

AC-02b: Rebuild Rotary Actuator (Rack and Pinion)

SAFETY FIRST

- Follow all Caterpillar facility safety standards when performing this task.
- Wear heavy industrial gloves for protection against the hazards associated with the cleaning solvents.
- An explosion hazard exists with cleaning solvents. Smoking is not permitted in the cleaning area.
- Know the location of the MSDS for the cleaning solutions.
- Solvents must be disposed of according to the HAZMAT regulations.

EQUIPMENT

- hammer and punch
- Maintenance Mechanic hand tools
- lifting straps
- 20-weight oil, hydraulic oil or other suitable lubricant
- plastic rod
- adjustable pin spanner wrench

RESOURCES

- Maintenance Manual for Rack and Pinion Rotary Actuator

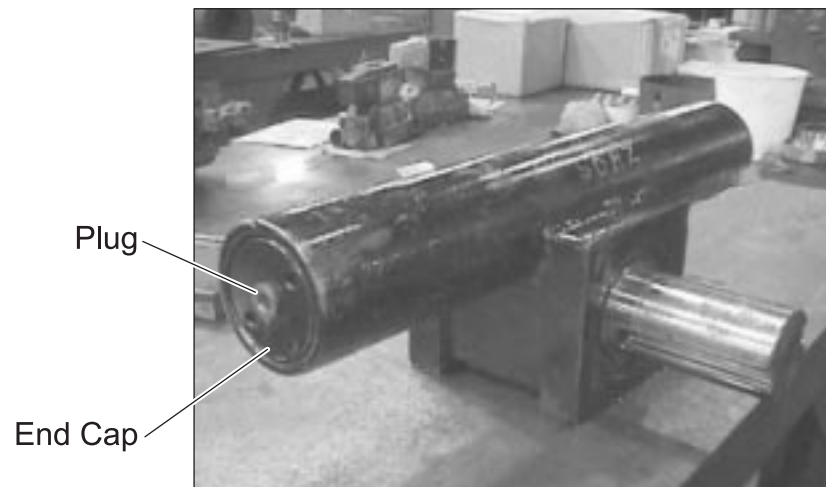
Rebuild Rotary Actuator (Rack and Pinion)

Part A: Rack and Pinion Rotary Actuator Disassembly

1. Drain the oil from the housing gearbox.

- Remove the plug from housing and drain the oil into a bucket.

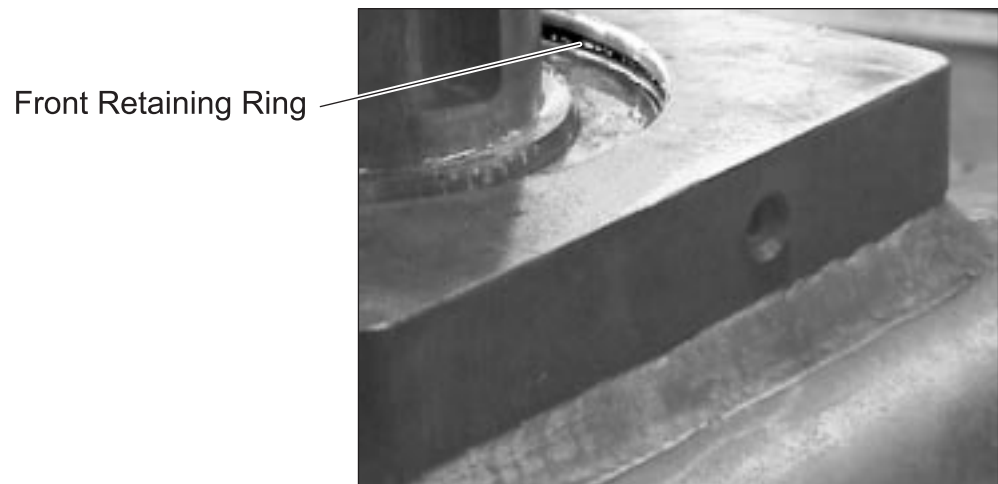
- Remove the plug from both end caps and drain the oil into a bucket. See the figure below.



- Dispose of the oil according to HAZMAT procedures.

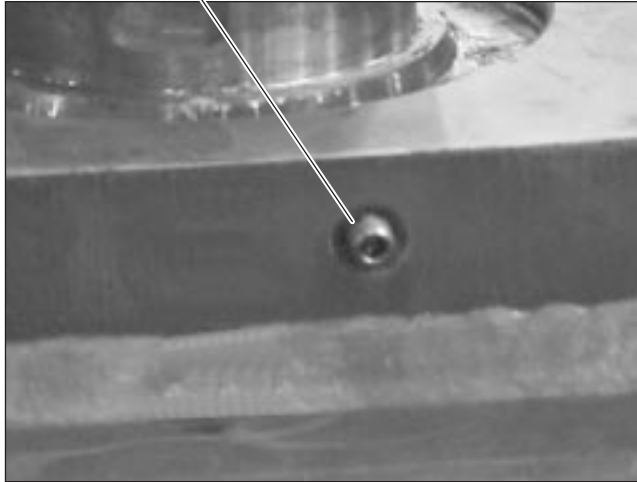
2. Remove the pinion shaft.

- Remove the front-retaining ring. See the figure below.



- Remove the setscrew holding the bearing retainer in place. See the figure below.

Set Screw



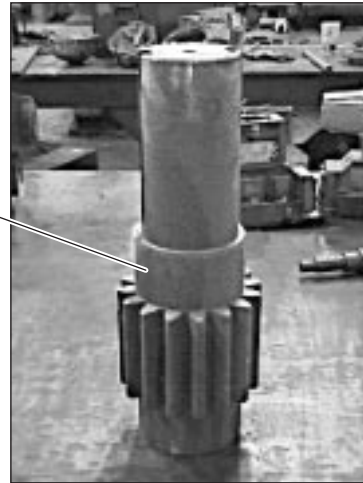
- Position the rotary actuator in the hydraulic press with the shaft pointing down. See the figure below.



Rotary Actuator

- Press the pinion shaft out of the housing. See the figure below.

Pinion Shaft



- Using a hammer and brass rod, remove the front-bearing retainer.

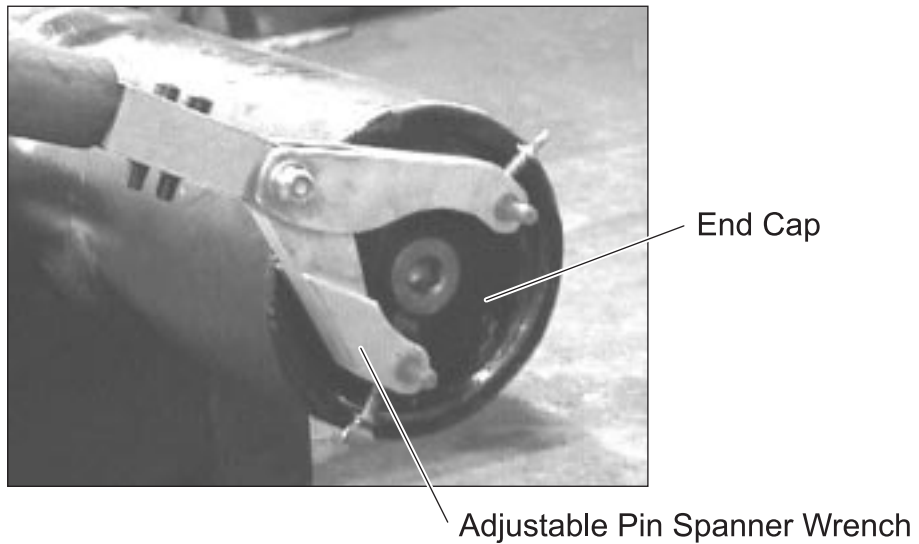
Note: The front-bearing retainer may come out with the shaft.

3. Remove the rack.

- Remove both setscrews from both ends of the cylinder body. See the figure below.

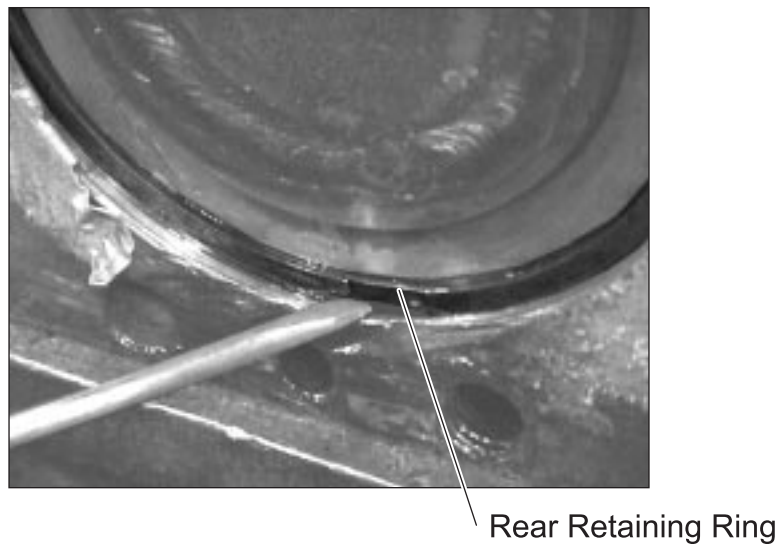


- Using an adjustable pin spanner wrench, remove both end caps. See the figure below.



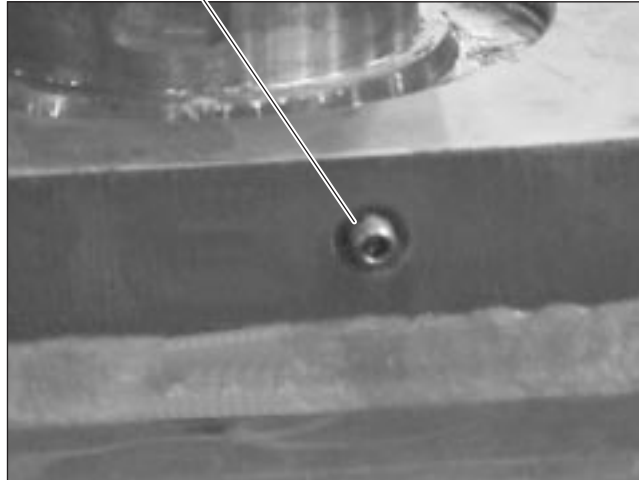
- Position the cylinder body (on its end) on the workbench.
- Using a hammer and brass rod, drive the rack out of the housing.

4. Remove the rear-retaining ring. See the figure below.



5. **Remove the setscrew holding the rear-bearing retainer. See the figure below.**

Set Screw



6. **Using a hammer and brass rod, remove the rear-bearing retainer.**
7. **Remove the seals from both bearing retainers. See the figure below.**

Bearing Retainer

Pinion Seal



8. **Remove the nylatron bearings for both bearing retainers.**
9. **Remove the O-ring from both ends of the gear housing.**
10. **Remove all seals and bearings from the rack and pinion shafts.**

Part B: Parts Cleaning and Inspection

1. Clean all the parts.
2. Inspect all polished surfaces for nicks, wear, or scratches.
3. Inspect the rack and pinion shafts for serviceability.

Part C: Rack and Pinion Rotary Actuator Assembly

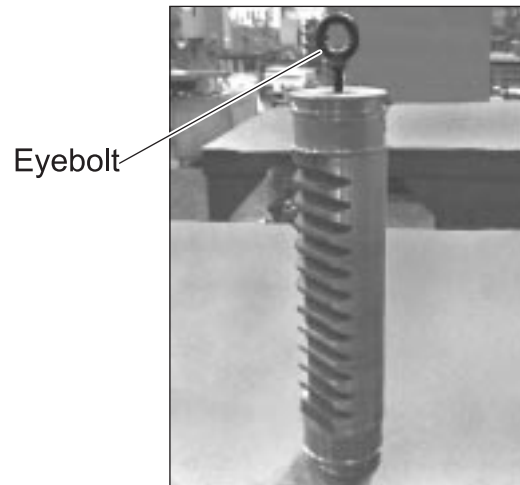
Note: Lubricate all seals and O-rings with 20-weight oil, hydraulic oil or other suitable lubricant to the seals.

1. Install the rack piston.
 - Locate the center tooth on the rack and mark the tooth on both sides. See the figure below.



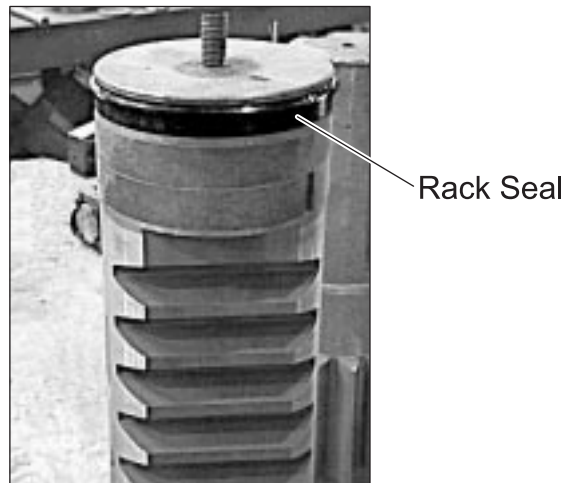
Mark the Center Tooth

- Install an eyebolt in one end of the rack piston. See the figure below.



Note: Only one rack seal is installed to allow the rack to slide easily through the cylinder body opening. This prevents damage to the seal at the opposite end of the rack.

- Install the rack seal with the lip facing outward. See the figure below.



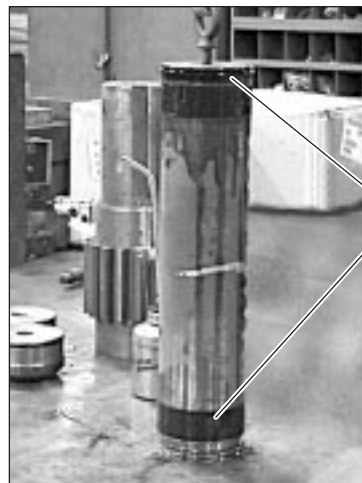
- Wrap two nylatron bearing strips around the rack in the bearing groove at both ends of the rack. See the figure below.



Nylatron®
Bearing Strips

Note: The two nylatron bearing strips must be positioned so that the joints are 180 degrees apart.

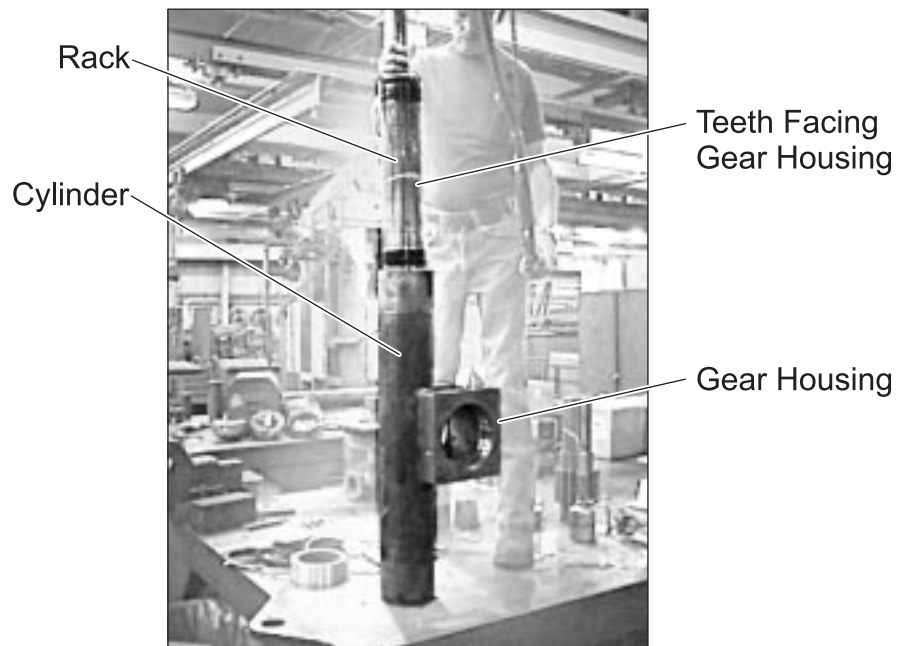
- Apply 20-weight oil, hydraulic oil or other suitable lubricant to the seals. See the figure below.



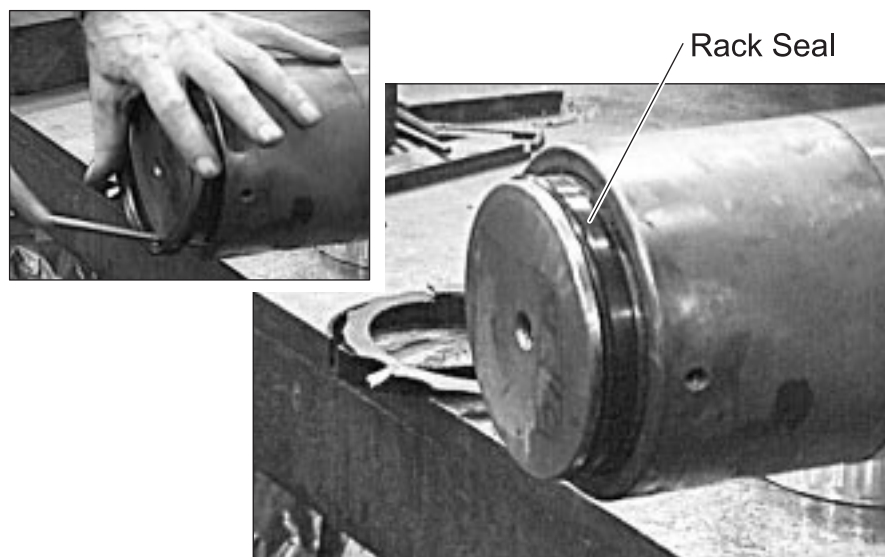
SAE 20W Oil

- Position the cylinder body on its end.
- Attach a lifting strap to the eyebolt in the rack and the hoist.

- ❑ Lift the rack and position it over the cylinder opening. See the figure below.

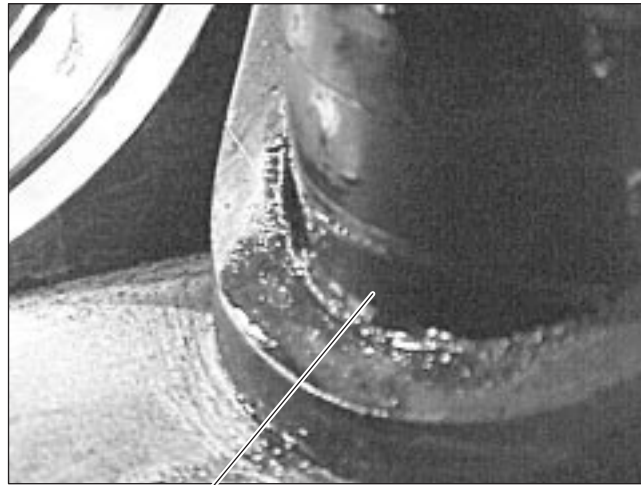


- ❑ Ensure that the teeth are facing towards the gear housing.
- ❑ Lower the rack slowly into the cylinder body.
- ❑ Using a hammer and brass rod, drive the rack all the way through the cylinder body.
- ❑ Lay the actuator on its side, and drive the rack piston through the cylinder far enough to get the other lip seal on.
- ❑ Install the seal with the lip facing outward. See the figure below.



- Apply 20-weight oil, hydraulic oil or other suitable lubricant to the seals.

Note: Monitor the seal as it passes through the pinion opening to ensure that it does not catch on the housing. Use a blunt tool to assist the seal past the pinion opening edges. See the figure below.



Check the Seal

- Drive the rack piston back through the actuator until the marked tooth is centered in the pinion opening. See the figure below.



Marked Tooth

2. Install pinion shaft.

- Mark the pinion shaft for the proper timing relative to the rack. See the figure below.



Center Timing Marks

- Install the pinion seal in both bearing retainers.
- Install the two nylatron bearings in both bearing retainers. See the figure below.

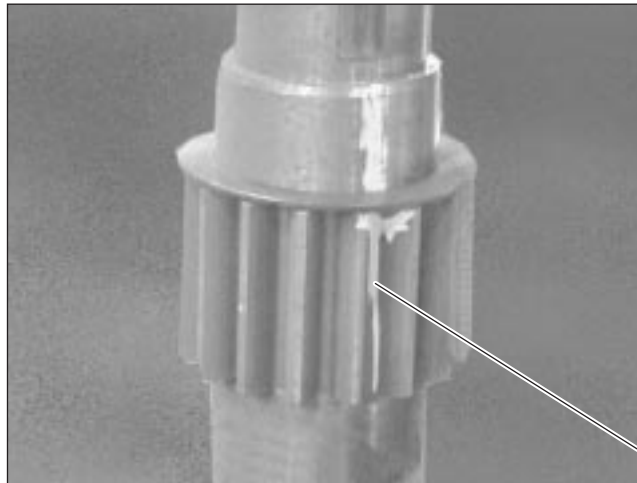


Nylatron®
Bearing Strip

Note: If the nylatron bearings are too long, cut them to fit. The nylatron bearing strips must be positioned so the joints are 180 degrees apart.

- Install the bearing retainer in the backside of the gear housing. Make sure that the yellow seal is facing inward.
- Install the retainer ring to prevent the bearing retainer from falling out of the gear housing.

- Position the actuator so that the backside of the gear housing is facing down.
- Apply 20-weight oil, hydraulic oil or other suitable lubricant to the seal in the bearing retainer.
- Center the bearing over the bearing retainer.
- Position the pinion shaft over the gear housing opening.
- Ensure that the timing mark matches the center mark on the rack. See the figure below.



Center Timing Mark

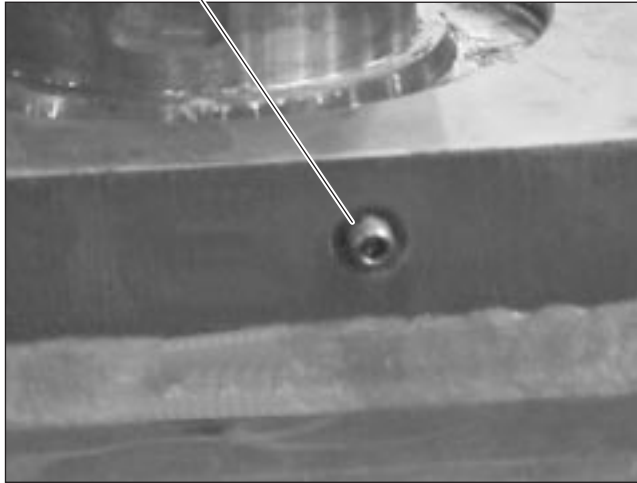
- Slide the pinion into the gear housing opening.
- Drive the pinion shaft with a hammer and brass rod, if necessary.
- Install the second bearing and bearing retainer over the pinion shaft. Make sure that the yellow seal is facing inward. See the figure below.

Bearing Retainer



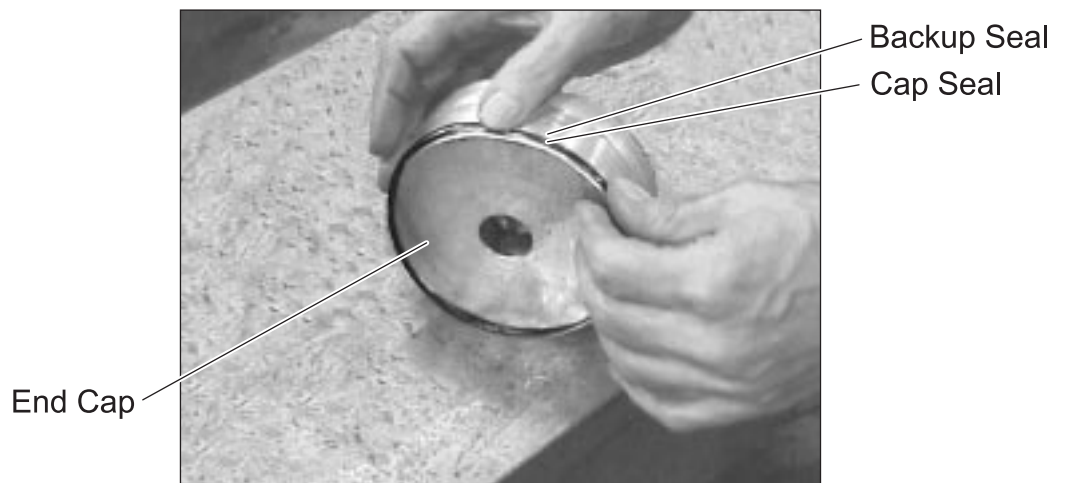
- Install the retaining ring.
- Install the setscrews to secure both bearing retainers. See the figure below.

Set Screw



3. Install the end caps.

- Install the caps seals and back up seals on both end caps. See the figure below.



- Apply 20-weight oil, hydraulic oil or other suitable lubricant to the seals.

- Screw the end caps in flush with the cylinder body. See the figure below.



- Cut four 1/8-inch pieces from a 1/4-inch plastic rod.
- Install each of the plastic pieces into the setscrew holes.

Note: The pieces of plastic act like a washer and prevents the setscrews from damaging the threads on the end caps.

- Replace all the setscrews in the cylinder to secure the ends caps and tighten wrench-tight. See the figure below.

