GATE VALVE MAINTENANCE AND ADJUSTMENT PROCEDURES

Table of Contents

Table of Figures, Tables and Drawings

I. VITON GATE AND BONNET O-RING

STD AND MSB 0.625" – 21" GATE VALVES

A. Tools and Materials Required:
   1. Allen Wrench for 1 ½"—14" Gate Valves
   2. ½" Box Wrench for 16"—21" Gate Valves
   3. O-Ring Pick
   4. Rubber Gloves
   5. Grease – *Apezion L* O-Ring Type
   6. IPA

B. Procedure: Always wear Rubber Gloves when handling the Gate Valve
   1. Vent station and pump corresponding to Gate Valve to atmosphere;
   2. Actuate valve to Gate Open position;
   3. For safety, remove air to actuator;
   4. Remove bolts that hold Bonnet Actuator Assembly to body; or for Quick-Clamp Bonnet, undo the clamp;
   5. Pull out the Bonnet Actuator Carriage Assembly, taking care not to move adjustment of linkage;

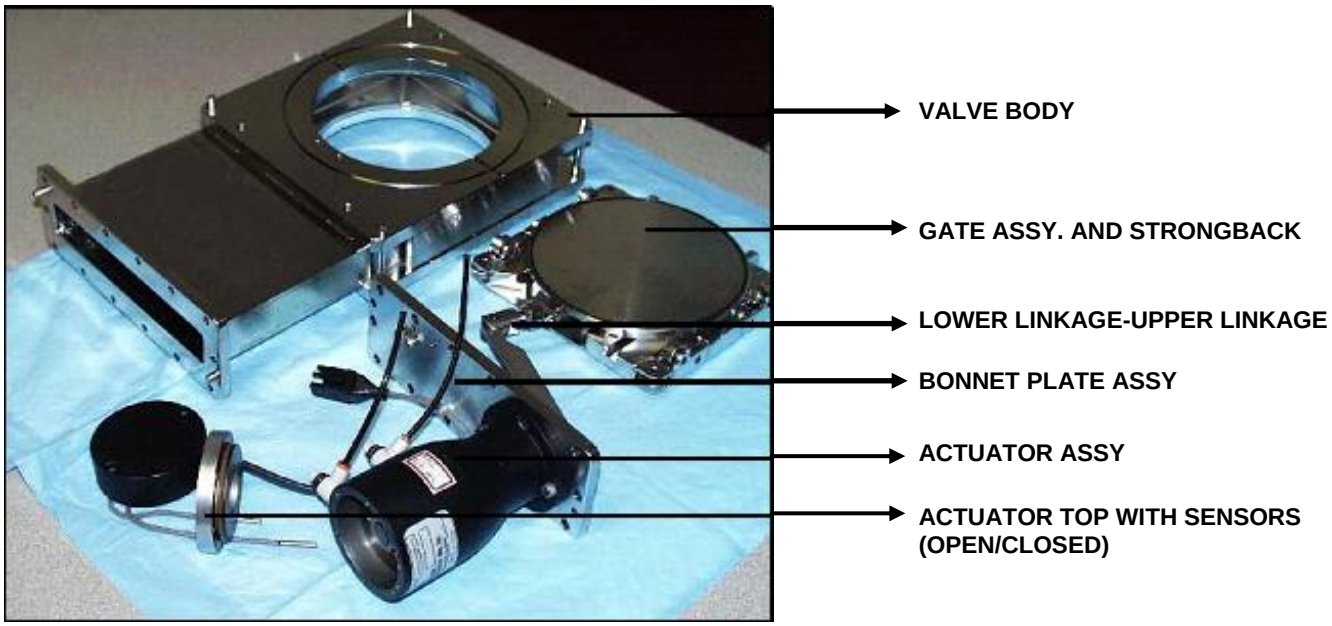


Figure 1 BONNET ACTUATOR CARRIGE ASSY. SEPARATED FROM VALVE BODY

6. Remove O-Ring or Gasket from Bonnet Assembly and discard;
7. Remove Gate O-Ring with the plastic pick, taking care not to scratch the O-Ring groove; Discard the O-Ring;
8. Clean O-Ring groove with IPA and dry out with Nitrogen or CDA;
9. Apply a light coat of *Apezion L* Grease to the new Gate O-Ring;(It is very important that gloves are worn for this step)
10. Install new O-Ring on gate, taking care to avoid twisting or deforming the O-Ring;
11. Apply a light coat of *Apezion L* Grease to the new Bonnet assembly Viton O-Ring; Copper Gasket install dry
12. Install new O-Ring/Gasket on Bonnet assembly, taking care to avoid twisting or deforming the O-Ring
13. Replace Bonnet Actuator Assembly into valve body;
14. Install bolts and tighten. (For MSB, Copper gasket type, tighten side to side 20-25ft-lb)

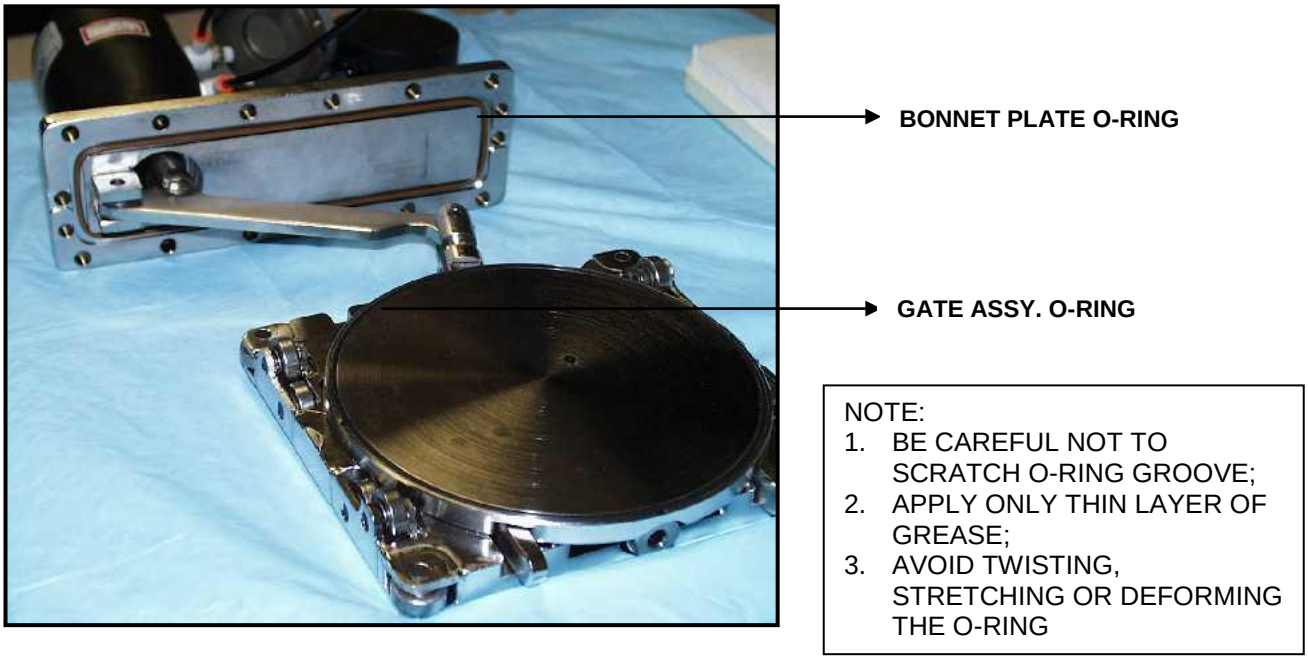


Figure 2 GATE O-RING AND BONNET PLATE O-RING

II. BELLOWS, PNEUMATIC STD CYCLE ONLY

0.625" – 21" GATE VALVES

A. Tools and Materials Required:
   1. Spanner Wrench
   2. Allen Wrench Set
   3. O-Ring Pick
   4. Pick (for R-Ring removal)
   5. Needle-Nose Pliers
   6. Small Standard Screw Driver
   7. Actuator O-Rings
   8. Grease for Bellows O-Ring: *Apezion L*
   9. Vacuum Grease
   10. IPA
   11. Heat Gun
   12. *Lock-Tite*

B. Procedure:
   1. Vent station and pump corresponding to Gate Valve to atmosphere;
   2. Actuate valve to Gate Open position;
   3. For safety, remove air to actuator;
   4. Remove Actuator Cover (2 screws);
   5. Remove Actuator Top (6 screws);
   6. Measure the distance between the top of the Piston and the top of the Drive Shaft. (This will be helpful later during reassembly and adjustment)
   7. Remove the Jam Nut from the Drive Shaft. (Heat gun may be needed to melt the Lock-Tite on the thread)

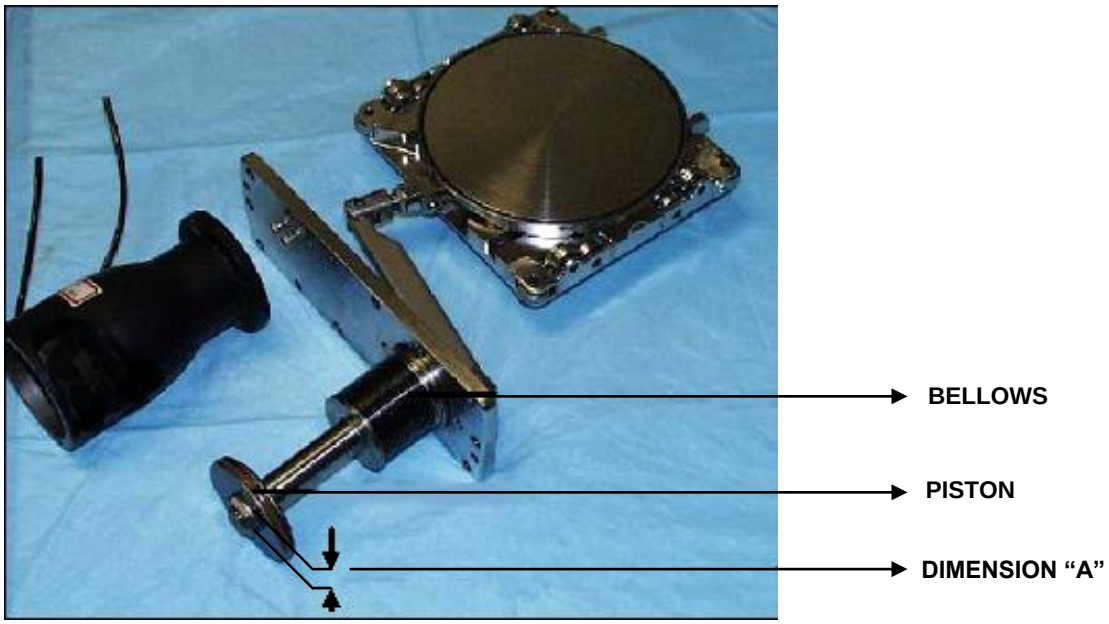


Figure 3 BELLOWS AND PISTON SHOWN WITH ACTUATOR HOUSING REMOVED

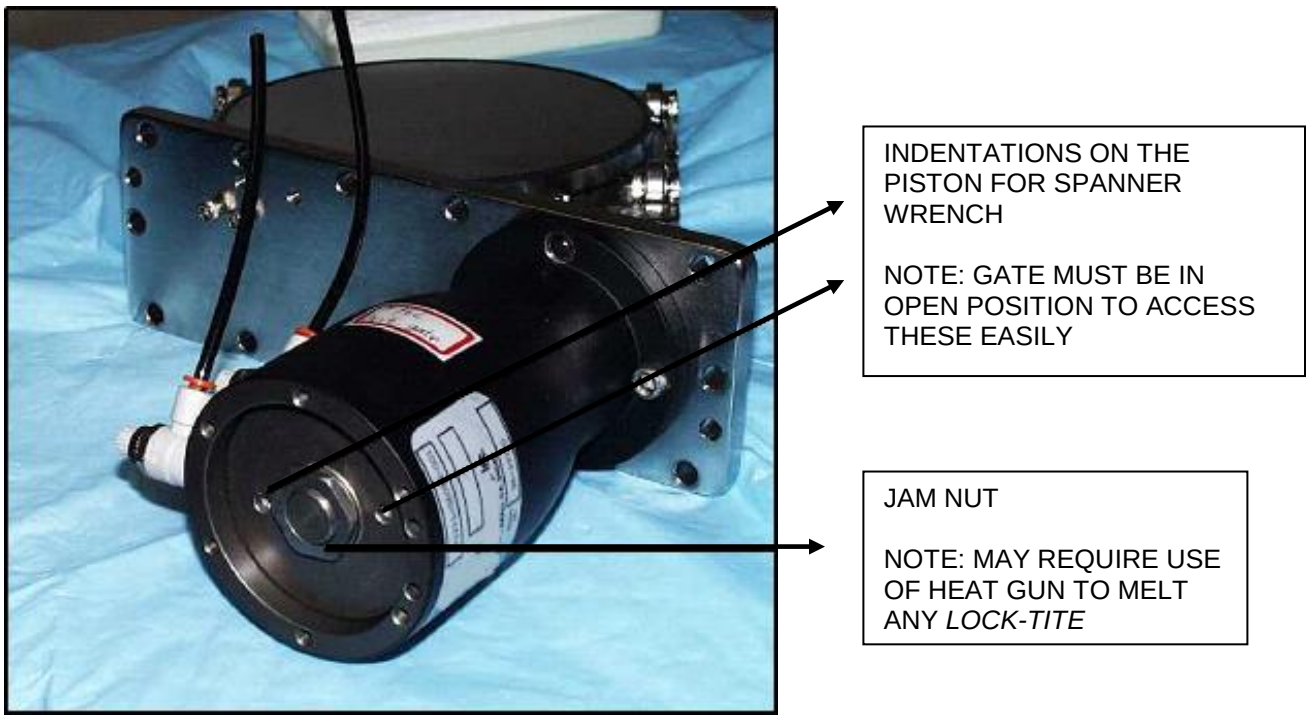


Figure 4 PISTON CLOSE-UP FOR SPANNER WRENCH POSITIONING

8. Using a spanner wrench, turn Piston counterclockwise to remove from Actuator Housing;
9. Remove O-Ring from top of Drive Shaft;
10. Remove remaining screws holding the Actuator Housing to the Bonnet Plate (2 screws)
11. Remove the Actuator Housing;
12. Remove R-Ring from Drive Shaft, using a pick. If a replacement is NOT available, use care to preserve the R-Ring. Otherwise, pull out using the needle nose pliers and discard;
13. Remove bellows by pulling and twisting slightly. Discard;
14. Remove O-Ring in the Bellows drive shaft area and discard;
15. Clean Drive Shaft groove and Bellows area with IPA;
16. Apply a thin coat of grease (*Apezion L*) on the O-Ring for the Drive Shaft in Bellows area;
17. Install O-Ring;
18. Apply a thin coat of grease (*Apezion L*) on the O-Ring for the Bellows base Flange;
19. Install O-Ring;
20. Replace Bellows assembly on the Drive Shaft, pushing and twisting slightly to go over the O-Ring;
21. Install R-Ring on the Drive Shaft, using a screw driver and a pick. Make sure it clicks into the groove next to the top of the Bellows.
22. Apply a thin coat of Vacuum Grease to the Drive Shaft;
23. Install Actuator Housing on the Bonnet plate;
24. Apply a thin coating of Vacuum Grease to the O-Ring for the top of the Drive Shaft;
25. Install O-Ring on the top of the Drive Shaft;
26. Apply a thin coating of vacuum Grease to the Piston area, if necessary;
27. Install Piston on Drive Shaft; using a spanner wrench, turn clockwise until the measurement in step # 5 is achieved;

28. Install Jam Nut, using *Lock-Tite* and tighten;
29. Install Actuator Top and tighten screws;
30. Install Actuator Cover and tighten screws;
31. Install air line and test operation of Valve and Actuator.

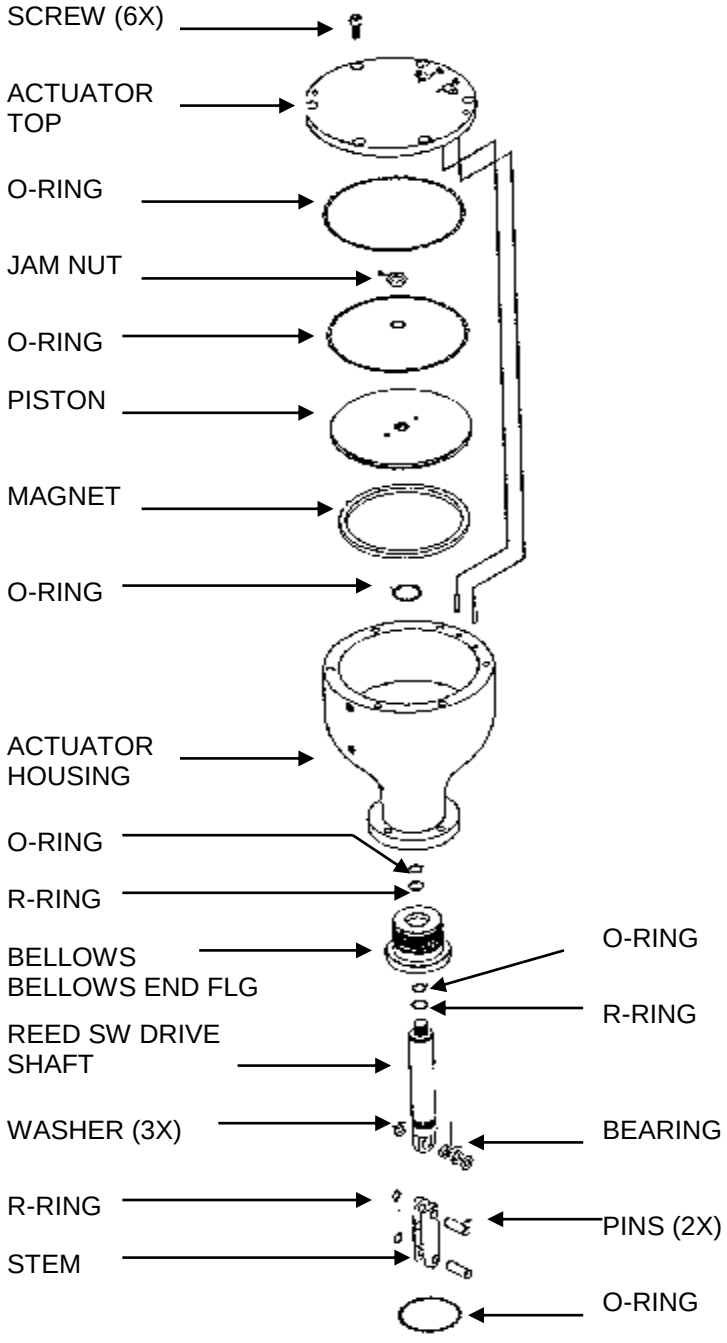


Figure 5 BELLOWS AND ACTUATOR ASSEMBLIES DRAWING

III. ACTUATOR O-RING

0.625” – 21” GATE VALVES STD AND MSB

A. Tools and Materials Required:
   1. Spanner Wrench
   2. Allen Wrench Set
   3. O-Ring Pick
   4. Pick (for R-Ring removal)
   5. Needle-Nose Pliers
   6. Small Standard Screw Driver
   7. Actuator O-Rings
   8. Grease for Bellows O-Ring: *Apezion L*
   9. Vacuum Grease
   10. IPA
   11. Heat Gun
   12. *Lock-Tite (Def Pro #51574 for high temp applications or Lock-Tite 242-31 for standard applications recommended)*

B. Procedure:
   1. Actuate valve to Gate Open position;
   2. For safety, remove air to actuator;
   3. Remove Actuator Cover (2 screws);
   4. Remove Actuator Top (6 screws);
   5. Measure the distance between the top of the Piston and the top of the Drive Shaft. (This will be helpful later during reassembly and adjustment)
   6. Remove the Jam Nut from the Drive Shaft. (Heat gun may be needed to melt the Lock-Tite on the thread)
   7. Using a spanner wrench, turn Piston counterclockwise to remove from Actuator Housing;
   8. Remove O-Ring from top of Drive Shaft;

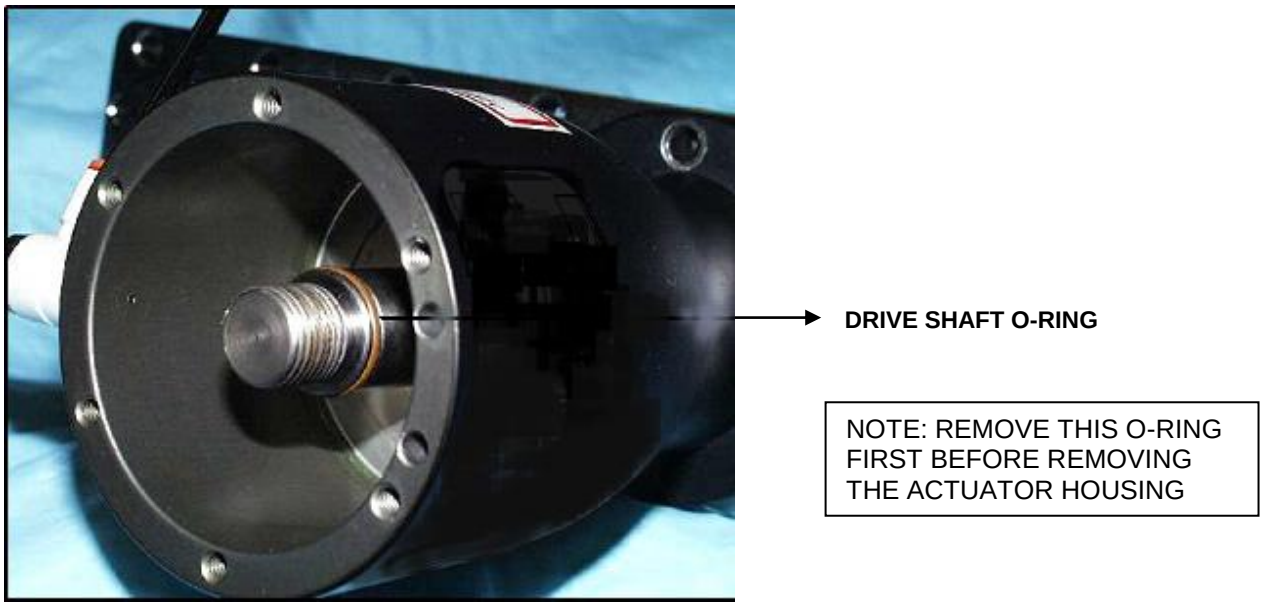


Figure 6 DRIVE SHAFT O-RING

9. Remove remaining screws holding the Actuator Housing to the Bonnet Plate (2 screws)
10. Remove the Actuator Housing;
11. Remove O-Ring in Actuator Housing, using a pick and using care to not scratch the groove surface;

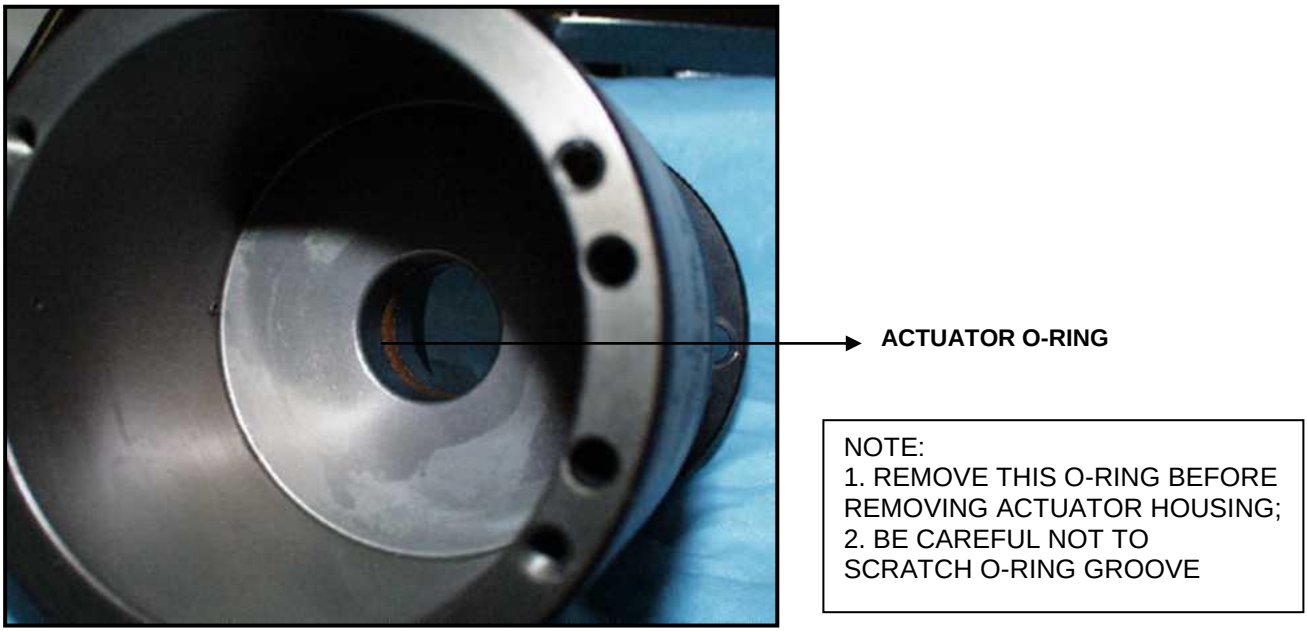


Figure 7 ACTUATOR O-RING

12. Apply a thin coat of vacuum grease on the new O-Ring;
13. Install O-Ring;
14. Inspect the drive shaft; clean and lubricate as necessary;
15. Install Actuator Housing on the Bonnet plate; Tighten screws;
16. Apply a thin coat of Vacuum grease on the O-Ring for the top of the Drive Shaft;
17. Install O-Ring;
18. Inspect actuator housing; clean and lubricate as necessary;
19. Apply a thin coat of vacuum grease on the O-Ring for the Piston;
20. Install O-Ring on the Piston;
21. Install Piston on Drive Shaft, using a spanner wrench and turning clockwise until the measurement in step # 5 is achieved;
22. Install Jam Nut, using *Lock-Tite (Def Pro #51574 for high temp applications or Lock-Tite 242-31 for standard applications recommended)* and tighten;
23. Apply a thin coat of vacuum grease to the O-Ring for the Actuator Top;
24. Install O-Ring on the Actuator Top;
25. Install Actuator Top and tighten screws;
26. Install Actuator Cover and tighten screws;
27. Install air line and test operation of Valve and Actuator.

IV. SEAL PLATE ASSEMBLY/ PINS BEARING

0.625”—21”

A. Tools and Materials Required:
   1. Allen Wrench Set
   2. Arbor Press
   3. Punch
   4. Hammer
   5. Wrenches (Box or Open)
   6. R-R Pliers
   7. Vacuum Grease
   8. IPA
   9. Latex Gloves

B. Procedure 4” – 21”
   1. Actuate valve to gate Open position;
   2. For safety, remove air to actuator;
   3. Remove bolts that hold Bonnet Actuator Assembly to body; For Quick-Clamp Bonnet, undo the clamp;
   4. Pull out the Bonnet Actuator Carriage Assembly;
   5. Using a punch and hammer, remove the pin that holds the Upper Linkage to the Lower Linkage-Upper Linkage of Strongback; (Three washers and an R-Ring should be recovered) **Note: If the pin does not move, flip the assembly over and try from the other side.** *Caution: Be careful not to bend the Upper Linkage; the use of a wooden block for support is recommended)*

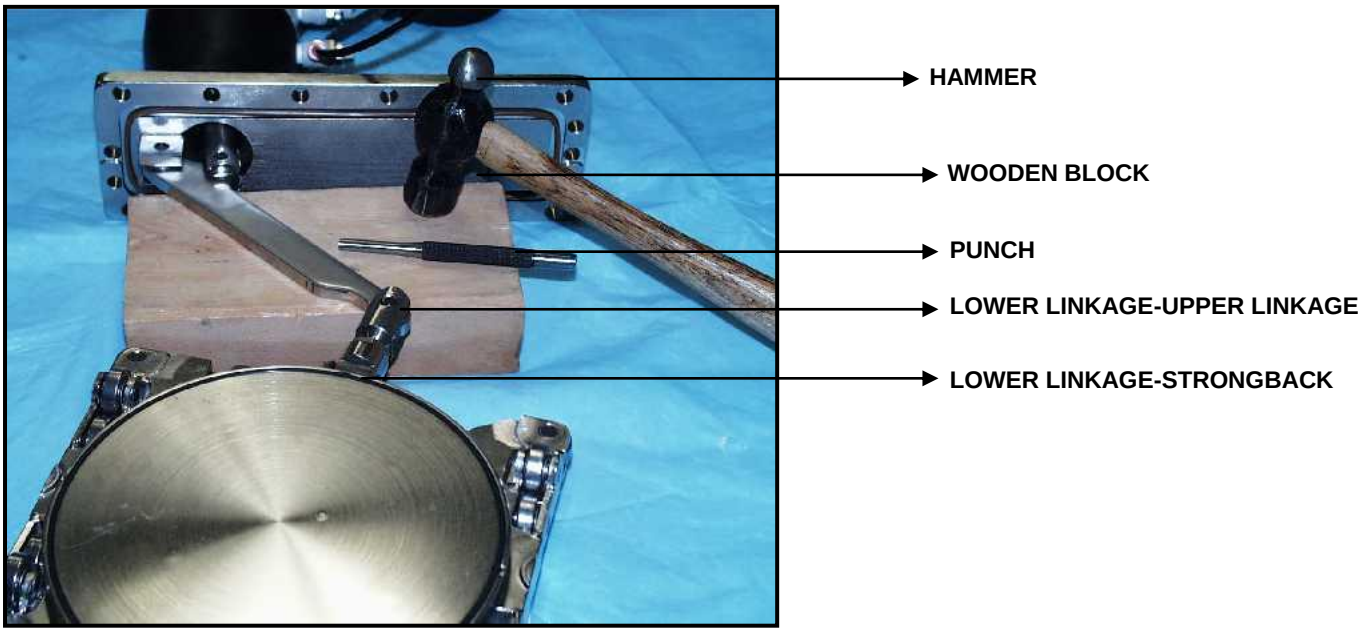
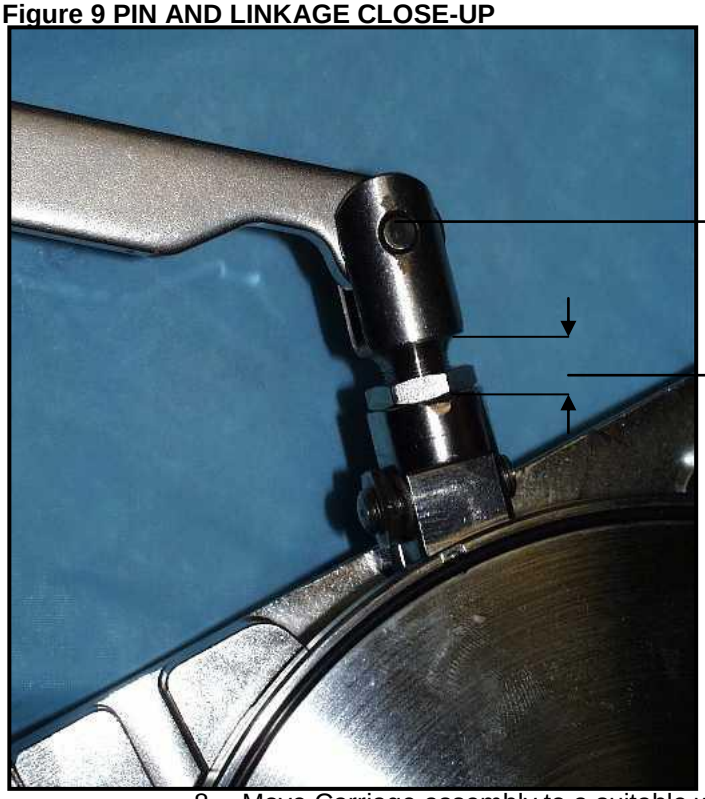


Figure 8 LINKAGE REMOVAL

   6. Separate the Bonnet Upper Linkage Assembly from the Carriage Assembly;

7. Measure the distance between the Strongback Lower Linkage and the Upper Linkage-Lower Linkage; (This will be helpful later during reassembly and valve adjustment)

Figure 9 PIN AND LINKAGE CLOSE-UP



NOTE: IF PIN DOESN'T COME OUT EASILY, FLIP OVER AND HIT WITH PUNCH ON THE OTHER SIDE

8. Move Carriage assembly to a suitable work place for disassembly and the replacement of Pins, Bearings and R-Rings;
9. Remove Gate Spring by removing one set screw (Allen Wrench);
10. Remove four set screws(Allen-3/32") that hold Gate and Strongback together;
11. Separate Gate from Strongback.

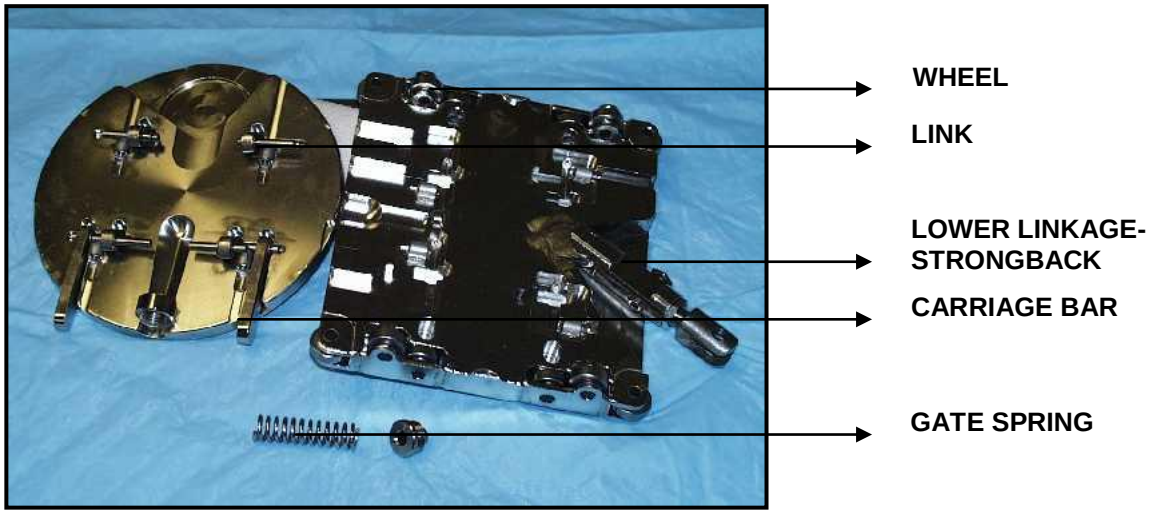
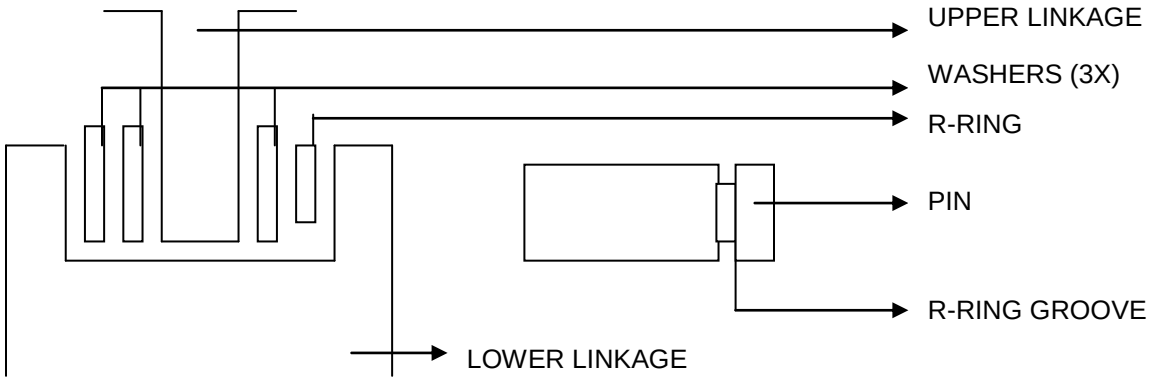


Figure 10 GATE AND STRONGBACK ASSEMBLIES OPENED

12. Remove Set Screws, Links, Washers, Pins, and Carriage Bars; Discard Washers;

13. Using a punch and hammer, remove wheels from their pin. **Note: If the pin does not move, try from the other side.**
14. Using an arbor press, remove the bearings from the links and wheels; Discard expendable parts;
15. Clean all reusable parts such as the gate, Strongback, Links, Carriage Bars, and Gate Spring with IPA;
16. Press new Bearings in using an arbor press; For Viton Bonnet sealing valves, ensure that the Bearings are properly lubricated with the appropriate vacuum grease(*Micro Coat 601* recommended); For Copper sealing bonnet valves run bearings dry
17. Verify that all bearings spin freely;
18. Install Washers, Pins and R-Rings into Strongback;
19. The recommended technique is as follows:
    a) Slide long side of pin through hole first (the side without the groove);
    b) Install R-Ring close to the end of the pin, not in the groove;
    c) Add on the pin one Washer, then the Wheel, then the other two Washers;
    d) Push Pin in until the R-Ring snaps into its groove;



NOTE; THE SAME TECHNIQUE IS USED TO REMOVE AND REINSTALL THE WHEELS IN THE STRONGBACK ASSY.

Figure 11 PIN, WASHERS AND R-RING REMOVAL DRAWING

20. Verify that all wheels spin freely;
21. Set Strongback aside for later assembly;
22. Install Links, Washers, and Pins into Gate Slots;
23. Adjust Pins to correspond to Strongback Pin Pockets;
24. Install Gate to Strongback; Verify that all Pins fit into Strongback pockets;
25. Tighten the set screws loosened in step # 10;
26. Verify that Gate moves freely up and down and is flush with the Strongback in the down position;
27. Install Gate Spring;
28. Install and tighten set screw removed in step # 9;
29. Reattach Upper Linkage to Strongback Lower Linkage-Upper Linkage, using the technique detailed in step # 19;
30. Replace complete assembly into valve body;

AFTER REASSEMBLY, CHECK THAT THE GATE ASSY SITS FLUSH ON THE STRONGBACK AND MOVES FREELY UP AND DOWN. DO THIS BEFORE INSTALLING THE GATE SPRING.

Figure 12 GATE AND STRONGBACK ASSYS AFTER REASSEMBLY

31. Verify the measurement in step # 7, and adjust as necessary;
32. Tighten bolts or install Quick-Clamp as appropriate;
33. Test Valve operation;
34. If necessary, refer to Valve Adjustment Procedure.

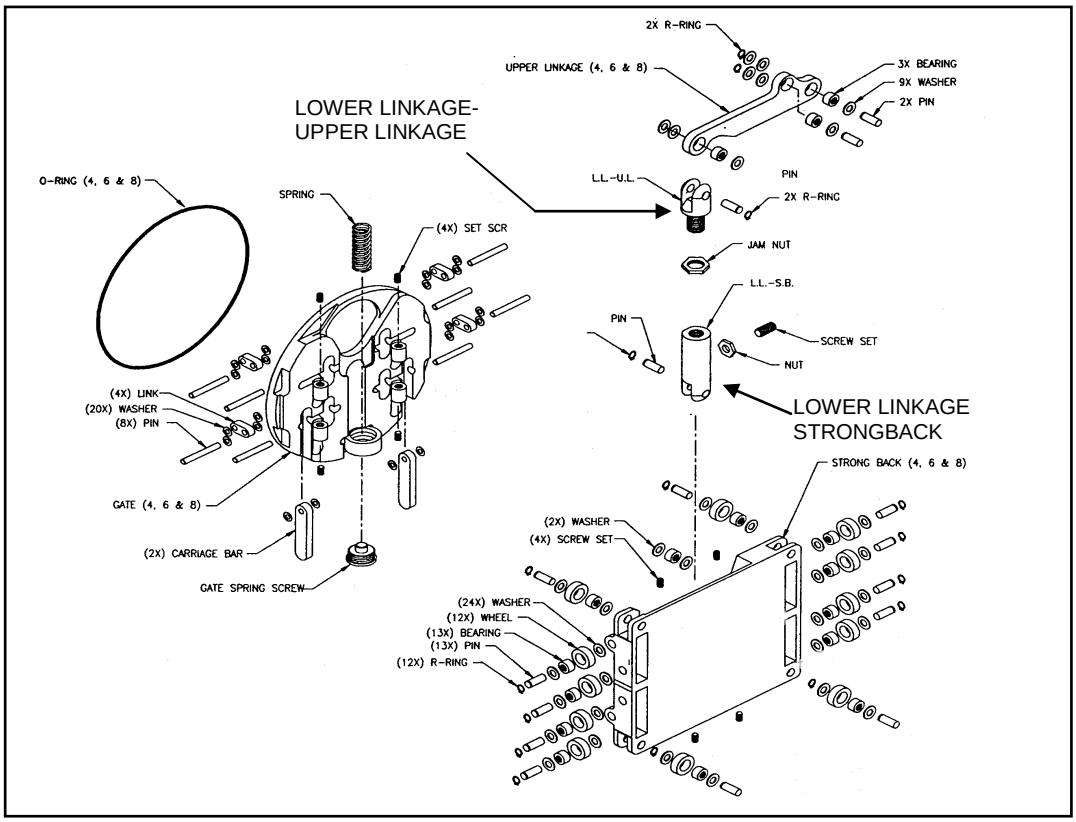


Figure 13 STRONGBACK AND GATE ASSYS DRAWING

V. VALVE ADJUSTMENT

COMPRESSION AND OVER-CENTER 0.625" – 21"

A. Tools and Materials required:
   1. Allen Wrench Set
   2. Wrench Set (Box and Open)
   3. Air Regulator
   4. Heat Gun
   5. Latex Gloves

B. Procedure:

Steps 1 – 8 apply to 0.625" – 3" Gate Valves Only

1. Actuate Valve to Open Gate position;
2. For safety, remove air from Actuator;
3. Remove Actuator Cover (2 screws);
4. Remove Actuator Top (6 screws);
5. Loose Jam Nut on Drive Shaft (This may require the use of the heat gun to melt the *Lock-Tite ((Def Pro #51574 for high temp applications or Lock-Tite 242-31 for standard applications recommended)* on the thread);
6. Check Dimension A on Chart for specific valve size;(This is only the starting adjustment)
7. Adjust and tighten Jam Nut; (Do not use *Lock-Tite* at this point, as adjustment may be needed later);
8. Install Actuator Top, using only 2-4 screws;
9. Remove bolts holding the Bonnet Actuator Assembly to valve body; For Quick-Clamp Bonnet, undo the clamp;
10. Pull out Actuator Bonnet Carriage Assembly from valve body;
11. Check Dimension C on Chart for specific valve size;
12. To adjust, loosen Jam Nut, then turn Lower Linkage-Upper Linkage counter clockwise to increase dimension for more compression; or turn clockwise to decrease the dimension for less compression.(More Compression means more air pressure to lock valve; Less Compression means less air pressure to lock valve);
13. After adjusting, tighten Jam Nut;
14. Reassemble Bonnet Carriage Assembly on valve body;
15. Using an in-line air regulator, check the air pressure required to lock valve. Refer to Chart for Recommended Locking Air Pressure per size of gate valve.
16. Adjust Dimension C until the correct Locking Air Pressure is achieved;

Steps 17 – 20 apply to 4" – 12"Gate Valves Only

17. Check Dimension B on Chart for specific valve size, depending on Over center or No Over center requirement. (Note: Proper Over center means that the Gate does not drop when air pressure is removed from the Actuator)
18. If necessary, loosen nut and adjust Dimension B by turning screw counter clockwise to increase dimension for less Over center or turn clockwise to decrease dimension for more Over center. Less Over center means less travel for the Linkage; more Over center means more travel;
19. Check for Over center adjustment: If gate drops after removal of air pressure for valves that require over center, go back to Step # 18.
20. Tighten nut;
21. Install all bolts and tighten;
22. Test valve operation.

VI. VALVE ADJUSTMENT CHART

INSTRUCTION FOR VALVE ADJUSTMENT					
VALVE SIZE	DIMENSION "A" PISTON ADJUST *	DIMENSION "B" OVERCENTER ADJUST	DIMENSION "B" NO OVERCENTER ADJUST	DIMENSION "C" COMPRESSION ADJUST	RECOMMENDED LOCKING AIR PRESSURE
1.50	.110 **	N/A	N/A	.210	20-30 PSI
2.00	.120 **	N/A	N/A	.360	35-50 PSI
2.50	.125 **	N/A	N/A	.190	35-55 PSI
3.00	.125 **	N/A	N/A	.390	60-65 PSI
4.00	N/A	.278	.360	.420	20-35 PSI
6.00	N/A	.085	.160	.350	35-45 PSI
8.00	N/A	.365	.465	.260	55-70 PSI
10.00	N/A	.770	.800	.500	25-35 PSI
10.75	N/A	.770	.900	.650	30-40 PSI
12.00	N/A	.690	.950	.520	30-40 PSI
14.00	N/A	--	--	--	45-55 PSI
16.00	N/A	.550	.730	.730	65-80 PSI
18.00	N/A	.400	.730	.730	--
21.00	N/A	.550	.850	.550	--
32.00	N/A	.950	1.10	.975	--
ALL DIMENSIONS IN INCHES					
* = STARTING ADJUSTMENT					
** = PISTON ADJUSTMENT CONTROLS OVER-CENTER ADJUSTMENT					as of 12/13/2012

Figure 14 VALVE ADJUSTMENT TABLE

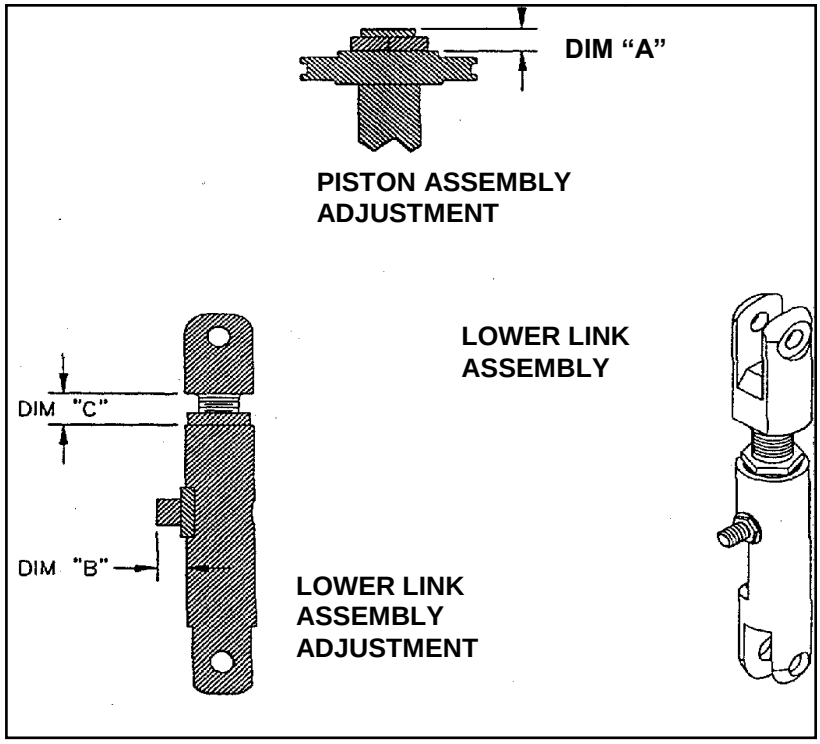


Figure 15 DIMENSIONS "A","B","C"

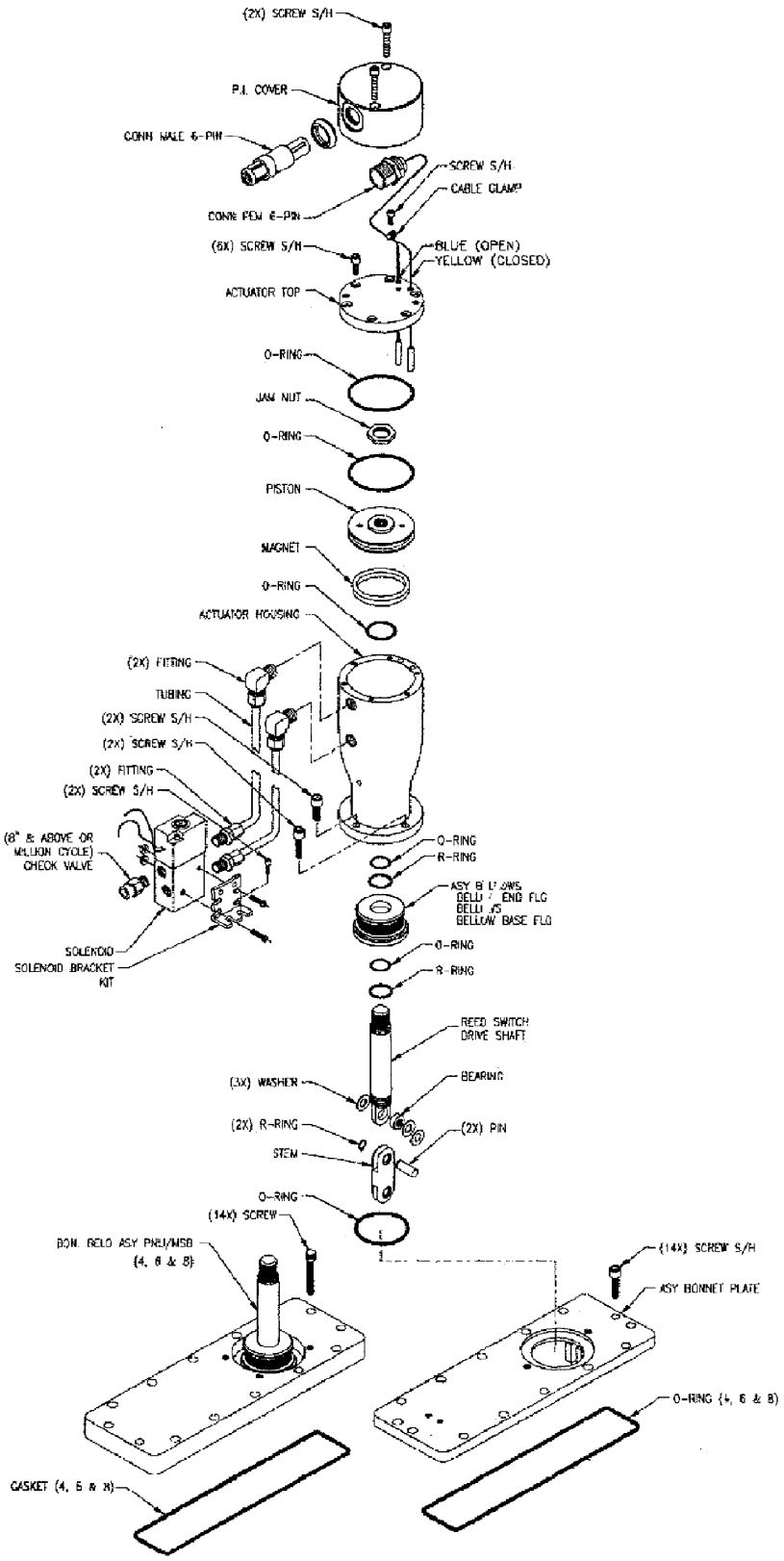


Figure 16 PNEUMATIC ACTUATOR ASSY.

Notes: