SHERLINE PRODUCTS

INCORPORATED 1974

Optical Encoder Mounting Instructions

P/N 8767, 8769

Mounting the Optical Encoder

⚠CAUTION

The power switch on the speed control must be in the off position when the spindle is not in use.

Notice the tapered sides of the mounting bracket and the two lines on the mating surface of the encoder. Any contact with the encoder must be between the two white lines (see Figure 1).

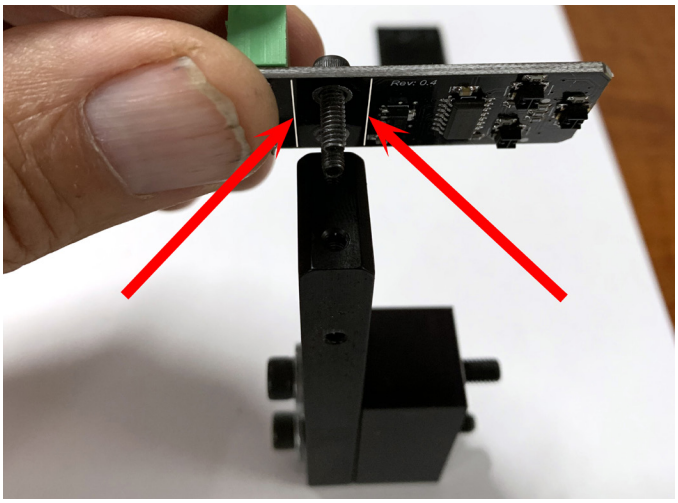


FIGURE 1—The arrows point to the two white lines on the encoder surface.

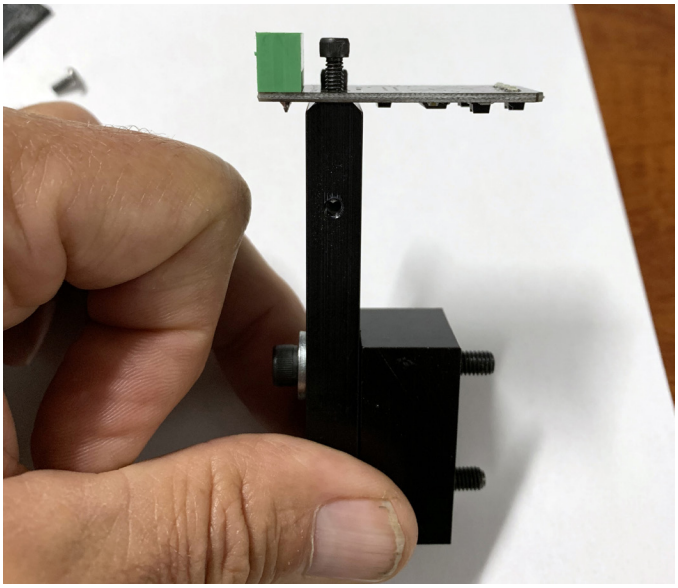


FIGURE 2—Full assembly side view: The screws are just in place for show. Nothing is tightened at this point.

You may need to drill and tap the 10-32 holes on your headstock to mount the optical encoder. If this is the case, please go to the page 6 of this document for the *Optical Encoder Mounting Template Instructions.*

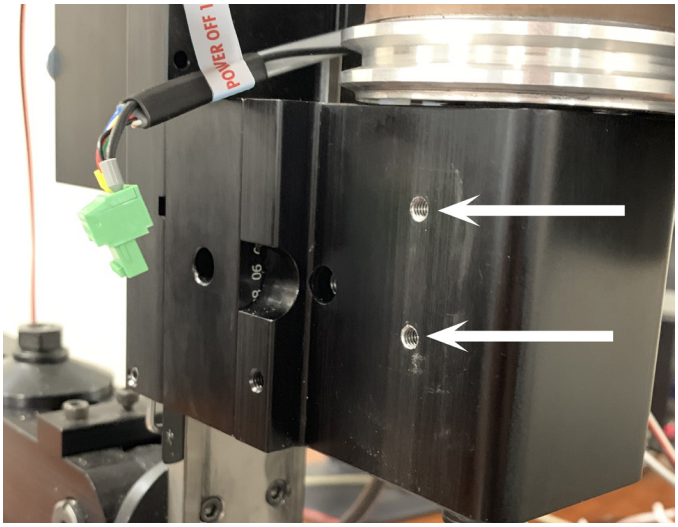


FIGURE 3—Mounting hole locations on the headstock. Use the template at the end of this document to drill and tap the mounting holes.

Parts List

NO. REQ.	PART NO.	DESCRIPTION
2	40340	10-32 x 1" SHCS and 40660 #10 washers (3C headstock spacer only)
2	40530	5-40 x 3/8" SHCS
2	40720	10-32 x 1-1/2" SHCS and 40660 #10 washers (standard headstocks only)
4	67124	Zip ties
1	68002	5-40 x 3/8" SHCS
1	68060	Tach spindle pulley RPM sticker
1	87810	Optical encoder
1	87812	Optical encoder cover
1	87813	.129 optical encoder gauge
1	87814	Optical encoder bracket
1	87816	Optical encoder spacer for standard headstock (standard headstocks only)
1	87817	Optical encoder spacer for 3C headstock (3C headstock only)
1	87820	Main Encoder speed control cable and ground cable
1	87830	Speed control cable
1	87840	Mill headstock cable support* (ball screw mills only)

***NOTE:** The cable support ships only with P/N 8769. It is not included with any lathes or leadscrew mills.

The encoder assembly is mounted to the headstock (see Figure 4), with the 10-32 screws just snug, so we can adjust the encoder bracket to get the encoder gap set (see Figure 5).

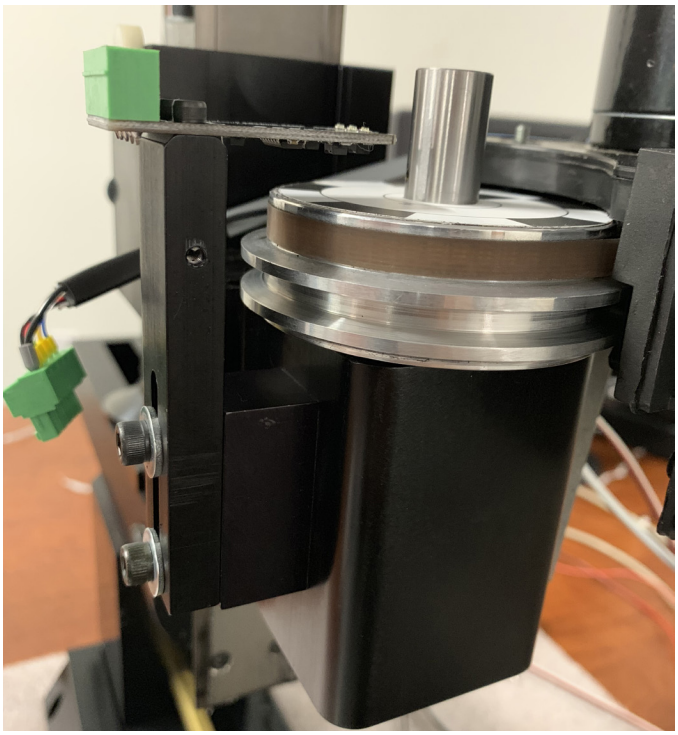


FIGURE 4

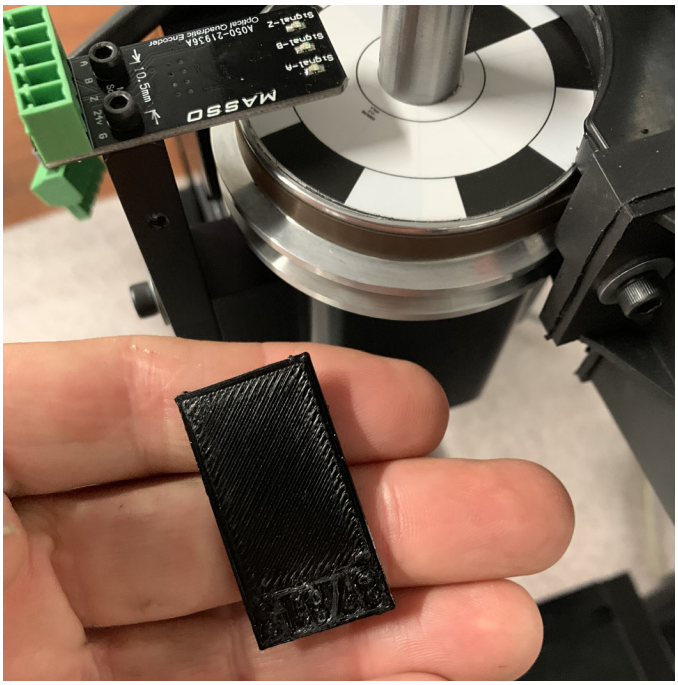


FIGURE 5—Encoder Gap Gauge P/N 87813.

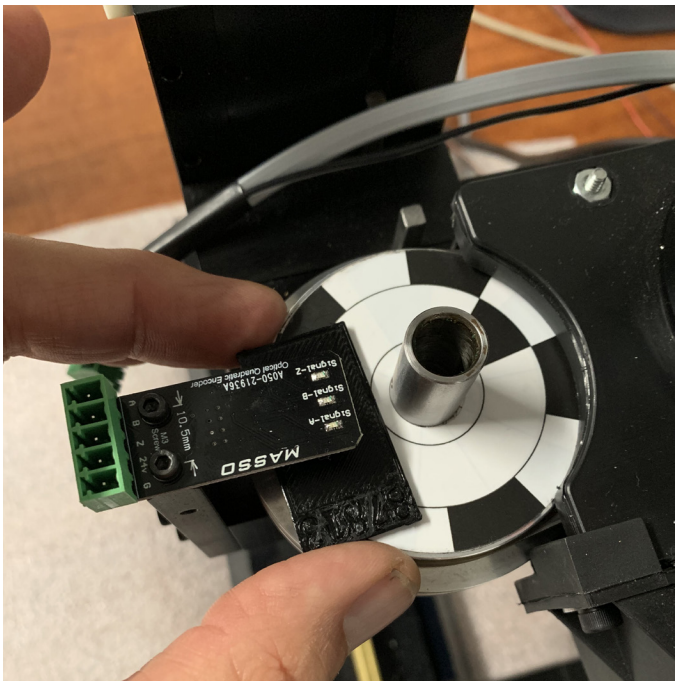


FIGURE 6—Gap gauge placement.

With the two 10-32 bracket mounting screws loose, lower the optical encoder down until it makes contact with the gap gauge. Make sure that the screws are loose enough so the optical encoder body is not flexing when you lower it into position.

Once the encoder is touching the gap gauge, put pressure on the top of it with your finger (see Figure 7).

While pressing on the encoder, tighten the two 10-32 bracket mounting screws.

FIGURE 7—With the gap gauge in place, apply pressure on top of the encoder.

There will generally be some space between the encoder and the gap gauge after you tighten the screws. This is fine. The gap gauge is set to the middle of the LED focal point length (.129" or 3.27 mm). Therefore, if the encoder is slightly higher or lower than the gap gauge, it will still be in tolerance.

Once the screws are tight, remove the gap gauge.

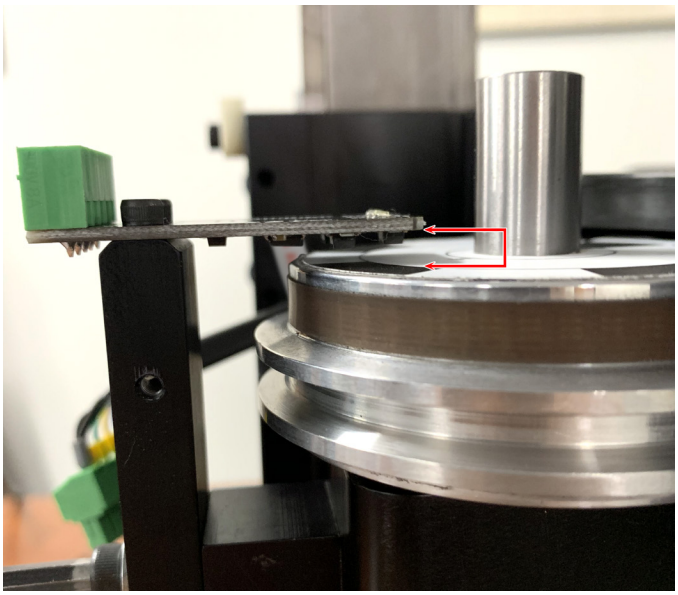


FIGURE 8—The red arrow shows the gap between the pulley and the LED sensors.

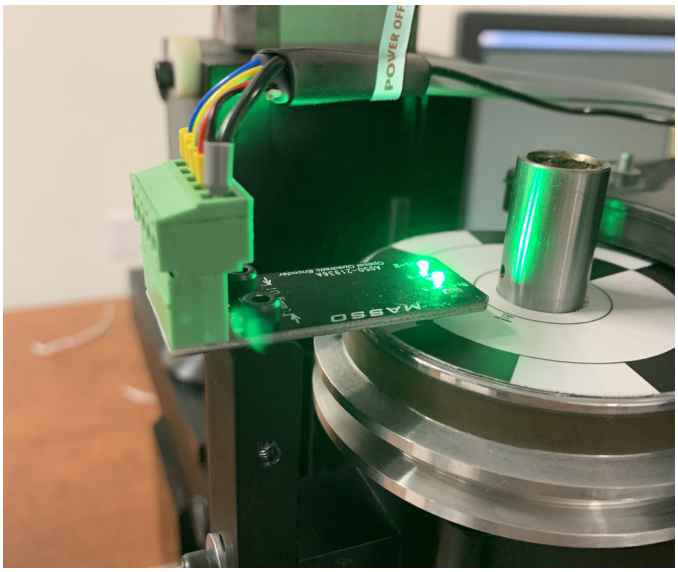


FIGURE 9—Shows the LED lights on the encoder with the power connection plugged in (Just for show). Remover the connection until the cover is in place.

⚠CAUTION

Do not connect or disconnect the optical encoder connector or the ground wire with the power on, or you will do irreparable damage to the optical encoder!

Now we are going to mount the encoder cover.

First a special note: The primary reason for the cover is to help avoid any damage to the encoder and also to keep oil and machine debris off of it. The second reason (which we found out the hard way) is to avoid exterior LED light interference with the LEDs that are on the encoder. If your machine is in an area that has fluorescent lighting, then exterior light interference will not be a problem. However, if you are using LED lights around your machine, such as overhead energy saving LED lights. The exterior LED light will bounce off of the tach/encoder sticker and cause the encoder to receive bad light readings and send inaccurate signals to the controller. This will cause erratic RPM and cross threading on the lathe threading cycle.

If the encoder is positioned correctly, you will see the signals coming into the setup page.

Click on the F1 Setup button on the lower left corner of the screen. If you double click on the password box and then click on the setup page, the password box will close.

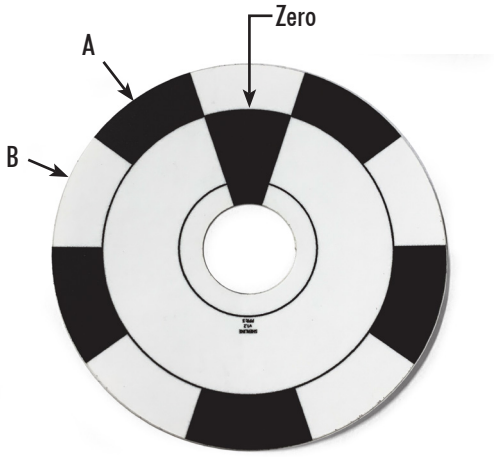


FIGURE 10—On the tach sticker, the black and white sections on the outer ring are for the A and B signals. The solitary black section in the center area is for the Index signal.

If you turn the spindle pulley by hand starting with the index point under the encoder, the signals will come into the setup page. See the signal sequence below (Figues 11-17).

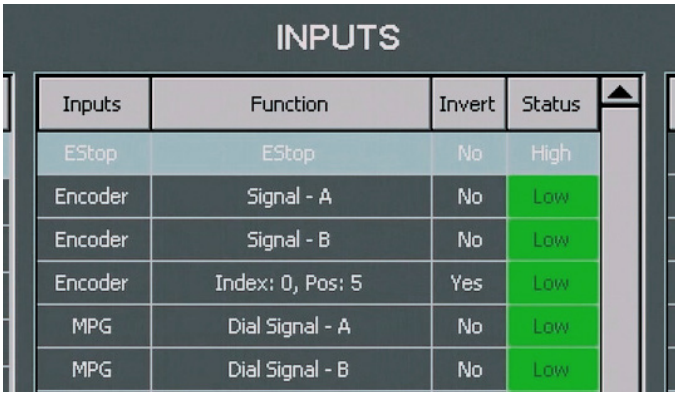


FIGURE 11—Starting between the index point and position 1, the status for A, B, and Index will be Low.

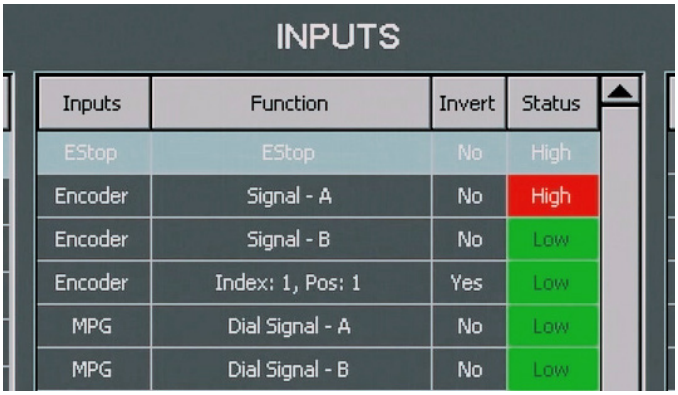


FIGURE 12—Turning the pulley slowly, Signal-A will turn to High.

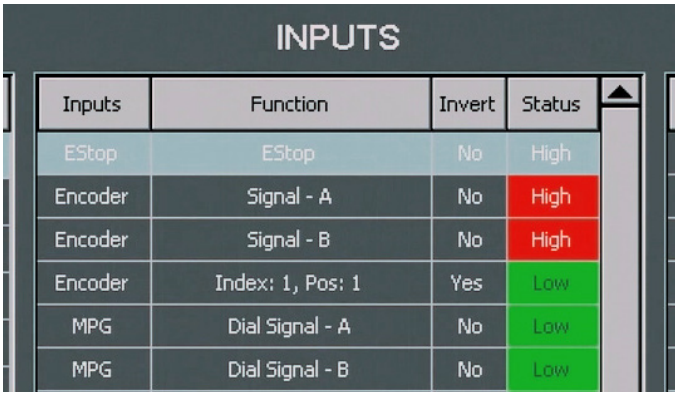


FIGURE 13—Continue to turn and Signal-B will turn to High.

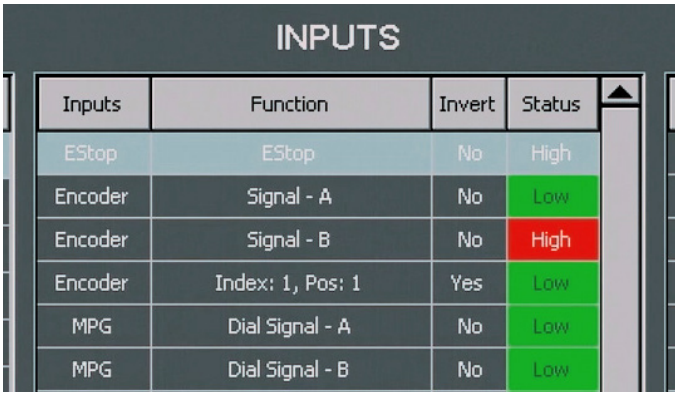


FIGURE 14—Continue to turn and Signal-A will change to Low.

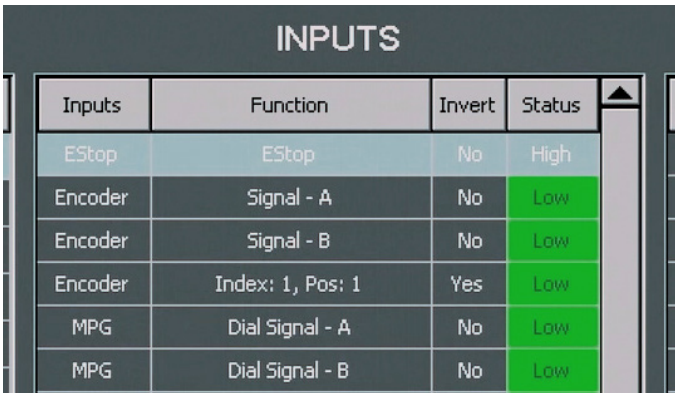


FIGURE 15—Then Signal-B will change to Low.

The inputs will follow this sequence from position 1 through position 4.

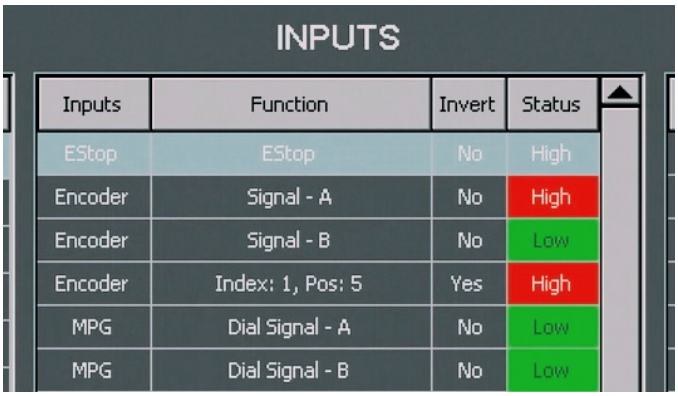


FIGURE 16—When you get to position 5 for the index point, first Signal-A will change to High, then Index Position 5 will change to High.

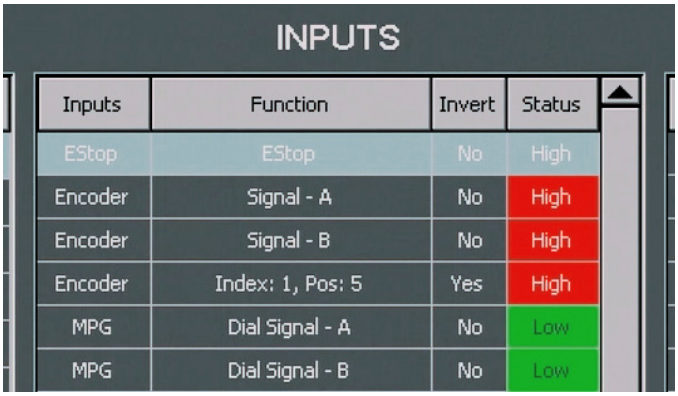


FIGURE 17—Then Signal-B will change to High so all three Inputs are showing High.

Then Signal-A will change to Low, Index Position 5 will change to Low and then position B will change to Low.

NOTE: If you are not getting these readings, try shading the encoder and the tach sticker with a piece of cardboard to eliminate any outside light source. Then turn the spindle again.

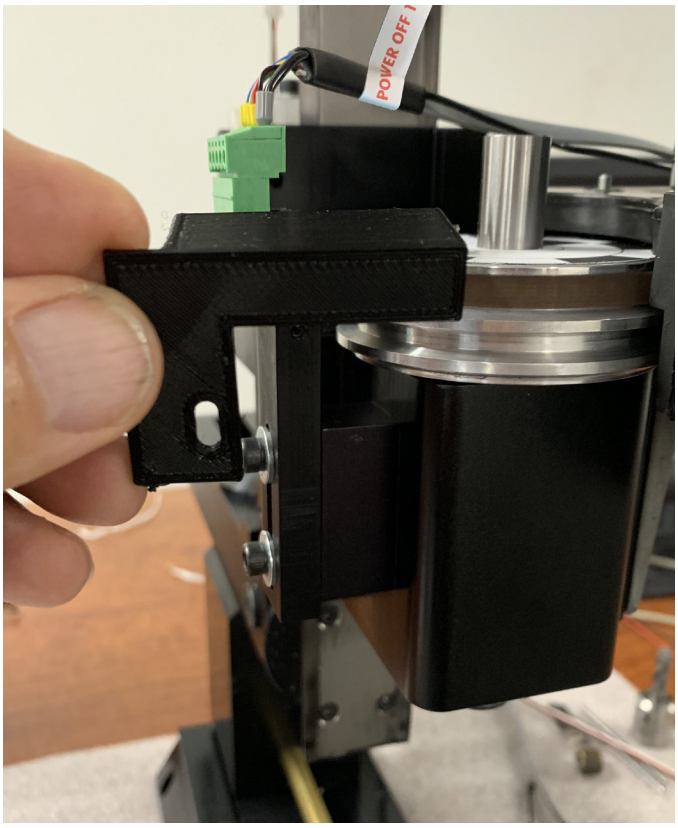


FIGURE 18—Placement of encoder cover P/N 87812.

There must be a gap between the front edge of the cover and the tach/encoder sticker so it doesn't rub on the sticker.

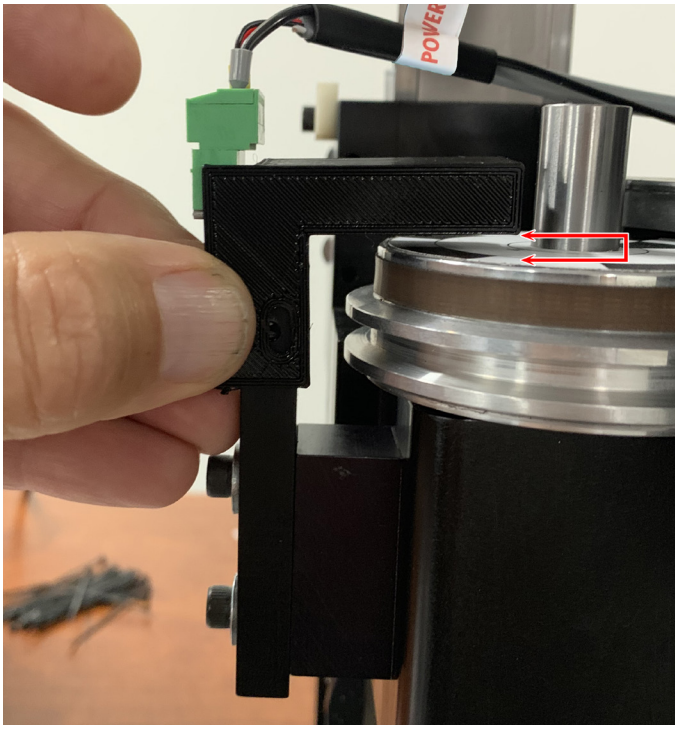


FIGURE 19—The red arrows indicate the gap between the encoder cover and the tach/encoder sticker.

NOTE: The gap is approximately .020"-.050" (.50 – 1.27mm).

Tighten the mounting screw snug. Then readjust the cover so there is still a gap between the cove and the pulley.

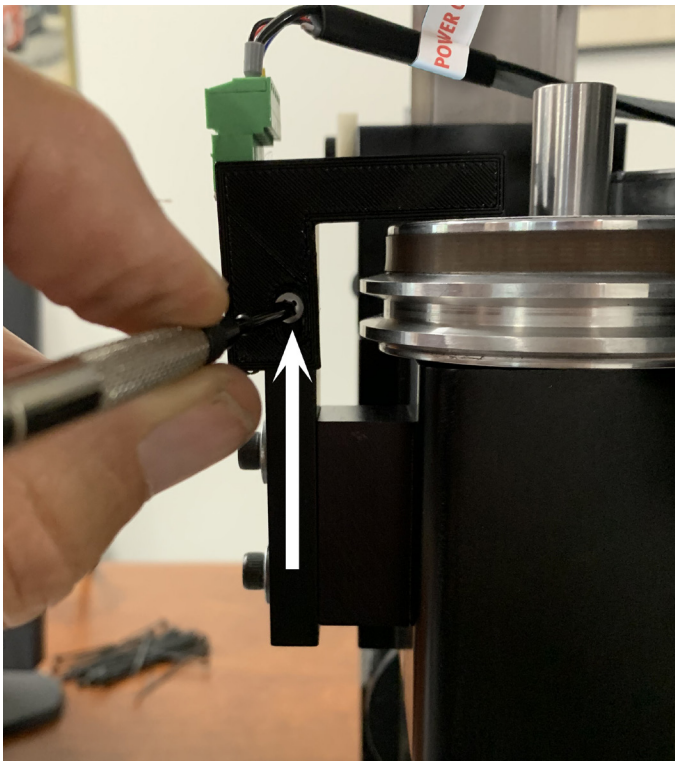


FIGURE 20—Encoder cover mounting screw P/N 87811 5-40 x 3/8" Phillips, button-head machine screw.

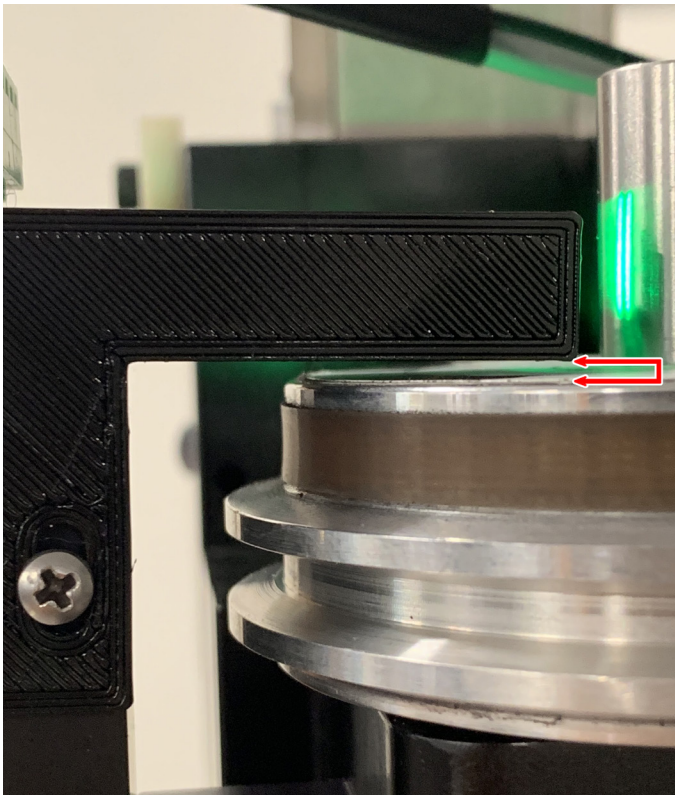


FIGURE 21—The red arrows show the gap after final adjustment.

⚠CAUTION

Do not connect or disconnect the optical encoder connector or the ground wire with the power on or you will do irreparable damage to the optical encoder!

The power must be off while adjusting the encoder.

Troubleshooting the 10,000 RPM Pulley with the MASSO Control

We have recently been informed that there is a problem with the 10,000 RPM pulley working with our MASSO control.

NOTE: The 10,000 RPM pulley is mechanically and electronically capable of achieving 10,000 RPM max. However, without the ability to use an oscilloscope to fine tune the encoder orientation, the maximum "programmable RPM" may be limited to 8,000 or 9,000 RPM.

Stating the Problem

What we found was that using the optical encoder headstock spacer (P/N 87816) and the encoder gap gauge (P/N 87813, .129"), the encoder orientation was fine when the maximum RPM was 2,800. However, we found the following problems when using the same encoder orientation with the 10,000 RPM pulley:

1. At RPM above 3,000-4,000, the RPM would first increase above the entered RPM value. Then instead of coming down to the entered value, the RPM would go to the maximum of 10,000. The RPM read-out on the MASSO control would read "0," while the actual RPM was at 10,000.
2. If you turned the spindle off and then tried to turn it back on, the spindle continued to go to the maximum RPM of 10,000 (regardless of the value entered).
3. The only way to reset the spindle RPM was to power the control off and back on.

The Solution to the Problem

1. Using an oscilloscope, we altered both the encoder gap and the spacer thickness until we achieved an encoder orientation that allowed the full RPM range up to 10,000 without any issues.
2. The encoder gap is .055" from the tach sticker to the encoder A & B readers on the bottom of the encoder (see Figure 22), or .005"-.010" between the tach sticker and the bottom of the encoder cover (see Figure 23).

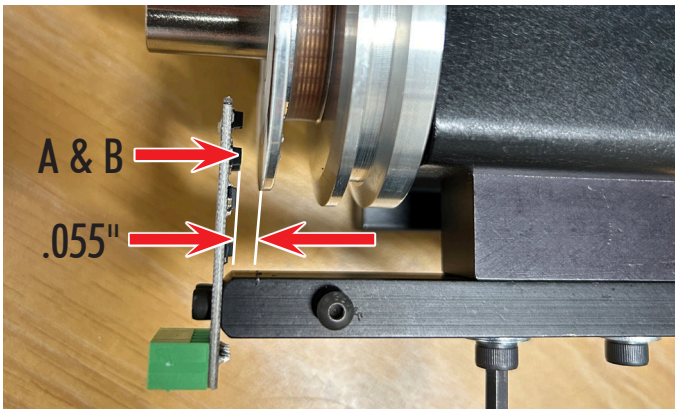


FIGURE 22—Showing .055" gap between the tach sticker and the A & B LEDs.

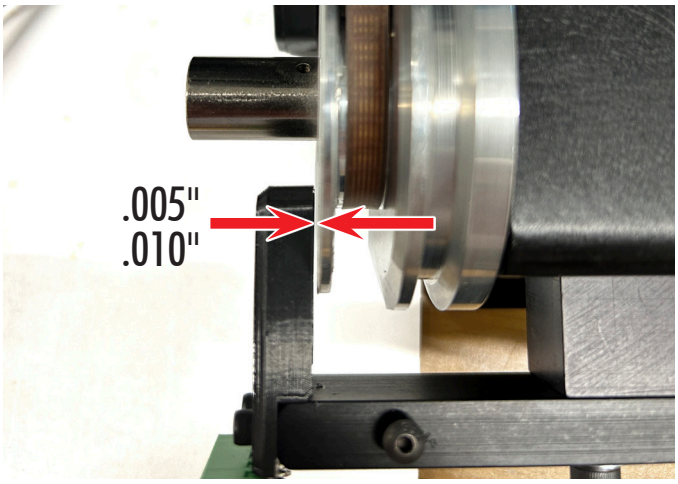


FIGURE 23—Showing the .005"-.010" gap between the MASSO encoder cover and the tach sticker.

3. The encoder headstock spacer (P/N 87816) thickness has been changed to (.790"-.795"). This is an increase of approximately .085" from the original spacer thickness.
4. Customers who are having a problem with their 10,000 RPM pulley with the MASSO control can either add a .075"-.085" spacer piece (or shim stock) under the existing headstock spacer (see Figure 24), or contact us for a new spacer (P/N 87816) that is .790"-.795". Then they will need to adjust the encoder gap to .055".

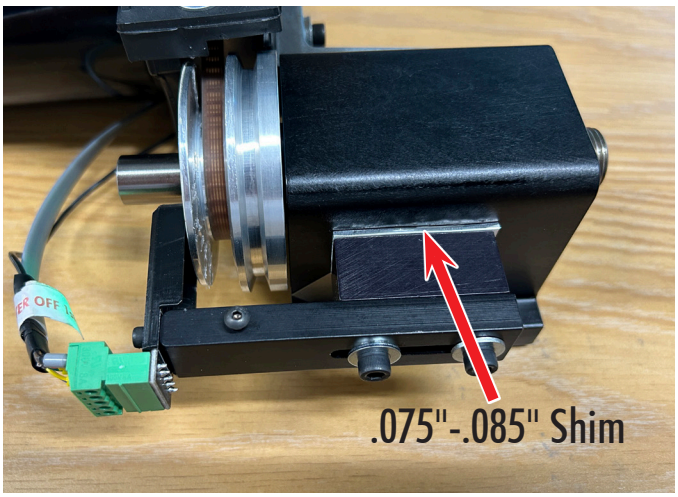


FIGURE 24—Showing the .075"-.085" shim stock installed between the headstock and the encoder headstock spacer.

5. If you have the new MASSO injection-molded optical encoder cover, no further modifications are necessary (see Figure 25). If, however, you have an older 3D-printed optical encoder cover, you will have to trim .075" from the bottom of the 3D-printed cover (see Figure 26). This is to ensure the proper gap of .005"-.010" between the cover and the tach sticker shown in Figure 23.

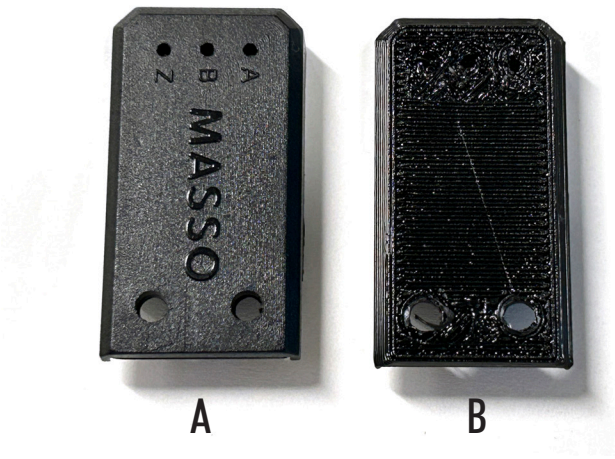


FIGURE 25—Showing the difference between the MASSO injection-molded cover (A) and the original 3D-printed cover (B).

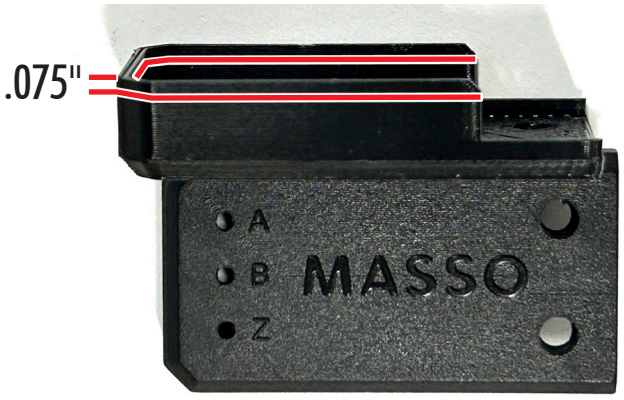


FIGURE 26—The red lines show where to trim the .075" off of the 3D-printed cover. The 3D-printed cover has been turned on its side to show where to trim.

6. Once the spacer and the gap have been reset, enter the RPM starting at 3,000 and then increase the RPM in increments of 1,000 until you reach 10,000. The RPM should climb up to the entered value and a bit higher, then come down and settle at about + or – 20 or 30 RPM of the entered value.

   NOTE: You may find that the maximum RPM that you will be able to achieve "without the spindle racing to the max RPM of 10,000," may be 8,000 or 9,000. See the settings changes below that may help you to achieve a higher "programmable RPM" range.

7. Setting changes:

   A. Go to the F1 screen and click on "Main Spindle Settings".

   B. When the Main Spindle box opens, change the Maximum RPM to (20,000). Change the Spin Up to (8000) or (10000).

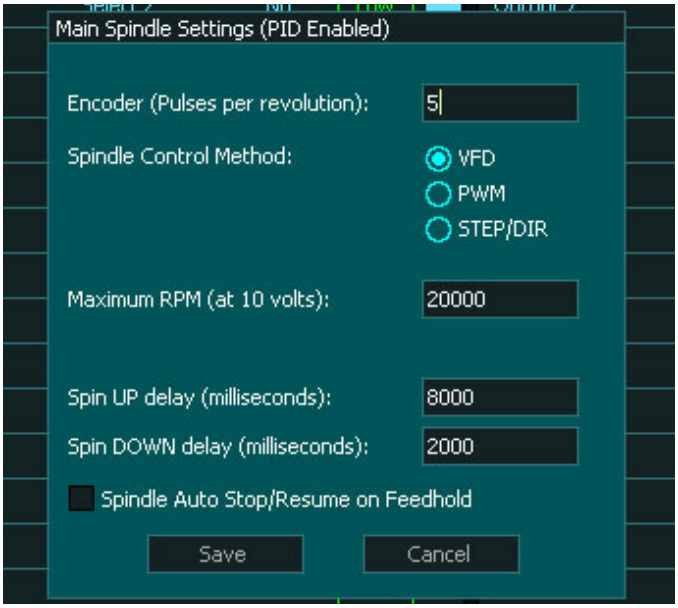
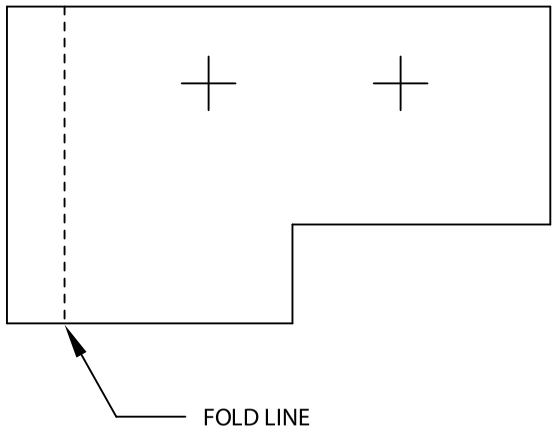
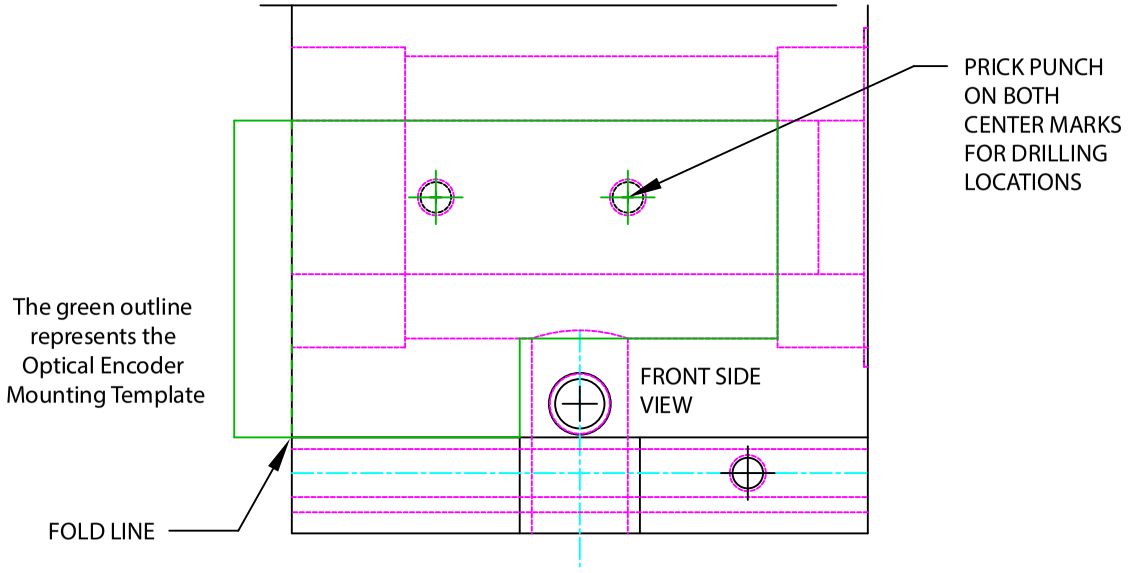


FIGURE 27—The Main Spindle Settings dialog box.

OPTICAL ENCODER HOLES FOR THE SHERLINE/MASSO CONTROLLER

Optical Encoder Mounting Template





Optical Encoder Mounting Instructions

1. Cut out the template above.
2. Fold it on the dotted line.
3. Align the template with the folded edge on the "pulley" side of the headstock, and tape it in place as noted by the green outline in the example, (upper-right).
3. Prick punch on both of the center crosshairs to mark the drilling location.
5. Drill through with #21 bit in the example (bottom-right).
6. Tap a 10-32 thread.