

SHERLINE
PRODUCTS
INCORPORATED 1974

10,000 RPM Pulley Set

P/N 4335 (Pulley set only for retrofit)

P/N 3307 (Complete Headstock/motor/speed control)

Purpose of the high speed pulley set

Over the years we've had several requests for a spindle that would turn at higher RPM. The fact that we use a 6,000-RPM DC motor made this a difficult task to accomplish and maintain our present motor mounting hardware. The main purpose of the high-speed spindle is for turning small diameters on the lathe or for turning small diameter cutters at a higher RPM, which makes them less prone to breakage. We do not consider this an accessory to use like a standard accessory. You have to take the drive system apart to add it, and it will take about ten minutes to change over. There is a second belt position; however, you also have to take the drive system apart to change from high-speed to low-speed. This is a design compromise needed to allow you to fine-tune your Sherline machine while still maintaining a reasonable cost.

Safety considerations

You have to realize that when you are dealing with high-speed spindles you are dealing with a different "animal." You have to consider the safety of your setup before you turn the spindle on. An unsupported shaft turned at high RPM may suddenly wobble and bend 90°. Having a part come loose because of a poor set up and dance around your workbench while still spinning at 10,000-RPM is dangerous. Both ends of the spindle must be considered because the work that may be sticking out the back end of the spindle will be unsupported. As with all machining operations safety glasses are a must. Do not spin large diameters or out of balance setups at high RPM on a Sherline. Remember, these are lightweight machines and cannot tolerate errors of this type.

Adjusting preload for high speed operation

At the factory we set the end play of the spindle at 0.0002" We have found that this setting is too "tight" for use at this high an RPM and increased it to 0.0003" for spindles that are going to run continually for long periods. If you are mounting the 10,000 RPM pulley set on a spindle that has had considerable use, you may not have to change the adjustment. In any case I'd run it and check to see if it gets too hot before making any adjustments to the preload nut. You can't hurt the bearings on a Sherline spindle by letting

them get hot for a few moments. If it gets too hot to hold your hand on the headstock comfortably or if it won't spin up to the full 10,000 RPM, back the preload nut off less than 2°* and give the pulley end of the spindle a sharp tap with a mallet. The tap is to move the inner race of the bearing on the spindle shaft increasing end play. If you have a good indicator you can check the end play by putting around ten pounds of pressure to both ends of the spindle, one end at a time, and reading the total movement. You could also spin a free running spindle with a flick of the wrist and if it makes less than two revolutions with a 3-jaw chuck mounted on it, it will probably need to be backed off 2° to 4° to be run for a long periods at 10,000 RPM.

* **NOTE:** If you are using a 6" long wrench, each degree of rotation will cause the end of the wrench to move about 0.1" (2.5 mm). Therefore, 2° of rotation will cause the end of the wrench to move about 0.2" (5 mm). Each degree of rotation also increases end play by 0.00012".

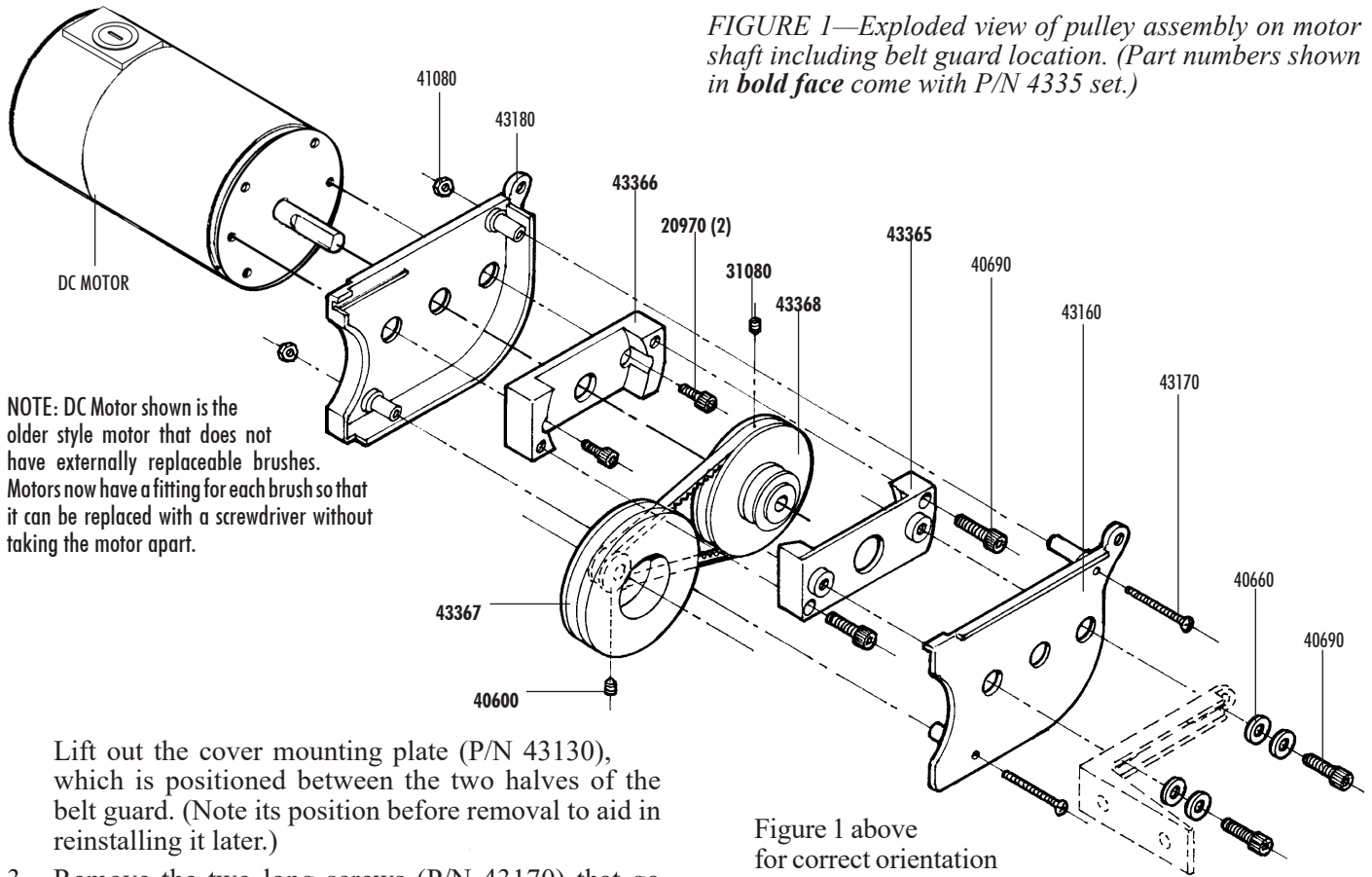
Replacing the standard pulleys with the 10,000 RPM pulley set

To remove the existing standard pulley set on your Sherline headstock and replace it with the 10,000 RPM pulley set, follow the instructions below. Refer to Figure 2 on page 4 of these instructions or to the exploded view in your *Sherline Assembly and Instruction Guide* for reference to the standard pulley and speed control parts.

Removing the standard pulley set: Because the motor pulley diameter had to be larger than the center distance of the motor mounting holes, a relatively complex set of parts had to be manufactured to replace the two inexpensive motor standoffs. These parts have to be assembled in the correct sequence in order to work properly.

1. Remove the two socket head screws and washers that hold the motor in position on the mounting bracket. Slip the drive belt off the spindle pulley, remove the motor and speed control unit and set it down on a folded towel or padded surface to work on it.
2. Remove the socket head screw that holds the speed control housing in place and pivot the speed control upward on its hinge pins to expose the motor pulley.

FIGURE 1—Exploded view of pulley assembly on motor shaft including belt guard location. (Part numbers shown in **bold face** come with P/N 4335 set.)



NOTE: DC Motor shown is the older style motor that does not have externally replaceable brushes. Motors now have a fitting for each brush so that it can be replaced with a screwdriver without taking the motor apart.

Lift out the cover mounting plate (P/N 43130), which is positioned between the two halves of the belt guard. (Note its position before removal to aid in reinstalling it later.)

3. Remove the two long screws (P/N 43170) that go through the belt guard and take off the outer belt guard (P/N 43160). (Make sure you don't lose the nuts [P/N 41080] that are inset into the rear belt guard. They may stick in the holes or they may fall out.)
4. Remove the drive belt. Using the smallest hex key provided with your machine, loosen the set screw in the motor pulley (P/N 43360) and remove it from the motor shaft.
5. Using an adjustable wrench, remove the two motor standoffs (P/N 43100). The inner belt guard (P/N 43180) can now be removed.
6. Loosen the set screw and remove the spindle pulley (P/N 43230) from the spindle shaft on the headstock.

Installing the new 10,000 RPM pulley set

1. Slip the inner belt guard (P/N 43180) over the motor shaft and align the two outer holes with the appropriate holes in the end of the motor. See the exploded view for orientation of the motor and which two of the four holes to use.
2. Slip the inner standoff half (P/N 43366) over the motor shaft and attach it to the motor using the two 8-32 screws (P/N 20970). (Tighten using the 9/64" hex key provided with the kit.) Make sure the bosses on the back side register in the holes in the belt guard and are fully seated.
3. Put the drive belt over the motor pulley (P/N 43680) and slip the motor pulley and belt over the motor shaft. Tighten the set screw against the flat of the motor shaft. The pulley should be positioned close to the standoff but not touching it. Look at the exploded view in

Figure 1 above for correct orientation of the pulley. NOTE: The pulley position can be readjusted and the setscrew can be firmly tightened in place after the motor is mounted to the headstock to assure proper belt alignment.

4. Attach the outer half of the standoff assembly to the inner half using the two 10-32 x 3/4" socket head screws (P/N 40690). Make sure the drive belt exits in the proper location, with the leg of the standoff going through the center of the belt circle.
5. Register the outer belt guard (P/N 43160) over the raised bosses on the outside of the standoff assembly and attach it to the inner belt guard using the long screws (P/N 43170) going into the inset nuts (P/N 43180) in the back of the inner belt guard.
6. Put the new spindle drive pulley (P/N 43367) onto the headstock spindle shaft and secure it by tightening the set screw located in the groove of the smaller pulley. See Figure 1 for orientation.
7. Lift the motor assembly into approximate position. Make sure the drive belt is correctly fitted over the larger of the motor pulley grooves and is not binding, and then slip the other end of the drive belt over the smaller of the two pulleys on the spindle pulley.
8. Register the holes in the end of the outer standoff housing with the slots in the motor mounting bracket and loosely install the two mounting screws with two washers on each 10-32 x 3/4" screw.
9. Push the motor assembly away from the spindle to put sufficient tension in the drive belt and tighten the screws in the motor mount to hold it in position.

The belt does not have to be extremely tight to work properly. Pressing on the belt with your finger halfway between the pulleys, you should be able to depress it about 1/4" when properly tightened. Turn the motor by hand to make sure the belt is not rubbing anywhere and whole assembly turns easily.

10. Insert one of the speed control housing hinge pins into one of the "ears" on the rear of the belt guard. Push to bend the ear slightly until the other pin can be seated in the other ear.
11. Install the mounting bracket (P/N 43130) in the slots in the two halves of the belt guard by setting it atop the two molded-in rails. It should slide back and forth slightly.
12. Pivot the speed control housing downward and attach it to the mounting bracket with the socket head screw and washer to secure it in place.

Changing speed ranges with the 10,000 RPM pulley set

If you need to change pulley speed ranges on the standard pulley set, it is done by simply pivoting the speed control out of the way, loosening the motor mount and slipping the drive belt from one pair of pulleys to the other. The 10,000 RPM pulley set, on the other hand, has very little clearance between the belt and the inside of the motor standoff pair. Therefore, it is necessary to remove the outer belt guard and outer standoff half and loosen the motor pulley to move the belt to the lower speed position. Here's how:

1. Loosen the cap screws that hold the motor and speed control to the motor mounting bracket, remove the drive belt from the spindle pulley and set the motor unit down on a padded surface to work on it.
2. Remove the speed control mounting screw and pivot the speed control box upward.
3. Slide the mounting tab from between the belt guard halves, noting its position for later reinstallation.
4. Remove the long screws P/N 43170 that hold the two halves of the belt guard together and take off the outer belt guard.
5. Remove the two P/N 40690 socket screws from the outer standoff (P/N 43365) and take off the outer standoff.
6. Loosen the set screw (P/N 31080) in the groove of the motor pulley and slide it far enough down the motor shaft so that the pulley can be switched to the smaller pulley.
7. Move the pulley back into position and retighten the set screw.
8. With the drive belt in place on the smaller pulley, reinstall the outer standoff (P/N 43365) making sure the belt exits in the proper location.
9. Reinstall the outer belt guard (P/N 43160) using the two long screws.
10. Slip the drive belt over the large diameter groove of the spindle pulley and remount the motor/speed control unit to the machine. Push the motor outward on the motor mount to tension the belt as the two mounting screws are tightened.

11. Reinstall the speed control housing pins between the "ears" of the two halves of the belt guard.
12. Reinstall the mounting tab and swing the speed control housing down into place. Attach with the mounting screw.

Pulley speed ranges

The standard pulley set offers a speed range of 70-2800 RPM in normal position and 45-1400 in the "hi torque" position. The 10,000 RPM pulley set actually offers a speed range of from about 1500 to 10,200 RPM in the high speed position and 150 to 2200 RPM in the low speed position. Maximum RPM in the high speed position can be affected by the preload setting. If the preload is set to the original factory setting of 0.0002" of runout, it may not be possible to achieve an actual 10,000 RPM. Loosening the preload to the recommended high speed setting of 0.0003" of runout should make speeds of 10,000 RPM possible.

Precautions

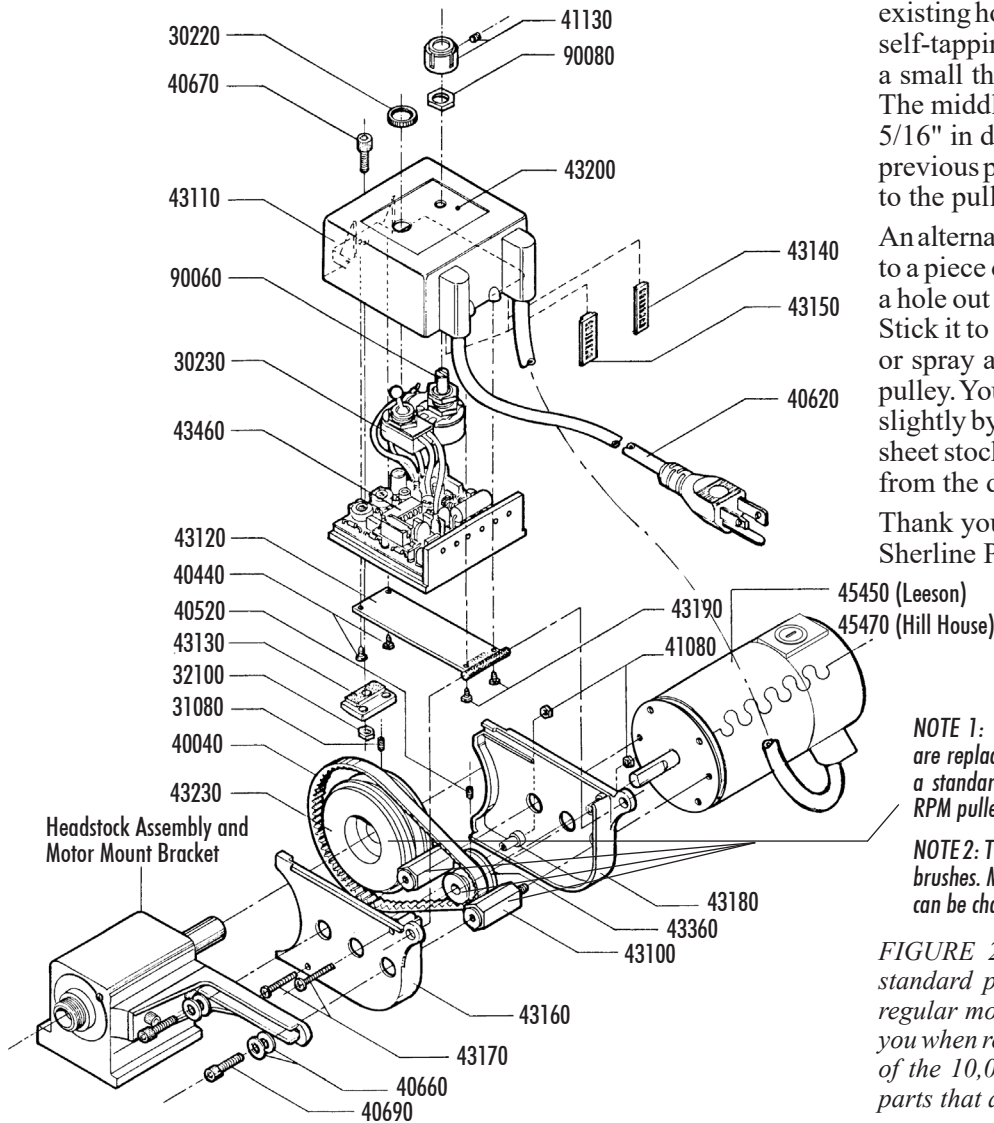
- Make sure speed control knob is in the slowest position before turning motor switch on, then adjust spindle speed as needed.
- Parts or chucks rotated at high speed must be in balance. Do not operate at high speed in an out-of-balance condition. Also, do not spin a chuck that is not tightened on a part as the scroll could unwind allowing the chuck jaws hit the lathe bed.
- Shafts at either end of the spindle should be supported if rotated at high speeds. An unsupported shaft that is slightly out of center can suddenly whip and bend 90° if speed is high enough.
- If headstock becomes too hot to hold your hand on it, the preload is set to tight. Refer to the instructions to back off the preload nut slightly.

Using the 10,000 RPM Pulley Set with a Digital Readout

RPM READOUT—Prior to the introduction of the 10,000 RPM pulley set, spindle speeds of over 5000 RPM were not anticipated. Therefore, the original design of the digital readout RPM gage did not read that high. After speeds higher than about 5100 RPM, the readout will return to zero and start over. All new DRO chips have been reprogrammed to read up to and far beyond 10,000 RPM, but if you have an older unit that does not, it can be upgraded by exchanging the IC chip. Call Sherline for details. There is a small service charge for the new chip, which is refunded when you return your old chip. If you prefer not to change the chip yourself, the DRO box may be returned to Sherline and we will make the exchange for you for a \$15.00 service fee.

INSTALLING THE DECAL AND PICKUP—The 10,000 RPM spindle pulley is different from the standard pulley. To install the RPM sensor decal, you will have to cut out a circle from the center of the decal to clear the inner pulley. Apply the part with the six black marks to the outer part of the larger pulley face.

The molded plastic sensor is also set to a height designed to read the upper pulley. Since the large pulley is now the lower pulley, the sensor will have to be lowered. One way to do this is to bend a "Z" bracket from scrap metal with two opposite 90° bends. Drill one end to mount to the



existing hole in the belt housing using the existing self-tapping screw. Drill the other end to accept a small through bolt and nut to hold the sensor. The middle “leg” of the bracket should be about 5/16” in depth. The sensor is mounted 90° to its previous position with its face as close as possible to the pulley decal without touching it.

An alternative method would be to attach the decal to a piece of cardboard or thin sheet stock and cut a hole out of the middle to clear the spindle shaft. Stick it to the outer pulley with double-stick tape or spray adhesive and let it hang over the inner pulley. You might have to space the sensor upward slightly by the same thickness as the cardboard or sheet stock to keep the sensor the proper distance from the decal face.

Thank you,
Sherline Products Inc.

NOTE 1: These two standard pulleys and two motor standoffs are replaced by the new pulleys and standoffs when converting a standard headstock/motor/speed control unit to the 10,000 RPM pulley set.

NOTE 2: The motor shown is the older style DC motor with internal brushes. Motors now have external brush mounts so the brushes can be changed without taking the motor apart.

FIGURE 2 (Left)—This exploded view shows the standard pulley arrangement as it comes with the regular motor and headstock. It can be used to help you when removing the standard parts for installation of the 10,000 RPM pulley set. See Figure 1 for the parts that are different in that installation.

Parts Listing

Parts for P/N 4335 10,000 RPM pulley set

P/N	REQ.	DESCRIPTION
12070	1	9/64” Hex key (not shown)
20970	2	8-32 x 1/2” SHCS
31080	1	10-32 x 3/8” Flat point set screw
40690	2	10-32 x 3/4” SHCS
43365	1	Outer standoff half
43366	1	Inner standoff half
43367	1	10,000 RPM Spindle pulley
43368	1	10,000 RPM Motor pulley
40600	1	10-32 x 1/4” cup point set screw
For P/N 3307 with headstock, motor and control add the following parts		
45450*	1	DC motor (made by Leeson)*
45470*	1	DC motor (made by Hill House)*
41080	2	6-32 nut
43180	1	Inner belt guard
43130	1	Speed control cover mounting plate
32100	1	10-32 hex nut
43120	1	Speed control hinge plate
43110	2	Motor standoff
43160	1	Outer belt guard
43170	2	6-32 x 1-3/8” pan head screw
43140	1	Speed control tab, small
43150	1	Speed control tab, large
43460	1	Speed control electronics

P/N	REQ.	DESCRIPTION
43110	1	Speed control case
90060	1	Speed control potentiometer
90080	1	Potentiometer washer
41130	1	Speed control knob with set screw
30230	1	On/off switch
30220	1	Switch knurled round nut
40670	1	10-32 x 1/2” SHCS
40660	5	3/16” I.D. washer
43200	1	Speed control label
40620	1	8’ power cord, USA (or 80630, UK; 40640, Europe)
40040	1	Drive belt
40520	1	Preload nut
40420	2	Headstock bearing
40100	1	Headstock case
40230	1	Spindle
40320	1	Bearing washer
40020	1	Motor mount
40510	2	10-32 x 3/8” SHCS
40690	2	10-32 x 3/4” SHCS
40520	1	10-32 x 3/16” cup point set screw
40540	1	5/16-18 x 3/4” cone point set screw
43190	2	#2 x 14” flat head sheet metal screw
40440	2	Self tapping screw

*NOTE—Sherline purchases motors from two sources. Specifications for each are identical, but the circuit boards are tuned for a particular motor, so replace with a like brand whenever possible. They can be identified by part number on the motor label.