



Adjusting Backlash on Sherline handwheels

What is backlash?

Backlash is the amount the handwheel can turn before the slide starts to move when changing directions. This is a fact of life on any machine tool, and on machines of this type it should be about .003" to .005" (.08mm to .12mm). As the leadscrew is rotated, one surface of the thread pushes on the saddle nut to move the saddle. As the direction of rotation is reversed, the thread must move a certain distance in the opposite direction before it contacts the other side of the saddle nut thread and begins moving the saddle in the other direction. Obviously, eliminating backlash would require both sides of the thread to be contacting the nut at the same time. This would cause excessive friction (wear) and make the handwheel very difficult to turn. On more expensive machines, "ball lead screws" are used. They use a series of ball bearings running in a track to drive the carriage; however, they are very expensive to manufacture and one leadscrew could cost more than an entire Sherline machine, so they are not used on small machines. Therefore, backlash is not considered a "fault" with a machine tool but rather is simply a factor that must be kept properly adjusted and accommodated for in your use of the machine.

Taking backlash into account when using your mill

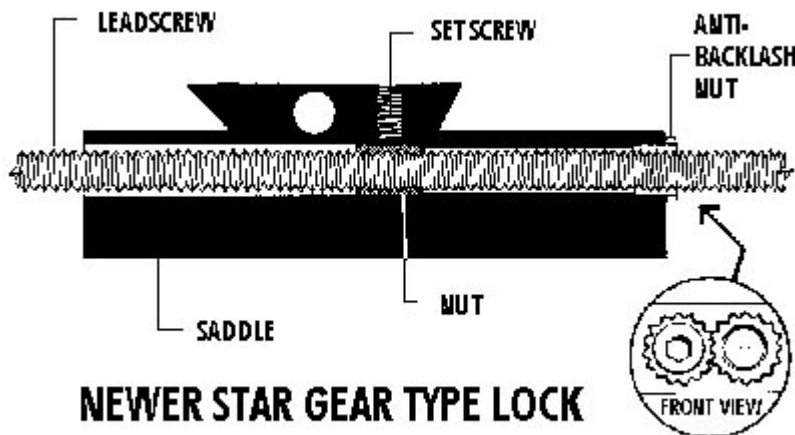
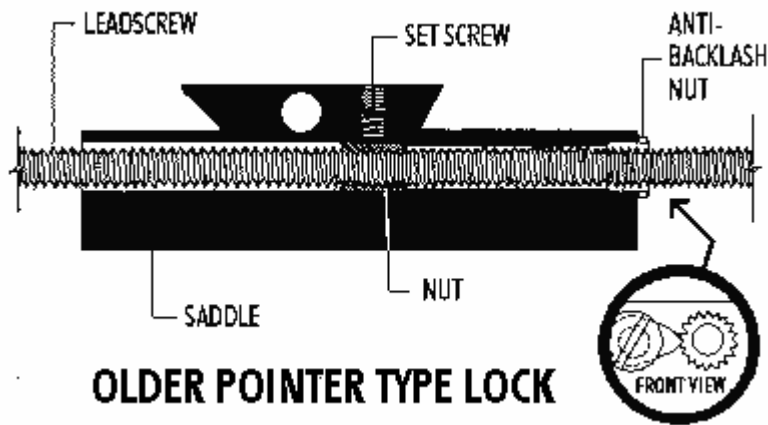
Backlash must be allowed for by feeding in one direction only. Example: You are turning a bar to .600" diameter. The bar now measures .622" which requires a cut of .011" to bring it to a finished diameter of .600". If the user inadvertently turns the handwheel .012" instead of .011", he couldn't reverse the handwheel just .001" to correct the error. The handwheel would have to be reversed for an amount greater than the backlash in the feed screws before resetting the handwheel to its proper position.

Adjusting for excessive backlash

MILL X and Y axes—Eventually, wear on leadscrew nuts can cause backlash to increase beyond the recommended .003" to .005" setting. Backlash on the "X" and "Y" axes of the mill may be reduced to a minimum by adjustment on the anti-backlash nuts. These brass nuts are located on the handwheel ends of the mill saddle where the leadscrew enters the saddle. The nuts are secured by slotted pan head screws which hold a lock that interlocks with teeth on the backlash nut. There are three versions of the lock. The earliest versions used a pointer to engage the teeth in the backlash nut to keep it from turning. The revised version used a second "gear" type circular lock to engage the backlash nut. This change was made to make the adjustment easier, as the gears remain constantly engaged during adjustment, whereas the pointer must be

physically put back into engagement each time it is adjusted. The star gear and backlash nut have about 16 points. Because the mounting hole for the locking gear had to be moved slightly farther from the backlash gear to accommodate its larger size, the new system cannot be retrofitted to the old pointer style lock. The latest version works like the star gear, but the teeth are much finer and look like a knurled finish rather than large points. This further reduces play in the lock and the resultant backlash. This system can be retrofitted to the older style star gear lock but not to the pointer style lock. (An upgrade is available as P/N 5011U/5111U.)

To adjust backlash, simply loosen the pan head screw that locks the pointer or star locking gear. Rotate the anti-backlash nut clockwise on the "X" axis and counterclockwise on the "Y" axis until snug. Replace the pointer in position and tighten the pan head screw. (The star gear system eliminates the need to replace the pointer, as it turns with the backlash nut as it is adjusted. With the anti-backlash nuts properly adjusted, the lead screws will turn smoothly and should have no more than the proper .003" to .005" of backlash.



Types of backlash adjustment systems. A new lock now uses a star gear rather than the older style pointer to locate the anti-backlash nut, and a button head socket screw locks it in place.

This system is easier to use, but the function is essentially the same. (The hole centers are different, which means the star gear cannot be used to replace the pointer on older models.) The

lower drawing shows the older 16-point star gears. The latest system is similar but has more and finer teeth.

Mill Z-axis—Backlash on the Z-axis is adjusted by supporting the weight of the headstock with your hand while loosening the handwheel set screw. Lift up on the headstock, index the handwheel 90° to pick up a new spot on the shaft, push the handwheel down tightly against the thrust and retighten the set screw while still pushing the headstock upward with your other hand. If the Z-axis handwheel has the newer design with the support screw in the center, retighten the screw until it just starts to support the weight of the headstock. This will take some of the stress off the handwheel set screw and help it maintain adjustment longer without slipping downward. (Don't overtighten or the handwheel will become hard to turn.) To minimize the effect of Z-axis backlash, always approach your desired setting from the top by coming down rather than lifting the headstock into the desired position.

A new adjustable backlash system was developed for the CNC mill in 2004. It is standard now on all CNC mills, but it can be retrofitted to the manual mills as well. See [P/N 4017Z/4117Z](#) for a description and link to instructions for its installation and use.

Handwheel adjustment

Lathe and Mill—The handwheels are secured to their corresponding leadscrew shafts by a small set screw in the side of the handwheel base. Check them periodically to make sure they have not been loosened by vibration. On the "zero" adjustable handwheels, you must first release the rotating collar by loosening the locking wheel. Then rotate the collar until you can see the set screw through the small hole in the side of the collar and adjust the screw as necessary.

If excessive backlash develops at the handwheel and thrust collar junctions, adjust by first loosening the handwheel set screw. Index (rotate) the handwheel so the set screw tightens on a different part of the shaft. (If you don't, it may tend to keep picking up the previous tightening indentation and returning to the same spot.) Push the handwheel in tightly while holding the mill saddle and retighten the handwheel set screw. Lathe handwheel backlash is adjusted in a similar manner.