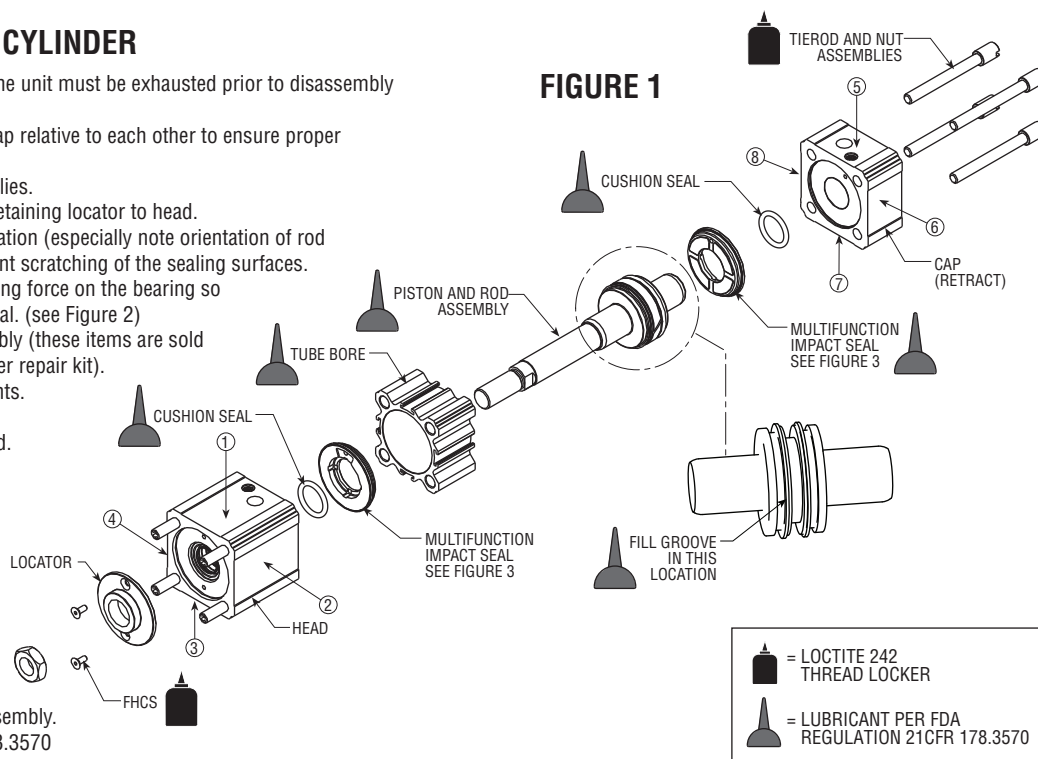


phd[®] REPAIR PROCEDURES: SERIES BCS1-6 STRETCHING CYLINDERS

These procedures include instruction for units with cushions.

DISASSEMBLY OF THE CYLINDER

- WARNING:** All air pressure in the unit must be exhausted prior to disassembly of nozzle cylinder.
- Mark orientation of head and cap relative to each other to ensure proper orientation during reassembly.
- Remove tierod and nut assemblies.
- Remove flat head cap screws retaining locator to head.
- Remove all seals, noting orientation (especially note orientation of rod seal).
- Exercise caution to prevent scratching of the sealing surfaces.
- Press out rod bearing by applying force on the bearing so that it moves toward the rod seal. (see Figure 2)
- Remove cushion needle assembly (these items are sold in separate kits from the cylinder repair kit).
- Clean and inspect all components. Excessively worn or damaged components should be replaced.



REASSEMBLY

- Be careful to prevent cutting or damaging seals during reassembly.
- Use FDA Regulation 21CFR 178.3570 lubricant for the lubrication of air cylinders during reassembly.
- Use Figure 1 for reference.

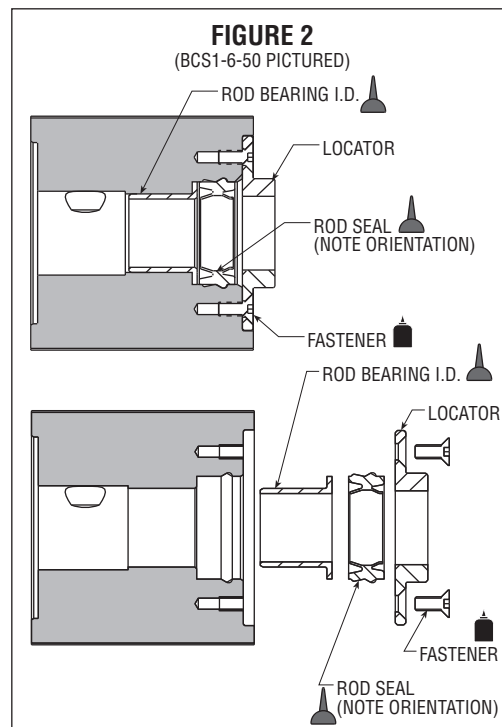
HEAD ASSEMBLY

- Press rod bearing into head from locator end until flush as shown. (see Figure 2)
- NOTE:** Be sure to install the same type of rod bushing which was removed.
ie. BCS1-5-50 (Non-flanged) or BCS1-6-50 (Flanged).
- Pre-lubricate rod seal cavity and press in rod seal. Orientation of this seal is critical. (see Figure 2)
 - Lightly lubricate cushion needle assembly and install into head. Then torque to Chart 1. Cushion needle assembly is supplied as part of cushion kit only. (see Figure 3)
 - Lightly lubricate the multi-function impact seal and cushion seal o-ring. (see Figures 3 and 3A)
 - Retain the cushion seal o-ring between the multi-function impact seal and the head.
 - With the alignment pin completely through the multi-function impact seal (see Figure 3A), install the multi-function impact seal into the head counterbore and at the same time insert the alignment pin into the head orifice hole. (see Figure 3B)
 - Remove alignment pin from multi-function impact seal before continuing assembly.
 - Apply removable liquid thread locker to flat head cap screws and loosely assemble. Continue to tighten flat head cap screws until they bottom out on the locator.
 - Torque flat head cap screws per Chart 1.

CAP ASSEMBLY

- Lightly lubricate cushion needle assembly and install into cap. Then torque to Chart 1. Cushion needle assembly is supplied as part of the cushion kit only. (see Figure 3)
- Lightly lubricate the multi-function impact seal and cushion seal o-ring.
- Insert the alignment pin through the orifice hole in the multi-function impact seal. (see Figures 3 and 3A)
- Retain the cushion seal o-ring between the multi-function impact seal and the cap.
- With the alignment pin completely through the multi-function impact seal (see Figure 3A), install the multi-function impact seal into the cap counterbore and at the same time insert the alignment pin into the cap orifice hole. (see Figure 3B)
- Remove the alignment pin from the multi-function impact seal before continuing assembly.

NOTE: Video tape #FM-CV1 is also available, covering repair procedures on Series CV Cylinders, on which the Series BCS Cylinder design is based.



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CAP ASSEMBLY TO TUBE

1. Lubricate the cushion seal and I.D. of the tube at the cap end. Align cap squarely with tube and press cap onto tube. Do not rotate cap with respect to tube during this process. This could cause misalignment of the orifices in the impact seal and the cap.
2. Apply removable liquid thread locker to tierod and nut assemblies and insert through cap.

PISTON ROD ASSEMBLY AND INSTALLATION INTO TUBE

1. Lightly lubricate seals and tube, install onto piston. See Figure 4 for proper seal orientation.
2. Lubricate piston grooves (filling the largest groove). See Figure 4 for correct groove location.
3. Re-lubricate the piston seals to assure uniform lubrication. Then apply a light coat of lubrication to the cylinder bore at the extend end of the tube.
4. Wrap wear ring around piston.
5. Insert the piston and rod assembly into the cylinder bore. A tool may be required to compress the lips of the seals to allow insertion. Be careful to prevent damage to seals during installation.

HEAD ASSEMBLY TO THE TUBE

1. Lubricate the extend end rod end. Also lubricate the cushion seal.
2. Insert the head onto the rod, rotating the head slightly to help the rod through the rod bearing and rod seal. Do not rotate the multifunction impact seal with respect to the head during this process.
3. Align head squarely with tube and press head onto tube. Do not rotate head with respect to tube during this process. This could cause misalignment of the orifices in the impact seal and the head.
4. Align head on tube and loosely thread tierod and nut assemblies into head. Continue to tighten assemblies until they bottom out on the counterbores in the cap, then torque per Chart 1.

START-UP PROCEDURES

Standard units should be securely mounted with all fittings and external flow control devices attached prior to applying pressure to unit. Care should be taken to provide adequate space for the rod to extend from unit. Apply pressure slowly to the unit.

Cushion control should have cushion needle closed (turn needle clockwise until rotation stops) and then opened one turn, prior to applying pressure to the unit. This is not necessary if a load has not been attached to the cylinder. If load is attached, follow the fine tuning the cushion instructions below.

FINE TUNING THE CUSHIONS

This should be accomplished by using the following guidelines. Varying loads and speeds will cause different internal pressures at the end of the cylinder travel with respect to the cushion needle adjustment, therefore, fine tuning should be done under pressure (about 1/4 of the final running pressure (i.e. 20 psi) at set-up) with the intended load the cylinder is to carry.

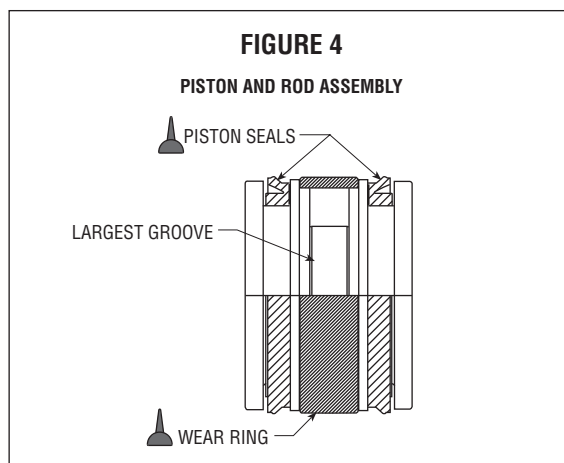
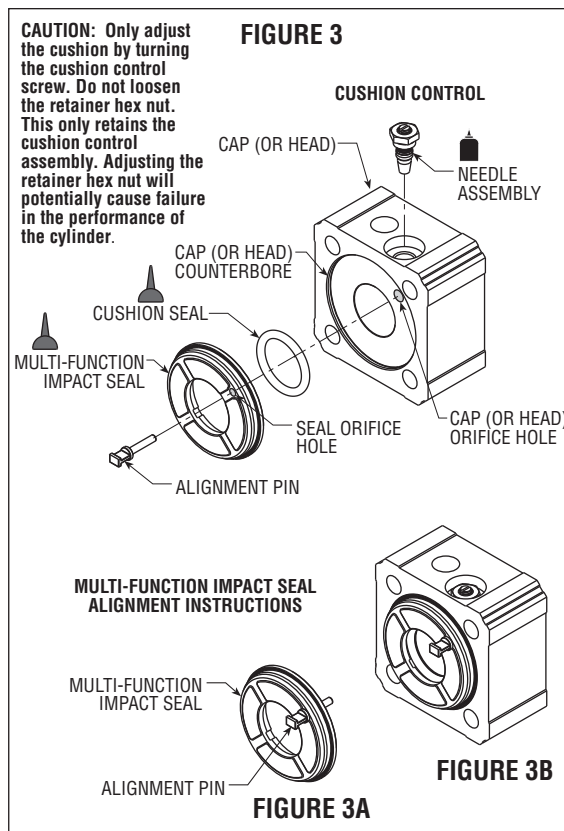
CAUTION: Only adjust the cushion by turning the cushion control screw. Do not loosen the retainer hex nut. This only retains the cushion control assembly. Adjusting the retainer hex nut will potentially cause failure in the performance of the cylinder.

If the cylinder is bouncing at end of travel, too much air is being compressed inside the cylinder:

1. Adjust the cushion needle by turning it in the counterclockwise direction (backing it out about a quarter turn at a time).
2. Cycle the cylinder.
3. Repeat until the bounce is eliminated.
4. Finish tuning the cushion by increasing the cylinder pressure to the final running pressure (i.e. 80 psi) of the unit and repeat steps 1 through 3.

If the cylinder is slamming at the end of travel, not enough air is being compressed inside the cylinder:

1. Adjust the cushion needle by turning it in a clockwise direction (turning it in about a quarter turn at a time).
2. Cycle the cylinder.
3. Repeat until the slamming is eliminated.
4. Finish tuning the cushion by increasing the pressure to the final running pressure (i.e. 80 psi) of the unit and repeat steps 1 through 3.



TORQUE CHART 1

PART DESCRIPTION	TORQUE in-lb [N-m]
TIEROD AND NUT ASSEMBLIES	110 [12.4]
FLAT HEAD CAP SCREWS (LOCATOR TO HEAD)	20 [2.3]
CUSHION NEEDLE	40 [4.5]

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