

Beam Alignment Procedure

M/V/X/X2/SuperSpeed models

The following procedure assumes that the user is an experienced user and operator of a Universal Laser System and is familiar with all of the menus of the control panel, its mechanical and electrical operation, and the laser beam optical path

Procedure Requirements

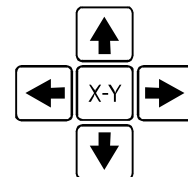
- The Laser Cartridge is mounted correctly (refer to the operations manual).
- The system is located on a level surface and the casters adjusted properly (refer to the operations manual).
- The X-axis arm is perpendicular (square) to the Y-axis rails (refer to the X-axis Arm Squaring Procedure).

Tools Required

- Allen key set (.050 and 1/16 inch).
- ¾ inch to 1 inch wide paper masking tape.
- Small flashlight.

General Information

- The CO2 laser beam is invisible and the Red Diode laser beam is visible.
- The CO2 laser beam and the Red Diode laser beam originate from two different sources inside the laser cartridge. Their beam paths are combined into relatively one beam path by using special beam-combining optics. The angle and displacement of the combined beam path, exiting the laser cartridge, is pre-set at the factory and is not user adjustable.
- The Red Diode laser beam is intended to represent the path of the CO2 laser beam. However, in reality, since perfect alignment of the two beam paths is not achievable, we'll use the Red Diode beam path only as an approximate reference.
- The combined beam path within the system enclosure is adjustable but is only adjustable at the #2 Mirror mount. Any adjustments to the #2 Mirror mount have the same effect on the path of the CO2 laser and the Red Diode laser beams.
- Use paper masking tape to see the beam paths of both laser beams.
- The system has a built-in test mode called the alignment mode. It can be found in the PREFERENCES>DIAGNOSTICS>ALIGNMENT menu. It enables you to check the alignment of both laser beams. This menu has the following operational characteristics:
 - ❖ The Red Diode laser turns ON and OFF when entering and exiting the menu, respectively.
 - ❖ The Motion Control arrow keys function as the "four corners" arrow keys. Pressing each, one at a time, will position the Focus Carriage to the respective four corners of the engraving area: top-left, top-right, bottom-left, and bottom-right.
 - ❖ The X-Y button operates as an ON/OFF switch to momentarily test fire the CO2 laser beam.
 - ❖ For maximum control, the % POWER and FREQUENCY of the CO2 laser beam is adjustable
- The correct alignment of the CO2 laser beam path is essential to proper system operation.



Beam Alignment Check

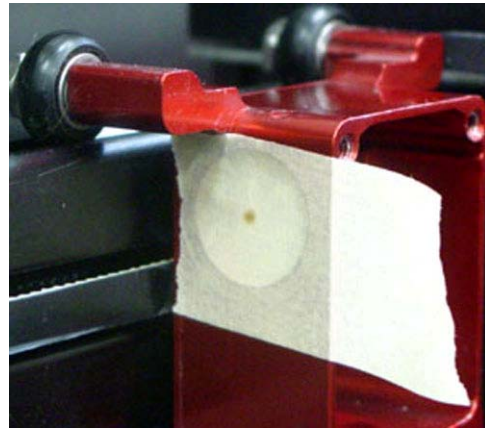
- If the system is already powered ON, please power it OFF.
- Open the top user door.
- Remove the #2 mirror cover.

- Remove the three thumbscrews and the Focus Lens Kit from the Focus Carriage.
- Place a strip of paper masking tape **TIGHTLY** across the hole in the Focus Carriage. Using your finger, rub the perimeter of the hole so that you can see the impression of the outline of the hole through the tape.
- Power ON the laser system and allow it to finish initializing. Do not download any files to the laser system and do not press the **START**, **PAUSE**, or **RESUME** buttons.
- Go into the **ALIGNMENT** mode menu. A red dot should appear on the tape.
- Using the Motion Control keys, position the Focus Carriage into the upper left corner of the field. The red dot should appear to be centered or close to the center of the hole.



- Since the Red Diode laser beam path is only the estimated path of the CO2 laser beam and its alignment is not critical to the operation of the system, you will need to fire the actual CO2 laser beam, by burning a spot in the masking tape.
- Close the top door and any other open doors.

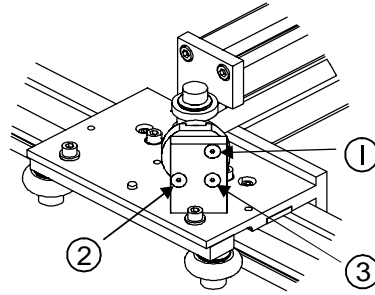
- Place your finger on the X-Y button. Visually observe the masking tape while pressing the X-Y button once to turn ON the laser beam, and a second time to turn it OFF. While the CO2 laser beam is firing the beeper will sound. The laser beam should burn a dot in the tape within a few seconds. The objective would be to control your timing of the pressing of the button so that you create the smallest, visible burn dot possible. If it burns too fast, reduce the power setting or reduce the time between button presses. If it burns too slow, increase the power setting 1% at a time and try again. Practice with several pieces of masking tape until you can control the size of the burn dot to be the smallest possible (refer to the photo). You may need to shine a light from the inside of the Focus Carriage to see if the spot is truly centered.



- Once you have mastered the technique of burning the smallest visible dot possible, replace the tape with a fresh piece.

- Using the Motion Control keys, position the Focus Carriage in each of the four corners of the engraving field, and burn a small dot in each one of those positions. Ultimately all four burn dots should be right on top of one another and approximately centered in the hole. However, in reality, if all four dots are not aligned, you will need to adjust the #2 mirror.

- On the backside of the #2 mirror mount locate the three hex screws. The upper screw (1) is used to adjust the beam vertically (up and down), the lower-left screw (2) adjusts it horizontally (left and right), and the lower-right screw (3) is not normally adjusted and serves as the pivot point.



- Escape out of the ALIGNMENT MODE menu and then SELECT back into it to illuminate the red dot once again. Observe the position of the red dot with respect to the burned dot. Again, it may or may not be aligned exactly on top of one another, but this is not important. What is important is that if there is a difference in position between the red dot and the burned dot, use that position difference as your reference. Since you can watch the red dot move as you make adjustments to the hex screws of the #2 mirror mount, keep in mind that the CO2 laser beam will be moving at the same rate.
- To move the red dot, using a hex wrench, observe the red dot while adjusting either of the two hex screws. Then, keep going back and forth, opening and closing the top door, burning tape, and using the red dot as a reference, **UNTIL THE CO2 LASER BEAM IS CENTERED IN THE HOLE OF THE FOCUS CARRIAGE WHILE IT IS LOCATED IN THE HOME POSITION.**
- Once you are comfortable with your burning technique when the Focus Carriage is in the home position, the **ULTIMATE** goal is to align the CO2 laser beam while the Focus Carriage is located in the **FURTHEST** point away from the source of the laser beam (lower right corner of the engraving field). To do this, use a fresh piece of masking tape, position the Focus Carriage in the lower right corner of the engraving field, and burn a dot. If it is aligned in the center of the hole, you are finished. If not and because it is difficult to make adjustments to the #2 mirror mount screws while the Focus Carriage is in the lower right corner, you may need to move the Focus Carriage to the home position, make adjustments while it is located there, and re-check it in the lower right corner of the field.
- **Once the CO2 laser beam is aligned to the center of the hole while the Focus Carriage is the lower right corner of the field (far field), beam alignment is complete.** Turn OFF the laser system, remove the masking tape, re-install the Focusing Lens Kit and the #2 mirror cover.

If you have any questions regarding this procedure, please contact us:

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