

## BC-01: Remove and Replace Ball Screw

### SAFETY FIRST

- Follow all Caterpillar facility safety standards when performing this task.
- Lockout/tagout the machine with your personal lock and tag to verify the machine has no possibility of movement.

### EQUIPMENT

- Lock and tag are required to lockout/tagout the machine.
- dial indicator equipped with a magnetic base
- Maintenance Mechanic hand tools
- Cribbing to block up the slide.

### RESOURCES

- machine manufacturer's manual
- machine print

### Remove and Replace Ball Screw

- 1. Ask the Machine Operator to "home" the machine.**
  - Also, ask the Machine Operator to document any edits to the program.
- 2. Perform lockout/tagout on the machine.**
  - Follow the ZMS procedures on the machine.
  - Use your own personal lock and tag.
- 3. Remove the guards to gain access to the ball screw.**
  - Different guards require different methods of removal.

- Some guards are excessively heavy and may require a crane or hoist to remove them.



Guard Handles



### Guard Removal

#### 4. Remove the motor, if necessary.

- Follow the procedures to replace the motor if the ball screw is attached to the motor with a coupling.
- Go to step 5 if the motor is connected to the ball screw with a gear or belt drive.

#### 5. Ask an Electrician to remove any switches, if necessary.

#### 6. Remove the ball screw protective cover.

Protective Cover



### Ball Screw Protective Cover

**Warning:** Ball screw covers may be steel wrapped. The steel wrapping can cause injury. Uncover with caution.

- Set the mounting bolts and the drain cover aside.

**7. Remove the ball screw plate or protective cover.**

- Be careful not to damage the lubrication line.



### Protective Cover Removal

**8. Remove the ball screw nut mounting bolts.**

- Use the appropriate Allen wrench to avoid damaging the bolts.
- Set the bolts to the side for reinstallation.

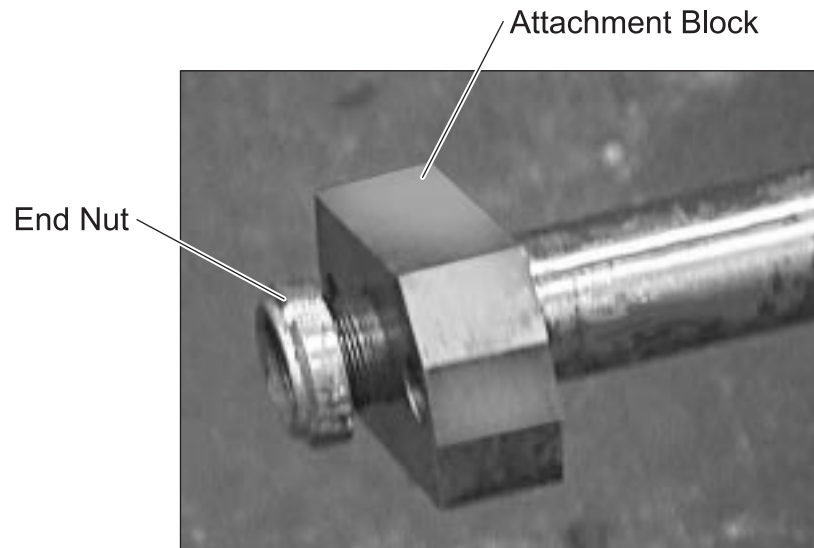
**9. Remove the mounting bolts from the slide ball screw attachment block or bearing cap.**

- Slide the ball screw from the bearing entrapment.

**10. Remove the end nut and the slide attachment block.**

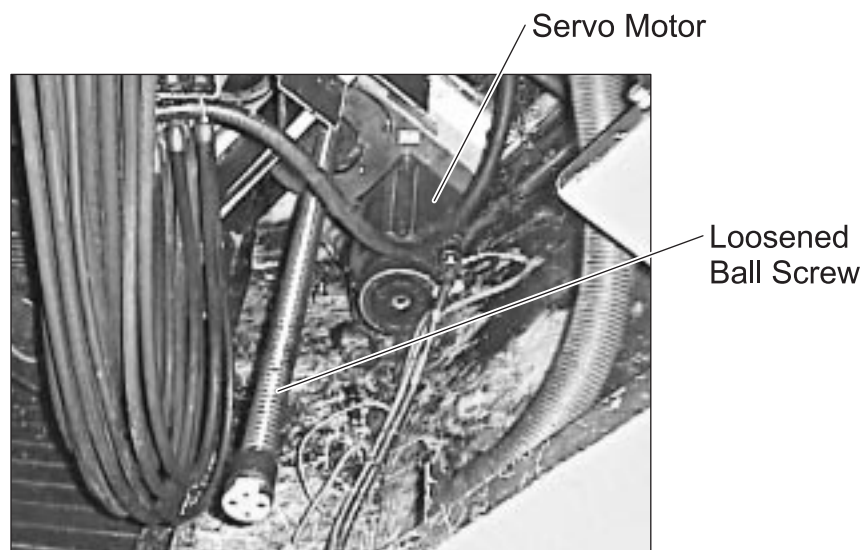
- Use a spanner wrench to remove the end nut.

- Slide the attachment block or the bearing off the end of the ball screw.



**Attachment Block and End Nut**

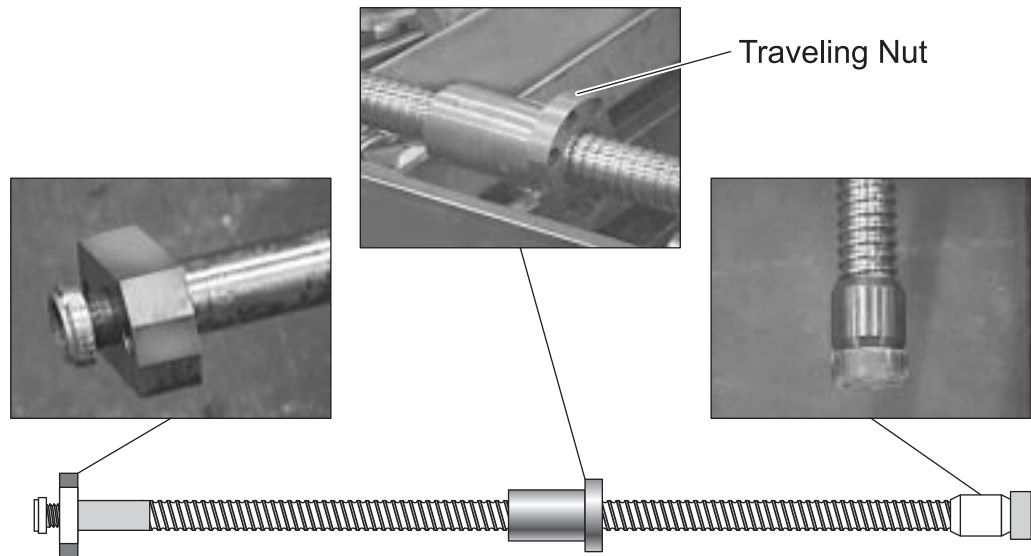
11. **Slide the ball screw out of the machine from the servo motor end of the ball screw.**



**Servo Motor End**

**12. Inspect the ball screw.**

- Visually inspect for any damage.
- Run the nut up and down the ball screw, if necessary, checking for looseness or uneven wear.

**Ball Screw Inspection**

- Check the ball screw for sufficient lubrication.

**13. Obtain the replacement ball screw.**

- Document the machine number, the ball screw axis on the machine, and the part number, if available.
- Use the print, if necessary, to locate the part number; it may also be imprinted on the ball screw nut.
- Order a new ball screw, seals, and bearings, or ask a lead man to order the parts.

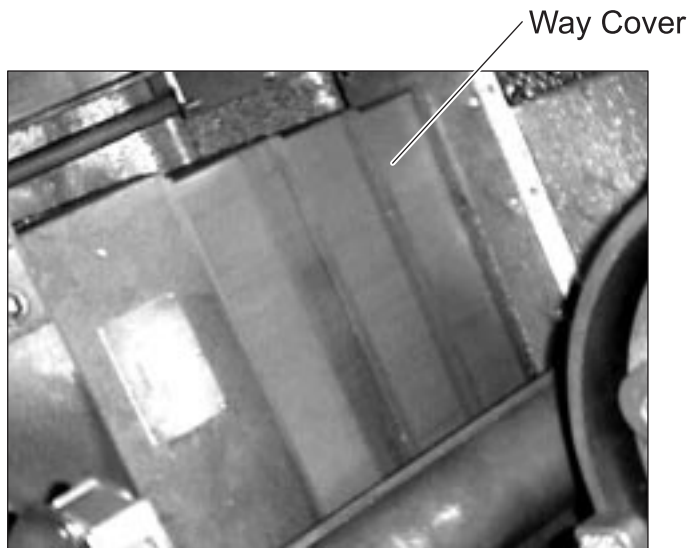
**14. Replace the damaged ball screw with the new ball screw.**

- Replace the bearings and seals.
- Slide the new screw into place.
- Replace the steel wrapped cover, if applicable.

**15. Install the traveling nut, attachment block, and end nut on the slide end of the ball screw.**

**16. Mount the ball screw mounting block to the slide.**

- Tighten the bolts wrench-tight according to the manufacturer's specifications.

**17. Mount the way covers.****Mounted Way Cover**

- Slide the way covers into place and attach with the bolts tightened according to the manufacturer's specifications.

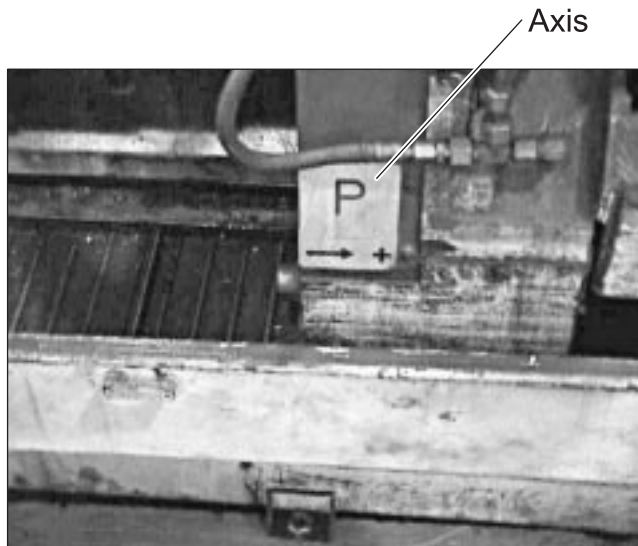
**18. Mount the ball screw nut.**

- Tighten the mounting nuts according to the manufacturer's specifications.

**19. Attach the face cover plate.****20. Install the covers.****21. Install the guards.****22. Verify ball screw operation.**

- Ask the Machine Operator to start and "home" the machine.

- Ask the Machine Operator to manually run the axis to check the ball screw operation.



### Axis Specification

#### 23. Indicate the slide movement repeatability.

- Ask the Machine Operator to enter a specific distance for linear travel (i.e., .100”).
- Set up a dial indicator equipped with a magnetic base to measure backlash.
- Ask the Machine Operator to move the slide the programmed distance.
- Ask the Machine Operator to return the slide to the “home” position.
- Backlash must measure within .001” for the ball screw to be operating normally.