



A subsidiary of CIRCOR International, Inc.  
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**INSTALLATION, OPERATING AND  
MAINTENANCE INSTRUCTIONS**  
**PARTS LIST**

**10/2.5.0 Rev.A**

## AEROFLOW CONTROL VALVE ACTUATORS

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## MAINTENANCE

### FOR 6" AND 10" AEROFLOW ACTUATORS

For item number designations, refer to module drawings 31195A or 31308A. See figure 4 for assembly of cylinder, yoke, and spring cartridge, see figure 5 for assembly of cylinder, yoke, and spring tower.

#### REMOVAL OF ACTUATOR FROM VALVE

1. For fail-close, trap enough air in the bottom of the actuator to hold the valve at about mid-stroke.
2. Secure the line in which the valve is installed. Detach accessories that are in the way. Note and/or tag the air and electric lines.
3. Note the amount of thread below the locknut. Loosen the stem locknut and thread it down the stem 2-3 turns.
4. Sling actuator with a rotating hook. Remove the four bolts holding the actuator yoke to the bonnet with a 1-1/16 wrench and spin off actuator.
5. Check the actuator for smoothness of operation and leaks. Connect air to the lower part of the actuator. Using a soap and water solution, spray the edges where the cylinder bottom meets the bottom end plate. Also spray around the bushings. If no bubbles appear, there are no leaks. Spray the edges where the cylinder top meets the top end plate. This will indicate whether or not the actuator leaks through the static end seals. Finally, monitor the top end air connection for leaks. Repeat this procedure while applying air to the top of the actuator. If leaks exist, tear down the actuator using the following disassembly procedure.

#### DISASSEMBLY

1. Stand the actuator on the yoke.
2. Loosen the four setscrews on the anti-rotation assembly. Loosen the nut on the anti-rotation assembly. Finally, unscrew the anti-rotation pin, and lower the assembly onto the valve stem. (See Figure 1)

3. Remove the spring cartridge or spring tower, if applicable, as described in the section on cartridge or tower maintenance. Reference Fig. 4 for assembly drawing of actuator with spring cartridge and Fig. 5 for assembly drawing of spring tower.
4. Remove the top tie rod nuts (item 200) with a 5/8 wrench.
5. Remove the top end plate (item 206). Use a soft hammer if necessary. Remove o-ring (item 207) and clean groove.
6. Pull out the piston subassembly. The piston should pull out by hand, but if more force is necessary, an eyehook can be attached to the internal threads of the upper rod (item 203). The size of the threads is 1/2-20.
7. Pull the cylinder (item 208) off the bottom end plate (item 206). Use a soft hammer if necessary. Check cylinder for any scoring, wear, etc.
8. Remove the four socket head screws (item 219) connecting the bottom end plate to the yoke with a 3/8" allen wrench. Lift off the bottom end plate. Remove the o-ring (item 207) from the end plate and clean groove.

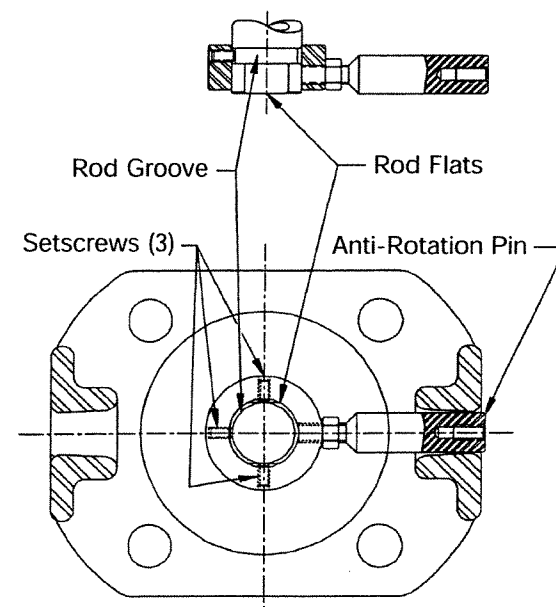


FIG. 1

#### REPAIR ROD BEARINGS

1. The following procedure should be used for both the upper and lower rod bearings (item 214).
2. Remove the two socket head screws (item 202) holding the rod bushing in place with a 3/16 allen wrench. Use a soft hammer if necessary.
3. Remove the seals and rod wiper and clean the grooves. (See Figure 2)

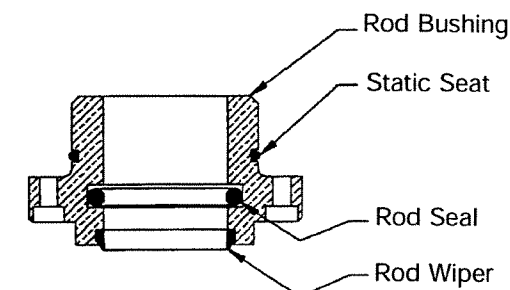


FIG. 2

#### REPAIR PISTON AND SEALS

Note: Do not take the piston subassembly apart. If any damage is suspected, return it to the manufacturer for servicing.

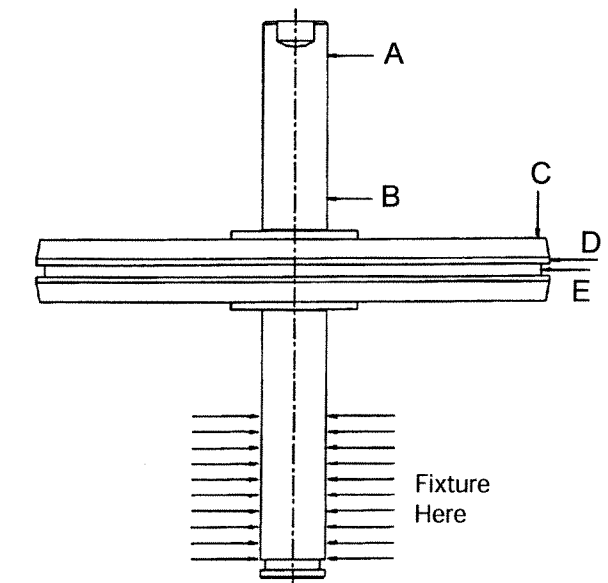
1. Remove o-ring (item 211) and clean groove.
2. Check the upper and lower rods for any scoring or wear, particularly at end stroke points.
3. Check the piston subassembly for tightness. If it is not tight, place the lower rod in soft jaws in a vise. This subassembly should be tightened to 75-100 ft-lbs.
4. Loc-Tite and screw in the setscrew (item 215).
5. The piston subassembly should also be inspected to the values shown in Figure 3.

#### REASSEMBLY

Note: Lubricate as directed below using Parker O Lube or Leslie approved equivalent.

1. Install the proper rod seal o-rings into the two bushings.
2. Lubricate the bore in each end plate.

3. Install the rod bushings into the end plates with four socket head screws using 3/16 allen wrench.
4. Install the cylinder o-rings into the end plates.
5. Attach one of the end plates to the yoke with four socket head screws using a 3/8 allen wrench. Align the matching marks or position the air connection on the end plate so that it is adjacent to one of the legs of the yoke.
6. Clamp the yoke in a vise to ease assembly. Position it so the air connection on the previously assembled end plate is on the left.
7. Generously lubricate the bore of the cylinder barrel and slide it over the end plate o-ring.
8. Make sure that the sliding surfaces of the upper and lower cylinder rods are clean.
9. Install the main piston o-ring in the piston groove.



LOCATION	MAX. TIR (in.)	MAX. TIR (mm)
A	.003	.076
B	.001	.025
C	.005	.127
D	.003	.076
E	.003	.076

FIG. 3

10. Generously lubricate the rod bushing and upper and lower rods.
11. Slide the grooved end of the lower rod into the bushing of the clamped yoke/end plate assembly completed above. Push the piston all the way down until it touches the end plate. It may be necessary to tap the piston with a soft hammer.
12. Generously lubricate the rod bushing of the remaining end plate assembly.
13. Rotate the end plate assembly until the tie rod holes and the air connection line up with the same features on the other end plate.
14. Slide the remaining end plate on the upper rod. It may be necessary to use a soft hammer. The top plate can also be pulled down with the tie rods.
15. Push a tie rod up through the bottom end plate. Apply thread anti-seize compound and thread a locknut and a washer onto the top of the tie rod. Repeat for each tie rod. Tighten in a criss-cross with a 5/8 wrench or air wrench to 15-20 ft-lbs.
16. Check the assembly for leaks.
17. Thread the jam nut onto the anti-rotation pin. Thread the pin into a hole in the anti-rotation collar. Place the collar over the end of the lower rod and lock in place with the setscrews. Tighten the setscrews to 6-7 ft-lbs. Note that two setscrews tighten against the rod within the groove. Also tighten the jam nut. (See Figure 1)
18. Reinstall the spring cartridge or spring tower, if applicable, as described in the section on cartridge or tower maintenance. Reference Fig. 4 for assembly drawing of actuator with spring cartridge and Fig. 5 for assembly drawing of spring tower.

#### INSTALLATION ONTO VALVE

1. Coat the valve stem threads and the actuator mounting flange on the valve bonnet with anti-seize compound.
2. Screw the stem locknut to its lowest position

on the valve stem or to the approximate length measured during disassembly. Push the valve plug onto its seat.

3. Using a suitable hoist, begin spinning the actuator assembly onto the valve. For fail-close assembly, air should be supplied to the lower end of the actuator to position the actuator about midstroke.

*NOTE: The actuator can exert a considerable force if it is released or inadvertently extended. Keep fingers and hands away from the gap between the actuator rod and the valve stem/adaptor.*

4. Continue spinning the actuator until it rests on the mounting flange on the valve bonnet.
5. Orient the actuator by rotating it on the mounting flange so that the yoke legs are in line with the valve body inlet and outlet.
6. Coat the actuator attachment bolts with anti-seize compound and secure the actuator to the valve.
7. Retract the actuator to the top of its stroke and position the travel indicator for the fully open position.

#### VALVE/ACTUATOR ADJUSTMENT

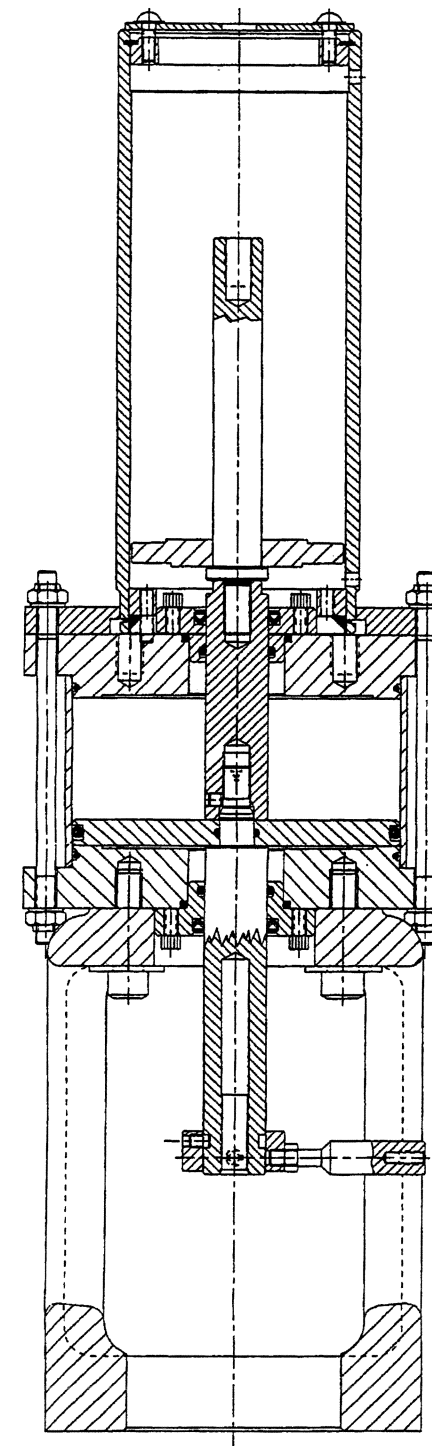
1. Raise the actuator piston to its highest position. Note that the top plate of the actuator is normally the upper stop.
2. Stroke the valve and take note of the distance traveled. Screw the stem out to decrease travel and screw the stem in to increase travel.

*Note: Never rotate the stem of the valve while it is against the valve seat. Always raise the stem off the seat before adjusting it.*

3. Repeat step 2 until the desired travel is reached. Note that this will ensure that the actuator is the upper stop and the valve plug seat is the lower stop.
4. If the spring cartridge is used, the spring load is fixed. If the spring tower is used, adjust the spring load until the approximate bench setting is reached. The bench setting is indicated on the data plate. Note that this is done with loose packing.

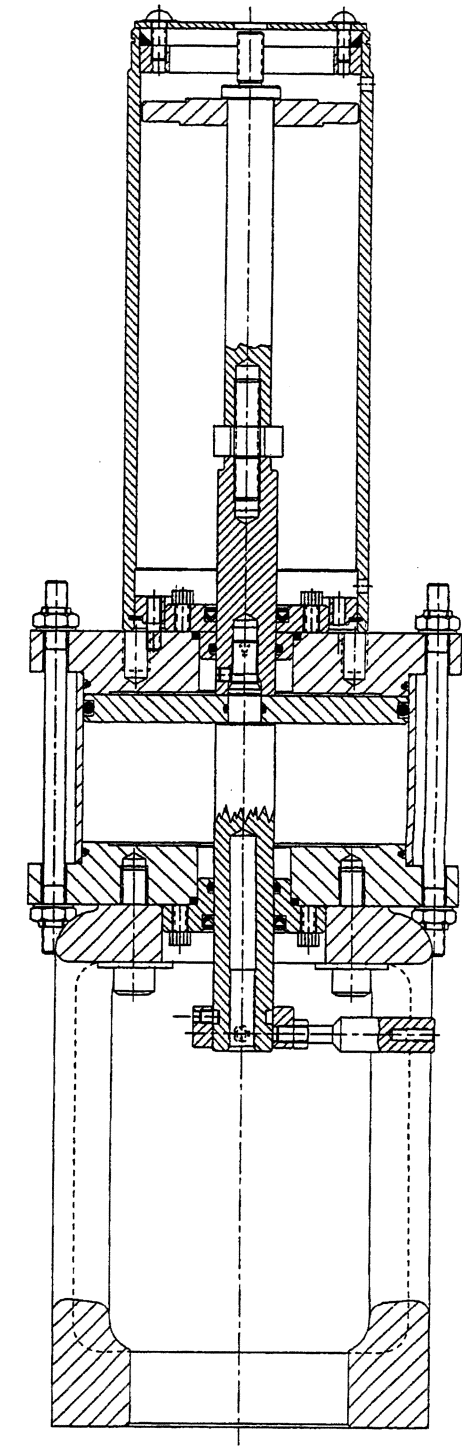
5. Cycle the actuator up and down several times to ensure that proper adjustment has been made.

6. Tighten the stem locknut to the bottom of the lower actuator rod when adjustments are complete. Reattach all accessories.

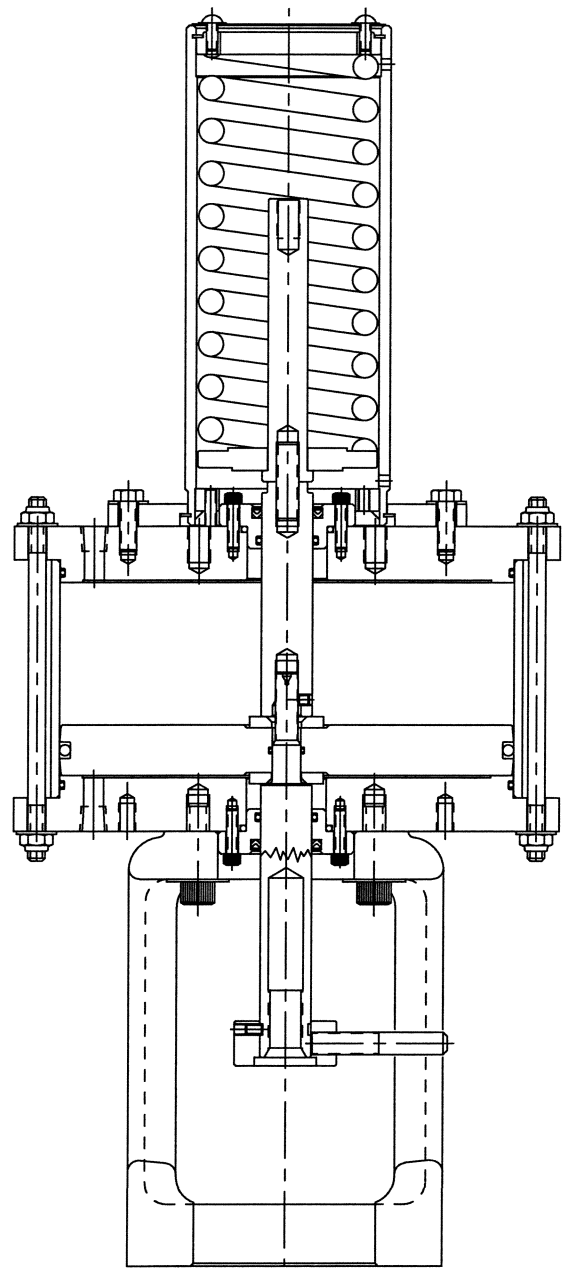


FAIL-CLOSE

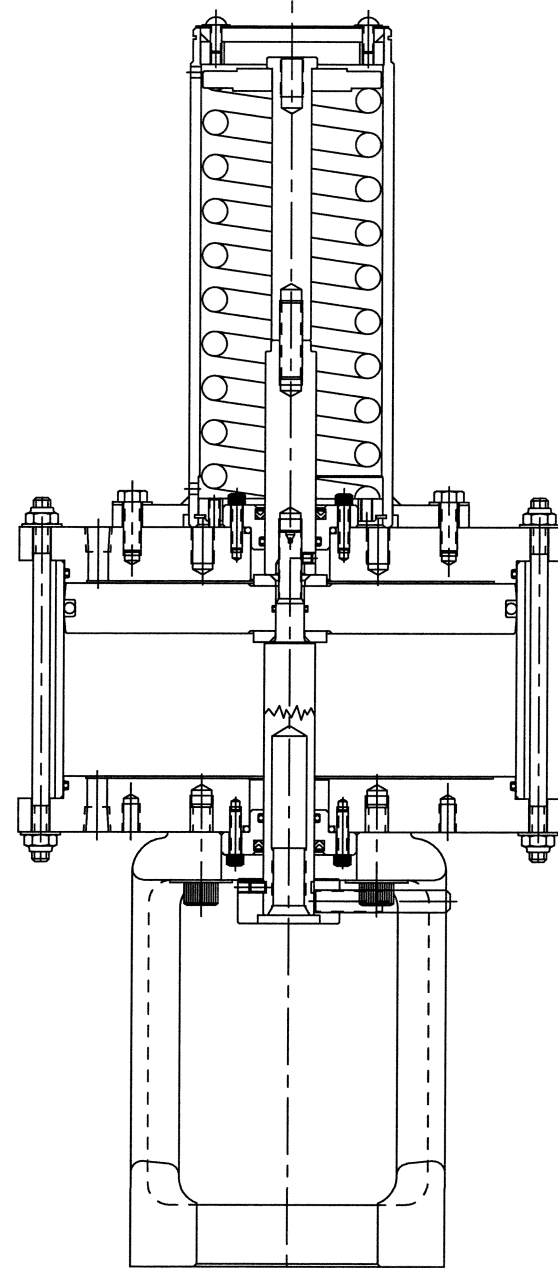
6" ACTUATOR WITH SPRING CARTRIDGE



FAIL-OPEN

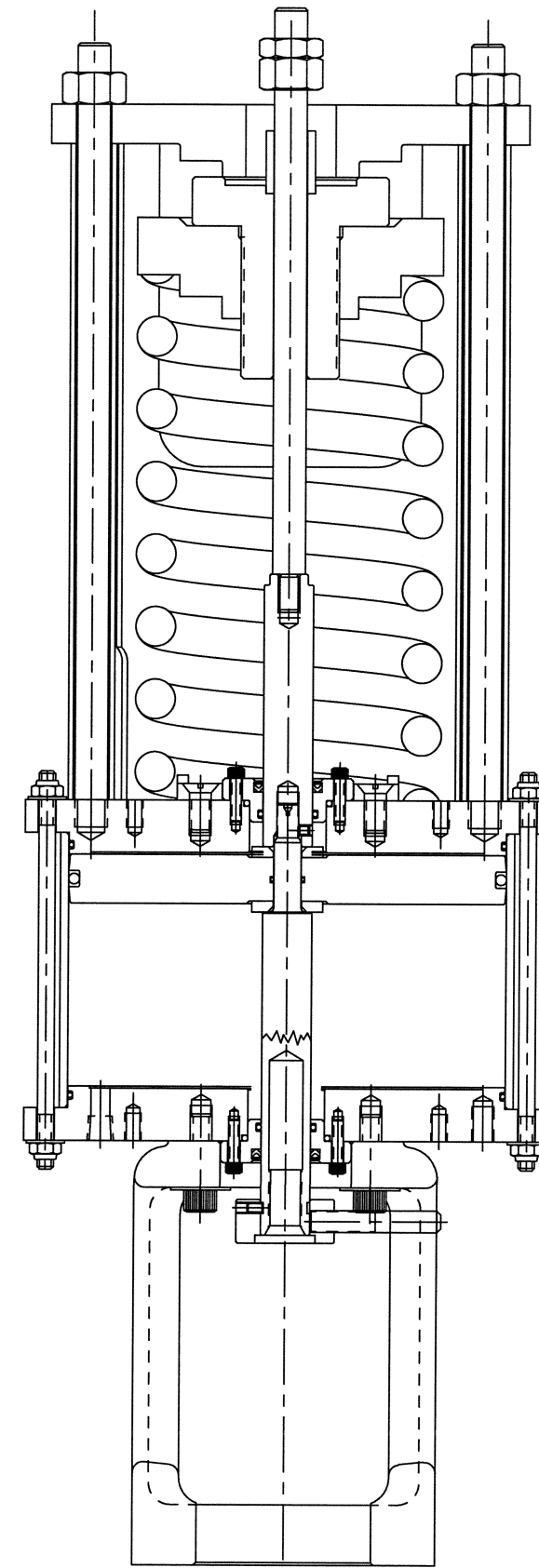


**FAIL-CLOSE**



**FAIL-OPEN**

**10" ACTUATOR WITH SPRING CARTRIDGE**

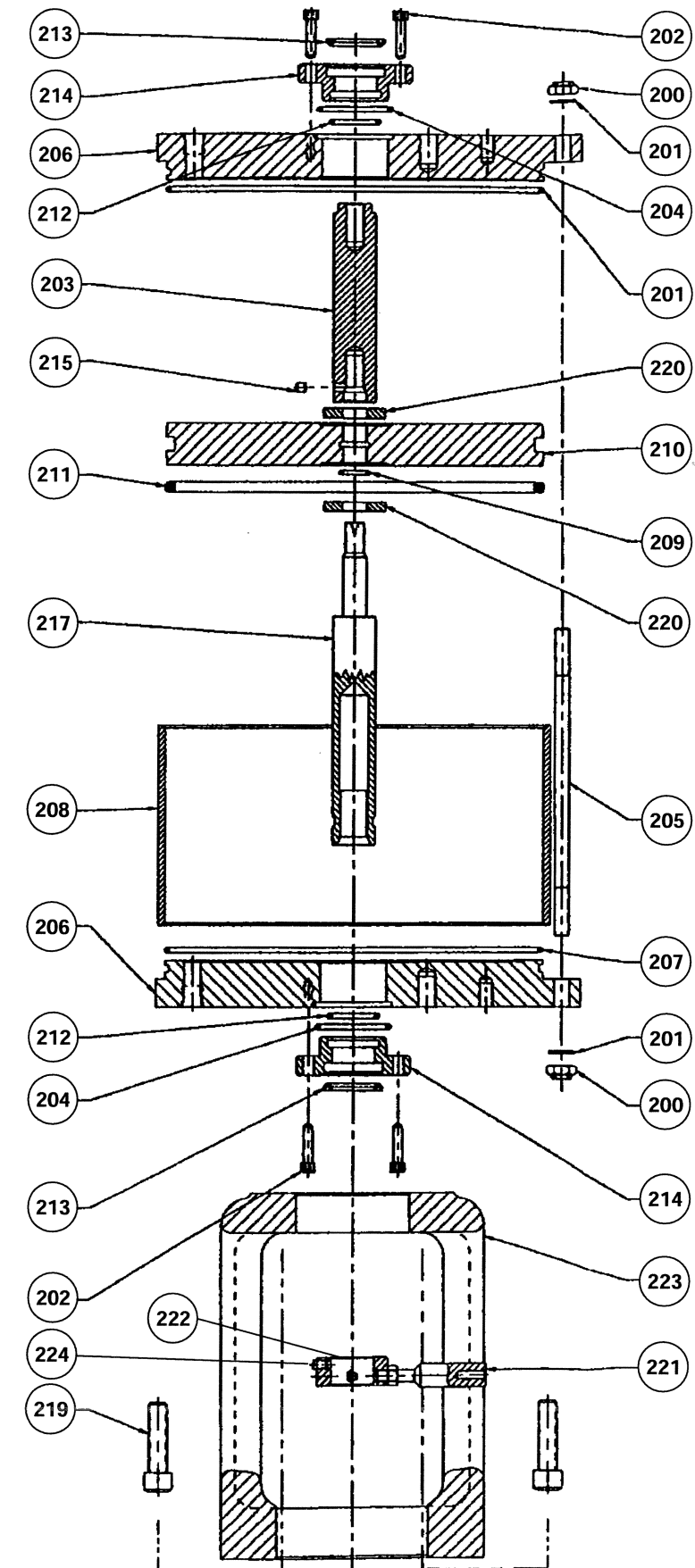


**FAIL-OPEN**  
**10" ACTUATOR WITH SPRING TOWER**

CYLINDER/YOKE MODULE U008964110 (Steel Barrel with 3" Stroke)					
ITEM	REF NO	QTY	DESCRIPTION	MATERIAL	MATERIAL SPEC
200	A40347	16	NUT,LOCK	STAINLESS STEEL	
201	A24741	16	WASHER,FLAT	STAINLESS STEEL	
202	A73051	4	SCREW,SOCKET HEAD	STAINLESS STEEL	
203	A73389	1	ROD,TOP	STAINLESS STEEL	
204	A69992	2	O-RING	BUNA N	COMMERCIAL
205	A73371	8	ROD,TIE	CARBON STEEL	ASTM A193 GR B7,ZINC PLATED
206	A73226	2	PLATE,END	ALUMINUM	
207	A7324494	2	O-RING	BUNA N	COMMERCIAL
208	A73228	1	BARREL,CYLINDER	STEEL	
209	A3866494	1	O-RING,PISTON ROD	BUNA N	
210	A73227	1	PISTON	ALUMINUM	6061
211	A7324594	1	O-RING,PISTON ROD	BUNA N	COMMERCIAL
212	A2072694	2	O-RING	BUNA N	COMMERCIAL
213	A73153	2	WIPER,ROD	TEFLON	
214	A73072	2	BUSHING,ROD SCREW,SET	ALUMINUM BRONZE	ASTM B505,C932000
215	58800POL5	1	SCREW,SET	CARBON STEEL	COMMERCIAL
216					
217	A73650	1	WASHER,FLAT	STAINLESS STEEL	AISI 630 COND H900
218	A73068	1	ROD,CYLINDER	CAST STEEL	
219	A73152	4	YOKE	STAINLESS STEEL	
220	A73251	2	SCREW,SOCKET HEAD	STAINLESS STEEL	
221	A75565	1	ANTI-ROTATION PIN	STAINLESS STEEL	AISI 416
222	A75358	1	ANTI-ROTATION COLLAR	STAINLESS STEEL	AISI 416
223	A61357	1	NUT,HEX	STAINLESS STEEL	AISI 416
224	A73408	4	SCREW,SET	STAINLESS STEEL	AISI 300 SERIES

CYLINDER/YOKE MODULE U008964113 (Composite Barrel with 3" Stroke)					
ITEM	REF NO	QTY	DESCRIPTION	MATERIAL	MATERIAL SPEC
200	A40347	16	NUT,LOCK	STAINLESS STEEL	
201	A24741	16	WASHER,FLAT	STAINLESS STEEL	
202	A73051	4	SCREW,SOCKET HEAD	STAINLESS STEEL	
203	A73389	1	ROD,TOP	STAINLESS STEEL	
204	A69992	2	O-RING	BUNA-N	COMMERCIAL
205	A73371	8	ROD,TIE	CARBON STEEL	ASTM A193 GR B7,ZINC PLATED
206	A73226	2	PLATE,END	ALUMINUM	
207	A7324494	2	O-RING	BUNA-N	COMMERCIAL
208	A73380	1	BARREL,CYLINDER	COMPOSITE	FIBERGLASS EPOXY COMPOSITE
209	A3866494	1	O-RING,PISTON ROD	BUNA-N	
210	A73227	1	PISTON	ALUMINUM	6061
211	A7324594	1	O-RING,PISTON ROD	BUNA-N	COMMERCIAL
212	A2072694	2	O-RING	BUNA-N	COMMERCIAL
213	A73153	2	WIPER,ROD	TEFLON	
214	A73072	2	BUSHING,ROD SCREW,SET	ALUMINUM BRONZE	ASTM B505,C932000
215	58800POL5	1	SCREW,SET	CARBON STEEL	COMMERCIAL
216					
217	A73650	1	WASHER,FLAT	STAINLESS STEEL	AISI 630 COND H900
218	A73068	1	ROD,CYLINDER	CAST STEEL	
219	A73152	4	YOKE	STAINLESS STEEL	
220	A73251	2	SCREW,SOCKET HEAD	STAINLESS STEEL	
221	A75565	1	ANTI-ROTATION PIN	STAINLESS STEEL	AISI 416
222	A75358	1	ANTI-ROTATION COLLAR	STAINLESS STEEL	AISI 416
223	A61357	1	NUT,HEX	STAINLESS STEEL	AISI 416
224	A73408	4	SCREW,SET	STAINLESS STEEL	AISI 300 SERIES

CYLINDER/YOKE MODULE U008964133 (Steel Barrel with 3" Stroke and Nitronic 60 Rod)					
ITEM	REF NO	QTY	DESCRIPTION	MATERIAL	MATERIAL SPEC
200	A40347	16	NUT,LOCK	STAINLESS STEEL	
201	A24741	16	WASHER,FLAT	STAINLESS STEEL	
202	A73051	4	SCREW,SOCKET HEAD	STAINLESS STEEL	
203	A79500	1	ROD,TOP	NITRONIC 60	ASTM A276 UNS S21800
204	A69992	2	O-RING	BUNA N	COMMERCIAL
205	A73371	8	ROD,TIE	CARBON STEEL	ASTM A193 GR B7,ZINC PLATED
206	A73226	2	PLATE,END	ALUMINUM	
207	A7324494	2	O-RING	BUNA N	COMMERCIAL
208	A73380	1	BARREL,CYLINDER	COMPOSITE	FIBERGLASS EPOXY COMPOSITE
209	A3866494	1	O-RING,PISTON ROD	BUNA N	
210	A73227	1	PISTON	ALUMINUM	6061
211	A7324594	1	O-RING,PISTON ROD	BUNA N	COMMERCIAL
212	A2072694	2	O-RING	BUNA N	COMMERCIAL
213	A73153	2	WIPER,ROD	TEFLON	
214	A73072	2	BUSHING,ROD SCREW,SET	ALUMINUM BRONZE	ASTM B505,C932000
215	58800POL5	1	SCREW,SET	CARBON STEEL	COMMERCIAL
216					
217	A79501	1	WASHER,FLAT	NITRONIC 60	ASTM A276 UNC S21800
218	A73068	1	ROD,CYLINDER	CAST STEEL	
219	A73152	4	YOKE	STAINLESS STEEL	
220	A73251	2	SCREW,SOCKET HEAD	STAINLESS STEEL	
221	A17765	1	ANTI-ROTATION PIN	STAINLESS STEEL	AISI 416
222	A75358	1	ANTI-ROTATION COLLAR	STAINLESS STEEL	AISI 416
223	A61357	1	NUT,HEX	STAINLESS STEEL	AISI 416
224	A73408	4	SCREW,SET	STAINLESS STEEL	AISI 300 SERIES

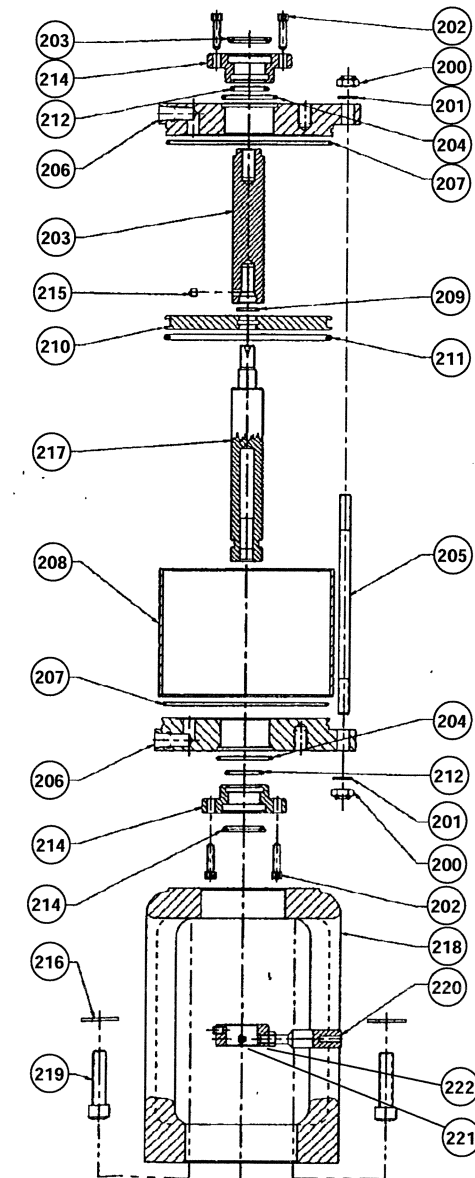


CYLINDER/YOKE MODULE U008964108 (Steel Barrel with 2" Stroke)					
ITEM	REF NO	QTY	DESCRIPTION	MATERIAL	MATERIAL SPEC
200	A40347	8	NUT, LOCK	STAINLESS STEEL	
201	A24741	8	WASHER, FLAT	STAINLESS STEEL	
202	A73051	4	SCREW, SOCKET HEAD	STAINLESS STEEL	
203	A73387	1	ROD, TOP	STAINLESS STEEL	AISI 416
204	A69992	2	O-RING	BUNA N	COMMERCIAL
205	A73030	4	ROD, TIE	CARBON STEEL	ASTM A193 GR B7, ZINC PLATED
206	A73039	2	PLATE, END	ALUMINUM	
207	A7307494	2	O-RING	BUNA N	COMMERCIAL
208	A73041	1	BARREL, CYLINDER	CARBON STEEL	
209	A3866494	1	O-RING, PISTON ROD	STAINLESS STEEL	
210	A73032	1	PISTON	ALUMINUM	
211	A7307394	1	O-RING, PISTON	BUNA N	COMMERCIAL
212	A2072694	2	O-RING	BUNA N	COMMERCIAL
213	A73153	2	WIPER, ROD	TEFLON	
214	A73072	2	BUSHING, ROD	ALUMINUM BRONZE	ASTM B505, C932000
215	58800POL5	1	SCREW, SET	CARBON STEEL	COMMERCIAL
216	N38790	4	WASHER, FLAT	CARBON STEEL	COMMERCIAL
217	A73031	1	ROD, CYLINDER	STAINLESS STEEL	AISI 416
218	A73068	1	YOKE	CAST STEEL	
219	A73152	4	SCREW, SOCKET HEAD	STAINLESS STEEL	
220	A75565	1	ANTI-ROTATION PIN	STAINLESS STEEL	AISI 416
221	A75358	1	ANTI-ROTATION COLLAR	STAINLESS STEEL	AISI 416
222	A61357	1	NUT, HEX	STAINLESS STEEL	AISI 316
223	A73408	4	SCREW, SET	STAINLESS STEEL	AISI 300 SERIES

CYLINDER/YOKE MODULE U008964109 (Steel Barrel with 3" Stroke)					
ITEM	REF NO	QTY	DESCRIPTION	MATERIAL	MATERIAL SPEC
200	A40347	8	NUT, LOCK	STAINLESS STEEL	
201	A24741	8	WASHER, FLAT	STAINLESS STEEL	
202	A73051	4	SCREW, SOCKET HEAD	STAINLESS STEEL	
203	A73388	1	ROD, TOP	STAINLESS STEEL	AISI 416
204	A69992	2	O-RING	BUNA N	COMMERCIAL
205	A73370	4	ROD, TIE	CARBON STEEL	ASTM A193 GR B7, ZINC PLATED
206	A73039	2	PLATE, END	ALUMINUM	
207	A7307494	2	O-RING	BUNA N	COMMERCIAL
208	A73369	1	BARREL, CYLINDER	CARBON STEEL	
209	A3866494	1	O-RING, PISTON ROD	STAINLESS STEEL	
210	A73032	1	PISTON	ALUMINUM	
211	A7307394	1	O-RING, PISTON	BUNA N	COMMERCIAL
212	A2072694	2	O-RING	BUNA N	COMMERCIAL
213	A73153	2	WIPER, ROD	TEFLON	
214	A73072	2	BUSHING, ROD	ALUMINUM BRONZE	ASTM B505, C932000
215	58800POL5	1	SCREW, SET	CARBON STEEL	COMMERCIAL
216	N38790	4	WASHER, FLAT	CARBON STEEL	COMMERCIAL
217	A73031	1	ROD, CYLINDER	STAINLESS STEEL	AISI 416
218	A73068	1	YOKE	CAST STEEL	
219	A73152	4	SCREW, SOCKET HEAD	STAINLESS STEEL	
220	A75565	1	ANTI-ROTATION PIN	STAINLESS STEEL	AISI 416
221	A75358	1	ANTI-ROTATION COLLAR	STAINLESS STEEL	AISI 416
222	A61357	1	NUT, HEX	STAINLESS STEEL	AISI 316
223	A73408	4	SCREW, SET	STAINLESS STEEL	AISI 300 SERIES

CYLINDER/YOKE MODULE U008964111 (Composite Barrel with 2" Stroke)					
ITEM	REF NO	QTY	DESCRIPTION	MATERIAL	MATERIAL SPEC
200	A40347	8	NUT, LOCK	STAINLESS STEEL	
201	A24741	8	WASHER, FLAT	STAINLESS STEEL	
202	A73051	4	SCREW, SOCKET HEAD	STAINLESS STEEL	
203	A73387	1	ROD, TOP	STAINLESS STEEL	AISI 416
204	A69992	2	O-RING	BUNA N	COMMERCIAL
205	A73030	4	ROD, TIE	CARBON STEEL	ASTM A193 GR B7, ZINC PLATED
206	A73039	2	PLATE, END	ALUMINUM	
207	A7307494	2	O-RING	BUNA N	COMMERCIAL
208	A73378	1	BARREL, CYLINDER	COMPOSITE	FIBERGLASS EPOXY COMPOSITE
209	A3866494	1	O-RING, PISTON ROD	STAINLESS STEEL	
210	A73032	1	PISTON	ALUMINUM	
211	A7307394	1	O-RING, PISTON	BUNA N	COMMERCIAL
212	A2072694	2	O-RING	BUNA N	COMMERCIAL
213	A73153	2	WIPER, ROD	TEFLON	
214	A73072	2	BUSHING, ROD	ALUMINUM BRONZE	ASTM B505, C932000
215	58800POL5	1	SCREW, SET	CARBON STEEL	COMMERCIAL
216	N38790	4	WASHER, FLAT	CARBON STEEL	COMMERCIAL
217	A73031	1	ROD, CYLINDER	STAINLESS STEEL	AISI 416
218	A73068	1	YOKE	CAST STEEL	
219	A73152	4	SCREW, SOCKET HEAD	STAINLESS STEEL	
220	A75565	1	ANTI-ROTATION PIN	STAINLESS STEEL	AISI 416
221	A75358	1	ANTI-ROTATION COLLAR	STAINLESS STEEL	AISI 416
222	A61357	1	NUT, HEX	STAINLESS STEEL	AISI 316
223	A73408	4	SCREW, SET	STAINLESS STEEL	AISI 300 SERIES

CYLINDER/YOKE MODULE U008964112 (Composite Barrel with 3" Stroke)					
ITEM	REF NO	QTY	DESCRIPTION	MATERIAL	MATERIAL SPEC
200	A40347	8	NUT, LOCK	STAINLESS STEEL	
201	A24741	8	WASHER, FLAT	STAINLESS STEEL	
202	A73051	4	SCREW, SOCKET HEAD	STAINLESS STEEL	
203	A73388	1	ROD, TOP	STAINLESS STEEL	AISI 416
204	A69992	2	O-RING	BUNA N	COMMERCIAL
205	A73370	4	ROD, TIE	CARBON STEEL	ASTM A193 GR B7, ZINC PLATED
206	A73039	2	PLATE, END	ALUMINUM	
207	A7307494	2	O-RING	BUNA N	COMMERCIAL
208	A73379	1	BARREL, CYLINDER	COMPOSITE	FIBERGLASS EPOXY COMPOSITE
209	A3866494	1	O-RING, PISTON ROD	STAINLESS STEEL	
210	A73032	1	PISTON	ALUMINUM	
211	A7307394	1	O-RING, PISTON	BUNA N	COMMERCIAL
212	A2072694	2	O-RING	BUNA N	COMMERCIAL
213	A73153	2	WIPER, ROD	TEFLON	
214	A73072	2	BUSHING, ROD	ALUMINUM BRONZE	ASTM B505, C932000
215	58800POL5	1	SCREW, SET	CARBON STEEL	COMMERCIAL
216	N38790	4	WASHER, FLAT	CARBON STEEL	COMMERCIAL
217	A73031	1	ROD, CYLINDER	STAINLESS STEEL	AISI 416
218	A73068	1	YOKE	CAST STEEL	
219	A73152	4	SCREW, SOCKET HEAD	STAINLESS STEEL	
220	A75565	1	ANTI-ROTATION PIN	STAINLESS STEEL	AISI 416
221	A75358	1	ANTI-ROTATION COLLAR	STAINLESS STEEL	AISI 416
222	A61357	1	NUT, HEX	STAINLESS STEEL	AISI 316
223	A73408	4	SCREW, SET	STAINLESS STEEL	AISI 300 SERIES



## MAINTENANCE

### 10" ACTUATOR SPRING TOWERS

*For item number designations, refer to module drawing 33768B for Fail Closed and 33769B for Fail Open.*

#### REMOVAL OF SPRING TOWER FROM ACTUATOR

1. Relieve all spring adjustment with thrust nut.(Item 101) Make note of the number of turns to which the nut was adjusted.
2. Slowly remove the four nuts (Item 109) and washers (Item 110) from the tie rods. (Item 106)
3. Lift off the top plate (Item 100).
4. For fail-open, slowly undo the jam nut (Item 117), hex nut (Item 108), and thrust spacer(Item 114) to remove all remaining tension.
5. Lift off the spring cover (Item 103).
6. Remove the four standoffs (Item 107), and unscrew the tie rods (Item 106) from the actuator top plate.
7. Lift off the remaining pieces of the spring tower, including spring seat (Item 115) and screws (Item 116) for fail open.
8. Check the thrust nut (Item 109) and mating threads for wear.

#### INSTALLATION OF DIRECT-ACTING (FAIL-OPEN) TOWER MODULE

1. Position the actuator to the "open" position.
2. Install spring seat (Item 115) and screws (Item 116).
3. Apply permanent thread locking adhesive (Loc-Tite) to the smaller threads on the extension rod (item 105). Screw the extension rod into the upper rod of the actuator.
4. Lower the return spring onto the actuator.
5. Apply anti-seize compound to the threads of the thrust nut (item 101) and screw it into the adjusting nut (item 102) using the orientation shown on the module drawing.

Place this assembly on top of the return spring.

6. Apply anti-seize compound to the thrust spacer (Item 114) and place it on the thrust nut (Item 101) as shown on the module drawing.
7. Screw the hex nut(Item 108) onto the top of the extension rod until it bottoms out on the thrust spacer (Item 114).
8. Thread the jam nut(item 117) onto the top of the extension rod. Tighten the nut to 40-50 ft-lbs.
9. Thread the four threaded rods (Item 106) into the four corresponding holes in the actuator top plate. Slide the four sleeves (Item 107) over the threaded rods.
10. Place the cover washer (Item 104) on the actuator top plate. Lower the spring cover (Item 103) over the spring return assembly. Rotate the cover until the access hole is located at the front of the assembly.
11. Slide the top plate (Item 100) and the four washers (Item 110) over the threaded rods and secure them with the four nuts (Item 109). Tighten securely with an air wrench to 50-75 ft-lbs.
12. For proper spring preload, rotate the adjusting nut the same number of turns as noted originally or check the bench set as noted on the data plate.

#### INSTALLATION OF REVERSE ACTING (FAIL CLOSED) TOWER MODULE

1. Position the actuator to the closed position.
2. Loc-Tite the largest threads on the extension rod (Item 105). Screw the extension rod into the upper rod of the actuator.
3. Apply anti-seize compound to the threads of the thrust nut (Item 101), and screw it into the adjusting nut (Item 102) using the

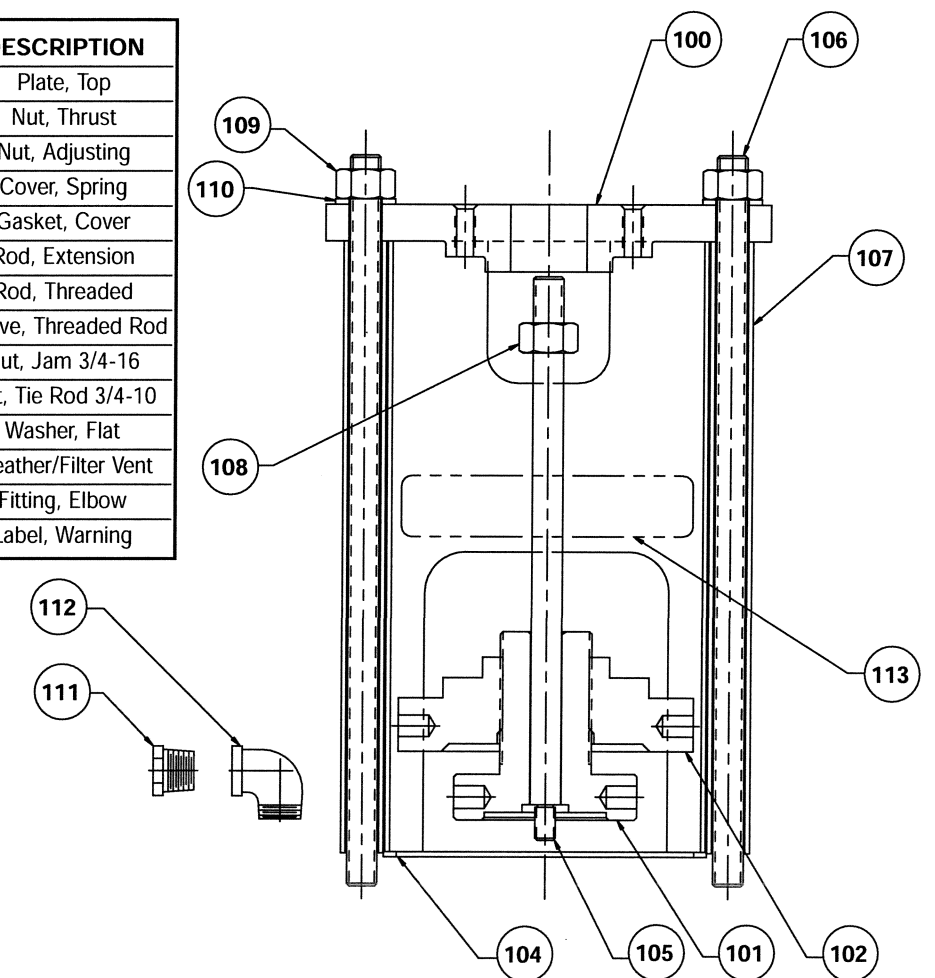
orientation shown on the module drawing. Apply anti-seize compound to top of actuator upper rod. Slide this assembly down the extension rod until it seats on the actuator upper rod.

4. Position the return spring(s) on the adjusting nut (Item 102).
5. Thread the four threaded rods (Item 106) into the four corresponding holes in the actuator top plate. Slide the four sleeves (Item 107) over the threaded rods.
6. Lower the spring cover (Item 103) over the

spring return assembly. Rotate the cover until the access hole is located at the front of the assembly.

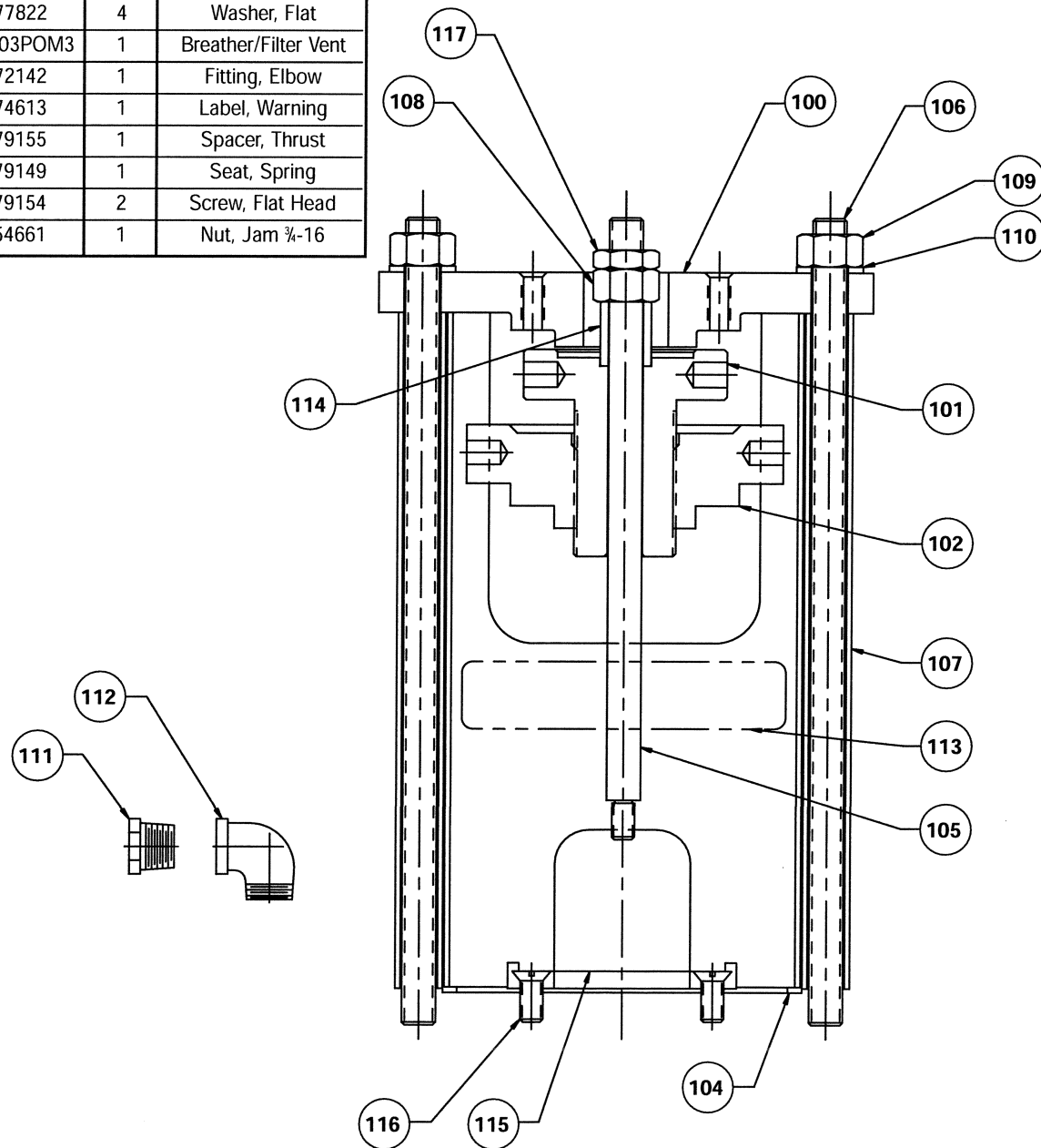
7. Slide the top plate (Item 100) and the four washers (Item 110) over the threaded rods and secure them with the four nuts (Item 109). There may be a gap between the tops of the sleeves and the top plate. Tighten securely with an air wrench to 50-75 ft-lbs.
8. For proper spring preload, rotate the adjusting nut the same number of turns as originally noted or check the bench set as noted on the data plate.

ITEM	REF. NO.	QTY	DESCRIPTION
100	79145	1	Plate, Top
101	79146	1	Nut, Thrust
102	79147	1	Nut, Adjusting
103	79148	1	Cover, Spring
104	79150	1	Gasket, Cover
105	79151	1	Rod, Extension
106	79152	4	Rod, Threaded
107	79153	4	Sleeve, Threaded Rod
108	70308	1	Nut, Jam 3/4-16
109	79075	4	Nut, Tie Rod 3/4-10
110	77822	4	Washer, Flat
111	67603POM3	1	Breather/Filter Vent
112	72142	1	Fitting, Elbow
113	74613	1	Label, Warning



**DRAWING 33768B**

ITEM	REF. NO.	QTY	DESCRIPTION
100	79145	1	Plate, Top
101	79146	1	Nut, Thrust
102	79147	1	Nut, Adjusting
103	79148	1	Cover, Spring
104	79150	1	Gasket, Cover
105	79151	1	Rod, Extension
106	79152	4	Rod, Threaded
107	79153	4	Sleeve, Threaded Rod
108	70308	1	Nut, Jam 3/4-16
109	79075	4	Nut, Tie Rod 3/4-10
110	77822	4	Washer, Flat
111	67603POM3	1	Breather/Filter Vent
112	72142	1	Fitting, Elbow
113	74613	1	Label, Warning
114	79155	1	Spacer, Thrust
115	79149	1	Seat, Spring
116	79154	2	Screw, Flat Head
117	54661	1	Nut, Jam 3/4-16



DRAWING 33769B

## MAINTENANCE 6" & 10" SPRING CARTRIDGES

*For item number designations, refer to module drawings 31475A.*

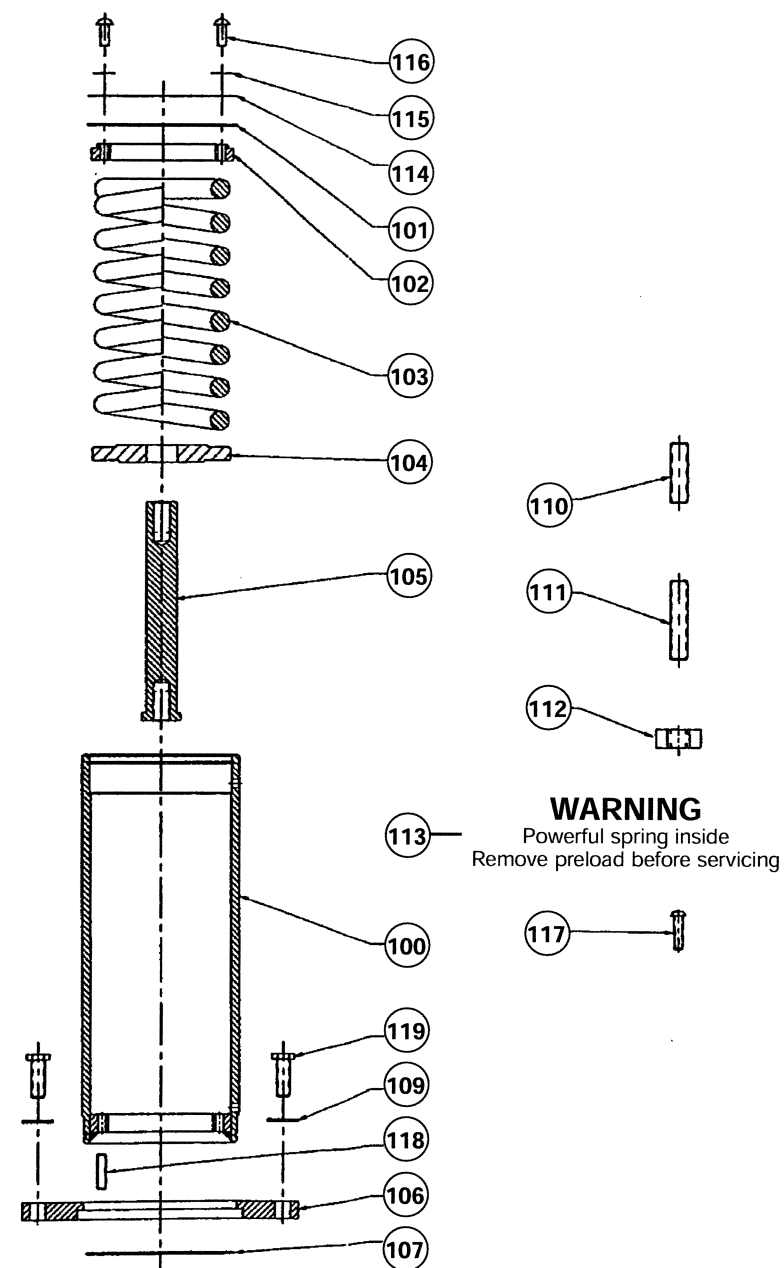
### REMOVAL FROM ACTUATOR

1. If the spring cartridge is on a 6" actuator, apply vise grips to the tie rods on the actuator. Slowly loosen both bottom and top tie rods equally to remove spring load.
2. If the spring cartridge is on a 10" actuator and the cartridge is mounted on a plate (item 107), thread about 2" all-thread into the plate holes, and slowly let the plate up to remove spring load.
3. Fail-close:
  - A. If the spring cartridge assembly will slide off the guide rod (item 105), do so. Unscrew the guide rod with a pipe wrench. Hold the lower rod of the actuator with a wrench to ensure that the guide rod does not just spin.
  - B. If the spring cartridge assembly will not slide off the guide rod (item 105), remove the cover (item 114). Use a basin wrench to unscrew the guide rod from the actuator. Hold the lower rod of the actuator with a wrench to ensure that the guide rod does not just spin.
4. Fail Open:
  - A. Remove the cover (item 114).
  - B. If there is a nub on the end of the guide rod, tack weld a 1/2" nut to the top of the guide rod. Weld it along the side and across the top.
  - C. If there is not a nub on the end of the guide rod, tack weld a 7/8" maximum length 1/2-20 bolt to the top of the guide rod.
  - D. Use the nut or the bolt to unscrew the guide rod from the upper rod of the actuator. Hold the lower rod of the actuator with a wrench to ensure that the guide rod does not just spin.
  - E. Slide off the spring cartridge assembly.

### INSTALLATION ONTO ACTUATOR

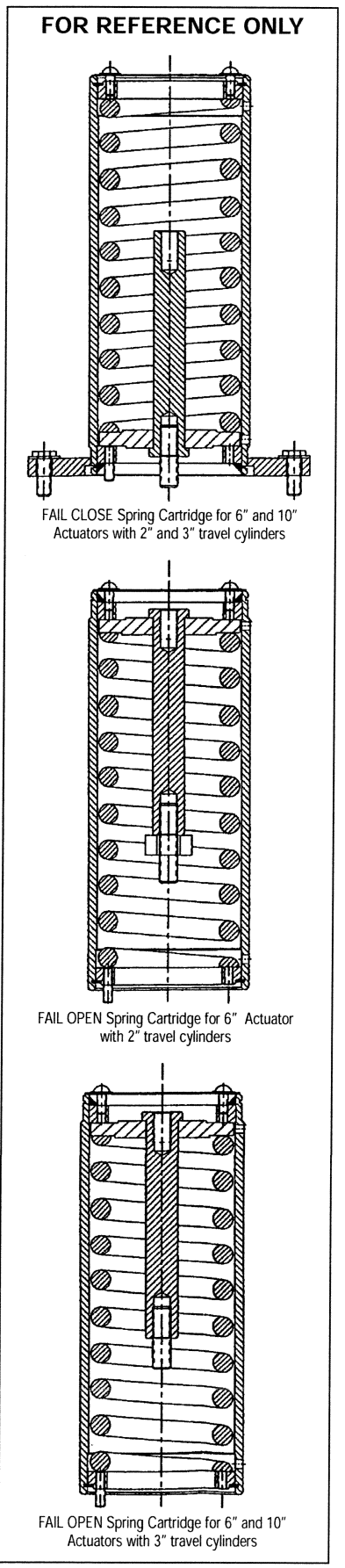
1. If no anti-rotation pin exists, create one out of 1" long 1/4-28 all thread. Thread the pin into the appropriate hole of the retainer (item 102), shown in the module drawing. Note that the fail-close version where the seat is welded to the guide rod does not require an anti-rotation pin.
2. Fail-Open:
  - A. Make sure the upper part of the stud (item 110 or 111) is screwed into the guide rod. Loc-Tite the lower part of the stud.
  - B. Line up the anti-rotation pin with its hole in the actuator plate, and slide the cartridge assembly over the actuator upper rod.
  - C. Use the nut or bolt on the top of the guide rod to screw the stud into the upper rod of the actuator. Continue wrenching until the guide rod makes solid contact with the upper rod. Tighten to 50-75 ft-lbs, while holding onto the lower rod of the actuator.
  - D. If necessary, rebolt the plate and tighten to 15-20 ft-lbs. Make certain there is approximately 1/8" clearance between the seat and the retainer.
3. Fail-Close:
  - A. Make sure the upper part of the stud (item 110 or 111) is screwed into the guide rod. Loc-Tite the lower part of the stud.
  - B. If the seat is not welded to the guide rod, screw the stud into the upper rod of the actuator. The guide rod should make solid contact with the upper rod of the actuator. Tighten the guide to 50-75 ft-lbs. Slide on the cartridge assembly while lining up the anti-rotation pin.
  - C. If the seat is welded to the guide rod, screw the cartridge assembly on top of the upper actuator rod. The guide rod should make solid contact with the upper actuator rod. Tighten the cartridge assembly to 50-75 ft-lbs.
  - D. If necessary, rebolt the plate and tighten to 15-20 ft-lbs. Also replace the cover, if necessary.





**WARNING**  
Powerful spring inside  
Remove preload before servicing

ITEM	DESCRIPTION	MATERIAL	MATERIAL SPEC.
100	BODY SUB ASM	CARBON STEEL	-
101	INTERNAL RETAINING RING	CARBON STEEL	-
102	RETAINER	CARBON STEEL	AISI 1020
103	SPRING	CARBON STEEL	-
104	SPRING SEAT	CARBON STEEL	C-1018 CRS
105	SPRING GUIDE ROD	CARBON STEEL	ASTM A108 GR. 1018 CRS
106	EXTERNAL RETAINING RING	CARBON STEEL	-
107	CARTRIDGE RETAINER PLATE	CARBON STEEL	C-1018 CRS
109	WASHER, FLAT	CARBON STEEL	COMMERCIAL
110	STUD 1.75" LONG	STAINLESS STEEL	AISI 316
111	STUD 2.25" LONG	STAINLESS STEEL	AISI 316
112	HEX NUT	STAINLESS STEEL	AISI 316
113	LABEL, WARNING		COMMERCIAL
114	COVER	CARBON STEEL	A36 STEEL PLATE
115	WASHER, LOCK	STAINLESS STEEL	COMMERCIAL
116	SCREW, ROUND HEAD	CARBON STEEL	COMMERCIAL
117	SCREW, BUTTON HD SCKT CAP	STAINLESS STEEL	COMMERCIAL
118	ANTI-ROTATION SET SCREW	STAINLESS STEEL	COMMERCIAL
119	SCREW, HEX HEAD	CARBON STEEL	COMMERCIAL



## MAINTENANCE

### 13" AEROFLOW ACTUATOR

*For item number designations, refer to module drawing 33177A.  
See Figure 3 for assembly of Cylinder, Yoke, and Spring Tower.*

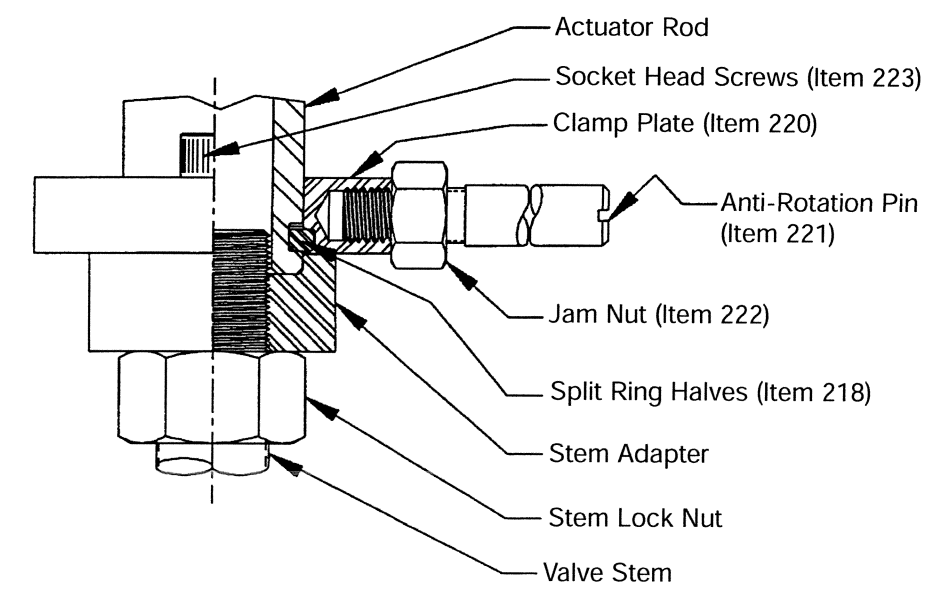
#### REMOVAL OF ACTUATOR FROM VALVE

1. For fail-close, trap enough air in the bottom of the actuator to hold the valve at about mid-stroke.
2. Secure the line in which the valve is installed. Detach accessories that are in the way. Note and/or tag the air and electric lines.
3. Remove the two socket head screws (item 223) from the stem coupling with a 3/8 allen wrench. Lift the clamp plate (item 220) and remove the split ring halves (item 218).
4. Note the thread length showing below the stem lock nut. Loosen the stem locknut and thread it down the stem 2-3 turns.
5. Sling actuator. Remove the four bolts holding the actuator yoke to the bonnet with a 1-1/16 wrench and lift off actuator.
6. Check the actuator for smoothness of operation and leaks. Connect air to the lower part of the actuator. Using a soap and water solution, spray the edges where the cylinder bottom meets the bottom end plate. Also

spray around the lower bushing. There should be no bubbles, but minor weepage is acceptable. Spray the edges where the cylinder meets the top end plate. This will indicate whether or not the actuator leaks through the static end seals or rod seal. Finally, monitor the top end air connection for leaks to test for piston leakage. Repeat this procedure while applying air to the top of the actuator. If the operation is not smooth and/or if leaks exist, tear down the actuator using the following disassembly procedure.

#### DISASSEMBLY

1. Stand the actuator on the yoke.
2. Remove the spring tower. See the section on spring tower maintenance.
3. Remove the top tie rod nuts (item 209) with a 1" wrench.
4. Remove the top end plate (item 202). Use a soft hammer if necessary. Remove o-ring



**FIG. 1  
STEM ADAPTER ASSEMBLY**

(item 211) and clean groove.

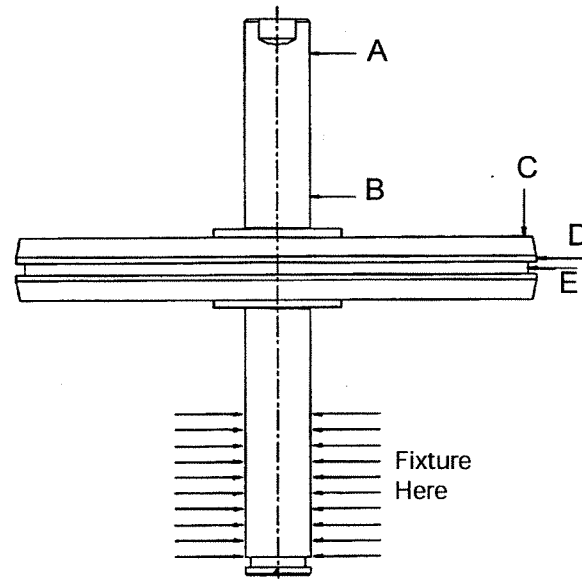
5. Pull out the piston subassembly using a hoist. The internal threads of the upper rod (item 200) are 1"-12.
6. Pull the cylinder (item 205) off the bottom end plate (item 209). Use a soft hammer if necessary. Check cylinder for any scoring, wear, etc.
7. Mark the orientation of the end plate to the yoke. Remove the four socket head screws connecting the bottom end plate to the yoke with a 1/2 allen wrench. Lift off the bottom end plate. Remove the o-ring (item 211) from the end plate and clean groove.
8. Inspect upper and lower bearings (items 208) for wear. Minor wear or scoring of the plastic bearing should not impact performance of the actuator. If irregular wear patterns or excessive wear which allows the piston rod to contact the bore in the aluminum end plate is observed, the bearings should be replaced. The bearings will be damaged during the removal process so they must be replaced with new bearings.

*NOTE: The actuator should be returned to a Leslie Controls Authorized Service Center for repair if field replacement of bearings is not practical. Correct alignment of the bearings is critical to proper performance of the actuator.*

9. Remove the piston rod seals (item 207) and rod wipers (items 206) and clean the groove.
10. Remove the piston O-ring (item 213) and clean groove.
11. Check the piston rod for any scoring or wear. The piston rod can be polished to clean up any minor imperfections.

*NOTE: Do not take the piston subassembly apart. IF any damage is suspected, return it to a Leslie Controls Authorized Service Center.*

12. Check the piston subassembly for tightness. If it is not tight, place the lower rod in soft jaws in a vise. Lock Nut (item 212) should be tightened to 100-150 ft-lbs.
13. The piston subassembly should be inspected to the values shown in Fig. 2.



LOCATION	MAX. TIR (in.)	MAX. TIR (mm)
A	.003	.076
B	.001	.025
C	.005	.127
D	.003	.076
E	.003	.076

**FIG. 3**  
**CONCENTRICITY REQUIREMENTS**

#### REASSEMBLY

*Note: Lubricate as directed below using Parker O Lube or Leslie approved equivalent.*

1. If the rod bearings (item 208) were removed, replace with new bearings by pressing into the end plates. No special tools are required, however due to a slight interference fit, care should be taken to ensure the bearing is square with the end plate as it is pressed into place.
2. Install new piston rod seal O-rings (item 207) and rod wipers (206) into the two end plates.
3. Install the cylinder O-rings (item 211) on each end plate.
4. Attach one of the end plates to the yoke with four socket head screws using a 1/2" allen wrench. Align the matching marks or position the air connection on the end plate so that is adjacent to one of the legs of the yoke.
5. Clamp the yoke in a vise to ease assembly. Position it so the air connection on the end plate is on the left.

6. Generously lubricate the bore of the cylinder barrel (item 205) with O-ring lubricant and slide it over the end plate O-ring (item 211).
7. Make sure that the sliding surfaces of the upper and lower cylinder rods are clean.
8. Install the main piston O-ring (item 213) in the piston groove.
9. Generously lubricate the piston rod bearing and upper and lower piston rod with O-ring lubricant.
10. Slide the grooved end of the piston rod into the bearing of the clamped yoke/end plate assembly. Push the piston all the way down until it touches the end plate. It may be necessary to tap the piston with a soft hammer.
11. Generously lubricate the piston rod bearing of the remaining end plate assembly.
12. Rotate the end plate assembly until the tie rod holes and the air connection line up with the same features on the other end plate.
13. Slide the remaining end plate on the upper rod. It may be necessary to use a soft hammer. The top plate can also be pulled down with the tie rods.
14. Push a tie rod up through the bottom end plate. Apply anti-seize compound and thread a locknut and a washer onto the top of the tie rod. Repeat for each tie rod. Tighten in a criss-cross pattern with a 1" wrench or air wrench to 30-45 ft-lbs in several steps.
15. Check the assembly for leaks.
16. Reinstall the spring tower if applicable. See the section on spring tower maintenance.
17. Slide the clamp plate (item 220; Fig. 1) onto the end of the lower rod, with the flat side upward. Hold it in place while installing the halves of the split ring (item 218) into the groove on the end of the rod. Lower the clamp plate to hold the split rings in place. (See Fig. 1).
18. Thread the jam nut (item 222) onto the anti-rotation pin (item 221). Thread the pin into the hole in the clamp plate. Lock in position using the jam nut.

#### INSTALLATION ONTO VALVE

1. Coat the valve stem threads and the actuator mounting flange on the valve bonnet with anti-seize compound.
2. Screw the stem locknut to its lowest position on the valve stem or to the approximate length measured during disassembly. Screw the stem adapter (item 219) all the way onto the valve stem. Push the valve plug down onto its seat.
3. Using a suitable hoist, lower the actuator assembly onto the valve until the stem adapter can be threaded up to the upper clamp plate. For fail-close assembly, air should be supplied to the lower end of the actuator to position the actuator about midstroke.

*WARNING: The actuator can exert a considerable force if it is released or inadvertently extended. Keep fingers and hands away from the gap between the actuator rod and the valve stem/adapter.*

4. Continue lowering the actuator until it rests on the mounting flange on the valve bonnet.
5. Orient the actuator by rotating it on the mounting flange so that the yoke legs are in line with the valve body inlet and outlet.
6. Coat the actuator attachment bolts with anti-seize compound and secure the actuator to the valve. Tighten to 75-100 ft-lbs.
7. Torque the stem coupler bolts to 30-40 ft-lbs.
8. Retract the actuator to the top of its stroke and position the travel indicator for the fully open position.

#### VALVE/ACTUATOR ADJUSTMENT

1. Raise the actuator piston to its highest position. Note that the top plate of the actuator is normally the upper stop.
2. Stroke the valve and take note of the distance traveled. Screw stem out to decrease travel and screw stem in to increase travel.

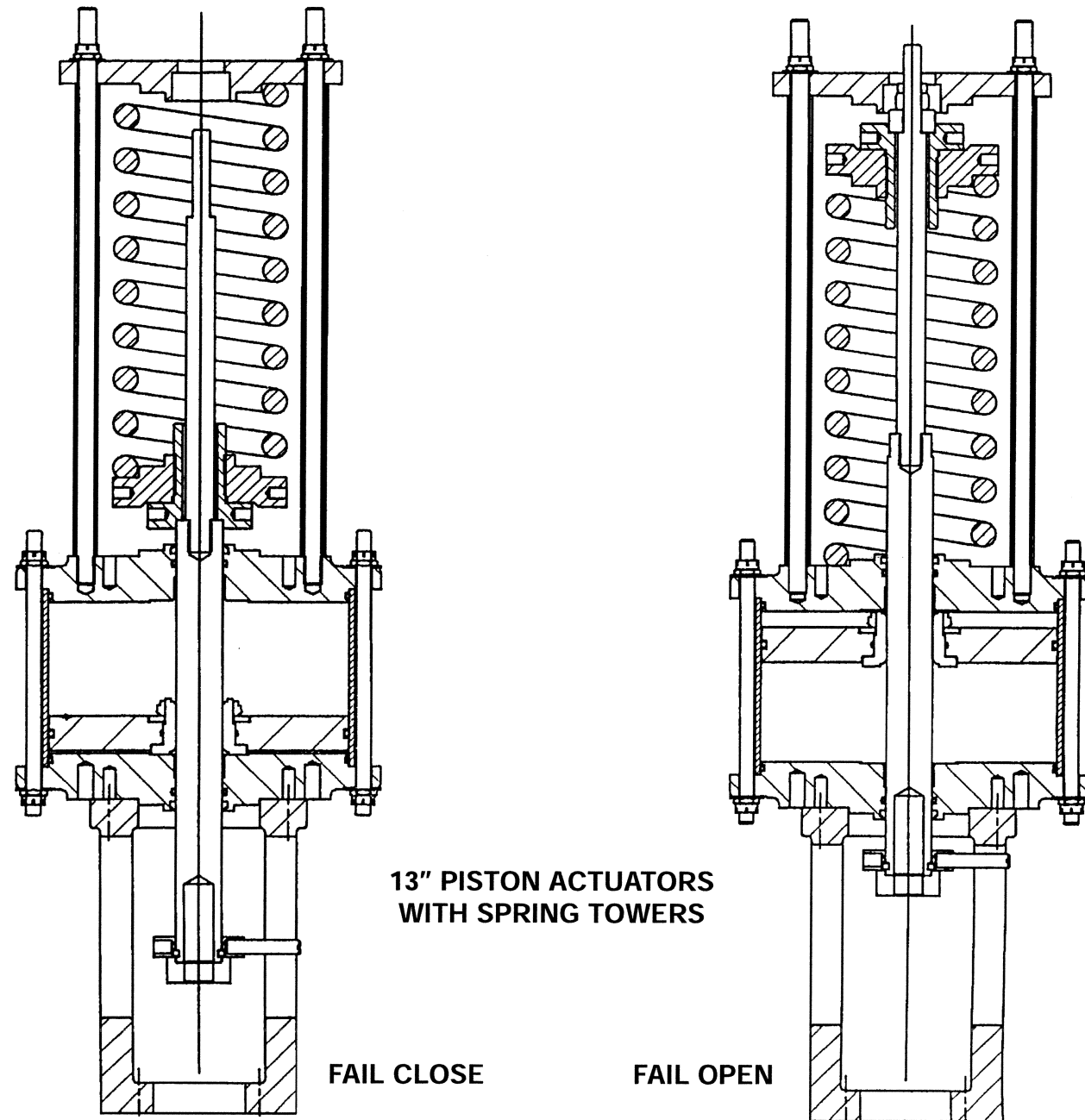
*NOTE: Never rotate the stem of the valve while it is against the valve seat. Always raise the stem off the seat before adjusting it.*

3. Repeat step 2 until the desired travel is reached. Note that this will ensure that the

actuator is the upper stop and the seated valve plug is the lower stop.

- If the spring tower is used, adjust the spring load until the approximate bench setting is reached. The bench setting is indicated on the data plate. Note that this is done with loose packing.

- Cycle the actuator up and down several times to ensure that proper adjustment has been made.
- Tighten the stem locknut to the bottom of the coupler when adjustments are complete. Reattach all accessories.



13" PISTON ACTUATORS WITH SPRING TOWERS

FIG. 10

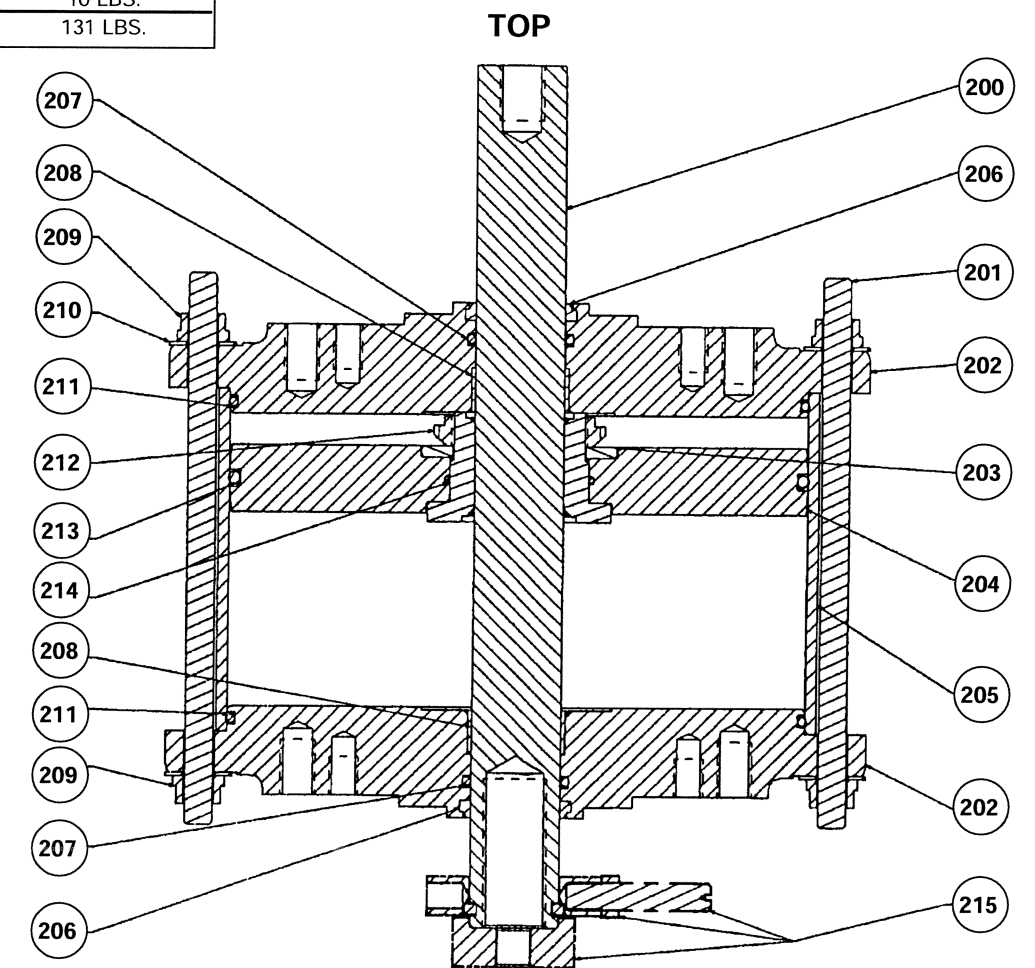
ITEM NO.	REF. NO.	DWG. NO.	DWG. SIZE	QTY.	DESCRIPTION	MATERIAL
200	A76209	33089	B	1	Stem and Hub Weldment	Stem-1050 Steel, Case Harden, Chrome Plate; HUB-1020 STLA
201	A76211	33091	C	4	Tie Rod	5/8 Dia. Steel, ASTM A193 GR. B7
202	A76289	33135	A	2	End Plate	Aluminum Casting, Alloy 356-T6
203	A76095	33063	D	1	Support, Disk	300 Series SS
204	A76092	33059	A	1	Piston	Aluminum Casting, Alloy 356-T6
205	A76103	33076	C	1	Barrel	Honed and Chrome Plated, Steel Tube
206	A76399	N/A		2	Rod Wiper	Parker No. 2000, Molythane
207	A75466	N/A		2	ORNG, Rod	-329 Viton
208	A76405	N/A		2	Bearing	IGUS Part No. LSI-3235-16
209	A76400	N/A		8	LNUT	5/8 - 11 UNC-2B, Steel Cad Plated, SPS NO. 31FA1011
210	A76406	N/A		8	Washer, Flat	5/8, 18-8 SS
211	A76401	N/A		2	ORNG, End Plate	Parker No. I.D. 12-5/8 NOM.X .210 x N70, BUNA N
212	A76404	N/A		1	LNUT, Stem	Whittet-Higgins Bearing Nut, BH-15Δ
213	A76402	N/A		1	ORNG, Pstrn	No. 454, BUNA N 70 DURO
214	A5949594	N/A		1	ORNG, Inner Pstrn	No. 235, BUNA N 70 DURO
*215	A77956	N/A		1	Stem Adapter Assy.	1/2-20 Stem
*215	A77957	N/A		1	Stem Adapter Assy.	3/4-16 Stem
*215	A77958	N/A		1	Stem Adapter Assy.	1-12 Stem
*215	A77959	N/A		1	Stem Adapter Assy.	1-1/4 Stem

\*NOT INCLUDED WITH CYLINDER ASSEMBLY

ITEM	APPROX. WT.
Machined Parts	121 LBS.
Hardware, etc.	10 LBS.
TOTAL	131 LBS.

U008964145

NOTE:  
The 1/2" NPT connections in the top and action plates must be oriented vertically in line with one another.



13" Pneumatic Cylinder Actuator

## MAINTENANCE

### 13" ACTUATOR SPRING TOWERS

*For item number designations, refer to module drawings 33175AA for Fail Close and 33176AA for Fail Open.*

#### REMOVAL OF SPRING TOWER FROM ACTUATOR

1. Relieve all spring adjustment with thrust nut. (For fail-closed item 107 or fail-open item 109). Make note of the number of turns to which the nut was adjusted.
2. Slowly remove the four nuts (Item 101) and washers (Item 102) from the tie rods (Item 100).
3. Lift off the top plate (Item 103).
4. For fail-open, slowly undo the jam nut (Item 111), hex nut (Item 106), and thrust spacer (Item 107) to remove all remaining tension.
5. Lift off the spring cover (Item 105).
6. Remove the four standoffs (Item 104), and unscrew the tie rods (Item 100) from the actuator top plate.
7. Lift off the remaining pieces of the spring tower.
8. Check the thrust nut (Item 107 or 109) and mating threads for wear.

#### INSTALLATION OF DIRECT-ACTING (FAIL-OPEN) TOWER MODULE

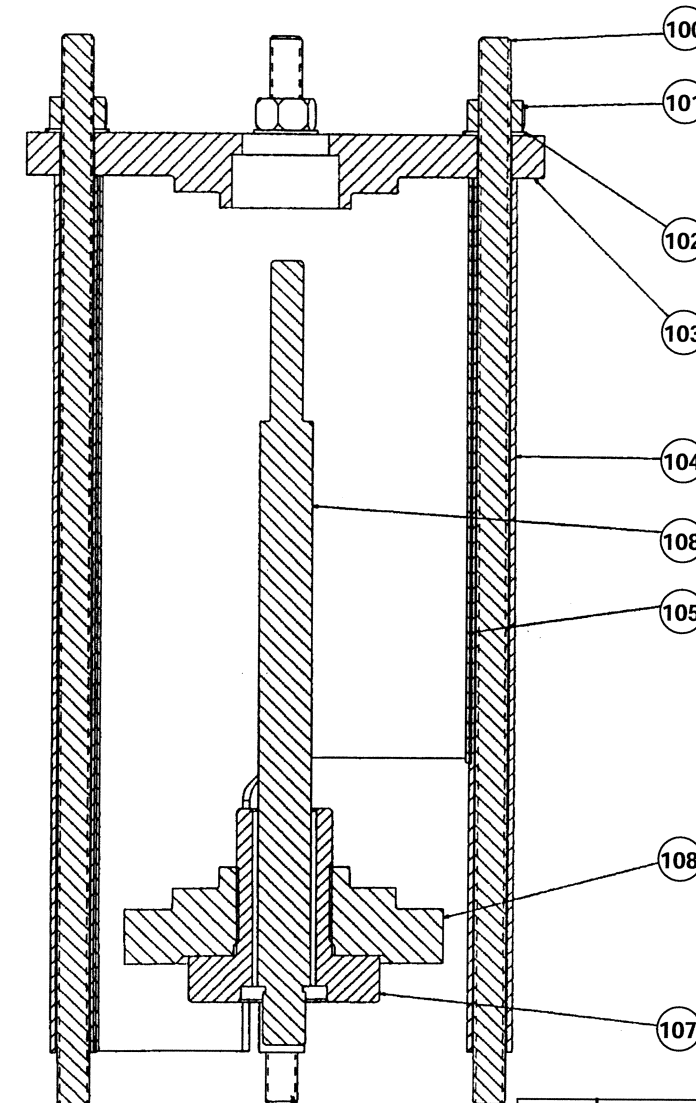
1. Position the actuator to the "open" position.
2. Apply permanent thread locking adhesive (Loc-Tite) to the larger threads on the extension rod (Item 110). Screw the extension rod into the upper rod of the actuator.
3. Lower the return spring onto the actuator.
4. Apply anti-seize compound to the threads of the thrust nut (Item 109) and screw it into the adjusting nut (Item 108) using the orientation shown on the module drawing. Place this assembly on top of the return spring.
5. Apply anti-seize compound to the thrust spacer (Item 107) and place it on the thrust

nut (Item 109) as shown on the module drawing.

6. Screw the hex nut (Item 106) onto the top of the extension rod until it bottoms out on the thrust spacer (Item 107).
7. Thread the jam nut (Item 111) onto the top of the extension rod. Tighten the nut to 50-100 ft-lbs.
8. Thread the four threaded rods (Item 100) into the four corresponding holes in the actuator top plate. Slide the four sleeves (Item 104) over the threaded rods.
9. Lower the spring cover (Item 105) over the spring return assembly. Rotate the cover until the access hole is located at the front of the assembly.
10. Slide the top plate (Item 103) and the four washers (Item 102) over the threaded rods and secure them with the four nuts (Item 101). Tighten securely with an air wrench to 50-75 ft-lbs.
11. For proper spring preload, rotate the adjusting nut the same number of turns as noted originally or check the bench set as noted on the data plate.

#### INSTALLATION OF REVERSE-ACTING (FAIL-CLOSED) TOWER MODULE

1. Position the actuator to the "closed" position.
2. Loc-Tite the larger threads on the extension rod (Item 108). Screw the extension rod into the upper rod of the actuator.
3. Apply anti-seize compound to the threads of the thrust nut (Item 107), and screw it into the adjusting nut (Item 106) using the orientation shown on the module drawing. Apply anti-seize compound to top of actuator upper rod. Slide this assembly down the extension rod until it seats on the actuator upper rod.



#### U008964117 13" SPRING TOWER FAIL CLOSE ASSEMBLY

ITEM	APPROXIMATE WEIGHT
MACHINED PARTS	81 LBS.
HARDWARE, ETC.	6 LBS.
TOTAL	87 LBS.

ITEM	DESCRIPTION	MATERIAL
100	TIE ROD 3/4" 10UNC-2A	THD RD ASTM A193 GR.B7 X 25-3/8
101	HEAVY HEX NUT	3/4" - 10. ASTM A-194 GR.2H. ZINC PLATED
102	WASHER 3/4"	1B-B STAINLESS STEEL
103	PLATE	DUCT IRON ASTM A536 GR.65-45-12
104	SLEEVE	3/4" SCH.40 ASTM A120 STEEL
105	SPRING COVER	METRIC PVC PIPE
106	ADJUSTING NUT	DUCT IRON ASTM A536 GR.65-45-12
107	THRUST NUT	STEEL C-1144 CR
108	STEM	87

4. Position the return spring(s) on the adjusting nut (Item 106).
5. Thread the four threaded rods (Item 100) into the corresponding holes in the actuator top plate. Slide the four sleeves (Item 104) over the threaded rods.
6. Lower the spring cover (Item 105) over the spring return assembly. Rotate the cover until the access hole is located at the front of the assembly.
7. Slide the top plate (Item 103) and the four washers (Item 102) over the threaded rods and secure them with the four nuts (Item 101). There may be a gap between the tops of the sleeves and the top plate. Tighten securely with an air wrench to 50-75 ft-lbs.
8. For proper spring preload, rotate the adjusting nut the same number of turns as originally noted or check the bench set as noted on the data plate.

## **MAINTENANCE**

### **16" & 20" ACTUATOR SPRING TOWERS**

*For item number designations, refer to the module drawing.*

#### **REMOVAL OF SPRING TOWER FROM ACTUATOR**

1. Remove all the adjustment from the adjusting nut (Item 109 or 108). Make note of the number of turns to which the nut was adjusted.
2. Slowly remove the four nuts (Item 101) and washers (Item 102 or 103) from the tie rods (Item 108 or 107).
3. Lift off the top plate (Item 104).
4. For fail-open, slowly undo the jam nut (Item 100) and bearing nut (Item 105) to remove all remaining tension.
5. Lift off the spring cover (Item 116 or 115).
6. Remove the four standoffs (Item 111 or 110), and unscrew the tie rods from the actuator top plate.
7. Lift off the remaining pieces of the spring tower.
8. Check the thrust nut (Item 107 or 106) and mating threads for wear.

#### **INSTALLATION OF DIRECT-ACTING (FAIL-OPEN) TOWER MODULE**

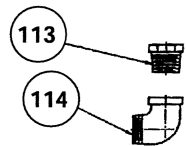
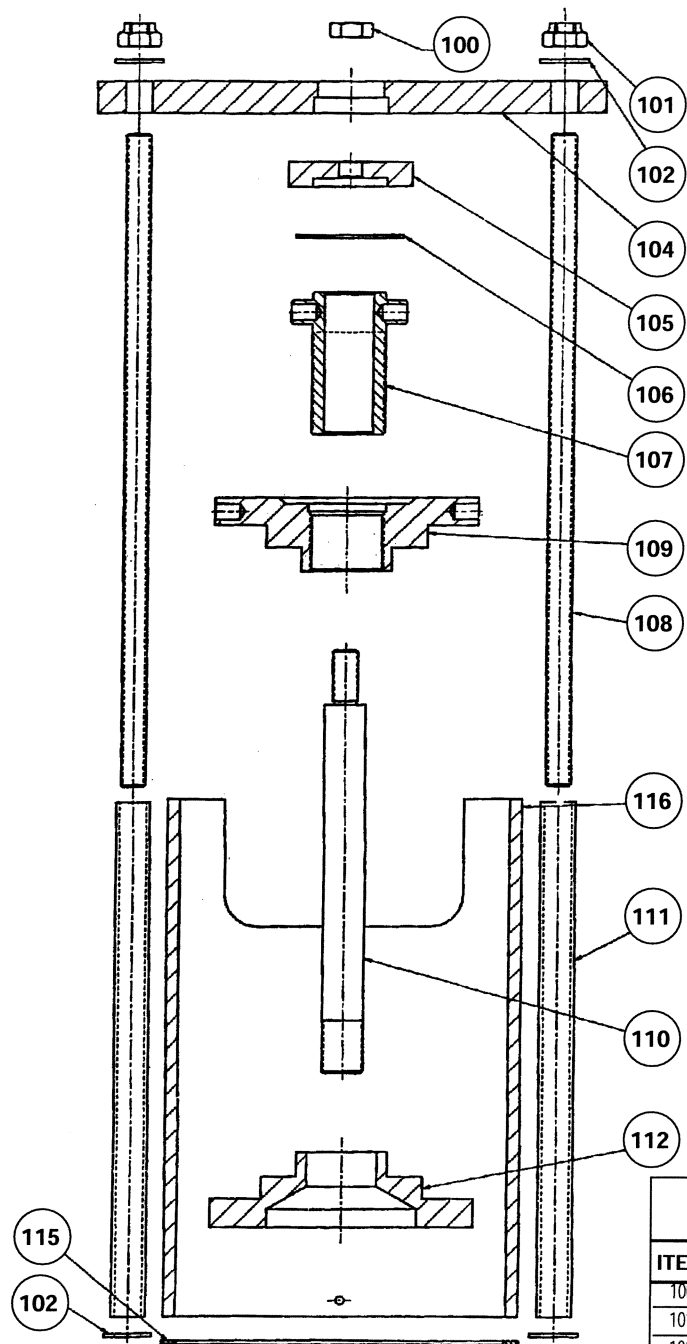
1. Position the actuator to the "open" position.
2. Place the spring seat (Item 112) on the top end of the actuator, centering it around the upper rod.
3. Apply permanent thread locking adhesive (Loc-Tite) to the larger threads on the extension rod (Item 110). Screw the extension rod into the upper rod of the actuator.
4. Lower the return spring onto the spring seat.
5. Apply anti-seize compound to the threads of the thrust nut (Item 107) and screw it into the adjusting nut (Item 109) using the orientation shown on the module drawing. Place this assembly on top of the return spring.

6. Apply anti-seize compound to the thrust bearing (Item 106) and place it on the thrust nut as shown on the module drawing.
7. Screw the bearing nut (Item 105) onto the top of the extension rod. If necessary, use a pipe wrench to turn it the last few turns until it is down to the shoulder of the extension rod.
8. Thread the nut (Item 100) onto the top of the extension rod. Tighten the nut to 50-100 ft-lbs.
9. Thread the four threaded rods (Item 108) into the four corresponding holes in the actuator top plate. Slide the four sleeves (Item 111) over the threaded rods.
10. Place the cover washer (Item 115) on the actuator top plate, centering it between the sleeves. Lower the spring cover (Item 116) over the spring return assembly, centering it on the cover washer. Rotate the cover until the access holes are located at the front and back of the assembly.
11. Slide the top plate (Item 104) and the four washers (Item 102) over the threaded rods and secure them with the four nuts (Item 101). Tighten securely with an air wrench to 50-75 ft-lbs.
12. For proper preload, rotate the adjusting nut the same number of turns as noted originally.

#### **INSTALLATION OF REVERSE-ACTING (FAIL-CLOSED) TOWER MODULE**

1. Position the actuator to the "closed" position.
2. Loc-Tite the larger threads on the extension rod (Item 109). Screw the extension rod into the upper rod of the actuator.
3. Slide the spring seat (Item 111) down the extension rod until it seats on the actuator upper rod.

4. Thread the nuts (Item 100) onto the top of the extension rod.
5. Position the return spring(s) on the spring seat.
6. Apply anti-seize compound to the threads of the thrust nut (Item 106), and screw it into the adjusting nut (Item 108) using the orientation shown on the module drawing. Place this assembly on the return spring(s).
7. Apply anti-seize compound to the thrust bearing (Item 105) and place it on the thrust nut as shown on the module drawing.
8. Thread the four threaded rods (Item 107) into the four corresponding holes in the actuator top plate. Slide the four sleeves (Item 110) over the threaded rods.
9. Place the cover washer (Item 114) on the actuator top plate, centering it between the sleeves. Lower the spring cover (Item 115) over the spring return assembly, centering it on the cover washer. Rotate the cover until the access holes are located at the front and back of the assembly.
10. Slide the top plate (Item 104) and the four washers (Item 103) over the threaded rods and secure them with the four nuts (Item 101). There may be a gap between the tops of the sleeves and the top plate. Tighten securely with an air wrench to 50-75 ft-lbs.
11. For proper preload, rotate the adjusting nut the same number of turns as originally noted or check the bench set as noted on the data plate.



117

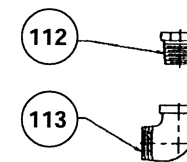
**WARNING**  
POWERFUL SPRING INSIDE  
REMOVE PRELOAD BEFORE SERVICING.

TOWER MODULE L1009005232			
ITEM	DESCRIPTION	MATERIAL	MATERIAL SPEC.
100	Nut, Jam 3/4 - 16	Stainless Steel	
101	Nut, Tie Rod 3/4 - 10	Steel	ASTM A194 GR 2H
102	Washer, Flat	Steel	ASTM A194 GR 2H
104	Plate, Top	Steel	ASTM A36
105	Washer, Bearing	Steel	ASTM A108
106	Bearing, Thrust	Steel/TFE	
107	Nut, Thrust	Steel	ASTM A194 GR 2H
108	Rod, Threaded	Steel	ASTM A193 GR 57
109	Nut, Adjusting	Ductile Iron	
110	Rod, Extension	Steel	ASTM A120
111	Sleeve, Threaded Rod	Steel	ASTM A108 GR 12L14
112	Seat, Spring	Ductile Iron	
113	Breather / Filter Vent	Cast Iron	
114	Fitting Elbow	Brass	
115	Gasket, Cover	Rubber	
116	Cover Spring	PVC Pipe	
117	Label, Warning		Commercial

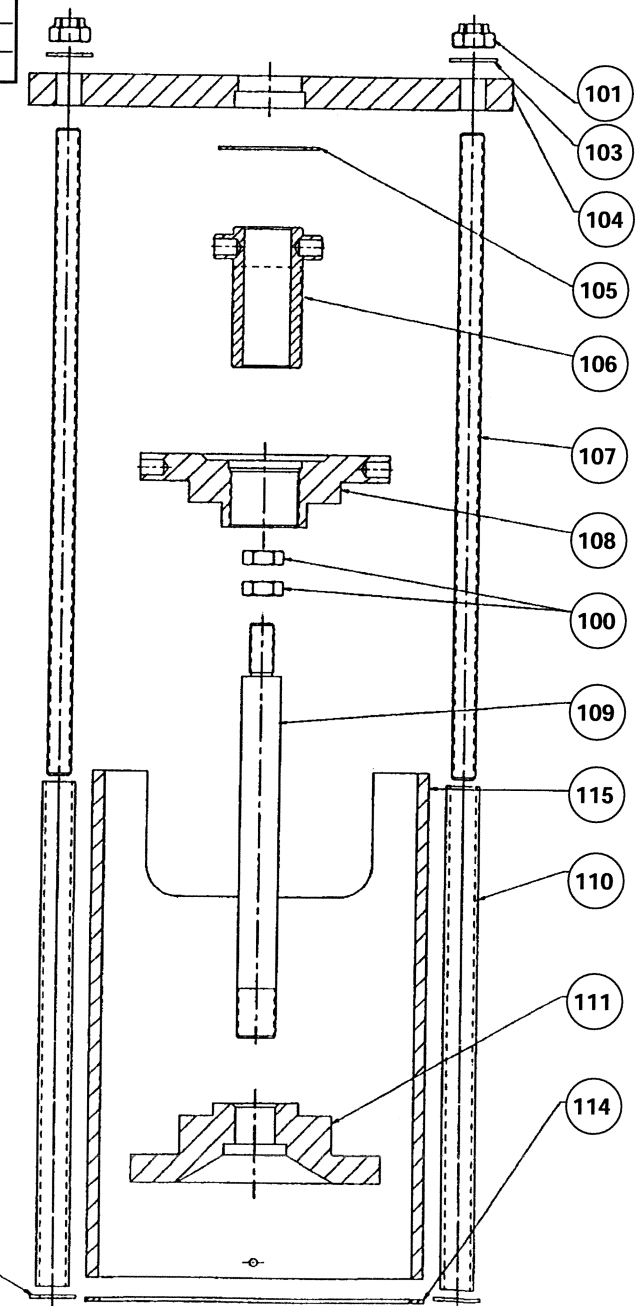
TOWER MODULE L1009005232			
ITEM	DESCRIPTION	MATERIAL	MATERIAL SPEC.
100	Nut, Jam 3/4 - 16	Stainless Steel	
101	Nut, Tie Rod 3/4 - 10	Steel	ASTM A194 GR 2H
103	Washer, Flat	Steel	ASTM A194 GR 2H
104	Plate, Top	Steel	ASTM A36
105	Bearing, Thrust	Steel/TFE	
106	Nut, Thrust	Steel	ASTM A194 GR 2H
107	Rod, Threaded	Steel	ASTM A193 GR 57
109	Rod, Extension	Steel	ASTM A108 GR 12L14
110	Sleeve, Threaded Rod	Steel	ASTM A120
112	Vent, Breather / Filter	Brass	
113	Fitting Elbow	Brass	
114	Gasket, Cover	Rubber	
115	Cover Spring	PVC Pipe	
116	Label, Warning		Commercial

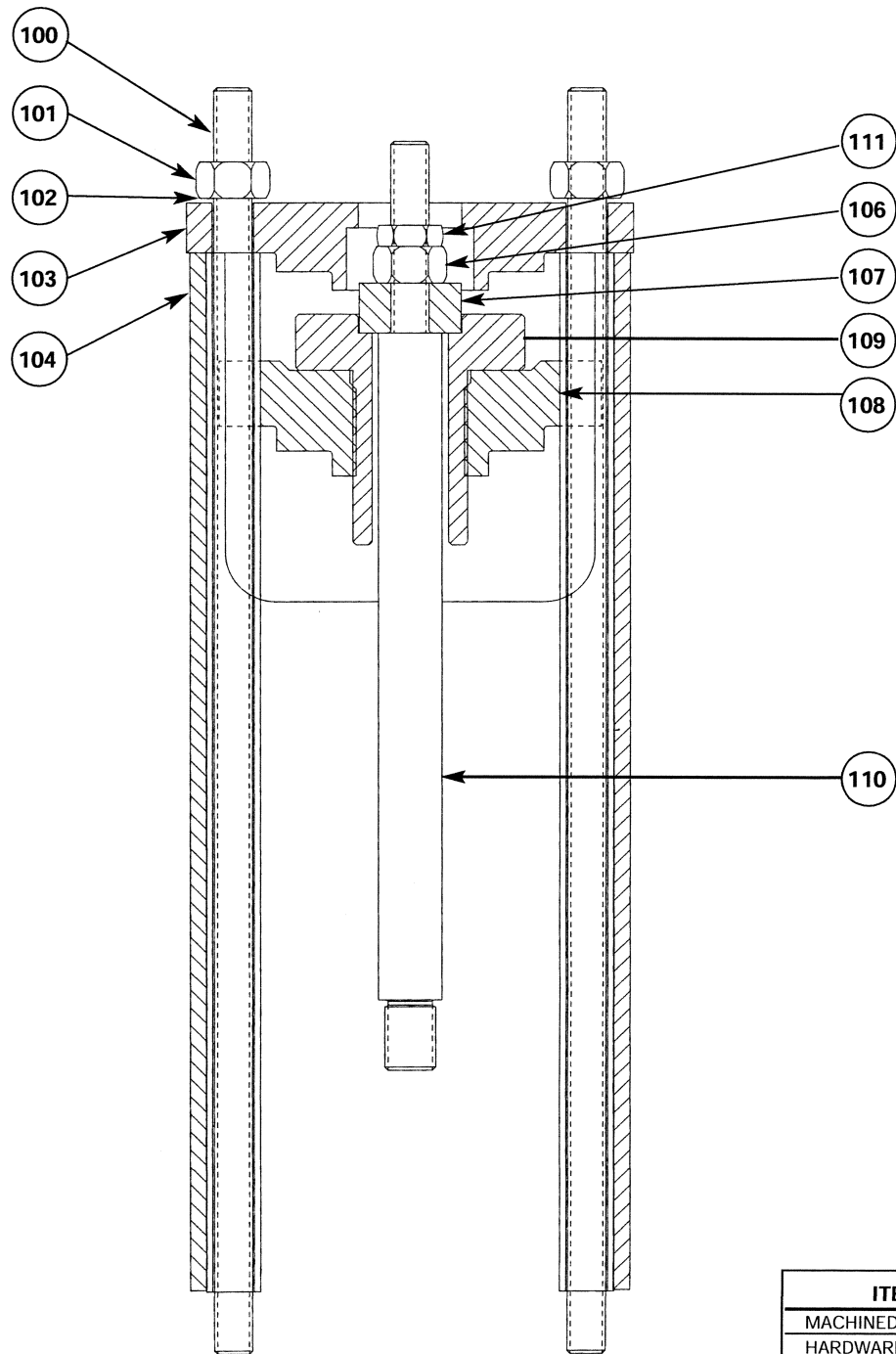
116

**WARNING**  
POWERFUL SPRING INSIDE  
REMOVE PRELOAD BEFORE SERVICING.



103





**U008964120  
13" SPRING TOWER  
FAIL OPEN ASSEMBLY**

ITEM	APPROXIMATE WEIGHT
MACHINED PARTS	81 LBS.
HARDWARE, ETC.	6 LBS.
TOTAL	87 LBS.

ITEM	DESCRIPTION	MATERIAL
100	TIE ROD 3/4" 10UNC-2A	THD RD ASTM A193 GR.B7 X 25-3/8
101	HEAVY HEX NUT	3/4" - 10. ASTM A-194 GR.2H. ZINC PLATED
102	WASHER	3/4" 18-8 STAINLESS STEEL
103	PLATE	DUCT IRON ASTM A536 GR.65-45-12
104	SLEEVE	3/4" SCH40 ASTM A120 STL PIPE
105	SPRING COVER	METRIC PVC PIPE
106	HEX NUT 3/4"	3/4" - 16 UNF2A CAD PLATED
107	THRUST SPACER	STEEL C-1144 CR
108	ADJUSTING NUT	DUCT IRON ASTM A536 GR.65-45-12
109	THRUST NUT	STEEL C-1144 CR
110	STEM	ASTM A193 GR B7 STEEL BAR
111	JAM NUT	3/4" - 16 UNF2A JAM NUT

**MAINTENANCE  
16" AND 20" AEROFLOW ACTUATORS**

*For item number designations, refer to module drawing 31334A.  
See Figure 4 for assembly of Cylinder, Yoke and Spring Tower.*

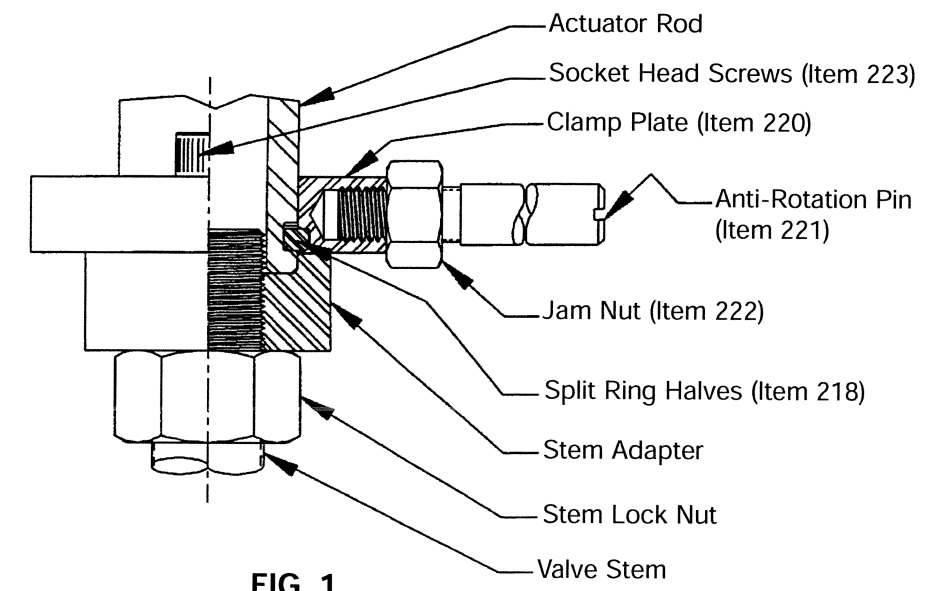
**REMOVAL OF ACTUATOR FROM VALVE**

1. For fail-close, trap enough air in the bottom of the actuator to hold the valve at about mid-stroke.
2. Secure the line in which the valve is installed. Detach accessories that are in the way. Note and/or tag the air and electric lines.
3. Remove the two socket head screws (Item 223) from the stem coupling with a 3/8 allen wrench. Lift the clamp plate (Item 220) and remove the split ring halves (Item 218). (Ref. Fig. 1).
4. Note the thread length showing below the stem lock nut. Loosen the stem locknut and thread it down the stem 2-3 turns.
5. Sling actuator. Remove the four bolts holding the actuator yoke to the bonnet with a 1-1/16 wrench and lift off actuator.
6. Check the actuator for smoothness of operation and leaks. Connect air to the lower part of the actuator. Using a soap and water solution, spray the edges where the cylinder bottom meets the bottom end plate. Also

spray around the lower bushing. There should be no bubbles, but minor weepage is acceptable. Spray the edges where the cylinder to meets the top end plate. This will indicate whether or not the actuator leaks through the static end seals or rod seal. Finally, monitor the top end air connection for leaks to test for piston leakage. Repeat this procedure while applying air to the top of the actuator. If the operation is not smooth and/or if leaks exist, tear down the actuator using the following disassembly procedure.

**DISASSEMBLY**

1. Stand the actuator on the yoke.
2. Remove the spring tower. See the section on spring tower maintenance.
3. Remove the top tie rod nuts (Item 207) with a 1-1/8 wrench.
4. Remove the top end plate (Item 209). Use a soft hammer if necessary. Remove o-ring (Item 212) and clean groove.



**FIG. 1**

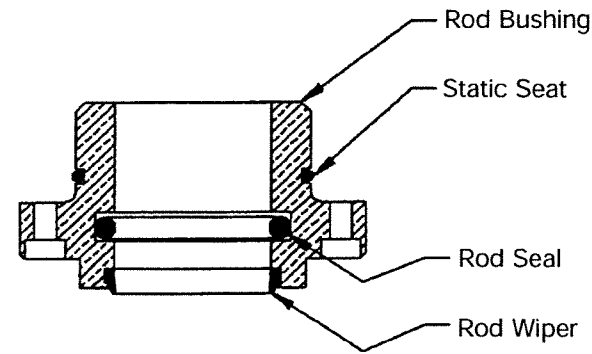


FIG. 2

5. Pull out the piston subassembly using a hoist. The tapped holes in the piston (Item 213) are 1/2-13. The internal threads of the upper rod (Item 200) are 11/4-12.
6. Pull the cylinder (Item 210) off the bottom end plate (Item 209). Use a soft hammer if necessary. Check cylinder for any scoring, wear, etc.
7. Mark the orientation of the end plate to the yoke. Remove the four socket head screws (Item 217) connecting the bottom end plate to the yoke with a 9/16 allen wrench. Lift off the bottom end plate. Remove the o-ring (Item 212) from the end plate and clean groove.
2. Check the upper and lower rods for any scoring or wear, particularly at end stroke points.
3. Check the piston subassembly for tightness. If it is not tight, place the lower rod in soft jaws in a vise. This subassembly should be tightened to 150-200 ft-lbs. Loc-Tite setscrew and tighten to 15-20 ft-lbs.

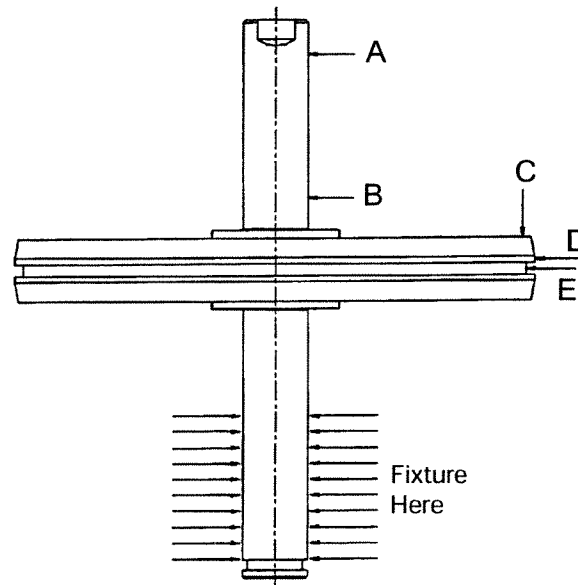
**REPAIR ROD BEARINGS**

1. The following procedure should be used for both the upper and lower rod bearings (item 204) (Ref. Fig. 2).
2. Remove the four socket head screws (item 203) holding the rod bushing in place with a 3/16 allen wrench. Two 1/4-28 tapped holes are provided in the rod bushing for jacking purposes.
3. Remove the seals and rod wiper and clean the grooves .

**REPAIR PISTON AND SEALS**

*NOTE: Do not take the piston subassembly apart. If any damage is suspected, return it to the manufacturer for servicing.*

1. Remove O-ring (item 212) and clean groove.



LOCATION	MAX. TIR (in.)	MAX. TIR (mm)
A	.003	.076
B	.001	.025
C	.005	.127
D	.003	.076
E	.003	.076

FIG. 3

4. The piston subassembly should also be inspected to the values shown in Fig. 3.

**REASSEMBLY**

*Note: Lubricate as directed below using Parker O Lube or Leslie approved equivalent.*

1. Install the proper rod seal O-rings into the two bushings.
2. Lubricate the bore in each end plate.
3. Install the rod bushings into the end plates with four socket head screws using 3/16 allen wrench.
4. Install the cylinder O-rings into the end plates.
5. Attach one of the end plates to the yoke with four socket head screws using a 9/16 allen wrench. Align the matching marks or position the air connection on the end plate so that it is adjacent to one of the legs of the yoke.
6. Clamp the yoke in a vise to ease assembly. Position it so the air connection on the previously assembled end plate is on the left.
7. Generously lubricate the bore of the cylinder barrel and slide it over the end plate O-ring.
8. Make sure that the sliding surfaces of the upper and lower cylinder rods are clean.
9. Install the main piston O-ring in the piston groove.
10. Generously lubricate the rod bushing and upper and lower rods.
11. Slide the grooved end of the lower rod into the bushing of the clamped yoke/end plate assembly completed above. Push the piston all the way down until it touches the end plate. It may be necessary to tap the piston with a soft hammer.
12. Generously lubricate the rod bushing of the remaining end plate assembly.
13. Rotate the end plate assembly until the tie rod holes and the air connection line up with the same features on the other end plate.

14. Slide the remaining end plate on the upper rod. It may be necessary to use a soft hammer. The top plate can also be pulled down with the tie rods.
15. Push a tie rod up through the bottom end plate. Apply thread anti-seize compound and thread a locknut and a washer onto the top of the tie rod. Repeat for each tie rod. Tighten in a criss-cross pattern with a 1-1/8 wrench or air wrench to 50-75 ft-lbs. in several steps.
16. Check the assembly for leaks.
17. Reinstall the spring tower if applicable. See the section on spring tower maintenance.
18. Slide the clamp plate (item 220) onto the end of the lower rod, with the flat side upward. Hold it in place while installing the halves of the split ring (item 218) into the groove on the end of the rod. Lower the clamp plate to hold the split rings in place. (See Figure 1)
19. Thread the jam nut (item 222) onto the anti-rotation pin item (221). Thread the pin into the hole in the clamp plate. Lock in position using the jam nut.

**INSTALLATION ONTO VALVE**

1. Coat the valve stem threads and the actuator mounting flange on the valve bonnet with anti-seize compound.
2. Screw the stem locknut to its lowest position on the valve stem or to the approximate length measured during disassembly. Screw the stem adapter (item 219) all the way onto the valve stem. Push the valve plug down onto its seat.
3. Using a suitable hoist, lower the actuator assembly onto the valve until the stem adapter can be threaded up to the upper clamp plate. For fail-close assembly, air should be supplied to the lower end of the actuator to position the actuator about midstroke.

*Note: The actuator can exert a considerable force if it is released or inadvertently extended. Keep fingers and hands away from the gap between the actuator rod and the valve stem/adaptor.*



4. Continue lowering the actuator until it rests on the mounting flange on the valve bonnet.
5. Orient the actuator by rotating it on the mounting flange so that the yoke legs are in line with the valve body inlet and outlet.
6. Coat the actuator attachment bolts with anti-seize compound and secure the actuator to the valve. Tighten to 75-100 ft-lbs.
7. Torque the stem coupler bolts to 30-40 ft-lbs.
8. Retract the actuator to the top of its stroke and position the travel indicator for the fully open position.

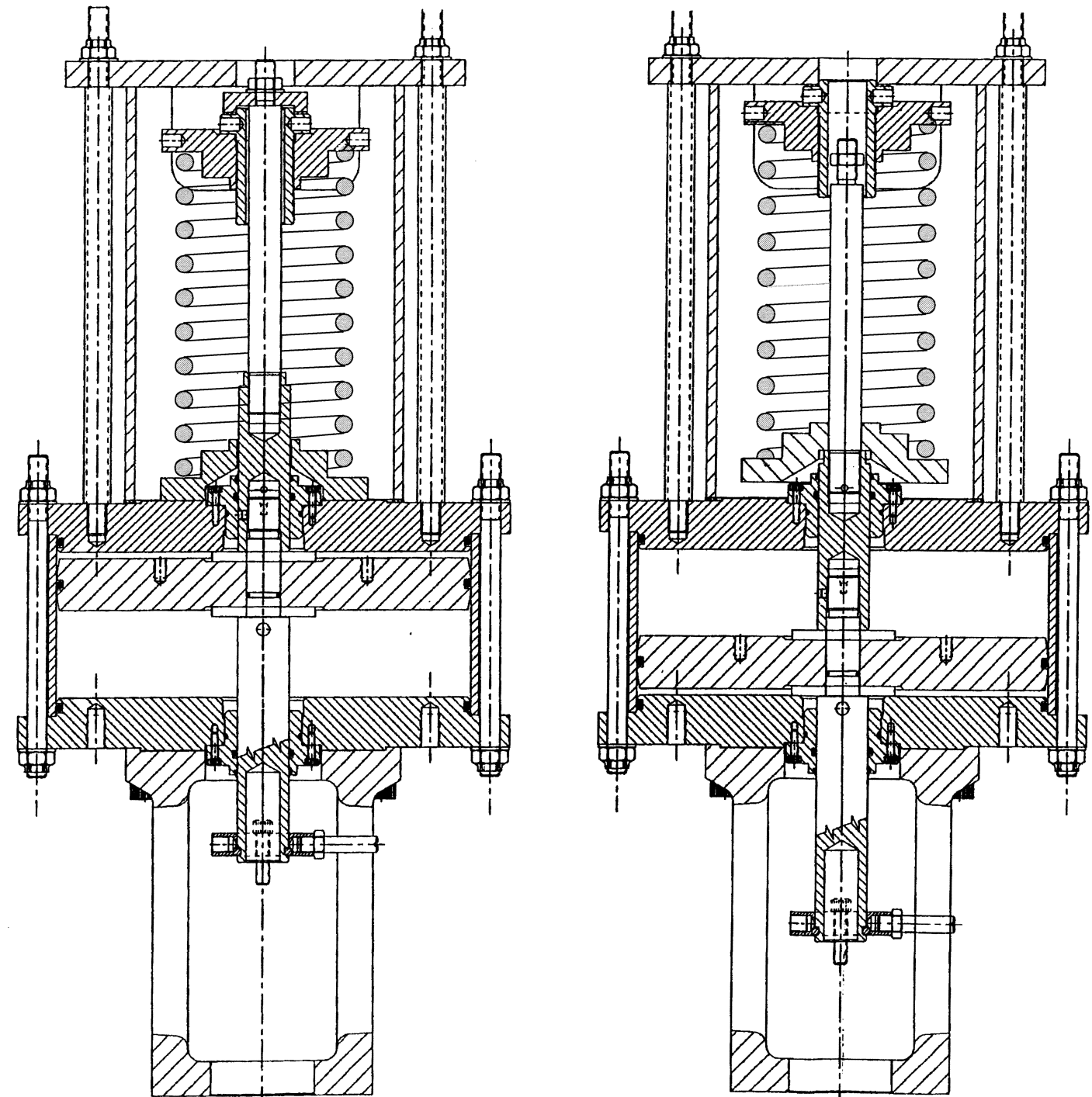
**VALVE/ACTUATOR ADJUSTMENT**

1. Raise the actuator piston to its highest position. Note that the top plate of the actuator is normally the upper stop.
2. Stroke the valve and take note of the distance traveled. Screw stem out to

decrease travel and screw stem in to increase travel.

*Note: Never rotate the stem of the valve while it is against the valve seat. Always raise the stem off the seat before adjusting it.*

3. Repeat step 2 until the desired travel is reached. Note that this will ensure that the actuator is the upper stop and the seated valve plug is the lower stop.
4. If the spring tower is used, adjust the spring load until the approximate bench setting is reached. The bench setting is indicated on the data plate. Note that this is done with loose packing.
5. Cycle the actuator up and down several times to ensure that proper adjustment has been made.
6. Tighten the stem locknut to the bottom of the coupler when adjustments are complete. Reattach all accessories.

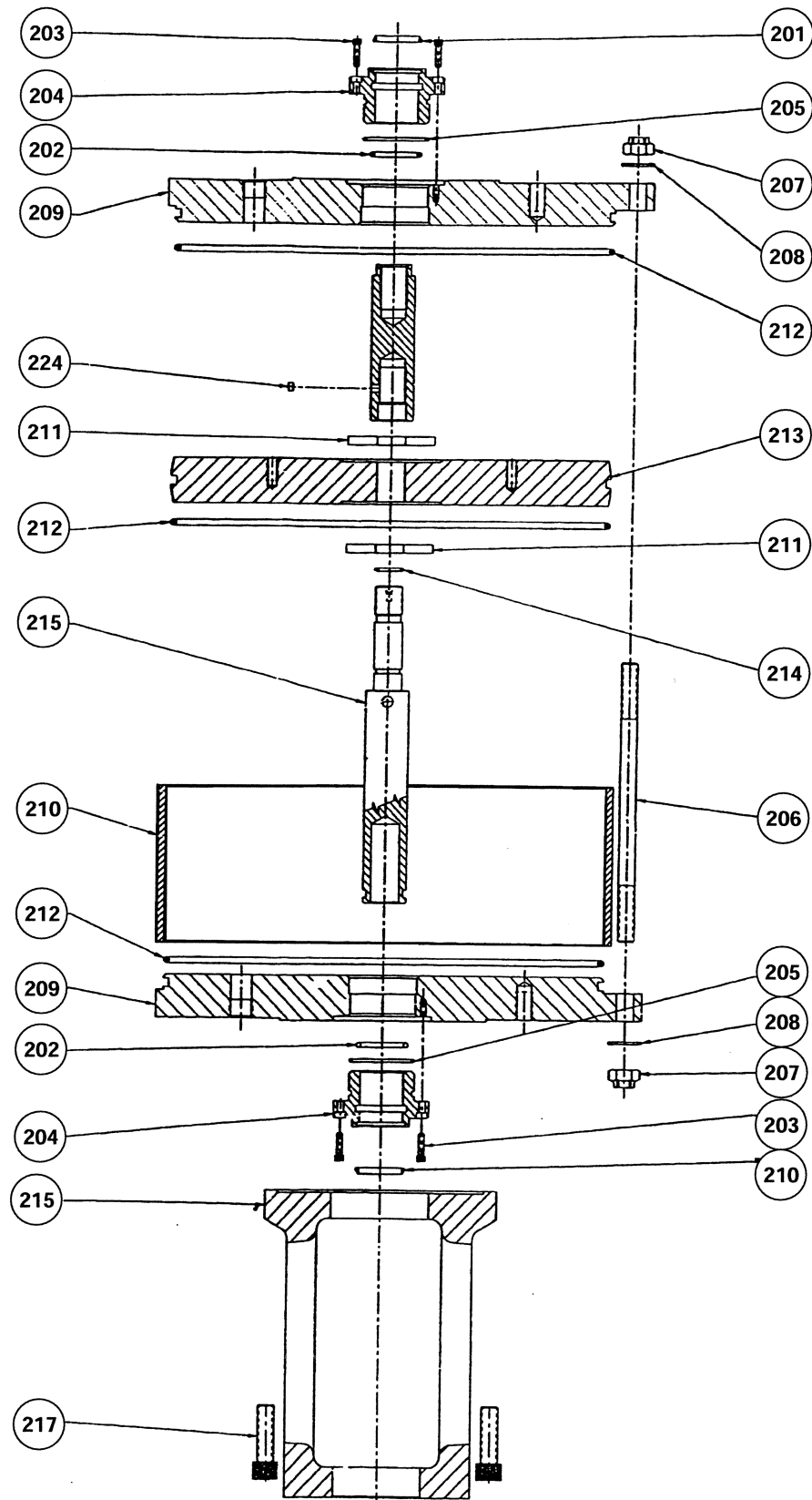


**FAIL-OPEN**

**FAIL-CLOSE**

**16"/20"  
ACTUATORS  
WITH SPRING TOWERS**

**16" - 20" PNEUMATIC CYLINDER ACTUATOR MODULE, DOUBLE ACTING**



CYLINDER/YOKE MODULE	ITEM	DESCRIPTION	MATERIAL	MATERIAL SPEC.
U008964104	200	ROD, UPPER	STAINLESS STEEL	AISI 630 COND H900
	201	WIPER, ROD	ACETAL	-
	202	O-RING, ROD	NITRILE	-
	203	CAPSCREW, SKHD 1/4-28	STAINLESS STEEL	COMMERCIAL
	204	BEARING	BRASS	ALLOY 93200
	205	O-RING, BEARING	NITRILE	-
	206	ROD, TIE	STEEL	ASTM A193 GR.B7 ZINC PLATED
	207	LOCKNUT, 3/4 - 10	STEEL	ASTM A194 GR.2H
	208	WASHER, FLAT	STEEL	COMMERCIAL
	209	PLATE, END	ALUMINUM	UNS A96961 - ALLOY 6061-T651
	210	BARREL, CYLINDER	STEEL	ASTM A108 GR. 1026
	211	WASHER, PISTON SUPPORT	STAINLESS STEEL	AISI 300 SERIES
	212	O-RING	NITRILE	-
	213	PISTON	ALUMINUM	UNS A96961 - ALLOY 6061-T651
	214	O-RING, PISTON ROD	NITRILE	-
	215	ROD, LOWER	STAINLESS STEEL	AISI 630 COND H900
216	YOKE	STEEL	ASTMA217 GR. WCB	
217	CAPSCREW, SKHD 3/4 - 10	STEEL	COMMERCIAL	
224	SCREW, SET 3/8 - 24	STAINLESS STEEL	COMMERCIAL	

CYLINDER/YOKE MODULE	ITEM	DESCRIPTION	MATERIAL	MATERIAL SPEC.
U008964105	200	ROD, UPPER	STAINLESS STEEL	AISI 630 COND H900
	201	WIPER, ROD	ACETAL	-
	202	SEAL ROD	NITRILE	-
	203	CAPSCREW, SKHD 1/4-28	STAINLESS STEEL	COMMERCIAL
	204	BEARING	BRASS	ALLOY 93200
	205	O-RING, BEARING	NITRILE	-
	206	ROD, TIE	STEEL	ASTM A193 GR.B7 ZINC PLATED
	207	LOCKNUT, 3/4 - 10	STEEL	ASTM A194 GR.2H
	208	WASHER, FLAT	STEEL	COMMERCIAL
	209	PLATE, END	ALUMINUM	UNS A96961 - ALLOY 6061-T651
	210	BARREL, CYLINDER	COMPOSITE	FIBERGLASS EPOXY COMPOSITE
	211	WASHER, PISTON SUPPORT	STAINLESS STEEL	AISI 300 SERIES
	212	O-RING	NITRILE	-
	213	PISTON	ALUMINUM	UNS A96961 - ALLOY 6061-T651
	214	O-RING, PISTON ROD	NITRILE	-
	215	ROD, LOWER	STAINLESS STEEL	AISI 630 COND H900
216	YOKE	STEEL	ASTMA217 GR. WCB	
217	CAPSCREW, SKHD 3/4 - 10	STEEL	COMMERCIAL	
224	SCREW, SET 3/8 - 24	STAINLESS STEEL	COMMERCIAL	

CYLINDER/YOKE MODULE	ITEM	DESCRIPTION	MATERIAL	MATERIAL SPEC.
U008964106	200	ROD, UPPER	STAINLESS STEEL	AISI 630 COND H900
	201	WIPER, ROD	ACETAL	-
	202	SEAL ROD	NITRILE	-
	203	CAPSCREW, SKHD 1/4-28	STAINLESS STEEL	COMMERCIAL
	204	BEARING	BRASS	ALLOY 93200
	205	O-RING, BEARING	NITRILE	-
	206	ROD, TIE	STEEL	ASTM A193 GR.B7 ZINC PLATED
	207	LOCKNUT, 3/4 - 10	STEEL	ASTM A194 GR.2H
	208	WASHER, FLAT	STEEL	COMMERCIAL
	209	PLATE, END	ALUMINUM	UNS A96961 - ALLOY 6061-T651
	210	BARREL, CYLINDER	STEEL	ASTM A108 GR. 1026
	211	WASHER, PISTON SUPPORT	STAINLESS STEEL	AISI 300 SERIES
	212	O-RING	NITRILE	-
	213	PISTON	ALUMINUM	UNS A96961 - ALLOY 6061-T651
	214	O-RING, PISTON ROD	NITRILE	-
	215	ROD, LOWER	STAINLESS STEEL	AISI 630 COND H900
216	YOKE	STEEL	ASTMA217 GR. WCB	
217	CAPSCREW, SKHD 3/4 - 10	STEEL	COMMERCIAL	
224	SCREW, SET 3/8 - 24	STAINLESS STEEL	COMMERCIAL	

CYLINDER/YOKE MODULE	ITEM	DESCRIPTION	MATERIAL	MATERIAL SPEC.
U008964107	200	ROD, UPPER	STAINLESS STEEL	AISI 630 COND H900
	201	WIPER, ROD	ACETAL	-
	202	SEAL ROD	NITRILE	-
	203	CAPSCREW, SKHD 1/4-28	STAINLESS STEEL	COMMERCIAL
	204	BEARING	BRASS	ALLOY 93200
	205	O-RING, BEARING	NITRILE	-
	206	ROD, TIE	STEEL	ASTM A193 GR.B7 ZINC PLATED
	207	LOCKNUT, 3/4 - 10	STEEL	ASTM A194 GR.2H
	208	WASHER, FLAT	STEEL	COMMERCIAL
	209	PLATE, END	ALUMINUM	UNS A96961 - ALLOY 6061-T651
	210	BARREL, CYLINDER	COMPOSITE	FIBERGLASS EPOXY COMPOSITE
	211	WASHER, PISTON SUPPORT	STAINLESS STEEL	AISI 300 SERIES
	212	O-RING, PISTON	NITRILE	-
	213	PISTON	ALUMINUM	UNS A96961 - ALLOY 6061-T651
	214	O-RING, PISTON ROD	NITRILE	-
	215	ROD, LOWER	STAINLESS STEEL	AISI 630 COND H900
216	YOKE	STEEL	ASTMA217 GR. WCB	
217	CAPSCREW, SKHD 3/4 - 10	STEEL	COMMERCIAL	
224	SCREW, SET 3/8 - 24	STAINLESS STEEL	COMMERCIAL	

# HYDRAULIC MANUAL OVERRIDE

NOTE: Refer to Figure 1A for parts described in this procedure.

## INSTALLATION

1. Before valve start-up, remove the plug from the top of the reservoir. Replace this plug with the vent fitting attached to the valve with tie wire. The valve may not operate correctly if the plug in reservoir is not replaced by the vent.

## OPERATION

The hydraulic manual override is to be used only when an air failure occurs or manual operation of valve is required. The hydraulic manual override allows you to reposition the actuator as needed.

1. Set the pump operation lever to desired position according to the pump tag. To close valve move pump operation lever to the up position. To open valve move pump operation lever to the down position.
2. Place the pump handle, fastened to the bracket with two wing bolts, into the hydraulic pump receptacle and stroke until the desired valve position is achieved.
3. To resume normal pneumatic operation, return the pump operation lever to the normal position.

## MAINTENANCE

1. The hydraulic manual override system, already filled and bled, is designed to be maintenance free. If the reservoir is over filled, hydraulic oil may spill out through the vent at the top of the reservoir. Remove some

of the hydraulic oil in the reservoir to remedy this situation.

2. If a part in the hydraulic system fails and a substantial amount of hydraulic oil is lost, replace the damaged part and refill the hydraulic system according to the following procedures.

Refilling and bleeding the hydraulic system:

- a. Remove the vent at the top of the reservoir and fill the reservoir with blue Enerpac hydraulic oil.
- b. Set the pump operation lever to the open valve or close valve position as needed to actuate the valve.
- c. Place the pump handle in the hydraulic pump receptacle and stroke the hydraulic pump. Continue to add hydraulic oil to the reservoir as needed when filling the system.
- d. Continue to stroke the hydraulic pump until the valve comes to a stop and a resistance is felt when stroking the hydraulic pump. Slowly move the pump operation lever to the opposite position (caution: if the pump operation lever is moved too quickly, hydraulic oil may shoot out of the top of the reservoir).
- e. Repeat steps b - d until no more air bubbles are being expelled and the valve actuates immediately after being stroked at the hydraulic pump. Replace vent on top of reservoir and set pump operation lever to normal position.

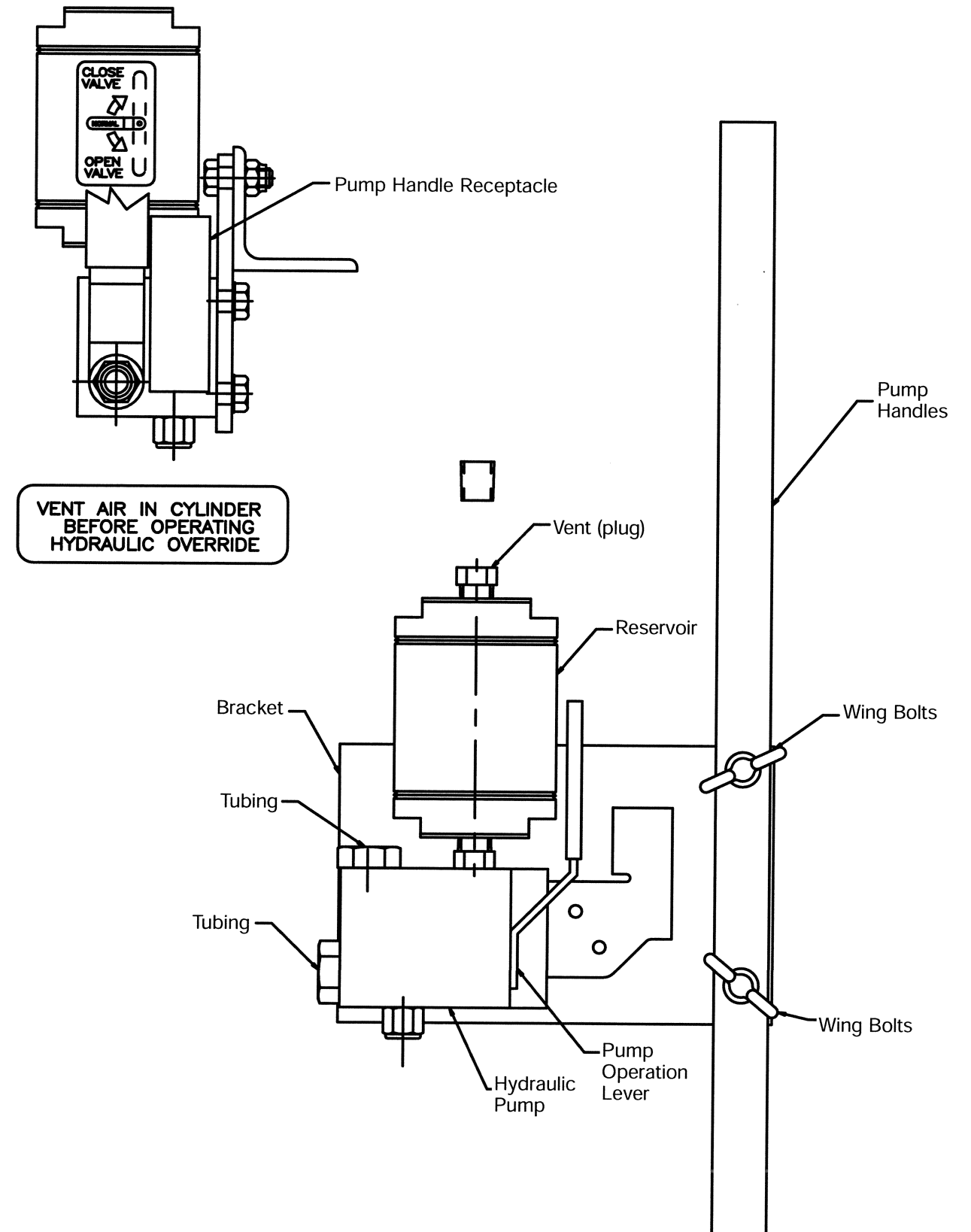


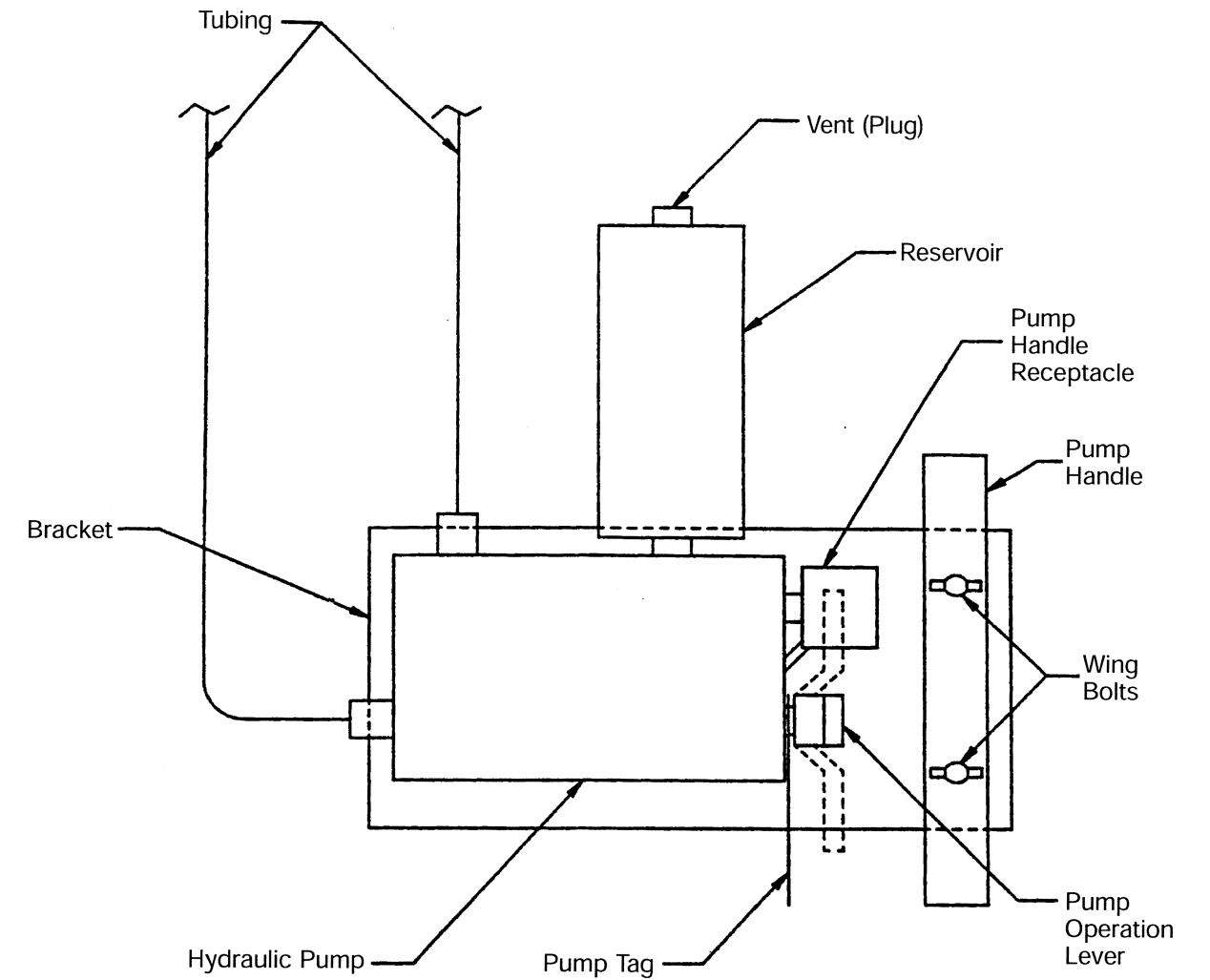
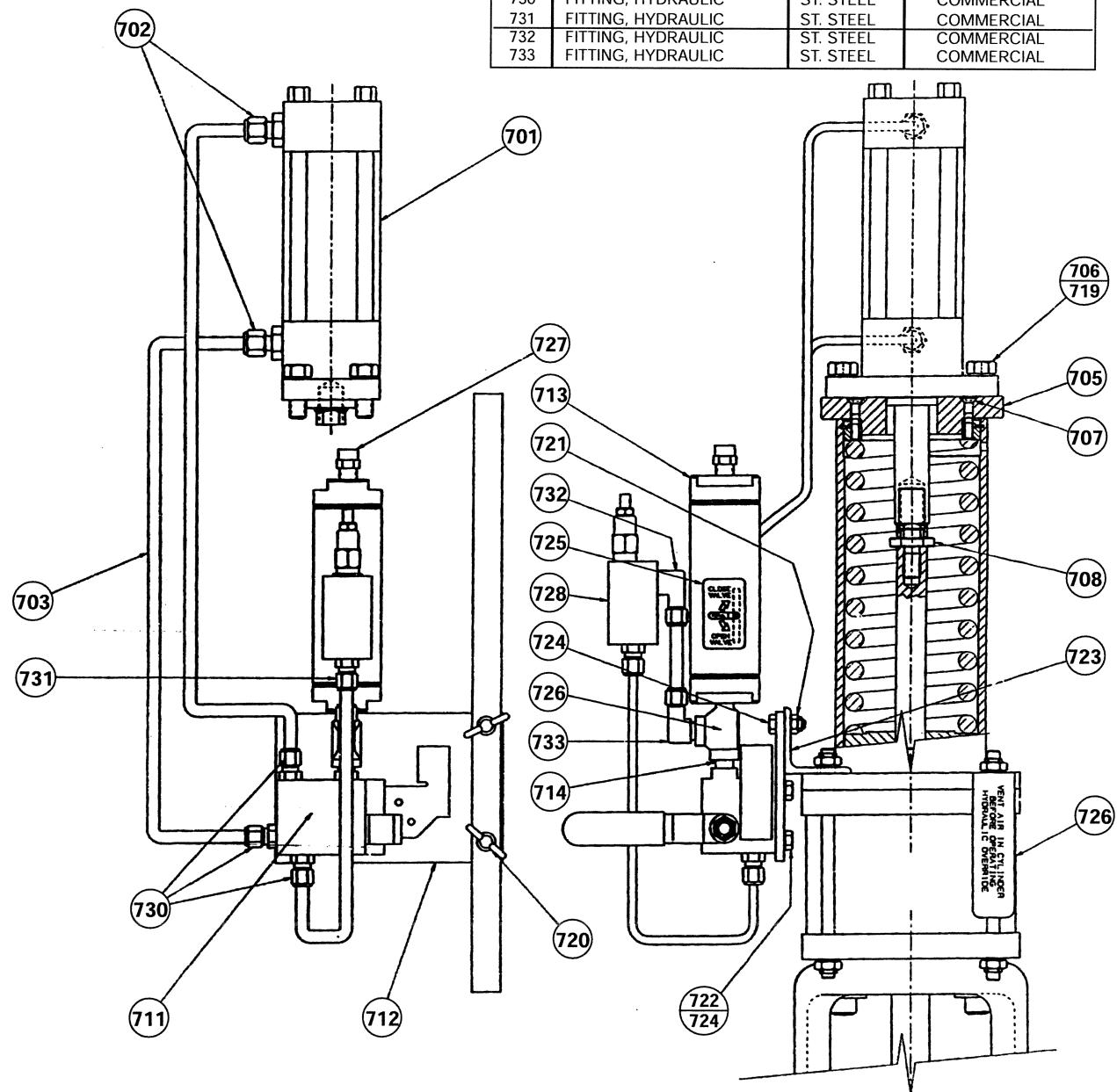
FIGURE 1A: HYDRAULIC MANUAL OVERRIDE COMPONENTS

### Reference assembly module drawings:

- 31657A — 6" cylinder actuator with spring cartridge
- 31577A — 16" and 20" cylinder actuators with spring tower
- 32398A — 10" cylinder actuator without spring tower
- 32439A — 16" and 20" cylinder actuators without spring tower
- 33842A — 13" cylinder actuator with spring tower
- 34367A — 10" cylinder actuator with spring tower

**31657A  
6" PNEUMATIC ACTUATOR  
HYDRAULIC MANUAL  
OVERRIDE**

ITEM	DESCRIPTION	MATERIAL	MATERIAL SPEC.
701	CYLINDER, HYDRAULIC	ST. STEEL	COMMERCIAL
702	FITTING, HYDRAULIC	ST. STEEL	COMMERCIAL
703	TUBE, 3/8"	ST. STEEL	COMMERCIAL
705	PLATE, MOUNTING	STEEL	AISI 1020 HR
706	BOLT, HEX HEAD	STEEL	ASTM A-193 GR. B7
707	SCREW, FLAT SCKT HEAD	STEEL	ANSI B18.3-1969
708	STUD, ADAPTER	ST. STEEL	AISI 416 SS
711	PUMP, HAND	-	COMMERCIAL
712	BRACKET, PUMP	STEEL	ASTM A-1018
713	RESERVOIR	-	COMMERCIAL
714	FITTING, HYDRAULIC	ST. STEEL	COMMERCIAL
719	WASHER, FLAT	ST. STEEL	COMMERCIAL
720	BOLT, WING	STEEL	-
721	NUT, FLEX	STEEL	-
722	WASHER, INT. TOOTH	ST. STEEL	-
723	BRACKET, MOUNTING	STEEL	ASTM A36
724	BOLT, HEX HEAD	STEEL	-
725	TAG, PUMP	-	COMMERCIAL
726	TAG, INSTRUCTION	ALUMINUM	COMMERCIAL
727	VALVE, RELIEF	-	COMMERCIAL
728	VALVE, RELIEF	ALUMINUM	COMMERCIAL
729	TEE, STREET, 1/4 NPT	ST. STEEL	COMMERCIAL
730	FITTING, HYDRAULIC	ST. STEEL	COMMERCIAL
731	FITTING, HYDRAULIC	ST. STEEL	COMMERCIAL
732	FITTING, HYDRAULIC	ST. STEEL	COMMERCIAL
733	FITTING, HYDRAULIC	ST. STEEL	COMMERCIAL

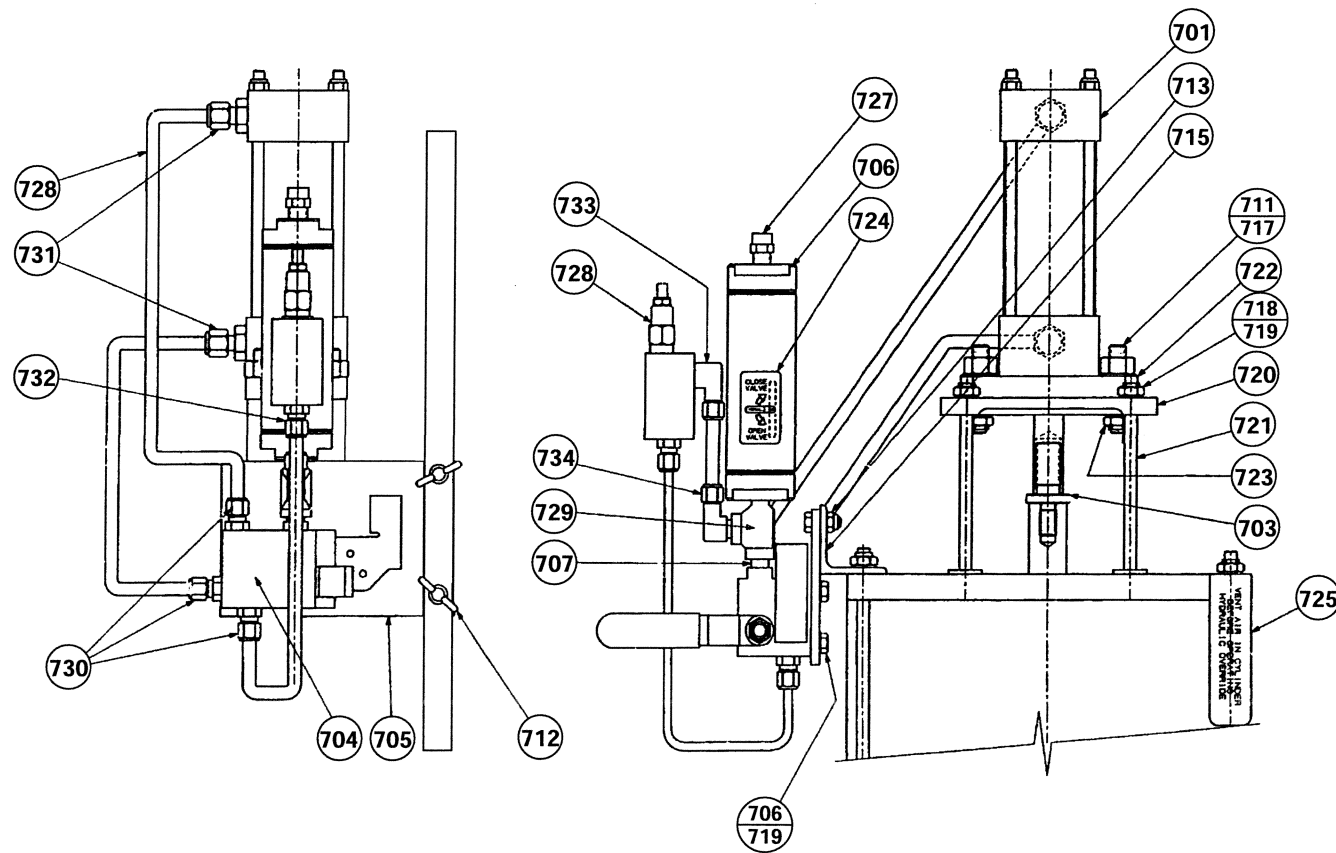


**FIGURE 1A  
HYDRAULIC MANUAL OVERRIDE COMPONENTS**

**32398A**  
**10" PNEUMATIC ACTUATOR**  
**HYDRAULIC**  
**MANUAL OVERRIDE**

**TOWER MODULE U009005238**

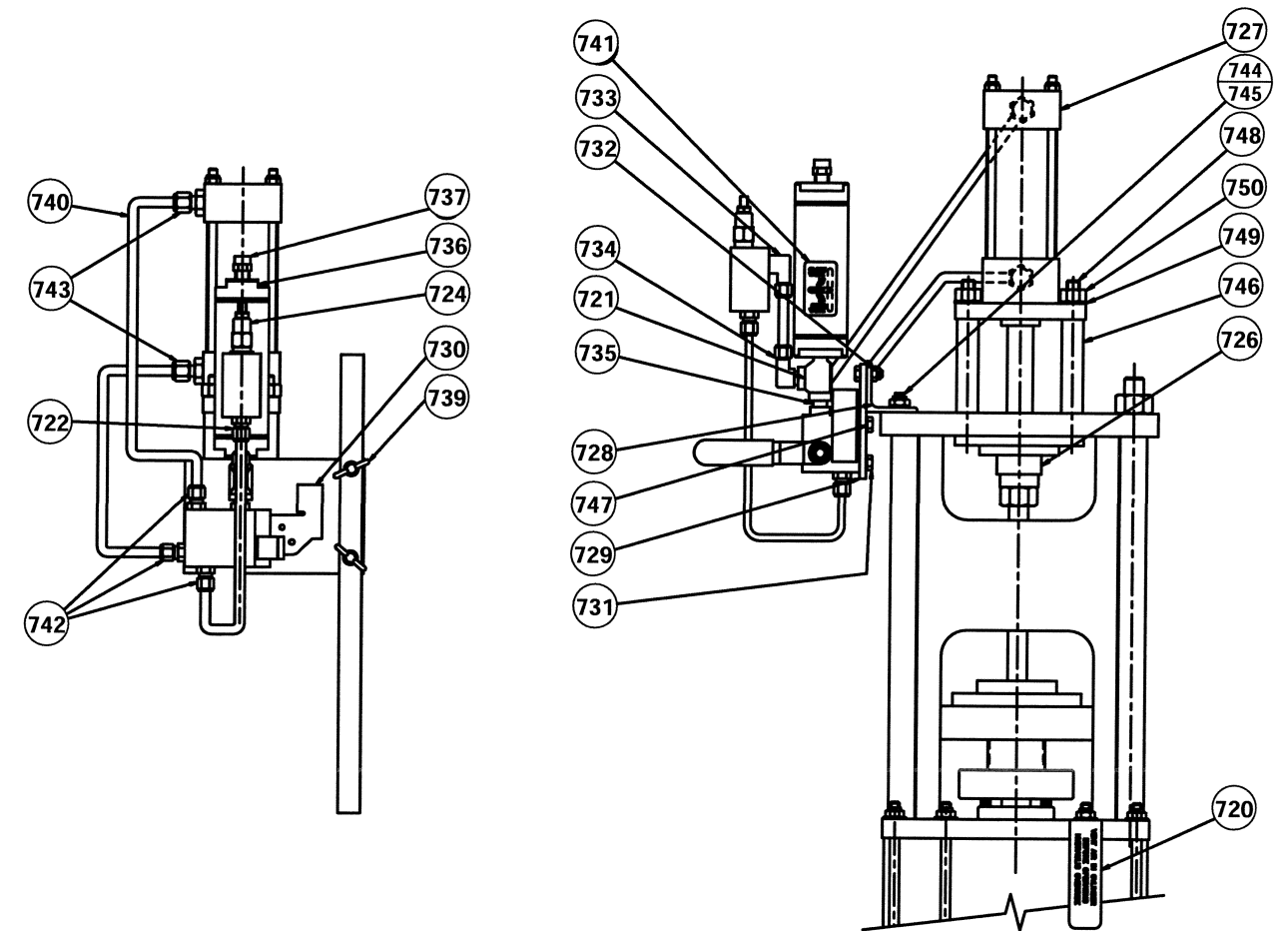
ITEM	DESCRIPTION	MATERIAL	MATERIAL SPEC.
701	CYLINDER, HYDRAULIC	-	COMMERCIAL
703	STUD, ADAPTER	ST. STEEL	AISI 416 SS
704	PUMP, HAND	-	COMMERCIAL
705	BRACKET, PUMP	STEEL	ASTM A-1018
706	RESERVOIR	-	COMMERCIAL
707	ADAPTER, 1/4 NPT X SAEB	-	COMMERCIAL
711	WASHER, FLAT	STEEL	-
712	BOLT, WING	STEEL	-
713	NUT, FLEX	STEEL	-
714	WASHER, INT. TOOTH	ST. STEEL	-
715	BRACKET, MOUNTING	STEEL	ASTM A36
716	BOLT, HEX HEAD	STEEL	-
717	BOLT, HEX HEAD	STEEL	-
718	NUT, FLEX	STEEL	-
719	WASHER, FLAT	ST. STEEL	COMMERCIAL
720	PLATE, MOUNTING	CAR. STEEL	C-1018 CRS
721	SPACER	STEEL	COMMERCIAL
722	ROD, THREADED	STEEL	-
723	NUT, FLEX	STEEL	-
724	TAG, PUMP INSTRUCTION	-	-
725	TAG, INSTRUCTION	ALUMINUM	-
726	TUBE, 3/8 O.D.	ST. STEEL	COMMERCIAL
727	VALVE, RELIEF	-	COMMERCIAL
728	VALVE, RELIEF	-	COMMERCIAL
729	TEE, STREET 1/4 NPT	ST. STEEL	COMMERCIAL
730	FITTING, HYDRAULIC	ST. STEEL	COMMERCIAL
731	FITTING, HYDRAULIC	ST. STEEL	COMMERCIAL
732	FITTING, HYDRAULIC	ST. STEEL	COMMERCIAL
733	FITTING, HYDRAULIC	ST. STEEL	COMMERCIAL
734	FITTING, HYDRAULIC	ST. STEEL	COMMERCIAL



**TOWER MODULE U009005243**

ITEM	DESCRIPTION	MATERIAL	MATERIAL SPEC.
720	INSTRUCTION PLATE	ALUMINUM	-
721	TEE, STREET, 1/4 NPT	STAINLESS STEEL	-
722	FITTING, HYDRAULIC	-	STAINLESS STEEL
724	VALVE, RELIEF	ALUMINUM	-
726	COUPLER, ROD ALIGNMENT	COMMERCIAL	-
727	CYLINDER, HYDRAULIC	COMMERCIAL	-
728	MOUNTING, BRACKET (ANGLE)	STEEL	ASTM A36
729	BRACKET, FLAT	STEEL	AISI 1018
730	PUMP, HAND	COMMERCIAL	-
731	BOLT, HEX HEAD 5/16-18	STEEL	-
732	NUT, FLEX	STEEL	-
733	FITTING, HYDRAULIC	STAINLESS STEEL	-
734	FITTING, HYDRAULIC	STAINLESS STEEL	-
735	FITTING, HYDRAULIC	STAINLESS STEEL	-
736	RESERVOIR, HYDRAULIC	COMMERCIAL	-
737	RELIEF VALVE	COMMERCIAL	-
739	BOLTS, WING	STEEL	-
740	TUBE, 3/8"	STAINLESS STEEL	-
741	TAG, PUMP INSTRUCTION	-	-
742	FITTING, HYDRAULIC	STAINLESS STEEL	-
743	FITTING, HYDRAULIC	STAINLESS STEEL	-
744	BOLT, HEX HEAD 5/16-18	STEEL	ASTM A193 GR B7
745	WASHER, LOCK 3/8	STEEL	ANSI B18.21.1
746	SPACER SLEEVE	STEEL	ASTM A53
747	INT. TOOTH LOCK WASHER	STAINLESS STEEL	-
748	ROD, THREADED	STEEL	-
749	WASHER, FLAT	STEEL	ASTM F844, CAD PLATED
750	NUT, HEX 1/2 - 13	STEEL	ASTM A-563 GR 2

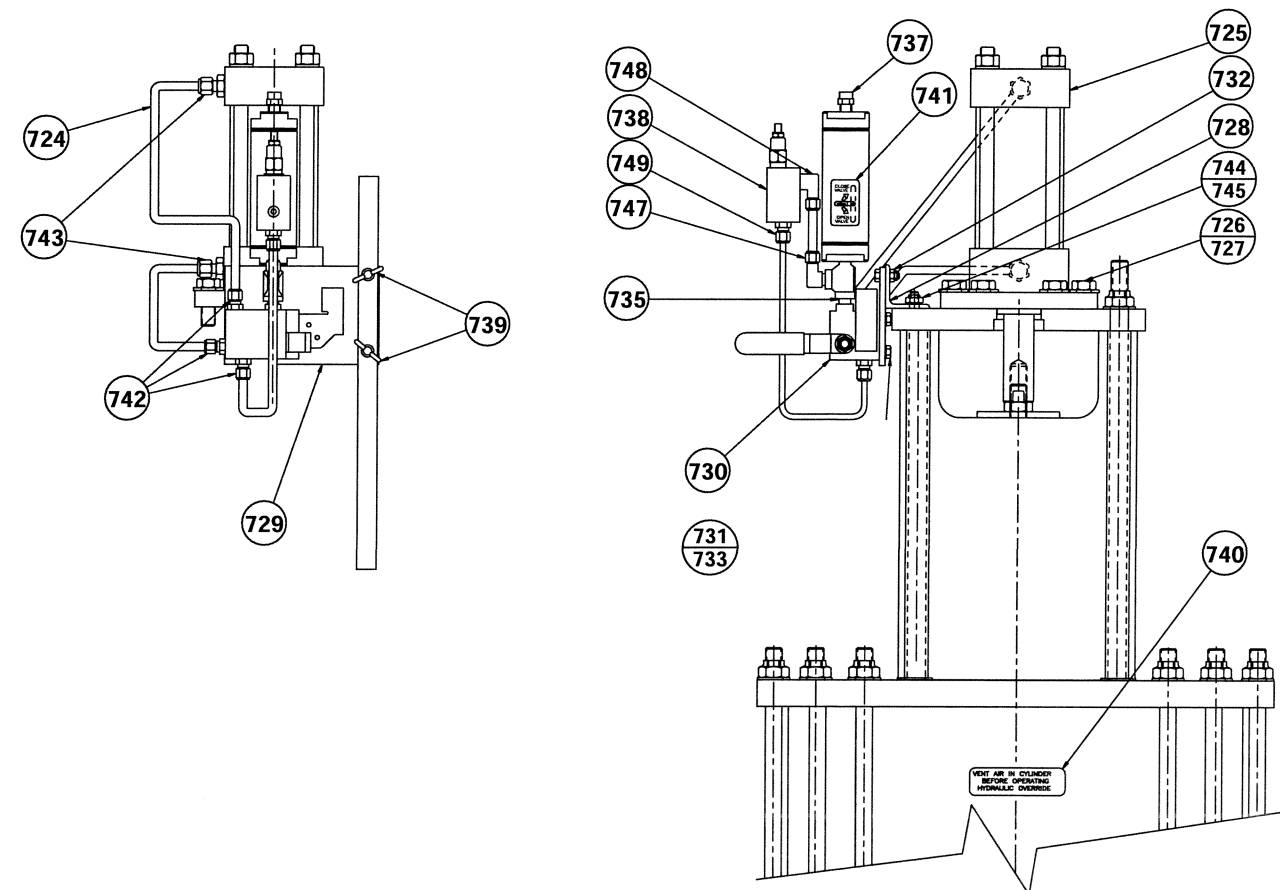
**34367A**  
**10" PNEUMATIC ACTUATOR**  
**HYDRAULIC**  
**MANUAL OVERRIDE**



**31677A**  
**16" - 20"**  
**PNEUMATIC ACTUATOR**  
**HYDRAULIC**  
**MANUAL OVERRIDE**

**TOWER MODULE U009005235**

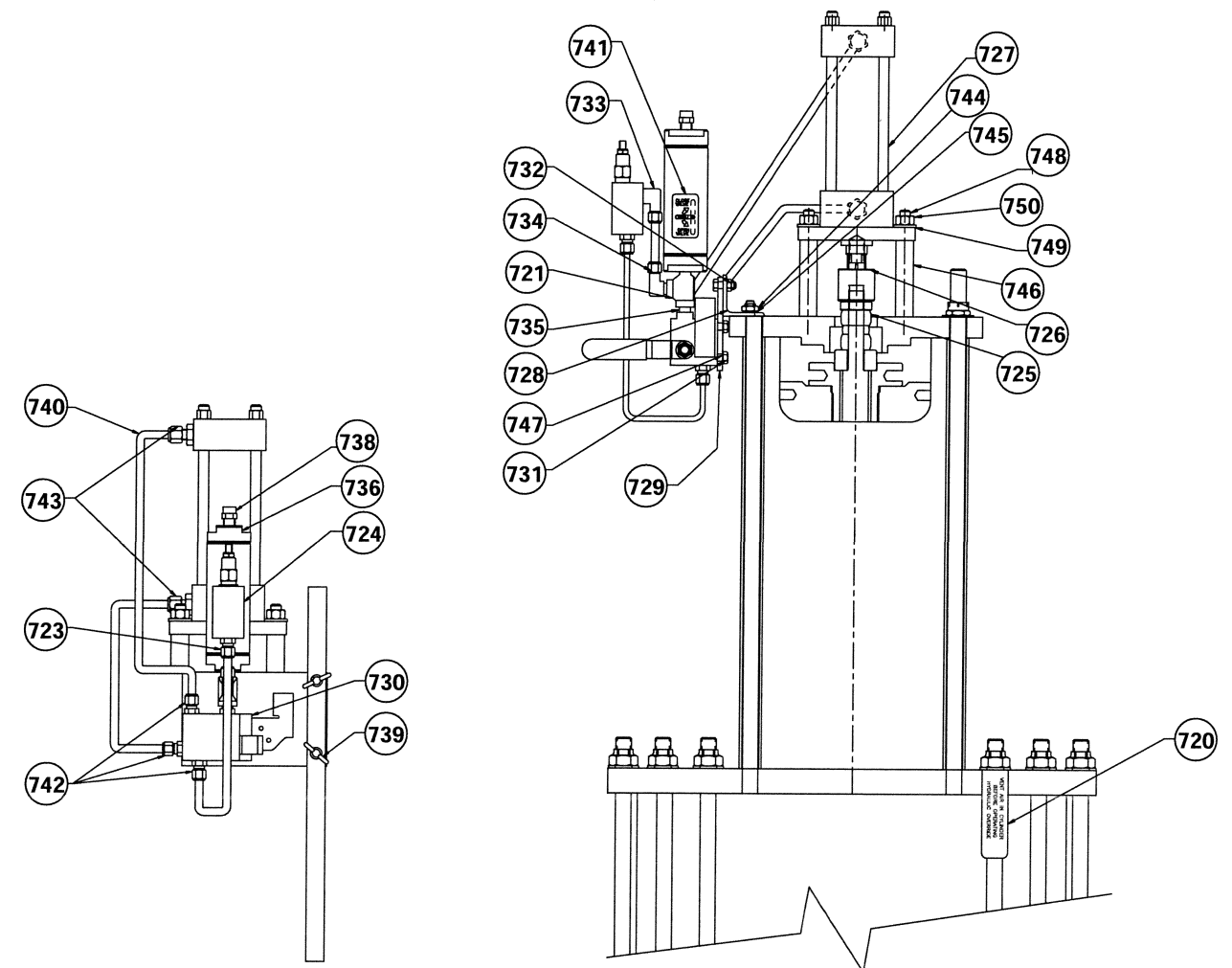
ITEM	DESCRIPTION	MATERIAL	MATERIAL SPEC.
724	TUBE, 3/8"	STAINLESS STEEL	
725	CYLINDER, HYDRAULIC	COMMERCIAL	
726	BOLT, HEX HEAD 5/8 - 11	STEEL	ASTM A193 GR B7
727	WASHER, FLAT	STEEL	AISI 1018
728	MOUNTING, BRACKET (ANGLE)	STEEL	ASTM A35
729	BRACKET, FLAT	STEEL	AISI 1018
730	PUMP, HANDQ	COMMERCIAL	
731	BOLT, HEX HEAD 5/16 - 18	STEEL	
732	NUT, FLEX	STEEL	
733	INT. TOOTH LOCK WASHER	STAINLESS STEEL	
735	ADAPTER, FITTING	STAINLESS STEEL	
736	RESERVOIR, HYDRAULIC	COMMERCIAL	
737	VALVE, RELIEF	COMMERCIAL	
738	VALVE, RELIEF	COMMERCIAL	
739	BOLTS, WING	STEEL	
740	TAG, INSTRUCTION	ALUMINUM	
741	TAG, PUMP INSTRUCTION		
742	FITTING, HYDRAULIC	STAINLESS STEEL	
743	FITTING, HYDRAULIC	STAINLESS STEEL	
744	BOLT, HEX HEAD 3/8 - 16	STEEL	ASTM A193 GR B7
745	WASHER, LOCK 3/8	STEEL	ANSI B18.21.1
746	TEE, STREET, 1/4 NPT	STAINLESS STEEL	
747	FITTING, HYDRAULIC	STAINLESS STEEL	
748	FITTING, HYDRAULIC	STAINLESS STEEL	
749	FITTING, HYDRAULIC	STAINLESS STEEL	



**TOWER MODULE U009005241**

ITEM	DESCRIPTION	MATERIAL	MATERIAL SPEC.
720	INSTRUCTION PLATE	ALUMINUM	
721	TEE, STREET 1/4 NPT	STAINLESS STEEL	
722	FITTING, HYDRAULIC	STAINLESS STEEL	
724	VALVE, RELIEF	ALUMINUM	
725	NUT, HEX 3/4 - 16	STAINLESS STEEL	ASTM F-594 300 SST
726	COUPLER, ROD ALIGNMENT	COMMERCIAL	
727	CYLINDER, HYDRAULIC	COMMERCIAL	
728	MOUNTING, BRACKET (ANGLE)	STEEL	ASTM A36
729	BRACKET, FLAT	STEEL	AISI 1018
730	PUMP, HAND	COMMERCIAL	
731	BOLT, HEX HEAD 5/16 - 18	STEEL	
732	NUT, FLEX	STEEL	
733	FITTING, HYDRAULIC	STAINLESS STEEL	
734	FITTING, HYDRAULIC	STAINLESS STEEL	
735	FITTING, HYDRAULIC	STAINLESS STEEL	
736	RESERVOIR, HYDRAULIC	COMMERCIAL	
738	VALVE, RELIEF	COMMERCIAL	
739	BOLTS, WING	STEEL	
740	TUBE, 3/8"	STAINLESS STEEL	
741	TAG, PUMP INSTRUCTION		
742	FITTING, HYDRAULIC	STAINLESS STEEL	
743	FITTING, HYDRAULIC	STAINLESS STEEL	
744	BOLT, HEX HEAD 3/8 - 16	STEEL	ASTM A193 GR B7
745	WASHER, LOCK 3/8	STEEL	ANSI B18.21.1
746	SPACER SLEEVE	STEEL	ASTM A53
747	INT. TOOTH LOCK WASHER	STAINLESS STEEL	
748	ROD, THREADED	STEEL	
749	WASHER, FLAT	STEEL	ASTM F844, CAD PLATED
750	NUT, HEX, 1/2 - 13	STEEL	ASTM A-563 GR 2

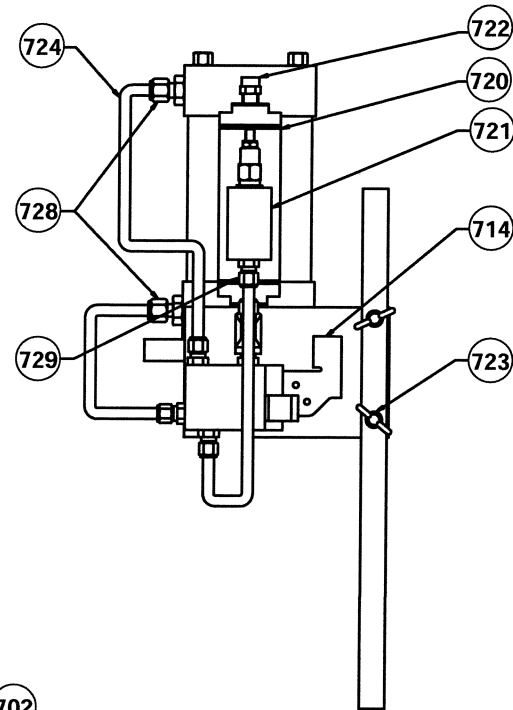
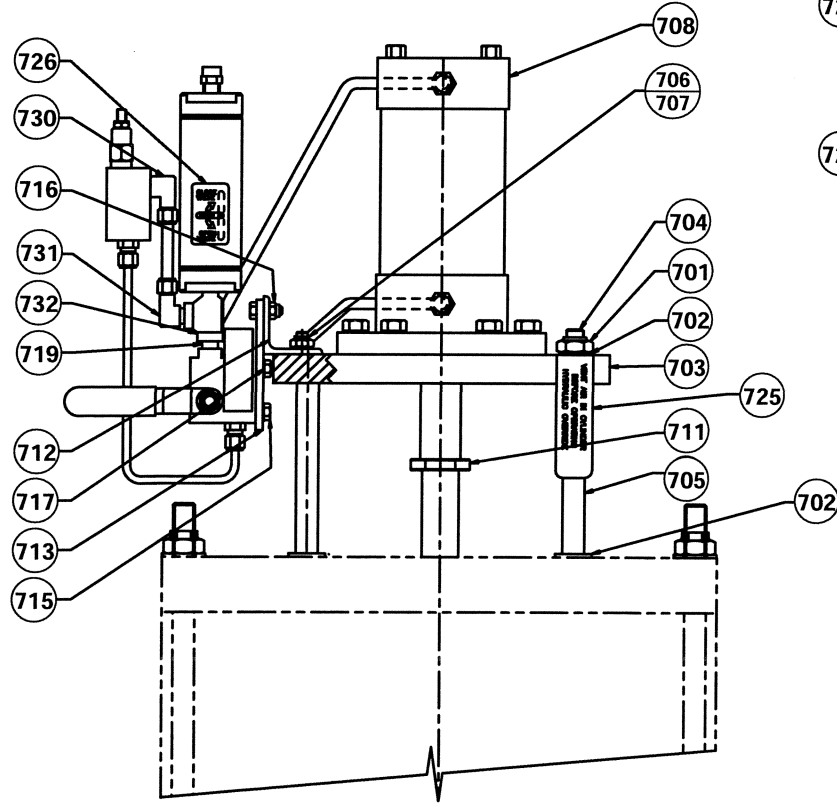
**33842A**  
**13" PNEUMATIC ACTUATOR**  
**HYDRAULIC**  
**MANUAL OVERRIDE**



TOWER MODULE U009005240

ITEM	DESCRIPTION	MATERIAL	MATERIAL SPEC.
701	NUT, HEX	STEEL	
702	WASHER, FLAT	STEEL	COMMERCIAL
703	PLATE MOUNTING	CAR. STEEL	C - 1018 CRS
704	WASHER, LOCK	STEEL	
705	SPACER	STEEL	COMMERCIAL
706	BOLT, HEX HEAD	STEEL	
707	WASHER, LOCK	STEEL	
708	CYLINDER, HYDRAULIC	-	COMMERCIAL
709	BOLT, HEX HEAD	STEEL	
710	WASHER, FLAT	STEEL	
711	ADAPTER, STUD	STEEL	AISI 416 SS
712	BRACKET, MOUNTING	STEEL	ASTM A36
713	BRACKET, PUMP	STEEL	ASTM A-1018
714	PUMP, HAND	-	COMMERCIAL
715	BOLT, HEX HEAD	STEEL	
716	NUT, FLEX	STEEL	
717	INT. TOOTH LOCK WASHER	STAINLESS STEEL	
719	FITTING, HYDRAULIC	ST. STEEL	COMMERCIAL
720	RESERVOIR	-	COMMERCIAL
721	VALVE, RELIEF	-	
722	VALVE, RELIEF	-	
723	BOLTS, WING	STEEL	
724	TUBE, 3/8 O.D.	ST. STEEL	COMMERCIAL
725	TAG, INSTRUCTION		
726	TAG, PUMP INSTRUCTION		
727	FITTING, HYDRAULIC	STAINLESS STEEL	COMMERCIAL
728	FITTING, HYDRAULIC	STAINLESS STEEL	COMMERCIAL
729	FITTING, HYDRAULIC	STAINLESS STEEL	COMMERCIAL
730	FITTING, HYDRAULIC	STAINLESS STEEL	COMMERCIAL
731	FITTING, HYDRAULIC	STAINLESS STEEL	COMMERCIAL
732	FITTING, HYDRAULIC	STAINLESS STEEL	COMMERCIAL
732	TEE, STREET, 1/4 NPT	STAINLESS STEEL	COMMERCIAL

32439A  
16" / 20"  
PNEUMATIC ACTUATOR  
HYDRAULIC  
MANUAL OVERRIDE



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## MANUAL HANDWHEEL OVERRIDE

*NOTE: Refer to Figure 2A for parts described in this procedure.*

### INSTALLATION

Before valve start-up, ensure pipe cap is installed on gear operator and all bolting is properly tightened.

### OPERATION BY ACTUATOR

During normal operation via an actuator, the engagement pin must be removed and stowed in the pin tube. The gear operator should also be in the fully raised position to ensure the actuator has full range of motion and to prevent contact between the actuator (or spring tower, where applicable) and the gear operator.

### OPERATION BY GEAR OPERATOR

When needing to operate the valve without air pressure to the actuator, during outage or emergency, or when not equipped with an actuator, the following steps must be observed:

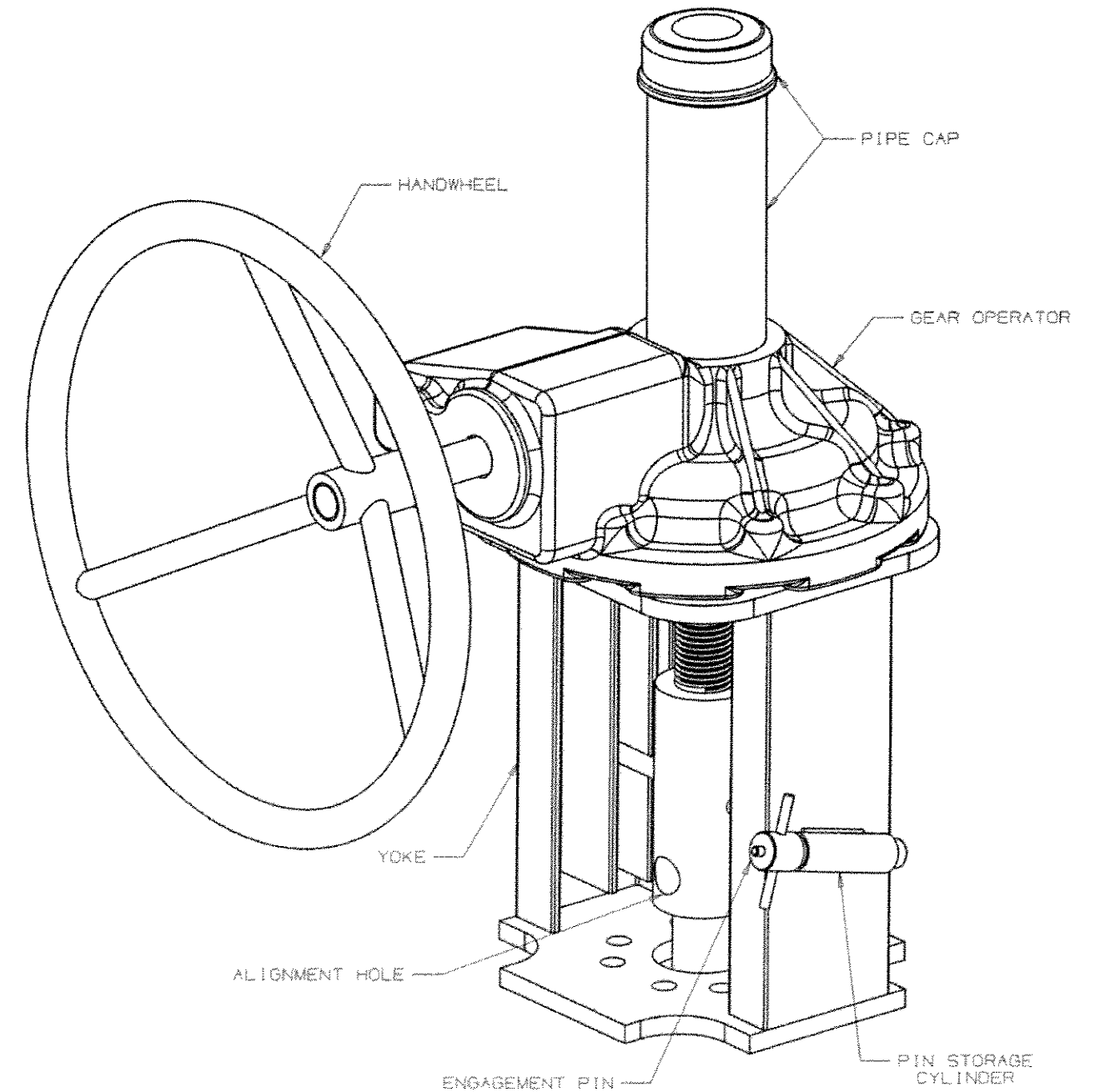
1. Bleed all pressure out of the actuator (where applicable) and ensure both sides of the actuator are vented to atmosphere.
2. Turn the handwheel counter-clockwise to lower the shaft so that the engagement holes can be aligned.
3. Remove the engagement pin from the storage cylinder and insert it into the aligned hole. The handwheel may need to be turned slightly to ensure complete engagement of the pin.
4. The valve may now be safely operated with the handwheel. Note that the process fluid and/or springs (where applicable) may increase the force required to operate the valve via handwheel.

### WARNING

Under no circumstances should cheater bars, chains, or other means of increasing torque be used with this handwheel/gear operator. Excessive force can damage the operator or the valve and could result in equipment damage, personal injury, or death.

### MAINTENANCE

The gear operator supplied is a lubricated and sealed unit. No maintenance is required. Please contact Leslie Controls, Inc. with any further questions.



**FIGURE 2A: MANUAL HANDWHEEL OVERRIDE**