

Installing the External Encoder on a Sherline Headstock

P/N 9402, 9406 (MIT), and 9404 (3C)

Installing the Encoder Pulley on the Headstock Spindle

1. Remove the motor and speed control unit from your machine, and the main spindle pulley from the headstock (see Figure 1).



FIGURE 1

2. With a marker, draw a line from the set screw to the center bore on the cog pulley assembly (P/N 43230E for the Morse #1 headstock or P/N 43234E for the 3C headstock) (see Figure 2).

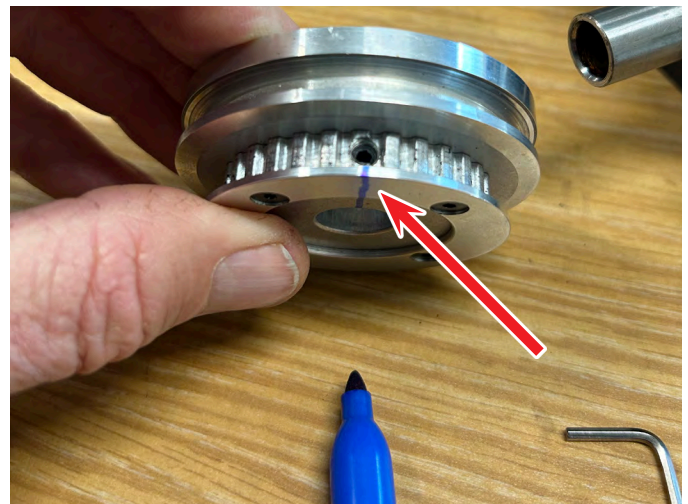


FIGURE 2

3. Push the pulley assembly onto the spindle with the set screw (P/N 31080) aligned with the flat on the spindle. Make sure there is a .020-.030" (.50-.75 mm) gap between the front of the pulley and the back of the headstock (see Figure 3).

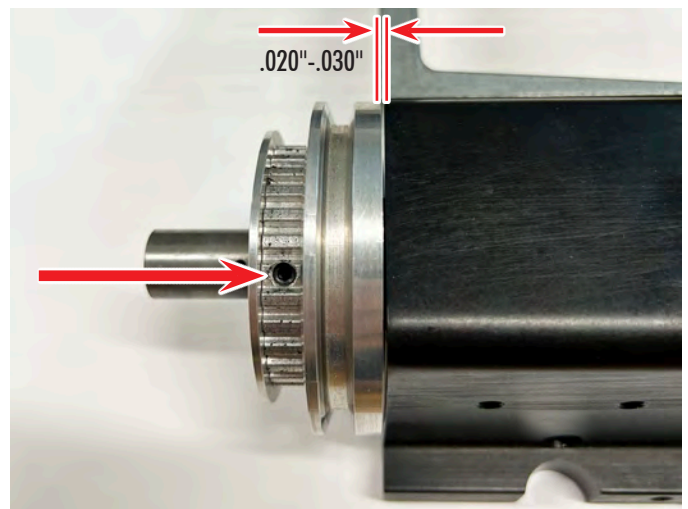


FIGURE 3

4. If there is excessive resistance when you try to push the pulley assembly onto the spindle, one of the three parts of the assembly may be misaligned. Follow the instructions below.

A. Disassemble the pulley by removing the (4) 5-40 screws (P/N 67119). Then lay the parts out in the order that they will be reassembled (see Figure 4).



FIGURE 4

B. Now, mount the three pulley parts onto the spindle one at a time.

C. The 30T cog pulley* and the cog pulley shoulder washer (P/Ns 43220E or 43233E, and 43240E, respectively) have chamfers on one side of the mounting holes. Be sure to assemble them with the chamfer side facing out, away from the headstock (see Figures 5 and 6).



FIGURE 5—P/N 43220E is the 30T cog pulley for the #1 Morse headstock. P/N 43223E is the 30T cog pulley for the 3C headstock.

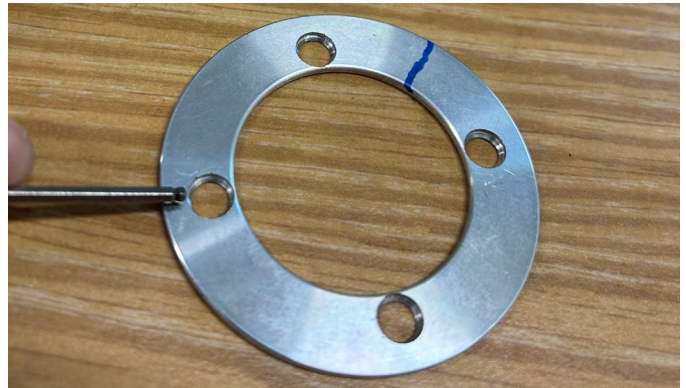


FIGURE 6

D. As you mount each part of the assembly onto the spindle, turn the part to align the 5-40 screw holes (see Figure 7).

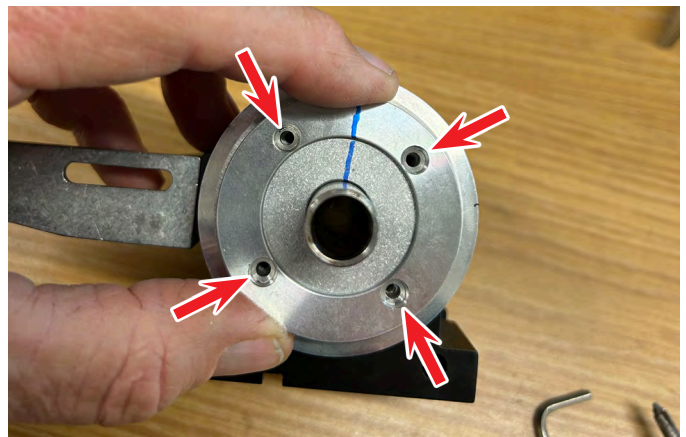


FIGURE 7

E. Insert the (4) 5-40 screws and thread them in partially. Once they are all threaded in, tighten them just enough to hold the three parts in place (see Figure 8).

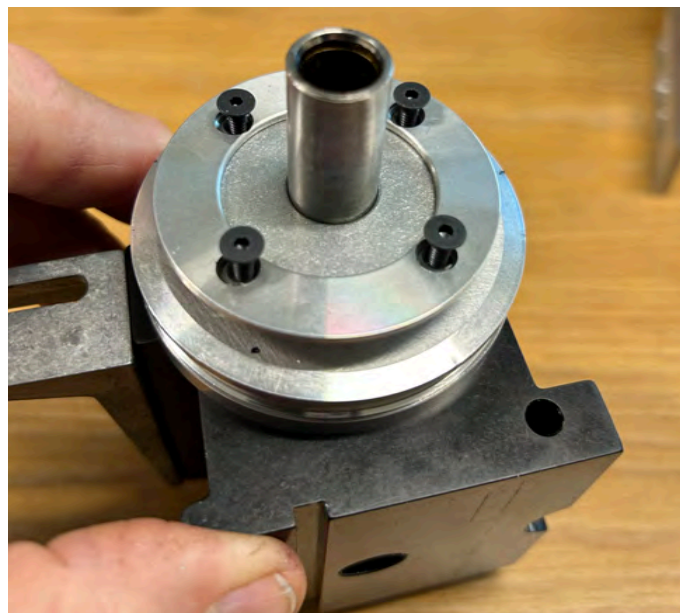


FIGURE 8

F. Using the set screw in the cog pulley and a 3/32" hex wrench, rotate the assembly so the set screw aligns with the flat on the spindle (see Figure 9).



FIGURE 9

G. Push the pulley assembly on until there is a .020" - .030" (.50 - .75mm) gap between the front of the pulley and the back of the headstock. Tighten the set screw in the cog pulley. Then tighten each of the 5-40 screws (see Figure 10).

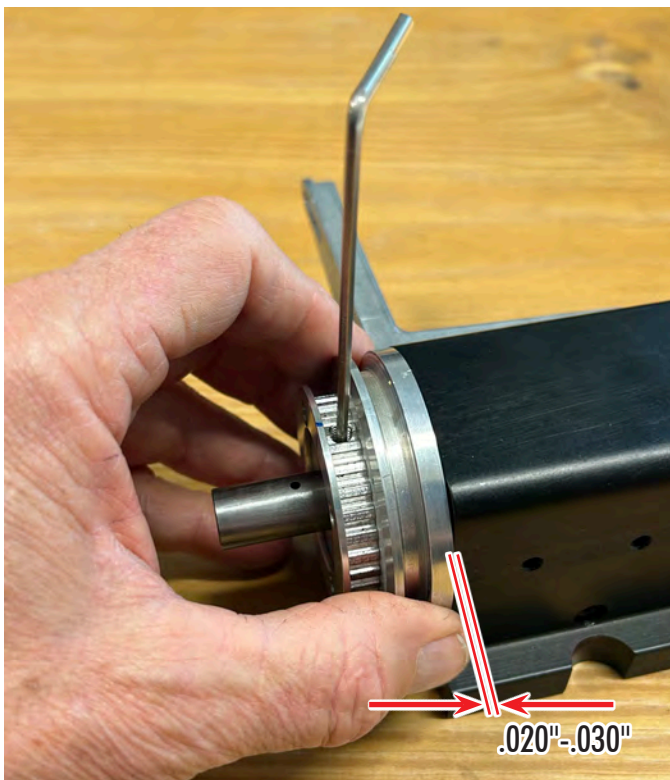


FIGURE 10

Aligning the Motor and the Encoder Pulley

With the encoder pulley properly mounted to the spindle, mount the motor and speed control back onto the headstock. The easiest way to remount the motor is to follow the picture and instructions below.

1. Align the motor and headstock with the pulley on the front motor pulley groove (see Figure 11).

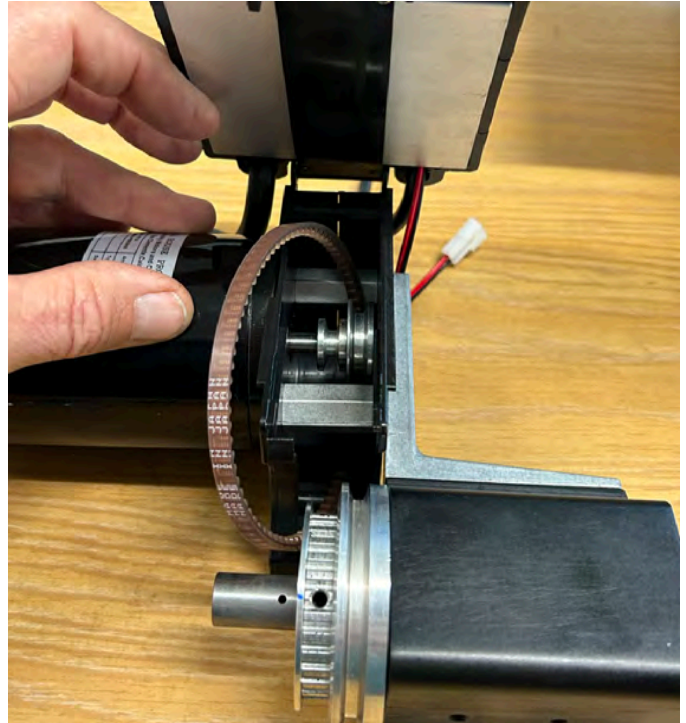


FIGURE 11

2. Tilt the motor assembly off at an angle so you can work the drive belt onto the cog pulley groove. Then turn the spindle pulley until the belt is properly seated in the cog pulley groove (see Figure 12).

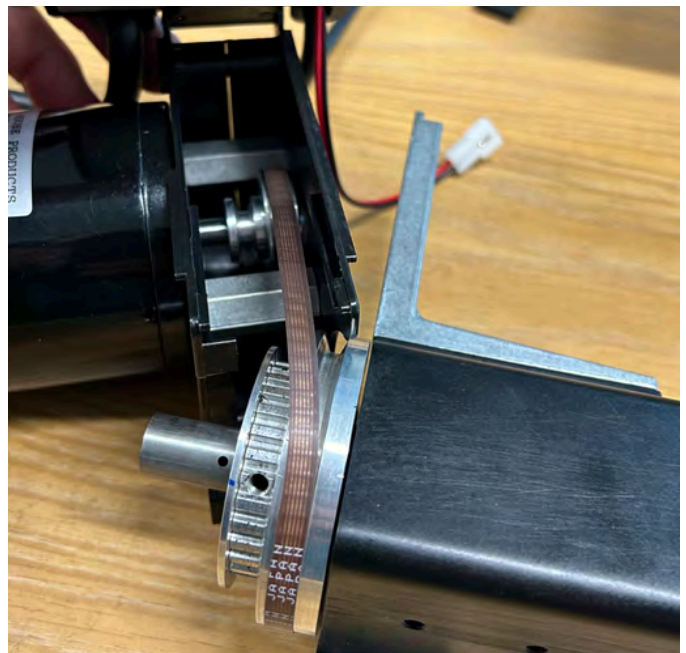


FIGURE 12

- Now push the front ear of the belt guard up against the headstock and the motor mount and rotate the motor assembly forward against the motor mount (see Figure 13).



FIGURE 13—The red oval indicates the front ear of the plastic belt guard.

- Insert the first mounting screw that is closest to the headstock. Do not tighten it all the way at this time (see Figure 14).



FIGURE 14

- Now insert the second mounting screw. Do not tighten the screw all the way at this time.
- Now insert a hex wrench between the motor bracket and the first mounting screw. Then pull back on the hex wrench to force the motor away from the headstock.

Use a fair amount of pressure to tighten the drive belt. While maintaining this pressure, tighten the outer mounting screw. Then tighten the inner mounting screw (see Figure 15).

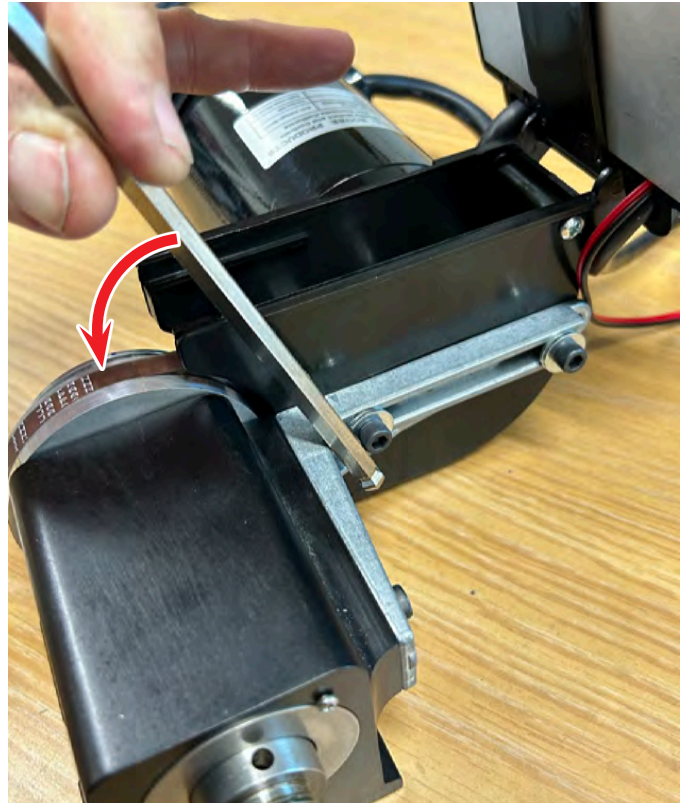


FIGURE 15—Pull back on the hex wrench in the direction of the red arrow to move the motor away from the headstock.

- Slip the timing belt (P/N 94006 for Morse #1 headstock or P/N 94007 for 3C headstock) between the belt guard and onto the cog pulley (see Figure 16).

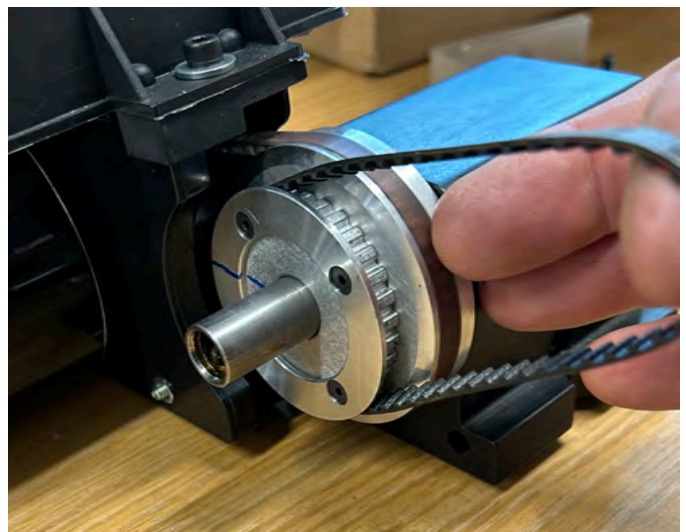


FIGURE 16

Assemble the Encoder Mounting Parts

- Mount the encoder bracket (P/N 67110) to the headstock using the (2) 10-32 x 5/8" SHCS (P/N 40330) with the #10 washers. Make sure that there

is a clearance gap between the bracket and the cog pulley. Turn the pulley 360 degrees to see if there is any contact (see Figure 17).

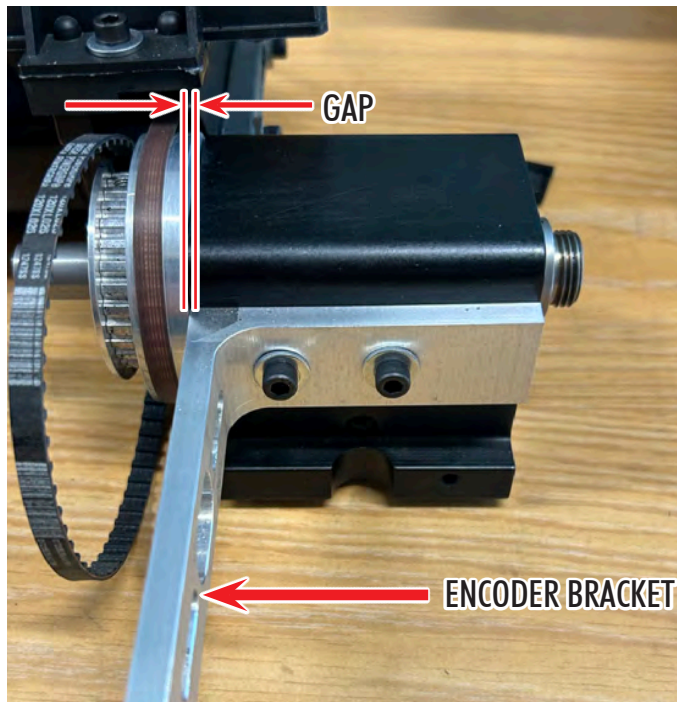


FIGURE 17

2. Lay out the encoder and the mounting plate (P/N 67112) as shown in Figure 18 below. Proper orientation of the three screw holes on the encoder to the mounting plate will result in the encoder cable being on the left side. The mounting plate will be assembled with the hole chamfer side facing away from the encoder body.

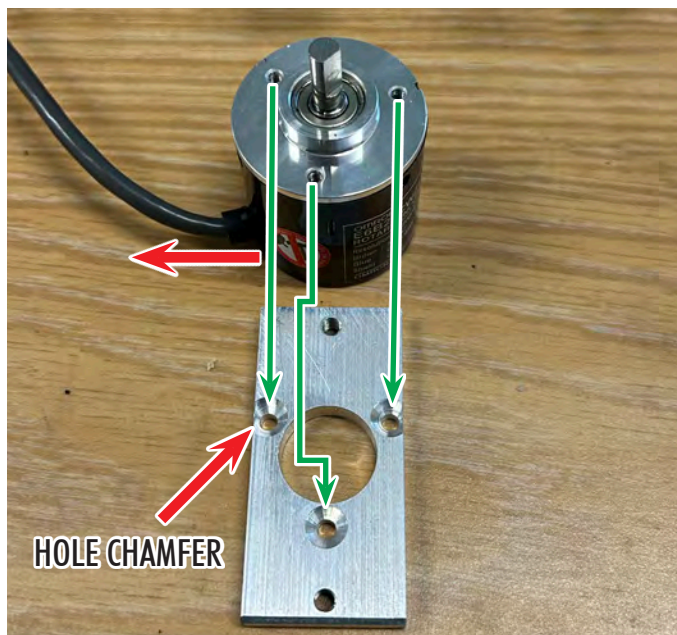


FIGURE 18

3. Use the (3) M3 x 0.5mm flat head screws (P/N 94011) to mount the mounting plate to the face of the encoder. Start all three screws first, then tighten each screw (see Figure 19).

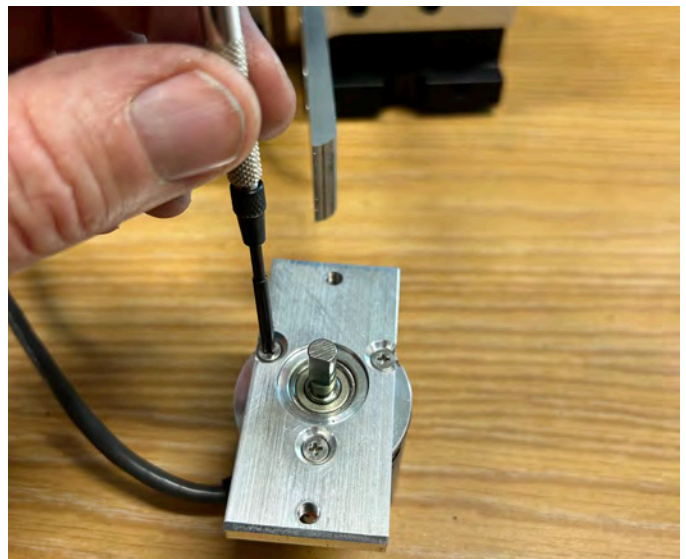


FIGURE 19

4. Insert the encoder shaft into the encoder to cog pulley shaft adapter (P/N 67113). Be sure to align the set screw with the flat on the encoder shaft (see Figure 20).

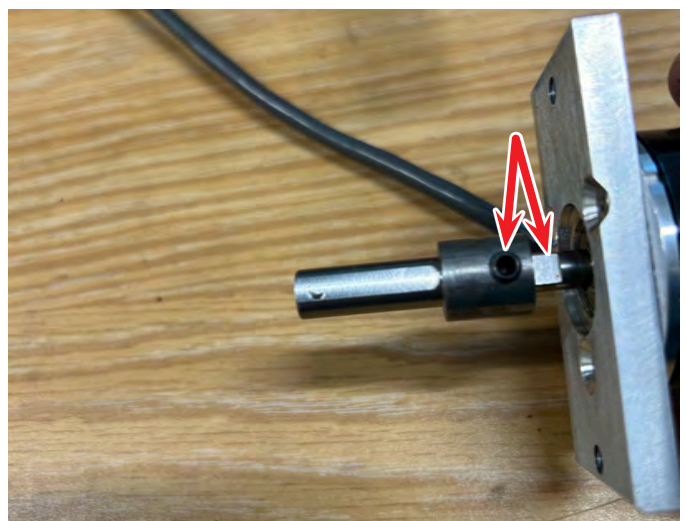


FIGURE 20

5. Push the shaft adapter on all the way as shown below and then tighten the set screw (see Figure 21).

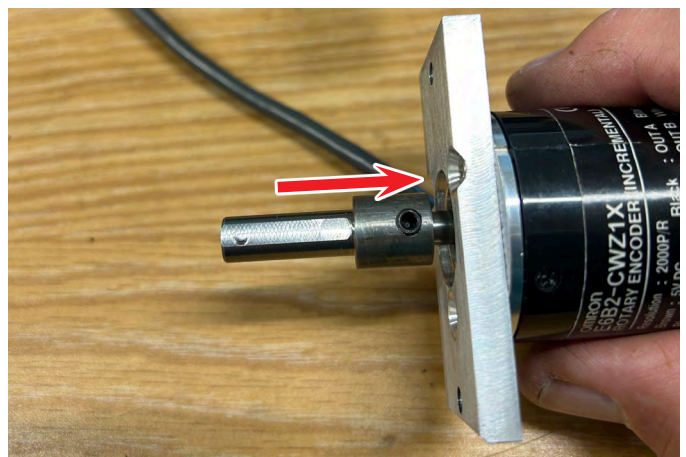


FIGURE 21

6. Insert the shaft adapter through the center hole in the mounting bracket and position the mounting plate with the mounting screw holes aligned with the adjustment slots (see Figure 22).

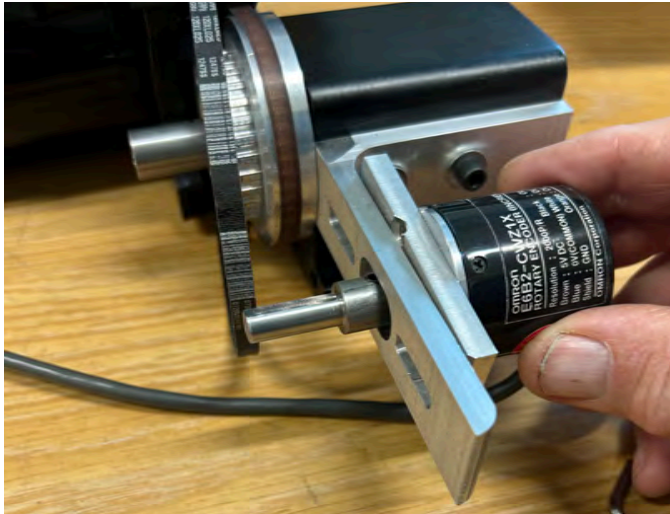


FIGURE 22

7. Insert the (2) 10-32 button head screws (P/N 94010) with washers into the bracket. Align them with the mounting holes in the mounting plate and thread them in two or three turns (see Figure 23).



FIGURE 23

8. Push the 30T cog pulley (P/N 94005) onto the shaft adapter the set screw boss facing away from the encoder. Align the set screw with the flat on the shaft adapter and push the cog pulley on all the way. Use a small 1/16" hex wrench in the set screw of the shaft adapter and a 3/32" hex wrench in the set screw of the 30T cog pulley to help align the set screw to the flat on the shaft. Then tighten the 30T cog pulley set screw (see Figure 24).



FIGURE 24

9. Move the encoder / cog pulley assembly towards the headstock. Walk the timing belt over the top lip of the cog pulley. Then turn the cog pulley to seat the belt around the entire pulley (see Figure 25).

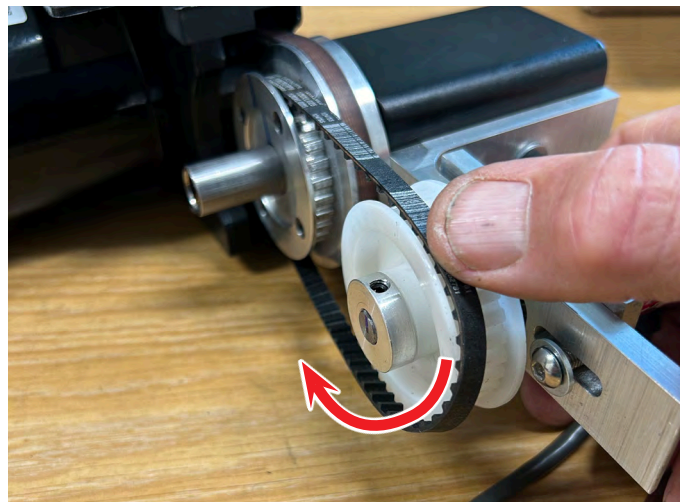


FIGURE 25—Turn the cog pulley to help seat the belt.

10. With the cog pulley towards the headstock, the timing belt will be arched upward (see Figure 26).

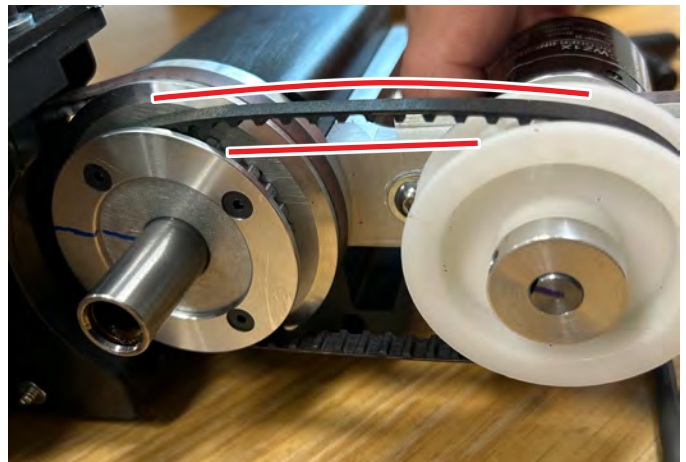


FIGURE 26

11. Tighten the (2) mounting screws (P/N 94010) just enough to hold the assembly square to the bracket, but loose enough to adjust the belt tension.
12. With your thumb and forefinger, squeeze the encoder towards the end of the bracket to tighten the timing belt.

NOTE: These encoders were designed to be mounted on the end of a spindle or motor shaft in a direct line with it. They have bearings on their shaft. However, the bearings are not designed to take a heavy side load. Therefore, the amount of tension force that should be exerted when you pull the encoder / cog pulley away from the headstock “should be just enough to make the arch in the belt straighten out with no additional force!” (see Figure 27).

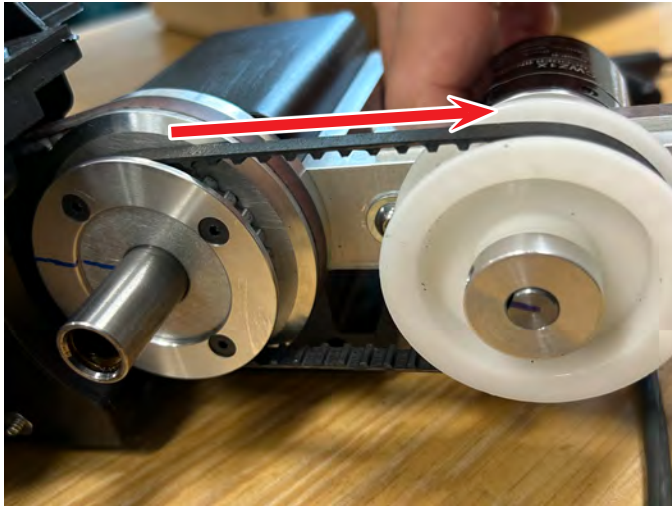


FIGURE 27

13. While maintaining the proper belt tension, use a “Ball End” 9/64” hex wrench to tighten the outer 10-32 mounting screw (P/N 94010). Then tighten the inner mounting screw (see Figure 28).

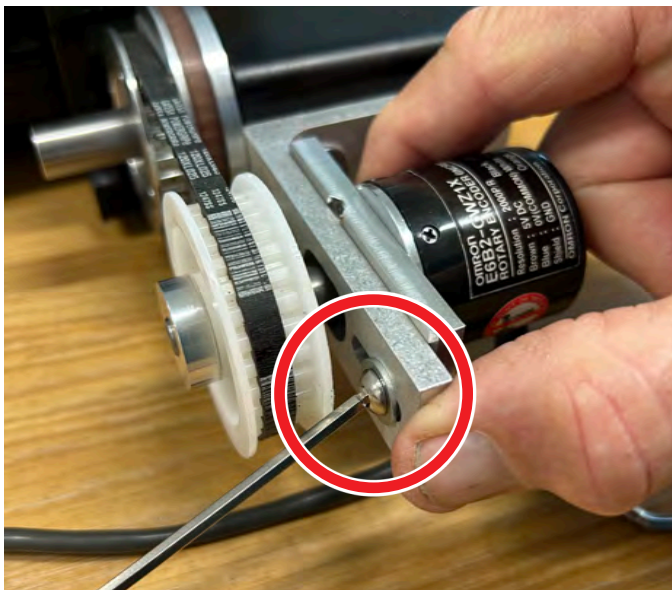


FIGURE 28

14. Now turn the spindle pulley several revolutions to see how the timing belt tracks on the cog pulley. The belt

doesn't need to track perfectly in the center of the cog pulley as long as it does not rub on the outer lips of the cog pulley it will be fine (see Figure 29).

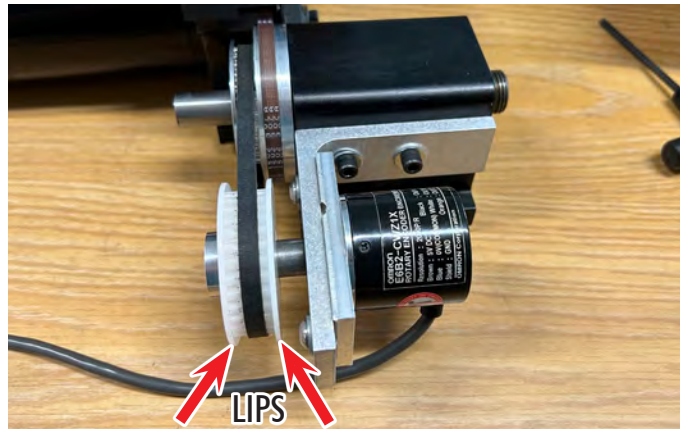


FIGURE 29

Additional Notes for the 3C headstock and Other Options

1. For the 3C headstock, you will need to use the XL-series timing belt that is 13" long (P/N 94007).
2. You will need to remove the set screws that are in the front side of the headstock, shown in Figure 30, in order to mount the encoder bracket (P/N 67110).

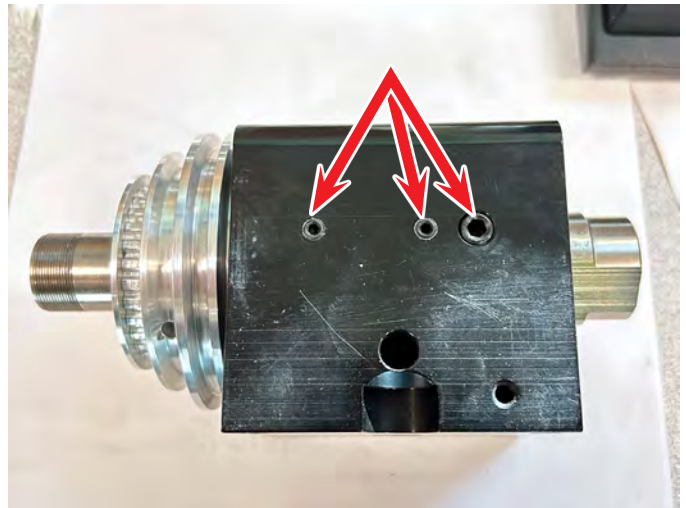


FIGURE 30

3. For the 3C headstock (and when using the 2-speed pulley on our original Morse #1 headstock) you will need to invert the 30T cog pulley (P/N94005) such that the boss with the set screw is on the inside facing the encoder. This will allow the cog pulley to extend farther out so it aligns with the cog pulley on the main spindle pulley (see Figure 31).

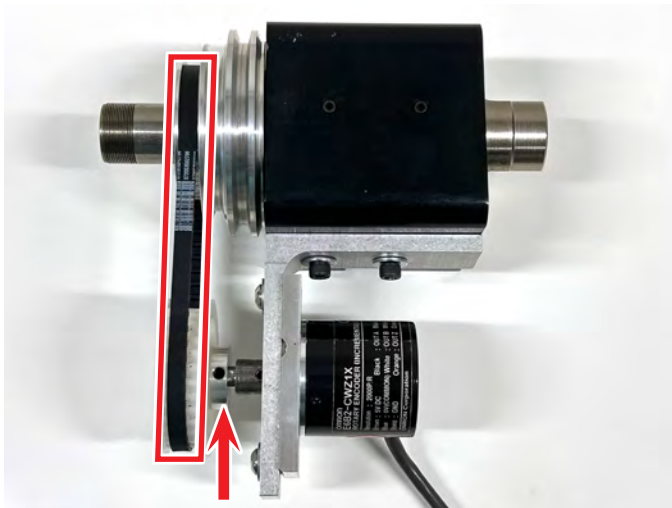


FIGURE 31

4. All other steps of the assembly process are the same between the 3C headstock and the Morse #1 headstock.

Connect the Encoder to the Acorn Control Unit

Connect the DB9 connector on the end of the encoder cable to the middle DB9 connector on the back of the control housing (see Figure 32).

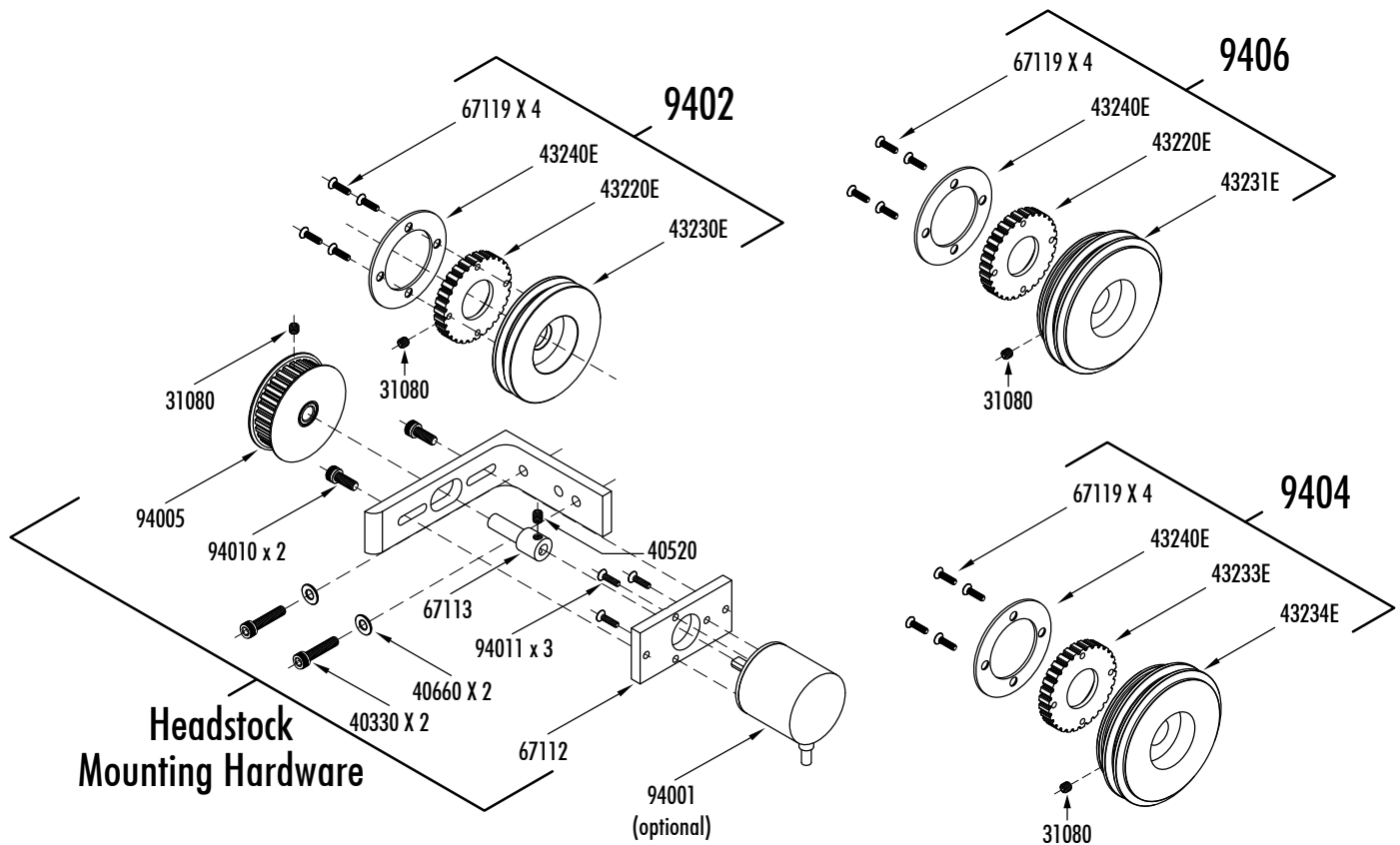


FIGURE 32

NOTE: If this is going to be connected DIY, use the wiring information on the electrical schematic file name “[acorn_mill_connection_back_panel_config.pdf](#)” that is on the last page.

Thank you,
Sherline Products Inc.

External Encoder Pulley Mounting Kit Exploded Views



Parts List – Morse #1 Headstock (9402 & 9406)

NO. REQ.	PART NO.	DESCRIPTION
1*	43230E	Main Spindle Encoder 1-speed Pulley for Standard Headstock (for use w/Lever Collet Closer)
1**	43231E	Main Spindle Encoder 2-speed Pulley for Standard Headstock (for use w/o Lever Collet Closer)
4	67119	Flat Head SH 5-40 x 5/8"
1	43220E	30T Spindle Cog Pulley for Encoder
1	43240E	Encoder Cog Pulley Shoulder Washer
1	67110	Encoder Bracket
2	40330	10-32 x 5/8" SHCS
2	40660	#10 Washer
1	67112	Encoder Mounting Plate
1***	94001	External Incremental Rotary Encoder (optional)
1	94005	30-Tooth XL Series Lightweight Timing Belt Pulley
1	94006	XL Series Timing Belt 120XL025, 12" OD
2	94010	18-8 Stainless Steel Button Head Hex Drive Screw, 10-32 Thread Size, 1/2" Long
3	94011	Steel Phillips Flat-Head Screws, M3 x 0.5 mm Thread, 12 mm Long
1	67113	Encoder to Cog Pulley Shaft Adapter
1	40520	10-32 x 3/16" Cup Point Set Screw
2	31080	10-32 x 3/8" Set Screw

Parts List – 3C Headstock (9404)

NO. REQ.	PART NO.	DESCRIPTION
1	43234E	3C Spindle Encoder 2-speed Pulley with additional 5-40 holes for a 3C Headstock
4	67119	Flat Head SH 5-40 x 5/8"
1	43233E	30T Spindle Cog Pulley for Encoder
1	43240E	Encoder Cog Pulley Shoulder Washer
1	67110	Encoder Bracket
2	40330	10-32 x 5/8" SHCS
2	40660	#10 Washer
1	67112	Encoder Mounting Plate
1***	94001	External Incremental Rotary Encoder (optional)
2	94005	30-Tooth XL Series Lightweight Timing Belt Pulley
2	94007	XL Series Timing Belt 13" x 1/4" (130xL025)
2	94010	18-8 Stainless Steel Button Head Hex Drive Screw, 10-32 Thread Size, 1/2" Long
3	94011	Steel Phillips Flat-Head Screws, M3 x 0.5 mm Thread, 12 mm Long
1	67113	Encoder to Cog Pulley Shaft Adapter
1	40520	10-32 x 3/16" Cup Point Set Screw
2	31080	10-32 x 3/8" Set Screw

* Available with P/N 9402 only (1-speed pulley for use w/LLC)

** Available with P/N 9406 only (2-speed pulley for use w/o LLC)

*** The Rotary Encoder (P/N 94001) is not included with the Encoder Pulley and Headstock Mounting Kits.

Acorn to External Encoder Wiring Schematic

