



## Ball Screw Mill Customer Notice

Please read this letter entirely before you start to assemble your machine!

### Receiving Your New Ball Screw Mill

**NOTE:** If your shipping box was damaged at all, **DO NOT UNPACK** the machine until you have taken pictures of the shipping box. Then contact UPS and tell them that your package was damaged, and ask them how to proceed to place a claim. Then contact us to let us know that your package was damaged.

### Unpacking the Ball Screw Mill

The major components of your new multi-direction mill are assembled at the factory and are then packaged for efficient shipping. The mill X/Y base must be removed from the piece of plywood that locates it during shipment. Your machine base is bolted to a plywood board to avoid damage to the machine. There is another plywood board screwed onto the top of the side supports. After you remove the boxes of components from the top of the box, you will need to use a Phillips head screwdriver to remove the two screws from the top board (see Figure 1).



FIGURE 1— Remove the Phillips head screw on top of the side supports.

**NOTE:** We have had a problem with machine damage during shipping. Therefore, we have added a second locking nut and washer to each of the mill base mounting screws. In order to remove these nuts from the base without damaging the base, you will need to use a 5/32" hex wrench and unscrew the 10-32 SHCS from the bottom while holding pressure on the side of the nuts on top (see Figures 2 and 3).



FIGURE 2—Shows the second locking nut and washer.



FIGURE 3— 10-32 SHCS on the bottom of the shipping base.

### Assembling the Ball Screw Mill

To assemble the column, make reference to the exploded views provided on the last page of these instructions and complete the steps that follow:

1. Attach the column base to the mill base with the two socket head cap screws provided; tighten the screws securely. Make sure that the screws do not protrude into the through-hole for the brass cover tube. You will have to grind the screw ends down if they interfere with the travel of the brass cover.
  - A. 12" mill base model: column base (P/N 50054), 1/4-20 x 1-3/4" SHCS (P/N 50220)
  - B. 14" mill base model: column base (P/N 56714), 1/4-20 x 1-1/2" SHCS (P/N 56240)
  - C. 18" mill base model: column base (P/N 50056), 1/4-20 x 1-1/2" SHCS (P/N 56240)

2. Slide the brass leadscrew cover through the hole in the back of the column base and over the ball leadscrew. Set the brass cover in place by seating it into the back of the X/Y saddle. The brass cover should be taped to the mill table.
  - A. 12" model: P/N 54165
  - B. 14" model: P/N 59165
  - C. 18" model: P/N 58165

The next steps apply only to the 14" and 18" base mills.

3. The mill column bed is attached to the swing arm. You will need to mount the swing arm onto the column base. Locate the following parts that shipped in a separate plastic bag.
  - A. Arm hold-down bolt (P/N 56140)
  - B. Arm hold-down washer (P/N 56200)
  - C. Flange nut (P/N 53260)
  - D. Column adjustment block (P/N 56350)
  - E. Column adjustment block screws (P/N 40330, 40340)
4. Using an 11/16" or 17mm\* wrench, loosen the flange nut holding the bed and swing arm together (see Figure 4). Rotate the bed away from the swing arm until they are at approximately a 90° angle to each other. Retighten the flange nut firmly to hold the column in this position. Discard the protective spacer that was installed between the bed and arm during shipping.

\*NOTE: A 17mm wrench usually works on an 11/16" hex nut but is only a close fit. If your 17mm wrench is too tight and you don't have any inch tools you will have to use an adjustable wrench.

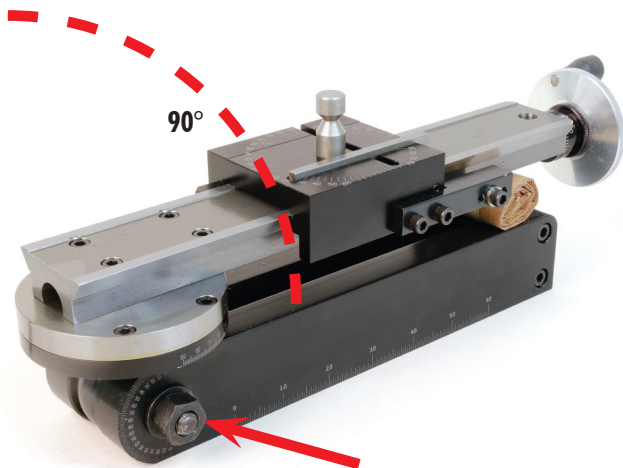


FIGURE 4—The red arrow points to the flange nut. The image is of a standard leadscrew column bed, and is for reference only.

5. Set the swing arm over the column and align it approximately square with the mill base and in about the center of its travel. Make sure the swing arm registers on the flats of the column top and is properly seated. While still holding the swing arm unit in place, set the hold-down washer (P/N 56200) over the end

of the bolt. Put a flange nut on the end of the bolt and tighten it against the hold-down washer firmly to lock the swing arm in place. **NOTE:** There should be **NO LUBRICATION** on the mating surfaces between the arm and the column base. Friction between these surfaces keeps the arm from moving during cuts.

6. Place the column adjustment block (P/N 56350) on top of the swing arm and attach it with two 10-32 x 5/8" socket head cap screws at both ends. Adjust the 1" long center bolt so that it is just touching the flat in the bottom of the relieved section in the top of the pivot knuckle when the column is in the 90° position. Before installing the adjustment block squaring fixture onto the swing arm, make sure there are no chips or debris in the pocket of the arm mount or on the end of the adjustment screw.

**NOTE:** If you remove the column adjustment block to accommodate a backward tilt movement of the column, make sure you replace it when returning the column to an upright position. It not only serves as a reference point when returning the column to the 90° position, it also keeps it from accidentally swinging down and damaging the table if the flange nut is loosened.

To make any adjustments to the handwheels, backlash, gibs, and so on, see the instruction manual that is included with the mill. Instructions are also found there for assembly of the headstock/motor/speed control unit.

### Stepper Motor Installation

If you ordered your machine with stepper motors, it was packaged with the stepper motors off so they would not be damaged during shipping.

1. **Tools:** There is a bag on top of the mill table with two Allen wrenches in it for assembling your stepper motors. The 3/32" wrench is for the stepper motor coupling, and the other one is for the 8-32 SHCS to attach the stepper motors to the mounts.
2. **Stepper Motor Assembly Video:** Watch the video before you attempt to assemble the stepper motors. The video is also available on our YouTube channel.

**Aligning the Stepper Motors to the Ball Screws** (YouTube link - [https://youtu.be/RLKs1GO\\_-5I](https://youtu.be/RLKs1GO_-5I)).

### Keeping Your Y-Axis Leadscrew Chip Free

1. The front Y-axis cover ships in place and must be in good condition to keep chips from getting onto your ball screw.
2. **NEVER** use compressed air to blow the chips off of your machine. Use a small brush or rag to wipe the chips off. The use of pressurized air will eventually force chips onto the ball leadscrew, and this, will in turn, damage the ball nut.
3. Brush chips off the top of the Y-axis accordion cover while you are machining, to avoid excessive chip buildup on the covers. Excessive chips on the Y-axis cover will eventually restrict the movement of the Y-axis and cause the stepper motor to stall and miss steps.

4. If you have purchased a mill with an 18" base, we have installed the front-side accordion way cover with the additional cover rods in place. We have a video on our YouTube channel that explains the assembly process and our reasons for adding the additional cover rods. If you choose to leave the front cover with the rods on your machine, you will not be able to use the backside Y-axis cover, although the brass cover should be sufficient protection for your ball screw. If you decide to use the backside Y-axis cover (which is included), you will need to remove the cover rods from the front Y-axis cover.

**Way Cover Upgrade Installation** (YouTube link - <https://youtu.be/zSJBfxZ5-Y8>).

### Lubrication

7. **Dovetail surfaces:** Use 3-in-1 oil in the mill saddle oiler. Use your finger to wipe oil onto the bottom dovetail surface of the mill table. Place a couple drops of oil on the front and back side of the dovetail surfaces on the column bed. Then move all three axes back and forth a few times to spread the oil.
8. **Ball screws:** The ball screws should not need to be lubricated as often. The ball screw manufacturer recommends NSK Grease AS2 (P/N 7565) for lubricating the ball leadscrews. Move the axis to the end of travel and put a minimal amount of grease on your fingertip. Apply it along the length of the leadscrew from the ball nut to the stepper motor mount. A little bit goes a long way. Don't over-grease the ball screw.

## Ball Screw Mill Column Base Exploded Views

