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## 240060-001 Align LED Mapping System

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- Objective:
- To ensure that the LED mapping system is aligned according to specification.
- Tools Required:
- Beam alignment tool (P/N 740-661275-00)
  - Illuminator (P/N 310-661273-00)
  - Illuminator adapter (P/N 310-661274-00)
  - English Allen wrench set
  - Wire cutters
  - 3/8" and 7/16" wrench
  - Small flat head screwdriver
  - Dry erase pen (black or blue fine tip)
- Materials Required:
- Reflective tape (P/N 310-661272-00)
  - Toe wrap tool and wraps
- Sequence:
- This procedures must be performed if the LED transmitter or receiver is altered, but you do not need to do it after replacing the sensor.
  - This is the second procedure in Autoloader Setup and Calibration. The next step is "Test and Adjust Cassette Carrier Pitch and Roll" and "Test and Adjust Cassette Carrier Position."

### Method:



#### IMPORTANT

*The steps in this procedure must be done in the specified order to ensure that the end effector path, the LED beam path, and the plane of the wafers are all parallel to each other.*

1. Perform the following steps to align the horizontal beam:
  - a. Remove all but two screws from the sensor post housing (see Figure 9-12) of the assembly (right or left) being aligned.

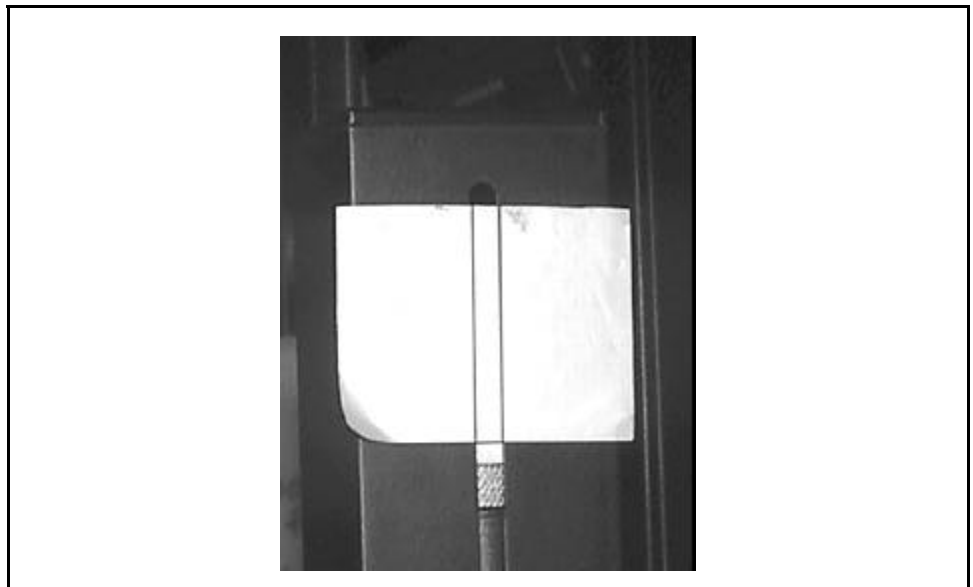
It will be removed again for alignment of the receiver assembly.

**Figure 9-12: Mapping Sensor Post Housing Screws**



- b. Peel the backing off, and place the reflective tape with vertical lines (P/N 310-661272-00) onto the sensor post housing at the height at which the receiver is vertically centered behind it. Line up the vertical lines with the edges of the slit in the cover (see Figure 9-13).

**Figure 9-13: Housing with Reflective Tape**



- c. Locate the fiber optic cable from the emitter for the side you are aligning, and connect it to the illuminator. (Pull the E-Drawer out slightly, and place the illuminator on top of it.)
- d. Using your fingers, tighten the socket head screw to *lightly* clamp the cable in place. *Be careful not to crush the cable.*
- e. Turn on the illuminator.

- f. Loosen the two screws that hold the lens assembly to the emitter assembly plate.
- g. Slide the lens assembly from side-to-side until the spot of light coming from the illuminator is centered between the two vertical lines on the reflective tape on the mapping post cover.

**Result:** The beam is centered horizontally.

Tighten the screws in the lens assembly to secure it to the emitter assembly plate.

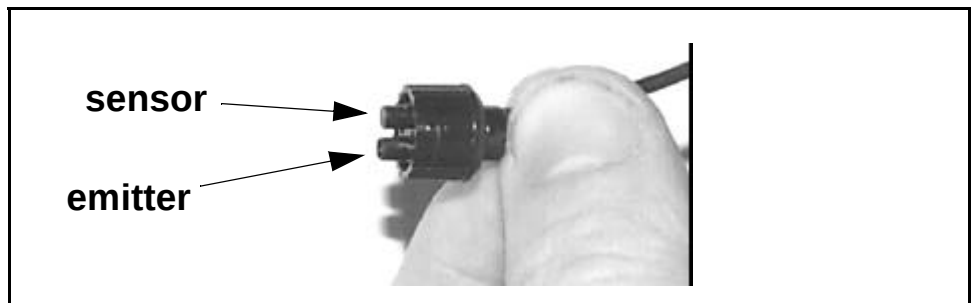
- h. Remove the fiber optic cable from the illuminator by gripping the cable as shown in Figure 9-14.



**NOTE**

*If the connector is plugged in the wrong way, then the sensor becomes the emitter.*

**Figure 9-14: Fiber Optic Cable Removal**



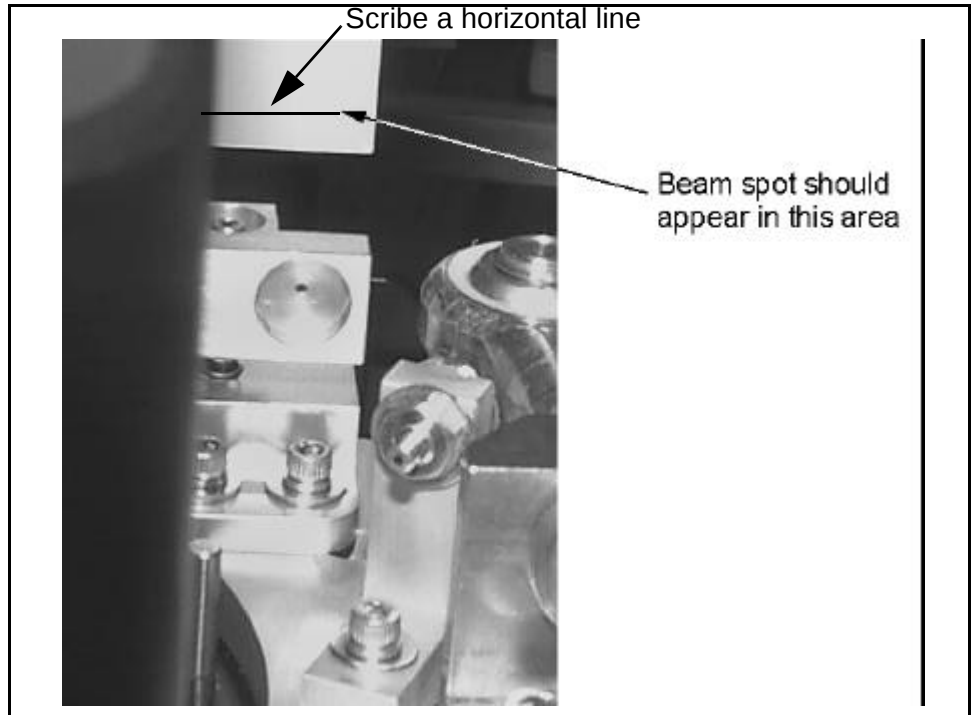
- i. Remove the reflective tape (and save) and the sensor post housing.
  - j. Repeat step a through step i for the other mapping assembly.
2. Perform the following steps to align the vertical beam:
- a. Remove the end effector; then use the end effector screws to attach the Beam Alignment Tool (P/N 740-661275-00) in its place (Figure 9-15).

*Figure 9-15: Beam Alignment Tool*



- b. Locate the fiber optic cable from the emitter for the side you are aligning, and connect it to the illuminator. (Pull the E-Drawer out slightly, and place the illuminator on top of it.)
- c. Using your fingers, tighten the socket head screw to *lightly* clamp the cable in place. *Be careful not to crush the cable.*
- d. Retract the end effector to the home position, and rotate the shoulder to position the vertical face of the alignment tool so that it blocks the beam. (The beam spot will be visible on the reflective tape.) See Figure 9-16.
- e. Label the fibre optic cables. Sacrifice horizontal lines on the horizontal beam align tool (See Figure 9-16). Init Robot-2. Turn off current to the end effector.

*Figure 9-16: Alignment Tool Blocking Beam*



- f. Using the dry erase pen, mark the near field position of the beam spot with a small dot.
- g. Manually extend the end effector to its fully extended position (see Figure 9-17) so that you can see the vertical location of the spot.

*Figure 9-17: Extended End Effector*



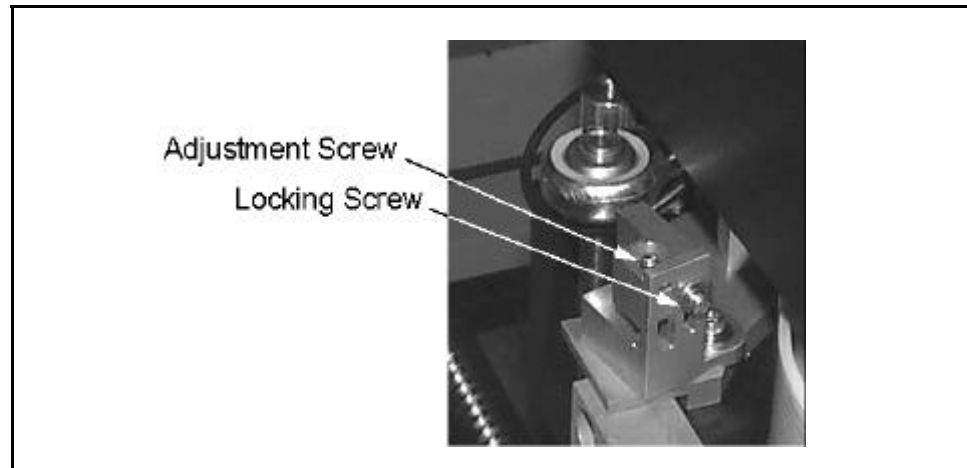
- h. Manually rotate the shoulder to a position where the spot from the beam and the spot that you marked are horizontally aligned.

If the center of the beam spot is within 0.030" of the center of spot you marked, then proceed to step 1.

- i. Loosen the locking screw on the lens assembly (see Figure 9-18) until the lock washer is completely free; and then tighten the screw just until the lock washer starts to touch the wall again.

**Result:** This will ensure that the lens holder piece rides smoothly up and down without rocking from side-to-side.

Figure 9-18: Lens Assembly Screws



- j. Using the vertical adjustment lead screw, bring the beam spot up or down to center it on the spot you marked.
- k. Repeat step f through step j (erasing the old mark between iterations) until, without using the vertical adjustment screw, the pen mark is approximately centered in the far field beam spot.

**Result:** The beam is vertically centered.

- l. Tighten the locking screw (see Figure 9-18) on the lens assembly.

**Result:** The locking screw must be just tight enough so that the assembly does not move; only the “slop” should be taken out of the threads.

- m. Secure the adjustment screw by tightening it about 1/4 turn.
- n. Remove the beam alignment tool, and replace the end effector.
- o. Repeat step a through step n for the other lens assembly.

3. To align the receiver, perform the following steps:

- a. Locate the fiber optic cable from the emitter for the side you want to align; connect the cable to the illuminator.



**NOTE**

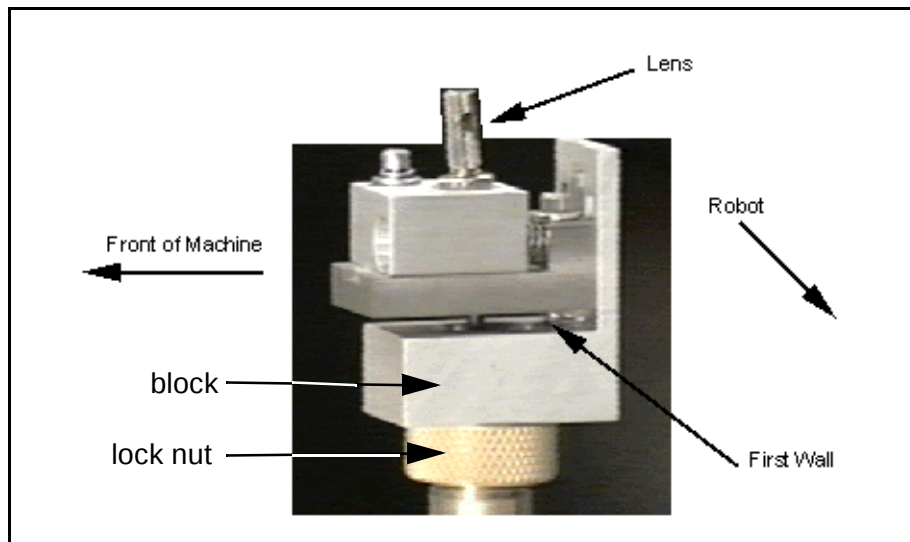
*The illuminator is still on.*

- b. Using your fingers, tighten the socket head screw to *lightly* clamp the cable in place. *Be careful not to crush the cable.*
- c. Hold the reflective tape in your hand, and place it near the receiver lens opening (see Figure 9-19).

**NOTE**

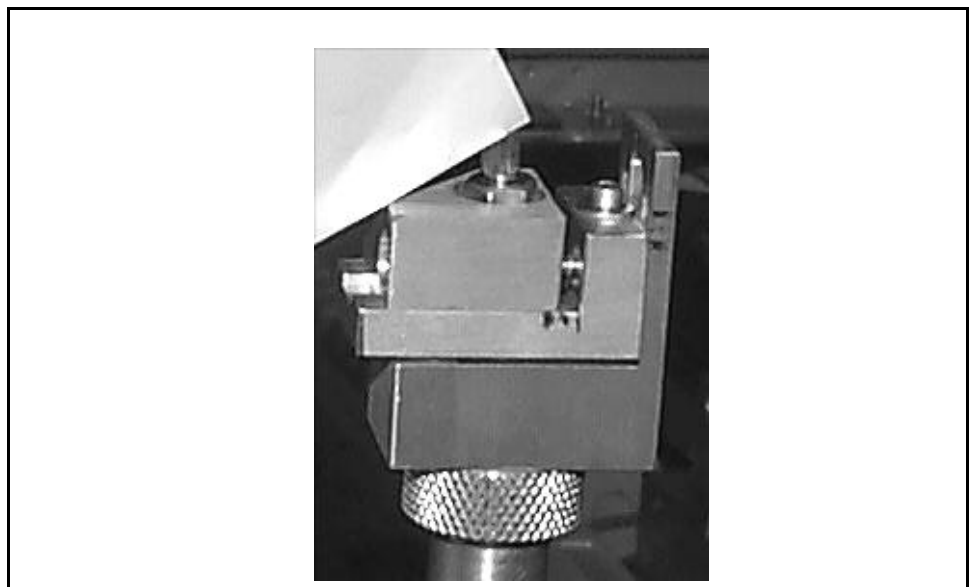
*If the block becomes loose as a result of a loose lock nut, then when tightening the lock nut, ensure that the block is aligned with the black hole in the table.*

**Figure 9-19: Receiver Lens Opening**



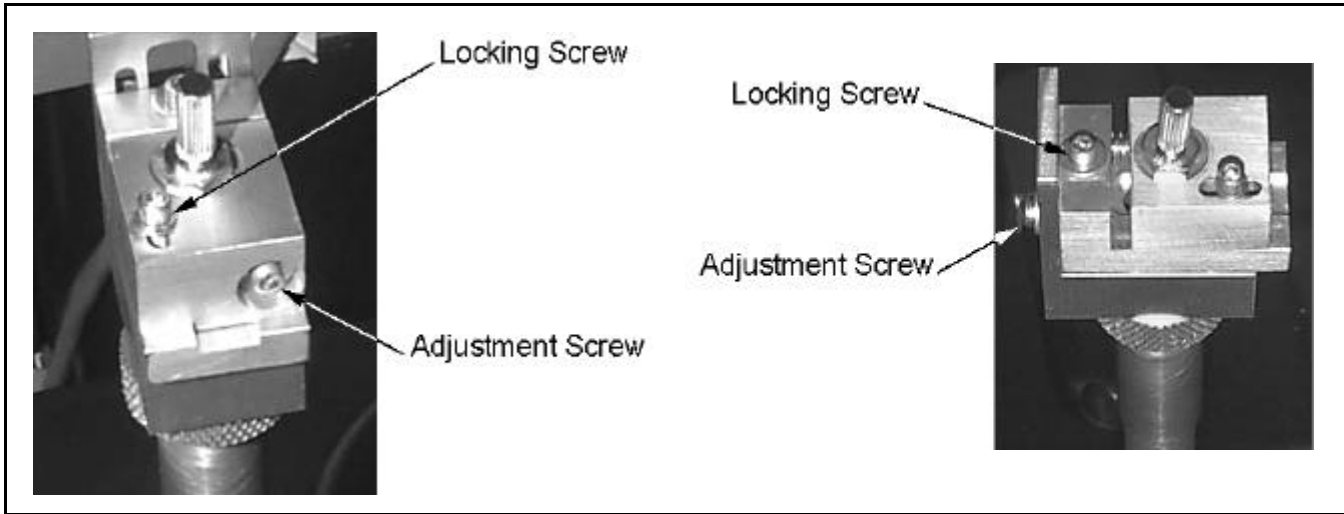
- d. Hold the tape so that the beam spot shines on the very corner of the tape, just in front of the receiver, so that you can look around the tape and see the lens opening (see Figure 9-20).

**Figure 9-20: Receiver Alignment**



- e. Loosen the vertical and horizontal locking screws on the receiver assembly as shown in Figure 9-21.

Figure 9-21: Receiver Assembly Screws



- f. Use the vertical and horizontal adjustment screws to adjust the receiver so the lens opening is centered on the beam spot.

**Result:** The beam is centered on the lens opening.

- g. Tighten the two locking screws (see Figure 9-21) on the receiver assembly.

**Result:** The locking screw must be just tight enough so that the assembly does not move; only the “slop” should be taken out of the threads.

- h. Secure the adjustment screw by tightening it about 1/4 turn.
- i. Disconnect the fiber optic cable from the illuminator.
- j. Follow the steps below to plug the emitter and receiver fiber optic cables into the Keyence sensor housing:
  - Take the connector off the Keyence sensor housing, and slide the cables through the holes of the connector until they are flush with the other side.
  - Reattach the connector, with the cable from the emitter going into the hole toward the front of the machine.
- k. Reduce the sensitivity of the signal presence on the front of the Keyence sensor housing until both LEDs are off, and then increase the sensitivity just until the green LED comes on. (The red LED comes on first.)

**NOTE**

*A lit red LED indicates signal presence; a lit green LED indicates a stable signal.*

**Result:** The goal is to have the lowest sensitivity with a stable signal.

- l. Repeat step a through step k for the other receiver.
- m. Remove the illuminator.