

**A-40 SERIES PNEUMATIC DIAPHRAGM TYPE  
Direct Actuator 50" — 75" — 100" — 200"****I. General**

- A. In the "normal" position (no air pressure on diaphragm), the direct actuator holds its stem in a fully retracted position by means of the spring. Increasing air pressure in the upper diaphragm chamber thrusts the actuator stem downward and compresses the spring; decreasing air pressure allows the spring to return the stem to its normal position.
1. Mounted on pull-stem-to-open valve body assemblies, the direct actuator closes the valve upon increasing air pressure on the upper diaphragm chamber.
  2. Mounted on push-stem-to-open valves, the direct actuator opens the valve upon increasing air pressure to the upper diaphragm chamber.
- B. Raised mounting pads on the yoke casting are provided for mounting accessories.
- C. All accessories should be removed before disassembling actuator.

**II. Actuator disassembly**

- A. To remove diaphragm and actuator stem:
1. Relieve spring compression.
    - a. Insert a rod or screwdriver into the spring adjuster (11) and turning counterclockwise, remove it from yoke-spring barrel bridge.
  2. Remove the diaphragm capscrews and nuts (9 and 10), then lift off the diaphragm case (1).
  3. Lift off the diaphragm assembly, withdrawing the attached actuator stem (20).
  4. Unscrew the actuator stem nut (17) to free the diaphragm washer (18) and diaphragm (15) from the actuator stem (20).

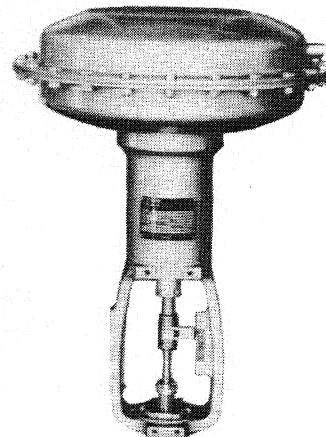
Note: For reassembly after replacement of the diaphragm only, see section VI, paragraph A.

Remove the actuator from the valve body assembly as outlined in the Basic Instruction Book covering the valve in use.

**CAUTION:** Do not remove diaphragm cap screws until spring compression has been relieved.

**III. Disassembly of spring unit**

- A. Remove diaphragm and actuator stem as described in section II, paragraph A.
1. Remove the spring (29) and spring seat (5).
  2. Remove spring retainer (73).

**IV. Disassembly of diaphragm case from yoke**

- A. Remove lower diaphragm case bolts (68) and travel stop, (97).
- B. Lower diaphragm case (21) is now free of yoke.

**V. Assembly**

1. Screw the spring adjuster (11) up into the bridge so that about 1 inch of the screw protrudes into the spring barrel.
2. Place the spring seat (5) and spring (29) on the spring adjuster (11).
3. Place spring retainer (73) on spring (29).

Proceed to VI, diaphragm assembly.

**VI. Diaphragm assembly**

- A. Diaphragm and actuator assembly enter spring barrel as a unit.
1. Replace diaphragm, if necessary.
  2. Slide the diaphragm plate (8) (flat side up) over the actuator stem (20) to rest on the shoulder of the stem.
  3. Dust the diaphragm thoroughly with talcum to prevent abrasion; place the diaphragm over the actuator stem to rest on the diaphragm plate so that the mold of the diaphragm will cause it to drape over the edge of the plate.
  4. Place diaphragm washer (18) (rounded corners down) over the actuator stem, then secure the assembly with the actuator stem nut (17).
  5. Mount with bolt (68) lower diaphragm case (21) to yoke (31).

6. Slide stem (20) with diaphragm assembly down through spring adjuster (11).
7. Line up the holes in the diaphragm with the capscrew holes in the spring barrel case assembly.

Note: To facilitate assembly, spring adjuster (11) can be turned upward or downward (to reposition the spring) so that the diaphragm drapes smoothly onto the capscrew flange.

8. Place the diaphragm case (1) on the diaphragm, positioning the air connection and aligning the capscrew holes with those in the diaphragm and lower case.
9. Insert the capscrews and nuts (9 and 10), and tighten all nuts evenly and securely to ensure a tight diaphragm seal.

## VII. Adjustments

### A. Adjusting actuator stroke

1. Determine the valve travel from the nameplate, add  $1/16$ ", and call this dimension "D."
2. Apply about 30 psig air pressure to the chamber above the diaphragm in order to extend the stem as far as it will go.
3. Exhaust all air pressure from the chamber above the diaphragm.

### B. Setting diaphragm pressure range

This adjustment consists of compressing the spring just enough to counterbalance the downward thrust of the diaphragm when air pressure in the upper chamber is at the preload pressure. Once this starting point for actuator stem movement has been established, the spring design ensures that the stem will be fully extended (in accordance with "D," see 1. above) when air pressure reaches the upper range value.

1. Connect an air gauge and a 0-60 psi regulator to an air line leading to the chamber above the diaphragm.
2. Turn the spring adjuster (11) upward until there is definite indication of spring compression.
3. Determine the lower value of the diaphragm pressure range from the nameplate.
4. Gradually increase air pressure to the upper diaphragm chamber, and determine at what pressure the actuator stem starts to move downward.

Note: Use one hand to regulate air pressure and the other to touch both the actuator stem and the end of the spring adjuster (11).

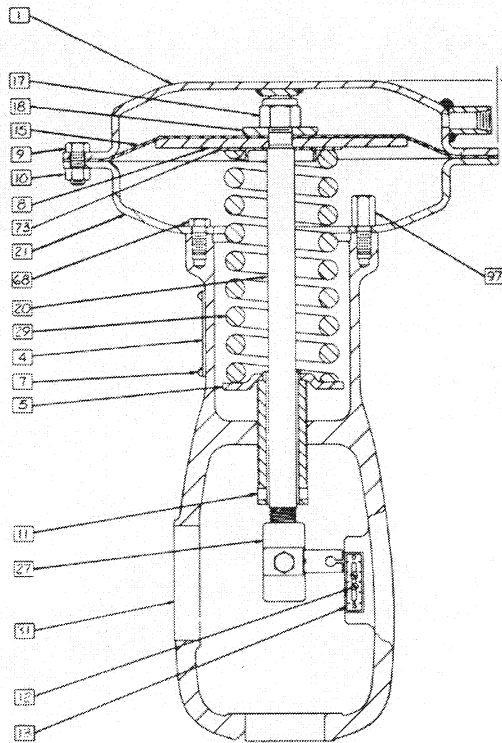
5. Adjust spring compression, by moving the spring adjuster (11), and again increase air pressure gradually. Repeat this testing and adjusting procedure until the actuator stem just starts to move as the increasing air pressure passes the lower value of the pressure range. The diaphragm pressure range has now been established.

6. The actuator is now ready for mounting on the valve body. (See Basic Instruction Book.)

### C. Setting the installed diaphragm pressure range (single seated valve action)

1. As standard factory procedure, single seated valves are tested for shutoff against the maximum inlet pressure stated on the order. The actuator furnished provides ample power to handle the specified flow conditions at the diaphragm pressure range stamped on the nameplate.
2. Under actual operating conditions, line pressure differentials may differ from the calculated figures. This may require a change in the diaphragm pressure range in order to obtain full valve travel and shutoff.
  - a. On pull-stem-to-open valves, the direct actuator usually requires only an increase of the air pressure range values to compensate for pressure drops slightly greater than calculated.
  - b. On push-stem-to-open valves, the direct actuator may require increased initial spring compression to ensure shutoff. (Accomplished by turning the spring adjuster (11). Diaphragm pressure range values must consequently be increased to counterbalance the greater spring force.

Note: Spring design limits the amount of possible "jack-up" compression. Too much initial compression leaves insufficient spring deflection for full actuator stroke.



#### Parts List

- 1 Diaphragm case
- 2 Packing box
- 4 Name plate
- 5 Spring seat
- 7 Name plate screw
- 8 Diaphragm plate
- 9 Capscrew
- 10 Capscrew nut
- 11 Spring adjuster
- 12 Travel indicator scale
- 13 Travel indicator scale screw
- \*15 Diaphragm
- 17 Actuator stem nut
- 18 Diaphragm washer
- 20 Actuator stem
- 21 Lower diaphragm case
- 26 Air vent assembly
- 28 Travel indicator
- 29 Spring
- 31 Yoke
- 68 Lower diaphragm case bolt
- 73 Spring retainer
- 97 Travel stop

\*Recommended spare part