

OPTOFORM[®] 40 - Axes Encoder Diagnosis

The OPTOFORM[®] 40 achieves its level of ultra-precision by using laser holographic linear encoders for axis positioning.

These encoder systems are very stable and durable by nature. The encoder scales and laser heads are not affected by changes in humidity and are only negligibly affected by changes in temperature. However, the scales and heads can be affected by concentrations of dust particles, chips, liquid, or by a sudden impact. These factors can serve to decrease signal integrity to a level that can cause positioning errors. When this occurs, the FAULT light will go ON, the Control will enter an ESTOP condition, and a Z or X ENC FAIL message will be displayed on the screen. This condition indicates the need to clean (or perhaps realign) the encoder scale and laser head on the affected axis. (The condition may also indicate a bad connection between the read head and detector board or between the detector board and the control.)

Tools Required

- One 8mm (5/64") hex key
- One 4mm (5/32") hex key
- One 5mm (3/16") hex key
- One #2 Phillips screwdriver
- One Oscilloscope (X-Y display capability)

Scale Cleaning and Alignment

1. Set the Main Disconnect to the OFF position.
2. Identify the affected slide axis, X or Z, and remove the white carriage side cover to expose the encoder scale and laser head.
3. Transfer the Slide Brake airline to bypass its BRAKES OFF (SOL2) output. This allows the carriage to be moved by hand when the machine is in ESTOP.
4. Inspect the glass scale and laser head for visible contamination. Clean thoroughly using Q-tips and lens paper moistened with ethanol or acetone. Move the carriage so the entire length of the scale can be cleaned. Cleaning the scale can correct an ENC FAIL error. RESET the control and jog the slide through its full limits to verify the problem has been corrected. If an ENC FAIL message reappears, continue to step five to verify scale and head alignment.
5. Remove the front cover on the center panel of the Machine Base for access to the X and Z-axis Encoder Detector Boards.
6. Connect the Oscilloscope probes to the test points at the bottom edge of the appropriate board. Attach the Ch1 probe to S(SIN) and G(GND) and the Ch2 probe to C(COS) and G(GND).

7. Set the input COUPLING switches of Ch1 and Ch2 on the scope to GND and adjust the POSITION controls to center the trace on the screen.
8. Reset both input COUPLING switches to DC and set the TIME/DIV selector to the X-Y mode.
9. Set both input VOLTS/DIV selectors to 0.5V/DIV.
10. With the ESTOP switch ON (knob in), turn the Master Disconnect ON and the System Control Key switch ON to energize the Detector Boards.
11. Manually move the carriage through its full travel and monitor the circular lissajous pattern on the scope screen. If the pattern has a consistent amplitude of less than 1.6 Vp-p, go to the next section: Laser Head Alignment.
12. If the pattern varies in amplitude above and below 1.6 Vp-p from one end of the scale to the other, then only the scale needs realignment.
13. Move the carriage to the end that displays the smallest pattern and slightly loosen the set screws that secure the scale-mounting flexures at that end.
14. Carefully press on each side of the scale just below the flexure to determine how to adjust the scale for a pattern amplitude of 1.6 Vp-p or more.
15. Maximize the pattern, tighten the set screws, and move the carriage through its entire travel to verify optimum alignment.
16. Repeat steps 13, 14, & 15 until the pattern's amplitude is maintained consistently at a 1.6 Vp-p (or higher) value.
17. Reconnect the Slide Brake airline to its BRAKES OFF (SOL2) output.
18. Turn the ESTOP switch OFF (knob out), RESET the Control, and JOG the carriage from one end to the other to verify the problem has been corrected.
19. Replace the covers on the front of the machine and the side of the carriage.