SHERLINE PRODUCTS

INCORPORATED 1974

Sherline/Acorn Spindle Speed-Control Information

How Acorn Controls the Sherline Speed Control

The following is an explanation regarding how the Acorn controls the Sherline speed control and the resulting RPM.

1. In the Sherline/Acorn control, we use a signal isolator board to send the signal (voltage) from the Acorn to the Sherline speed control.

2. The way the Acorn is designed to send voltage to a speed control is as follows:

   A. In the Acorn Wizard, you set the minimum and maximum speed for your spindle speed control or drive. The Acorn puts out minimal volts at the minimum speed, 5 volts at the middle speed range, and 10 volts at the maximum speed. The voltage output is linear.

   B. The Acorn control will show the actual spindle RPM on the control screen. These RPM values are received from the external encoder.

   C. If there is a difference between the commanded RPM and the actual RPM, the Acorn control does not increase or decrease the amount of voltage to correct the actual RPM.

   D. The result of the linear output without any voltage change is as follows:

      i. At the lower RPM range, the actual RPM will be lower than the commanded value.

      ii. As the RPM's increase, the actual RPM gets closer to the commanded RPM value.

3. We state on our website that the RPM range of our speed control is approximately 70 RPM to 2,800 RPM. This RPM range is for our stock speed-control unit when using the manual speed-control adjustment knob. When using the Sherline/Acorn control to drive the speed control, the lowest RPM will be approximately 150 to 200 RPM and a maximum RPM of up to 2,800.

   NOTE: The pulley for our Morse #1 headstock (P/N 43230E) only has a high-speed pulley groove (see Figure 1). This pulley was designed this way so our customers could use our Lever Collet Closer with their lathe. If you use this pulley you will need to invert the motor pulley so that the large pulley groove on the motor pulley will

line up with the high-speed groove on the spindle pulley (see Figure 2). If you do not change the motor pulley you will have a low speed pulley and all of your commanded rpm values will be half.
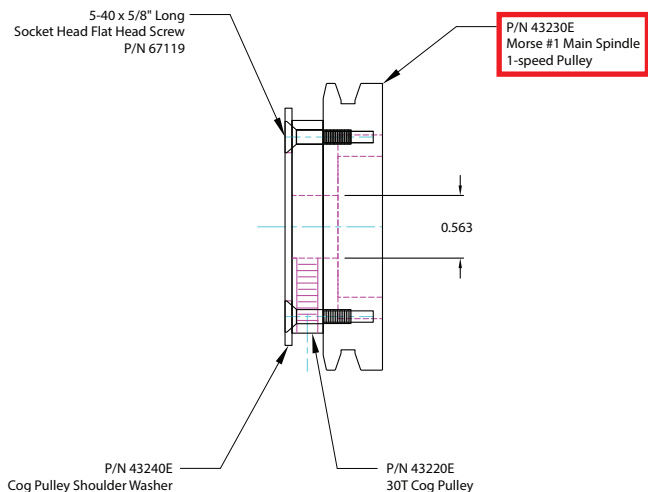

FIGURE 1—Morse #1 main spindle 1-speed pulley (P/N 43230E).
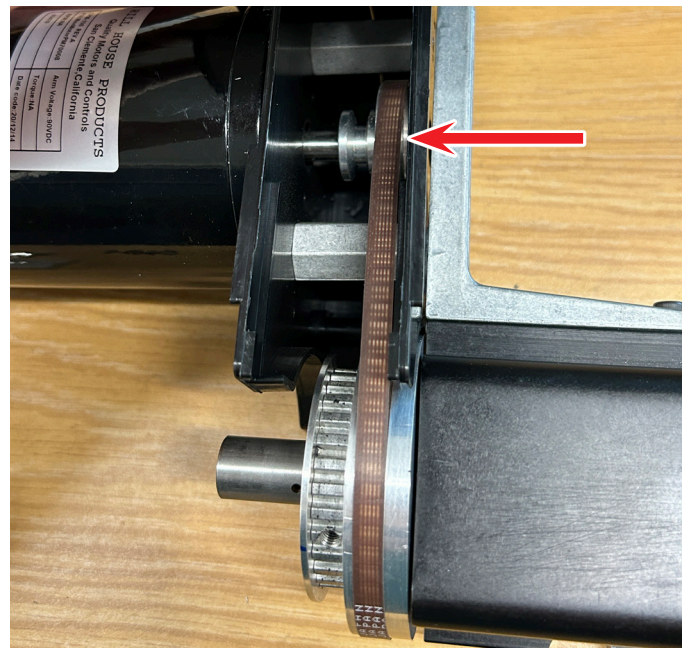

FIGURE 2—The red arrow is pointing to the high-speed groove on the spindle pulley.

The pulley for the 3C headstock (P/N 43234E) has both high-speed and low-speed (high torque) pulley grooves (see Figure 3).
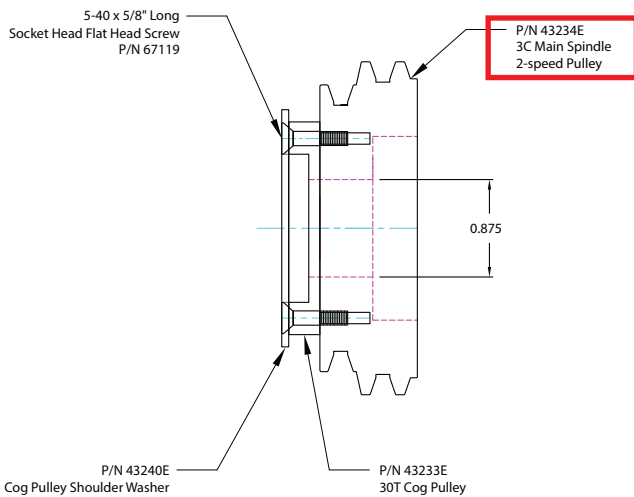

5-40 x 5/8" Long
Socket Head Flat Head Screw
P/N 67119

P/N 43234E
3C Main Spindle
2-speed Pulley

0.875

P/N 43240E
Cog Pulley Shoulder Washer

P/N 43233E
30T Cog Pulley

FIGURE 3—3C main spindle 2-speed pulley (P/N 43234E).

When using this pulley, the "Motor Pulley" must remain in its original orientation with the larger high-speed pulley groove on the motor side (see Figure 4).
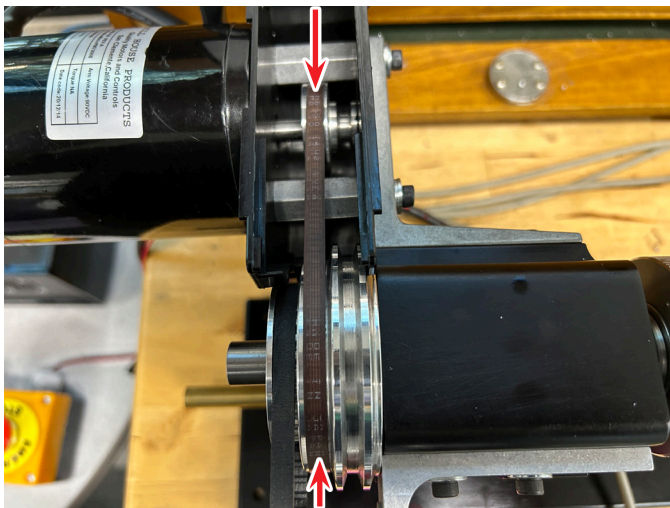

FIGURE 4

If you are not going to use the Lever Collet Closer and you would like to have both high-speed and low-speed (high torque) options for your Morse #1 headstock, then you will need to order P/N 43231E (see the two-speed pulley in Figure 5). The motor pulley orientation should be the same as in Figure 4 above for this pulley, as well.
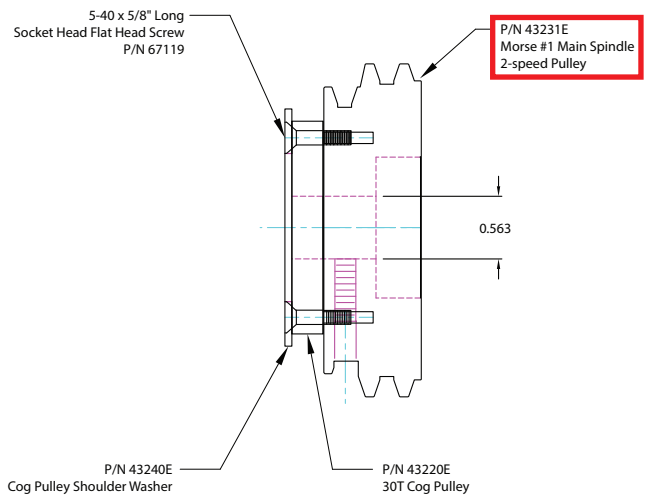

5-40 x 5/8" Long
Socket Head Flat Head Screw
P/N 67119

P/N 43231E
Morse #1 Main Spindle
2-speed Pulley

0.563

P/N 43240E
Cog Pulley Shoulder Washer

P/N 43220E
30T Cog Pulley

FIGURE 5— Morse #1 main spindle 2-speed pulley (P/N 43231E) for use without a Lever Collet Closer.

4. If you are taking a heavy cut that is causing your spindle RPM to decrease, the voltage being sent to the speed control does not change in order to increase or decrease the actual spindle RPM.

5. How does this RPM range variation affect single-point threading? Because the software synchronizes the "Actual" spindle RPM and the Z-axis feed rate, the Z-axis feed rate increases and decreases as the actual spindle RPM increases or decreases. Therefore, if your g-code program is cutting a 32 TPI thread at 400 RPM and the actual RPM of the spindle is only 340 RPM. The Z-axis feed rate will decrease proportionately and cut the threads at the proper TPI. The Z-axis feed rate will also increase or decrease in real time if you are taking a cut that is too heavy, which is slowing down the spindle RPM. However, there is a lag time (response time) for the feed rate variation. Due to this variation, we suggest that you reduce your depth of cut to a depth that will not cause the spindle RPM to drop excessively.

NOTE: Thread cutting is most accurate when using closed-loop stepper motors. If you are not using closed-loop stepper motors and your cut is too deep, resulting in stalling the stepper motor (or causing it to miss steps), your thread will not be accurate and you will lose your axis position.

6. Below are examples of the Commanded RPM and the Actual RPM that we found during our testing. These RPM values were obtained when the Acorn Wizard settings for the spindle were set to the following when

using an encoder that has 2,000 P/R:

Encoder counts per rev = 8,000	
Max RPM = 2,800	
Minimum RPM = 0	
Test results:	
Commanded RPM	**Actual RPM**
250	128
300	180
700	600
1,400	1,344
2,100	2,104
2,800	2,848

NOTE: Your actual RPM may vary slightly from our test results.

7. For most machining operations, these RPM variations are insignificant and fall within an acceptable range.

8. The RPM variation of the actual RPM is generally within ± 10 RPM which is very stable.

9. If you need precise RPM, do the following:

   A. Go to the MDI command page.

   B. Enter the desired RPM (S300 M03).

   C. Write down what the actual RPM is on the control page.

   D. Increase or decrease the entered RPM value until the actual RPM is what you want.

   EXAMPLE: After changing the S value a few times, we found that an S value of (S410 M03) resulted in an actual RPM OF 294–302.

   We then used S410 in our program or in MDI to achieve an actual RPM of 300 (± the fluctuation of ± 10 RPM).

Helpful Speed-Control Wiring Instructions

The spindle control isolator board controls the spindle speed via G-code in the Sherline/Acorn CNC controller. It works in conjunction with the external encoder that is mounted to your machine headstock.

CLICK HERE for the ***Wiring the Isolotor Board to the Speed Control*** instructions.

After wiring the isolator board to the speed-control unit, you may find that your maximum RPM needs to be adjusted.

The Acorn Speed Control – Isolator Board has been adjusted to the maximum output of 10V in the factory. Therefore, there is no need to adjust it.

Thank you,
Sherline Products Inc.