

# MULTIPOSITION AIR ACTUATOR O-RING REPLACEMENT

## Technical Note 410

### You will need:

- 1/16", 7/64", and 9/64" hex drivers
- 5/16", 3/8", 11/32", and 1/2" open end wrenches
- 3/16" screwdriver (only for older actuators)
- An awl or small jeweler's screwdriver
- Needle nose and regular pliers
- Silicone lubricant (such as Dow Corning DC-112)
- Lint-free tissues and a clean shop rag

### You will also need one of the following:

DESCRIPTION	PRODUCT NUMBER
Standard O-ring kit	ORMP
High temperature O-ring kit	ORTMP

- Use the 3/8" open end wrench to remove the air supply lines from the actuator.
- Remove the valve and valve-mounting hardware from the actuator as described below.

#### Closemount valve (Figure 1)

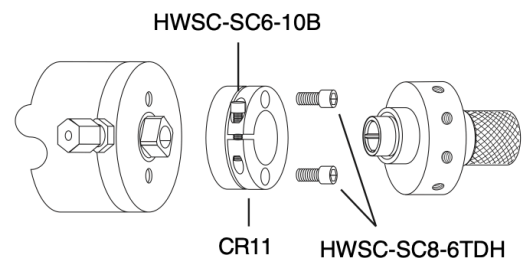
Use the 7/64" hex driver to loosen the HWSC-SC6-10B screw in the CR11 clamp ring between the valve and the actuator, and remove the valve from the actuator. With a 9/64" hex driver, remove the two HWSC-SC8-6TDH screws which hold the clamp ring and spacer to the actuator.

#### Valve on a standoff (Figure 2)

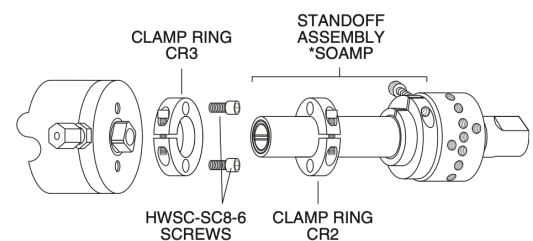
Use the 9/64" hex driver to loosen the HWSC-SC8-10B screw in the black anodized CR3 clamp ring on the actuator. Pull off the standoff with the valve attached. The same hex driver will remove the two HWSC-SC8-6 screws which hold the clamp ring to the actuator.

- Make sure that the 1/2" switch lock nut which holds the switch bracket in place is tight (Figure 10).

**FIGURE 1: Closemount valve removal**

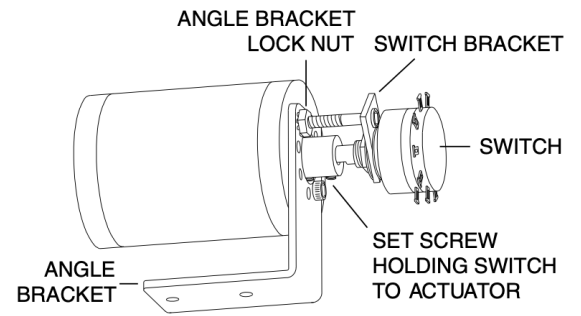


**FIGURE 2: Removal of a valve on a standoff**

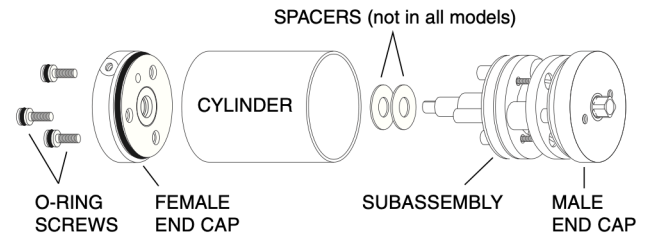


4. Use the 1/16" hex driver to loosen the set screw in the coupling which holds the switch to the actuator. Remove the switch with its bracket still attached.
5. Loosen the angle bracket lock nut with the 11/32" open end wrench, and then use the 9/64" hex driver to remove the two screws securing the angle bracket.
6. Loosen the set screw which holds the coupling to the actuator, and pull off the coupling.
7. Use the 9/64" hex driver to remove the three O-ring screws. (Figure 4) Some models have slotted head screws instead of hex head.
8. Place the actuator on a hard work surface with the O-ring screw holes up. Push down on the cylinder, and the female end cap will pop up.
9. While holding the cylinder and the rest of the assembly together, pull the female end cap all the way off. If the actuator has spacers, remove them at this point. (See Figure 4) If the bearing and thrust race washers fall out of the end cap, just set them aside.
10. Invert the actuator and push down on the cylinder so that the cylinder slides off of the male end cap. Remove the cylinder.
11. Pull the subassembly off the male end cap as indicated in Figure 5. (NOTE: Recently purchased actuators may have a subassembly made primarily of molded plastic, differing in appearance from the one shown in Figures 3, 4, and 5. The procedures are the same for either type.)
12. Remove the three slotted head screws which hold the subassembly together. While holding the rest of the assembly together, slide the O-ring plate off of the drive shaft assembly. (Figure 9).
13. Pull the bearing plates apart to separate the rest of the subassembly. Remove the balls if they are held in place by the lubricant, and pull the drive shaft assembly out of the countersunk bearing plate.

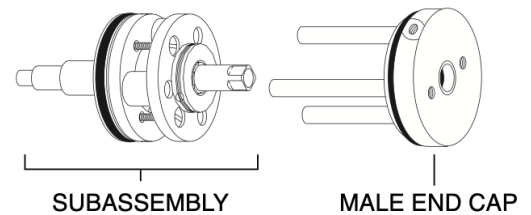
**FIGURE 3: Switch assembly**



**FIGURE 4: Steps 7-10**



**FIGURE 5: Removal of subassembly from male end cap**

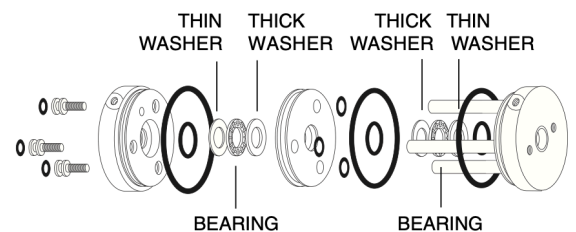


## O-RING REPLACEMENT

The O-rings to be replaced are in the two end caps, the O-ring plate, the three O-ring screws, and the drive shaft. (Some actuator "O-ring" screws use washers instead of O-rings. Both types of replacement seals are included in the repair kit.) If the bearings and thrust race washers haven't already fallen out of the end caps, remove them to replace the internal end cap O-rings.

1. Use the small screwdriver or awl to remove the old O-rings, being careful not to scratch the metal.
2. Use a lint-free tissue to clean the O-ring grooves as completely as possible.
3. As each new O-ring is installed, coat it with a thin layer of silicone lubricant. We recommend Dow Corning DC-112.

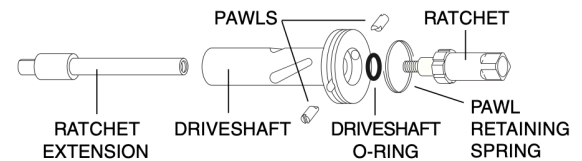
**FIGURE 6: O-ring locations**



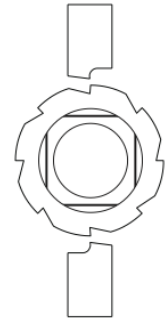
## Drive Shaft Assembly O-ring Replacement

1. Wrap a towel or shop rag around the ratchet extension to protect it, and grip it with pliers. Use a 5/16" wrench on the square of the ratchet to unscrew it from the ratchet extension.
2. Separate these two parts from the rest of the drive shaft assembly. When the ratchet is removed the spring will push the pawls toward the center, where they can be removed with needle nose pliers.
3. With the jeweler's screwdriver, pry off the pawl retaining spring.
4. The O-ring is inside the drive shaft, just beyond the ratchet seat. Use the jeweler's screwdriver to remove the old one and position the new one.
5. Reinstall the pawls. (They will usually go in easier from the inside.) The groove on the outside end of the pawl must align with the spring retaining groove in the driveshaft, but take care that they are positioned to yield the relationship to the ratchet illustrated in **Figure 8**.
6. While holding the driveshaft with thumb and index finger on the pawls to keep them from falling out, place the ratchet in position.
7. Reinstall the spring. Turn the ratchet to make sure that it moves with a definite "click" in each position.
8. Insert the ratchet extension and screw it into the ratchet by hand. (Don't shove too hard or the ratchet will pop out the other end!)
9. Use the rag, pliers, and wrench to tighten the ratchet into the ratchet extension.

**FIGURE 7: Drive shaft assembly**



**FIGURE 8: Pawl/ratchet orientation**

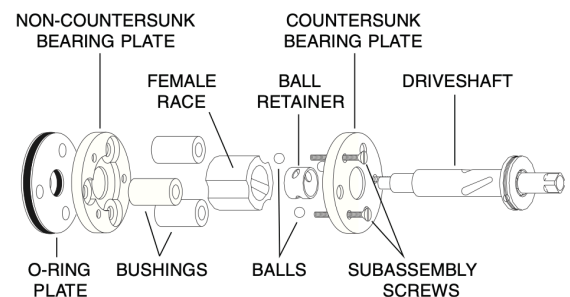


## Actuator Assembly

See **Figures 9 or 11** for parts identification.

1. Place the male end cap on the work surface with the three pins up. Slide the O-ring plate onto the pins with the three small O-rings facing up. If the small O-rings slide out of position, push them back into their recesses in the O-ring plate.
2. Place the non-countersunk bearing plate down against the O-ring plate.
3. Slide the three bushings onto the pins and into position on the bearing plate.
4. Put a liberal coating of DC-112 on the slots in the driveshaft, and put the driveshaft through the countersunk bearing plate as oriented in Figure 9.
5. Place the ball retainer over the driveshaft so that the holes in the retainer line up with the slots in the shaft.
6. Put the balls in the holes of the retainer so that they rest in the slots. They should be held in place by the thick lubricant.
7. Notice that the slots in the female race extend all the way to one end but not the other. Put the drive shaft through the female race so that the balls can enter the open ends of the slots, and push the race all the way up against the bearing plate.
8. Install the driveshaft/female race assembly into the subassembly in progress with the square end up. The bushings fit into the grooves in the female race.

**FIGURE 9: Subassembly parts**

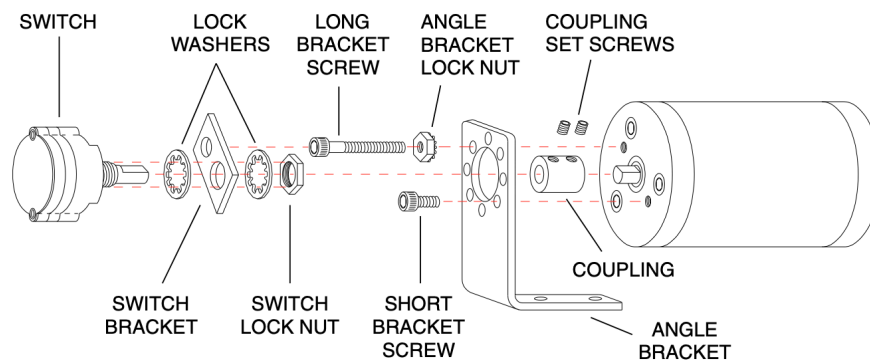


9. Insert the subassembly screws into the three countersunk holes. Tighten them firmly but evenly.
10. Pull the subassembly off of the pins.
11. Place the thrust race washers and bearing in the male end cap. (The thin washer goes in first, as in Figure 6.) Slide the subassembly onto the pins of the male end cap with the square end down.
12. Install the cylinder (the orientation is not critical), sliding it over the subassembly and pressing the male end cap into it. If the actuator has spacers, place them over the drive shaft at this point.
13. Place the thrust race washers and bearing in the female end cap. (The thin washer goes in first, as in Figure 6.) Press the end cap into the cylinder, making sure that the air inlet hole lines up with the one in the male end cap.
14. Install the three O-ring screws. They must be tightened securely, but too much force can strip the aluminum end cap.

## INSTALLING THE SWITCH, VALVE, AND MOUNTING BRACKET

1. The coupling has two set screws. On couplings of most recent manufacture, one set screw is closer to the end than the other. That end goes toward the actuator. On older models with symmetric screw placement, the orientation does not matter. Put the coupling on the ratchet extension and tighten the set screw on the flat surface of the shaft.
2. Reinstall the angle bracket. The shorter screw goes through the bracket hole which is roughly at 4 o'clock (as viewed in Figure 10), and the longer screw with the star washer and locking nut goes through the hole which is roughly at 10 o'clock. Screw the longer screw in until it bottoms out, then back it out one turn and tighten the locking nut.
3. Hold the switch and its mounting bracket in position with the shaft touching the coupling and the hole in the bracket in line with the head of the longer screw, so that the flat on the switch shaft can be seen.

**FIGURE 10: Switch mounting hardware**



4. Use the 5/16" open end wrench on the square at the other end of the actuator to rotate the driveshaft until the coupling set screw is properly lined up with the flat on the switch shaft. Push the switch shaft into the coupling and tighten the set screw.
5. Replace the valve mounting hardware (Figure 1 or 2) and slide the valve or standoff into the clamp ring, making sure that the square hole in the valve coupling or in the end of the standoff driveshaft is fully engaged by the square of the actuator drive shaft. Tighten the clamp ring screw and reinstall the air fittings and supply lines.

The valve and actuator should now have the same alignment they had before disassembly. If the alignment is off, consult Technical Note 701, Operation Notes and Alignment Instructions, Air Actuated Multiposition Valves.

**FIGURE 11: Exploded view of a multiposition actuator**

