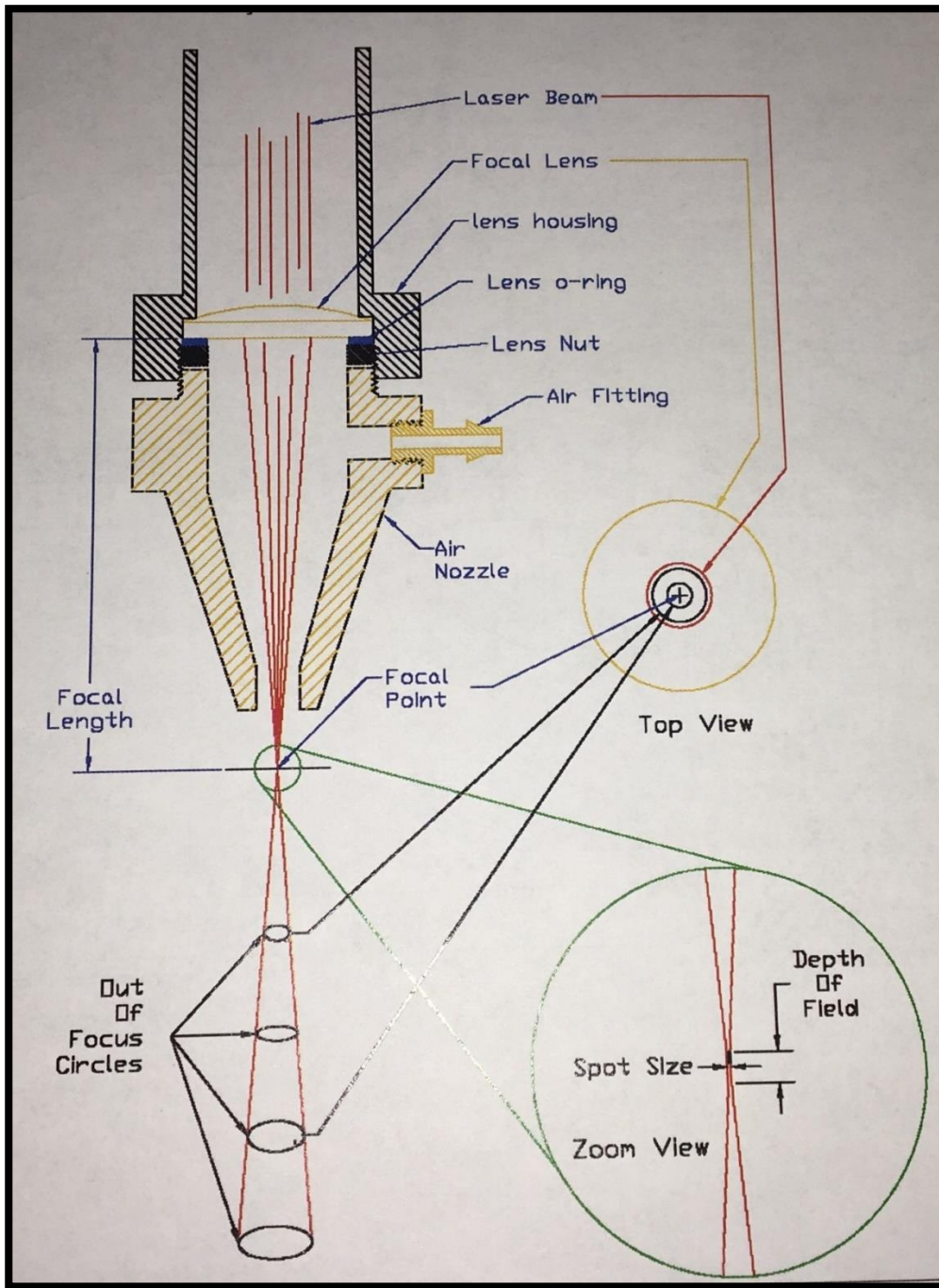
View of beam going into the laser head and nozzle

As you can see in the above picture the beam is going down into the head perfectly aligned on both the 1st and 3rd diagram. The image in the middle is it being too high on mirror three. As the beam travels down into the laser head after it hits mirror three, it must be completely centered. This makes sure that you will not be clipping on the way down on the edges of the nozzle and it also ensures that you do not need to make too many adjustments on the gold knobs on the laser head itself.



Single dot size throughout machine

This photo demonstrates what we are trying to achieve with the solid beam profile throughout the machine, with all the mirrors aligned and at a perfect 45-degree angle we will be getting a single dot size throughout. When we achieve a solid beam profile throughout the machine the laser strength is stronger and will be more concentrated going through the laser focal lens. This will give you the best results possible for both etching and cutting.



Single dot size down the center of the laser head and nozzle