

# Ball Screw Coupling Assembly Instructions

## Before You Begin

Use the exploded view below for reference (see Figure 1).

**NOTE:** The standard coupling that goes with our standard stepper motor, which has a 1/4" shaft, is P/N 59105. The coupling that goes with our 36V closed-loop stepper motor, which has an 8 mm shaft, is P/N 59105AP.

1. It is very rare that the coupling P/N 59106 wears out.
2. Some possibilities for slippage in the joint:
  - A. The assembly screw P/N 11534 may have come loose (or broken).
  - B. The two set screw P/N 40520 may have come loose.
  - C. The bearing preload nut P/N 59104 may have come loose.
  - D. P/N 40520 set screw may have come loose.
  - E. If a hard crash has occurred, the taper-to-taper fit between P/N's (59105 or 59105AP) and 59106 may have come loose (very low possibility if P/N 11534 is tight)

**NOTE:** We add removable, high-strength "Loctite 262" to the following parts on this assembly to prevent them from coming loose.

(2) 40520 set screws

The taper-to-taper fit on P/N 59105AP & 59106, and P/N 59104 preload nut (see red lines in exploded view).

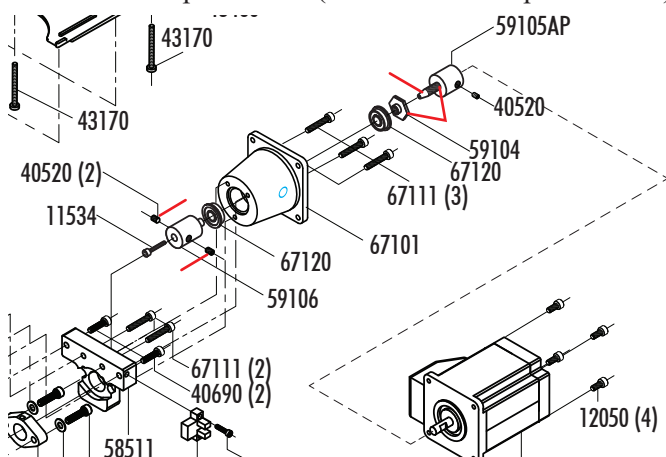


FIGURE 1

## Removal Instructions

Before you disassemble the coupling/stepper motor assembly, check the following:

1. Turn the coupling and listen and feel for a clicking noise. If you feel or hear a clicking noise, the bearings are probably bad and will need to be replaced.
2. Turn the stepper motor until the stepper motor set screw P/N 40520 is visible through the access hole in the side of the stepper motor mount P/N 67101 (blue circle in exploded view in Figure 1). Insert a 3/32" hex key through the access hole and into the set screw. Now, while holding the coupler P/N 59105AP in place with the hex key, try to turn the ball screw by hand. If something has come loose in the assemble, you may feel the disconnection now. If not, tighten set screw P/N 40520.
3. Turn the stepper motor until you have access to the (2) P/N 40520 set screws. These set screws hold the ball screw in place on P/N 59106 and they have the most force exerted on them during use. Tighten both of these.
4. Move the axis and check the backlash.
5. If tightening these set screws does not solve the problem, you will need to remove the stepper motor mount assembly. Follow the instructions below.
  - A. Loosen both of the 40520 set screws on either side of P/N 59106. These screws have removable Loctite on them. Be sure to use a good 3/32" hex key (not one with rounded corners). Once you have broken these set screws loose, back them out a few turns.
  - B. Loosen the stepper motor set screw P/N 40520 (using the access hole in the stepper motor mount).
  - C. Now remove the (3 or 4) 8-32 screws P/N 12050 that connect the stepper motor to the stepper motor mount. Then remove the stepper motor from the mount.
  - D. Now remove the (3) 8-32 screws P/N 67111 that connect the stepper motor mount P/N 67101 to the axis.
  - E. At this time, you should be able to remove the entire

stepper motor mount assembly from the machine and from the end of the ball screw.

**NOTE:** If you are having a hard time removing the end of the ball screw from the coupler P/N 59106, this may be due to an over flow of Loctite on the set screws that has gone into the coupler and is on the end of the ball screw. In this case, you may need to heat up the coupler in order to break down the Loctite. This can be done by using a small butane lighter. Hold the flame of the lighter under the coupler and turn the coupler so all sides are heated. Then wiggle the stepper motor mount assembly while you are pulling it away from the ball screw.

If needed, you can use a pair of pliers on the end of the ball screw (closest to the coupling) and another pair on the coupling to twist them apart. The ball screw is hardened and the ball nut will never make contact with the area of the ball screw that is closest to the coupling.

F. At this point the entire stepper motor mount assembly should be out and easy to work on. Leave the set screws P/N 40520 in both couplings (P/N 59105 and 59106). Insert 3/32" a hex key into the set screw in 59105 through the access hole so you can keep the coupling assembly from turning. Then place a 3/32" hex key in the 5-40 screw P/N 11534. Loosen and remove this screw.

G. Once the 11534 screw is removed, the coupling assembly should come apart. If not, insert a 3/32" hex key into one of the 40520 set screws in P/N 59106. Then turn P/N 59106 while holding P/N 59105 in place with the other hex key.

- i. Pull P/N's 59106 and bearing P/N 67120 from the front end of the stepper motor mount. Pull P/N's 59105, 59104, and bearing 67120 from the inside of the stepper motor mount.
- ii. Using a 3/4" wrench remove P/N 59104 from 59105. P/N 59104 has removable Loctite on the threads. You will need to insert the hex key into the set screw to help keep the coupling from turning. It will take some force to break the Loctite seal loose.

H. With all of the parts disassembled, clean off any Loctite from exposed surfaces and threads.

### Assembly Instructions

Check all parts for damage or excessive wear. Reuse the good parts and order new replacement parts. If you go to our "Machine Exploded Views" page, you can pick your machine from the list and order replacement parts using the individual part numbers that are on the exploded view ([Exploded Views - Sherline Products](#)).

Again, the standard coupling that goes with our standard stepper motor which has a 1/4" shaft is P/N 59105. The coupling that goes with our 36V closed-loop stepper motor, which has an 8 mm shaft is P/N 59105AP.

1. The most common part to wear out are the bearings. You can check the bearings by assembling all of the parts without the stepper motor mount as shown below. With the preload nut threaded all the way against the coupling 59105 and both bearings riding free on their mating coupling, tighten the 5-40 screw that connects both couplings together at their taper (see Figure 2).

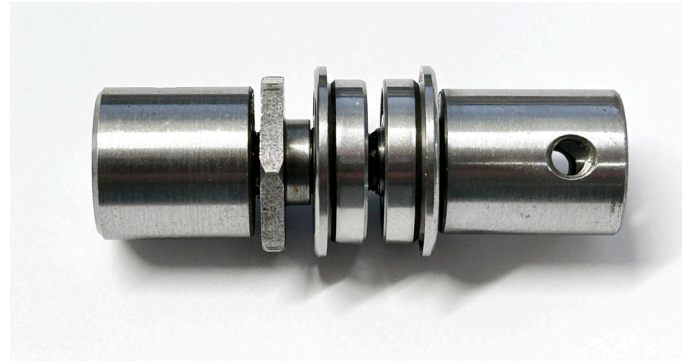


FIGURE 2

2. Now tighten the preload nut down against the inner race of the bearings "by hand" (see Figure 3).



FIGURE 3

3. Spin the bearings on the assembly and listen and feel for any clicking noise. If there is any clicking noise, the bearings are bad and should be replaced.

### THREE NOTES:

- A. Because there is no force outward on the bearing shoulder, this is not a 100% accurate test for the bearings.
- B. The amount of force that you just exerted on the bearings when you tighten the preload nut with your fingers, is the exact amount of torque that you want to use when you do the final assembly.
- C. If you have any reason to believe that the bearings are not 100% good, replace them now. They are cheap replacement parts and you already have your machine disassembled.
4. Take the assembly apart and reassemble as described below.



A. Clean both the male and female taper surfaces on P/N's 59105 and 59106 (see Figure 4).

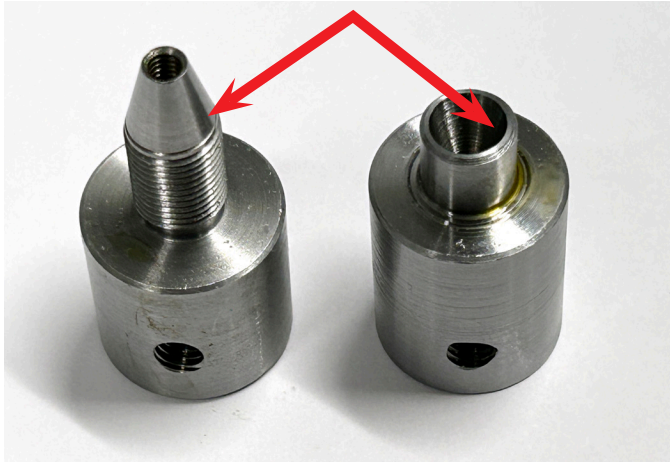


FIGURE 4

B. Place a bearing onto P/N 59106 with the bearing shoulder towards the shoulder on the coupling (see Figure 5).



FIGURE 5

C. Place a small drop of Loctite 262 on the taper and the threads of coupling 59105. Wipe the Loctite evenly around the entire tapered surface without getting any into the 5-40 threaded hole in the end of the coupling (see Figure 6).



FIGURE 6

D. Thread the preload nut 67120 onto the coupling 59105 all the way up to the shoulder. The preload nut must have the preload shoulder facing the tapered end on the coupling (see Figure 7).

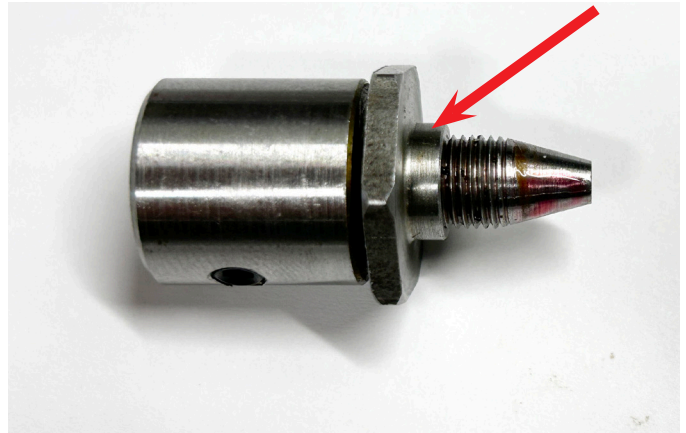


FIGURE 7

E. Place the bearing onto the thread on the coupling with the bearing shoulder facing the preload nut (see Figure 8).

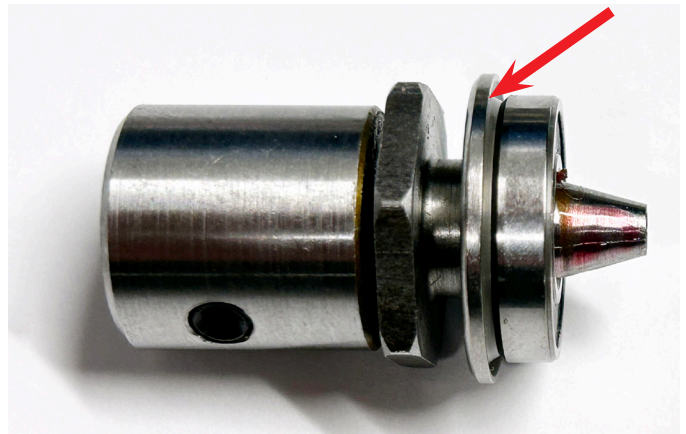


FIGURE 8

F. Put the 59105 coupling assembly into the stepper motor mount 67101 with the bearing pushed all the way up to its shoulder on the inner shoulder of the motor mount (see Figure 9).



FIGURE 9

- G. Put the 59106 coupling assembly into the front side of the motor mount until the bearing shoulder is pushed all the way down into the counter bore. Apply pressure to the 59105 assembly from the inside while you are doing this (see Figure 10).



FIGURE 10

- H. Insert the 5-40 screw 11534 into coupling 59106 and thread it into coupling 59105 until it is finger tight. This will begin to engage the two tapers and hold the assembly together.
- I. Turn the coupling until you can see the set screw in the side of 59105 through the access hole in the motor mount. Insert a hex key through the access hole in the side of the motor mount and into the set screw. This will hold the 59105 coupling in place while you tighten the 5-40 locking screw 11534 (see Figure 11).



FIGURE 11

Tighten the 5-40 screw as tight as you can. Then remove both hex keys and turn the coupling assembly. The assembly should turn free without any resistance. If you feel resistance, the preload nut may be applying pressure to the inner race of the bearings. If this is the case, remove the 5-40 locking screw, pull the 59105 coupling assembly out, and thread the preload nut up closer to the coupling shoulder. Then reassemble and tighten the 5-40 screw again.

- J. To adjust the preload nut you will need a “3/4” deep socket.” Place the deep socket into the backside of the motor mount until it engages with the hex on the preload nut. Place a hex key into one of the set screws on the side of 59106 coupling. This will keep the coupling from turning (see Figure 12).



FIGURE 12

**NOTE:** When you tighten the preload nut, you are forcing the inner race of each bearing towards each other. This in turn forces the balls inside the bearing against the inner side of the outer race ball carriage. The outer race is held in place by the shoulder on each bearing. What you are doing when you set the preload is to remove any free play between the inner race, the balls, and the outer race of the bearings. Proper preload adjustment will result in little to no free play between the two bearings. Excessive preload of the bearings will either cause the bearings to wear out prematurely or ruin the bearings.

To set the preload on the bearings, turn the 3/4" socket “by hand” until it makes contact with the bearing. Remove the socket and turn the coupling assembly. When the preload is set correctly, there will be a very slight amount of resistance when you turn the coupling. If you feel too much resistance, back out the preload nut a bit until the coupling assembly turns freely, then tighten it back a bit less than the previous adjustment.

**NOTE:** If you feel or hear a clicking noise, the preload is **Too Tight!** You will need to readjust the preload.



K. Once the stepper motor mount / coupling assembly is ready, place the assembly back onto the axis. Use the three 8-32 screws 67111 to attach the motor mount to the axis. **Do not fully tighten these screws at this time.**

L. Move the ball screw and axis towards the motor mount and coupling. Insert the ball screw into the coupling “with the flats on the ball screw perpendicular to the two set screws in the coupling.” If the ball screw is a snug fit into the coupling, you can use a pair of pliers on the end of the ball screw closest to the coupling. Then place the hex key in one of the set screws in the coupling and turn both the coupling and the ball screw as if you were threading the ball screw into the coupling. Once the ball screw is fully inserted into the coupling, use the same procedure to realign the flats on the ball screw with the two set screws.

M. Now you will need to tighten both of the set screws into the flats on the ball screw. To do this, alternate from one set screw to the other, tightening each set screw a little bit more until they are fully tightened.

N. Now you can either turn the ball screw by hand, or you can use a hex key in the 5-40 locking screw. You want to move the saddle on the given axis until it is as close to the stepper motor as possible.

Then loosen the three 8-32 screws inside on the motor mount. There is a slight amount of clearance between these screws and the screw holes in the motor mount. This clearance will allow the stepper motor mount to align itself with the ball screw and the saddle for proper alignment. Wiggle the motor mount CW and CCW. Then turn the ball screw CW and CCW. Then tighten the three 8-32 screws completely

O. With the stepper motor mount secured in place, turn the ball screw to gain access to the two set screws in the side of the coupling 59106. Loosen and remove one set screw **Only**. Put some Loctite on this set screw, then thread it back in and tighten it securely. Now remove the other set screw, add Loctite, thread it back in, and tighten it securely.

P. Now turn the ball screw until the set screw in the side of the coupling 59105 can be seen through the access hole in the side of the stepper motor mount. Insert the hex key through the access hole and into the set screw.

i. Insert the end shaft of the stepper motor into the coupling with the flat on the shaft perpendicular to the set screw.

ii. Insert the stepper motor all the way into the motor mount.

iii. You want to tighten the (3 or 4) 8-32 mounting screws 12050 first before you tighten the coupling set screw onto the stepper motor shaft. This will ensure that there is no lateral force on the end of the stepper motor shaft.

iv. When the 8-32 mounting screws are tight, tighten the set screw in coupling 59105 to secure the stepper motor shaft.

Q. Make all of the necessary connections between the control and the stepper motor. Set the Jog feed rate to a low speed. Then jog the axis in both directions. Listen for any clicking noise (which would be the bearings). If it all sounds good, increase the jog feed rate and jog in both directions again.

Thank you,  
Sherline Products Inc.