

MO953A-D and MP953A-F Pneumatic Valve Actuators

SERVICE DATA

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GENERAL

DESCRIPTION

The MO953 and MP953 Pneumatic Valve Actuators ("Actuators") are used with V5011 and V5013 Valves and can control older steam and water valves via adapters. The MO953A-D Actuators are functionally identical to the MP953A-D Actuators. Therefore, most of this sheet is directed to the MP953 Actuators.

MP953A and B Actuators use a Gradutrol Relay for positioning, and the MP953E and MP953F Actuators use a positive positioner. The relay and the positioner function in essentially the same way. Positive positioner retrofit kits are available for MP953A and B Actuators (see ACCESSORIES).

APPLICATION

These Actuators operate the V5011 and V5013 Valves and certain other coil, line, and zone valves that

proportionally control steam or hot and cold liquids in HVAC systems.

SPECIFICATIONS

MODELS:

- MP953A—Direct-acting with Gradutrol Relay
- MP953B—Reverse-acting with Gradutrol Relay
- MP953C—Direct-acting without positioner
- MP953D—Reverse-acting without positioner
- MP953E—Direct-acting with positive positioner
- MP953F—Reverse-acting with positive positioner

MAXIMUM SAFE AIR PRESSURE:

25 psi (172 kPa)

See Table 1 for additional specifications.

Table 1. MO953/MP953 Specifications.

Device Type	MP953		M0953		Size in In. (mm)	Travel in In. (mm)	Maximum Temperature* F (C)	Spring Range psi (kPa)	Corrosion Resistant						
	Active	Inactive	Active	Inactive											
Direct acting with Gradutrol Relay	—	A1087 A1004 A1210	—	A1	5 (127)	3/4 (19)	160 (71)	Adjustable	No						
	—	A1095 A1012 A1228	—	A2											
	—	A1103 A1046	—	A6											
	—	A1079 A1111	—	A9											
	—	—	—	A5	8 (203)	1/2 (13)	160 (71)	No							
	—	A1145 A1020 A1244	—	A3		3/4 (19)									
	—	A1038 A1152	—	A4		1-1/2 (38)									
	—	A1178 A1053	—	A7		3/4 (19)									
	—	A1202 A1186 A1061 A1269	—	A8		13 (330)	1-1/2 (38)		Yes						
	—	—	—	—		—	—		No						
Reverse acting with Gradutrol Relay	—	B1002 B1036 B1069	—	B6	7-1/8 (181)	3/4 (19)	160 (71)	Adjustable	No						
	—	B1010 B1044	—	B7		1/2 (13)									
	—	B1028 B1051	—	B8		3/4 (19)									
Direct acting, no Relay or positioner	C1000	—	C1000	C1XH	5 (127)	3/4 (19)	160 (71)	Adjustable	No						
	C1018	—	C1018	C1XK											
	C1026	—	C1026	C1XL											
	—	C1034	—	C2XH			8 (203)			3/4 (19)	250 (121)	No			
	—	C1042	—	C2XK									2-7 (14-48)		
	—	C1059	—	C2XL									8-12 (55-83)		
	—	C1505	—	—							4-11 (28-76)				
	C1067	—	C1067	C3XH							160 (71)		3/4 (19)	2-7 (14-48)	No
	C1075	—	C1075	C3XK											
	C1083	—	C1083	C3XL										4-11 (28-76)	
	—	C1422	—	—	250 (121)	4-11 (28-76)	Yes								
	—	C1091	—	C4XH	1-1/2 (38)	160 (71)	2-7 (14-48)	No							
	—	C1109	—	C4XK					8-12 (55-83)						
	—	C1117	—	C4XL					4-11 (28-76)						
	C1547	—	C1547	—			3-15 (21-103)		Yes						
	—	C1141	—	C9XH						5 (127)	1/2 (13)	2-7 (14-48)	No		
	—	C1158	—	C9XK			8-12 (55-83)								

Table 1. MO953/MP953 Specifications (Continued).

Device Type	MP953		M0953		Size in In. (mm)	Travel in In. (mm)	Maximum Temperature* F (C)	Spring Range psi (kPa)	Corrosion Resistant			
	Active	Inactive	Active	Inactive								
Direct acting no Relay or positioner (Cont.)	---	C1166	---	C9XL	5 (127)	1/2 (13)	160 (71)	4-11 (28-76)	No			
	---	C1174	---	CSXH		3/4 (19)		3-7 (21-48)	Yes			
	---	C1182	---	C5XK	8 (203)	250 (121)	8-12 (55-83)	4-11 (28-76)	No			
	---	C1190	---	C5XL			3-7 (21-48)					
	---	C1208	---	C6XH			8-12 (55-83)					
	---	C1216	---	C6XK			4-11 (28-76)					
	---	C1224	---	C6XL			3-7 (21-48)					
	---	C1232	---	C7XH			8-12 (55-83)					
	---	C1240	---	C7XK			4-11 (28-76)					
	---	C1257	---	CTXL			250 (121)			4-11 (28-76)		
	---	C1414	---	---	13 (330)	1-1/2 (38)	160 (71)	3-7 (21-48)	No			
	C1471	C1125	C1471	C8XH		3/4 (19)	160 (71)	4-11 (28-76)				
	C1489	C1133	C1489	C8XL				3-7 (21-48)				
	C1554	---	---	C1554		---	---	---		4-11 (28-76)		
	C1562	---	---	C1562		---	---	---		4-11 (28-76)		
Reverse acting, no Relay or positioner	D1032	---	---	---	7-1/8 (181)	3/4 (19)	200 (93)	8-13 (55-90)	No			
	D1107	A1008	D1107	D1		3/4 (19)		8-13 (55-90)	No			
	---	A1115 A1016	---	D1		1/2(13)		314 (19)	4-11 (28-76)	No		
	---	A1123 A1024	---	D3								
	D1131	A1073	D1131	---		1/2(13)		3/4 (19)	3-7 (21-48)	No		
	---	A1081 A1149	---	---								
	---	A1099 A1156	---	---								
	D1172	---	D1172	---		3/4 (19)		160 (71)	3-7 (21-48)	No		
	---	D1198	D1198†	---					4-11 (28-76)			
	---	D1206	D1206†	---					8-13 (55-90)			
	---	D1214	D1214†	---					3-7 (21-48)			
	D1222	---	D1222	---					4-11 (28-76)			
	D1230	---	---	---					4-11 (28-76)	No		
	D1248	---	---	---					8-13 (55-90)	No		
	D1255	---	---	---					3-7 (21-48)	No		
Direct acting with positive positioner	E1301	---	---	---	5 (127)		3/4 (19)		160 (71)	3 (21)	No	
	E1319	---	---	---						5 (34)		
	E1327	---	---	---	8 (203)	1-1/2 (38)	10 (69)	3 (21)				
	E1277	---	---	---					5 (34)			
	E1285	---	---	---					10 (69)			
	E1293	---	---	---					3 (21)			
	E1368	---	---	---					5 (34)			
	E1376	---	---	---					10 (69)			
	E1384	---	---	---					13 (330)	1-1/2 (38)	3 (21)	5 (34)
	E1392	---	---	---								
	E1400	---	---	---								
	E1418	---	---	---	13 (330)	3/4 (19)	10 (69)	3 (21)				
	E1427	---	---	---					5 (34)			
	E1435	---	---	---					10 (69)			
	E1443	---	---	---					3 (21)			
---	---	---	---	5 (34)								
Reverse acting with positive positioner	F1119	---	---	---	7 (180)	3/4 (19)	160 (71)	10 (69)	No			
	F1101	---	---	---				5 (34)				
	F1093	---	---	---				3 (21)				

*Diaphragm color indicates maximum temperature:
 Black (Neoprene)—160F (71C)
 Black with White Dot (Ethylene Propylene)—250F (121C)

OPERATION

In a direct-acting (n.o. valve) system, an increase in control (branch/pilot) air pressure forces the Actuator diaphragm and cup assembly downward, forcing the valve stem down to proportionally close off the flow through the valve (Fig. 1).

In a reverse-acting (n.c. valve) system, an increase in control (branch/pilot) air pressure forces the Actuator diaphragm and cup assembly upwards, forcing the valve stem up to proportionally increase the flow through the valve.

In Actuators without Gradutrol Relays or positive positioners, branchline pressure is applied to the diaphragm. In Actuators with Gradutrol Relays or positive positioners, up to full main air pressure is applied to the diaphragm to ensure the valve is positioned proportionally to the pilot pressure (the branchline pressure output from the controlling device).

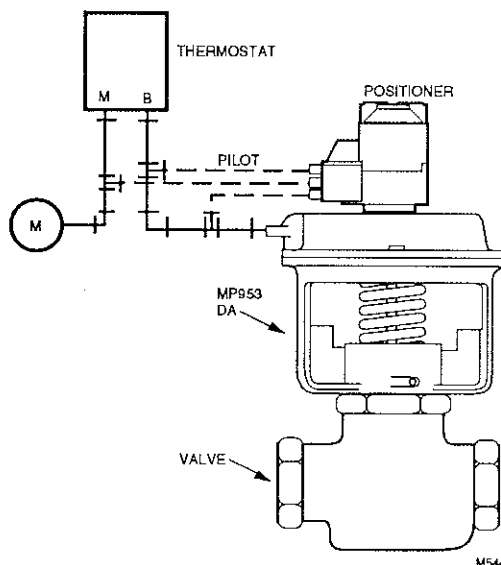


Fig. 1. Typical Direct-Acting MP953 Operation.

MAINTENANCE

EQUIPMENT NEEDED

- Commercial cleaning solvent or degreaser
- Pressure Gage 14003519 (0 to 30 psi [0 to 207 kPa])
- Wrench 301572A for MP953A and B

VISUAL INSPECTION

Check periodically for leaks, loose fittings, and other visible problems.

CLEANING

Clean the Actuator with a commercial cleaning solvent or degreaser.



WARNING

Careless handling of solvents can cause permanent respiratory or skin damage. Avoid prolonged exposure to solvents.

OPERATIONAL CHECK

Vary the branchline (pilot) pressure through the operational range of the Actuator in both directions. The valve should open and close smoothly.

ADJUSTMENTS

CHECK ADJUSTMENT ON MP953A, B, E, F

1. Install gages in the main and pilot air lines.
2. Main air pressure should be greater than or equal to the top of the sequencing range (span); 13 psi (90 kPa) is the minimum main pressure for the device to function.
3. Slowly increase pilot pressure and note the pressure at which the valve stem begins to travel. This pressure should be within ± 0.75 psi (5 kPa) of the start point setting of the MP953A and B. For MP953E and F, the pressure should be within ± 1 psi (7 kPa) of the start point.
4. Continue increasing the pilot pressure until the valve stem stops traveling. This pressure should be the start point pressure plus the range (span) setting.

SET OPERATING RANGE

MP953A, B

1. Use Wrench 301572A to loosen the cover locking screw (Fig. 2).
2. Unscrew the start point adjustment knob until thread is disengaged. Remove knob.
 - a. For 3 psi (21 kPa) range, back all range adjustment screws off to friction stop.
 - b. For 5 psi (34 kPa) range, back only the black range adjustment screws to stop and tighten the outer, cadmium-plated range adjustment screws.
 - c. For 10 psi (69 kPa) range, tighten all range adjustment screws.

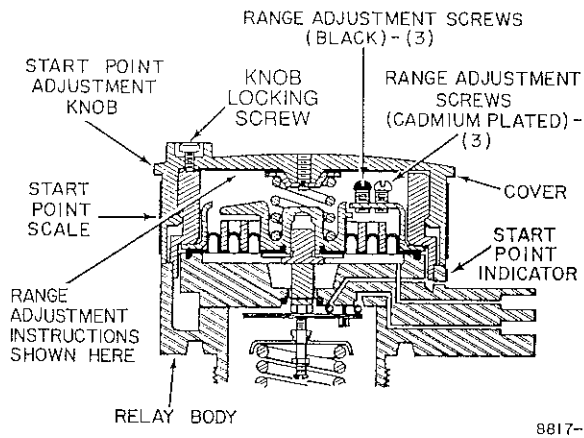


Fig. 2. Adjustment Points of MO953/MP953A and B Gradutrol Relay.

MP953E, F

Change the operating range of MP953E and F by replacing the feedback spring with one for the desired range (see REPAIR).

ADJUST START POINT

MP953A, B

CAUTION

For MP953A and B, loosen the cover locking screw before turning the start point adjustment knob.

1. Reinstall setpoint knob.
2. Tighten knob by turning it until it is seated on relay body (Fig. 2).
3. Loosen knob (maximum of one turn) until start point of correct scale range lines up with start point indicator.
4. Tighten knob locking screw until it engages relay body. Do not overtighten.

MP953E, F

Set the start point on the positioner to the value shown on the job drawings. Critical applications and feedback spring changes might require fine-tuning the start point. Each click of the start point knob will adjust the start point 0.25 psi (1.7 kPa).

TROUBLESHOOTING

EQUIPMENT NEEDED

Troubleshooting procedures require Pressure Gage 14003519 (0 to 30 psi [0 to 207 kPa]).

SYMPTOMS AND CORRECTIVE ACTION

Figures 3 and 4 show troubleshooting flowcharts.

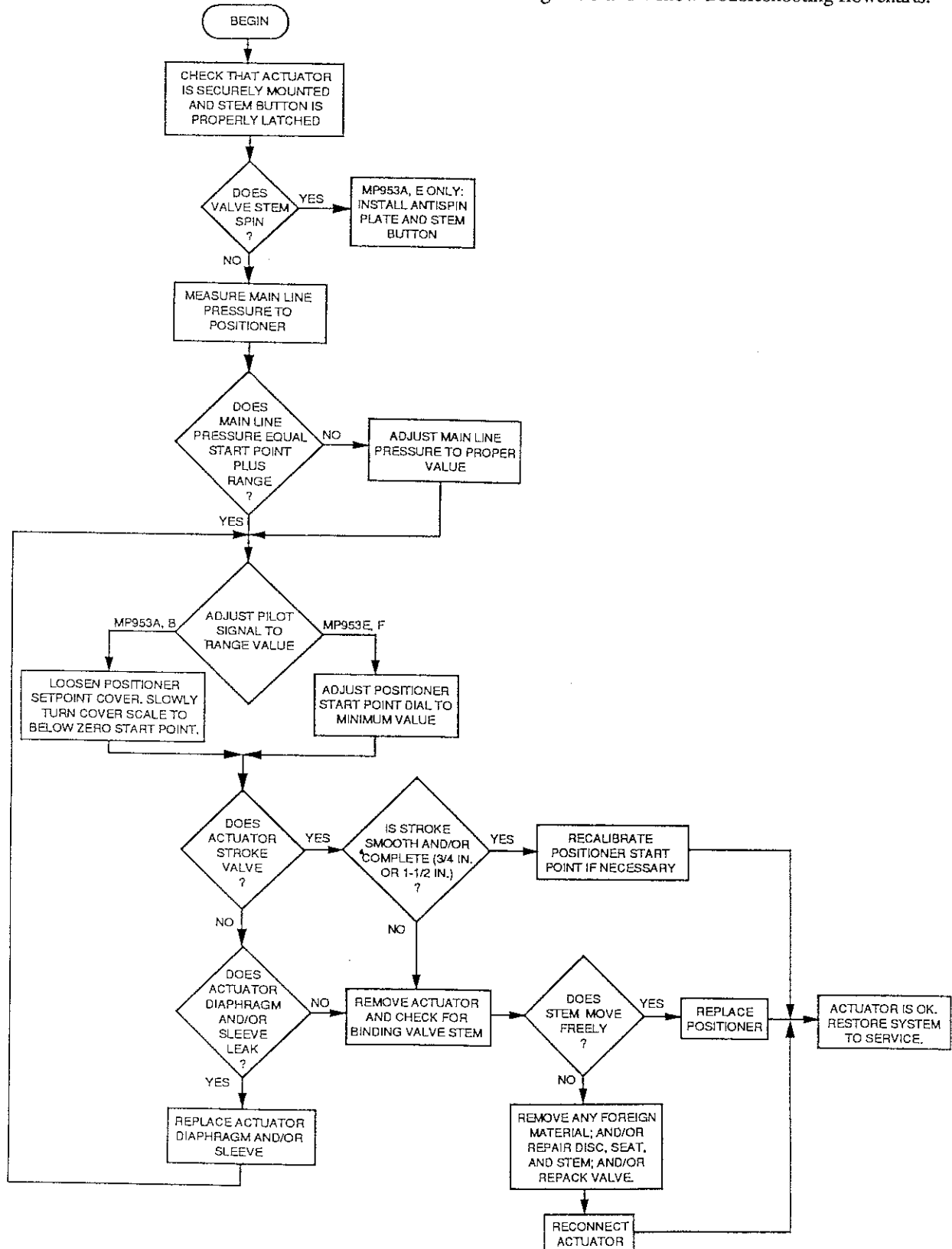
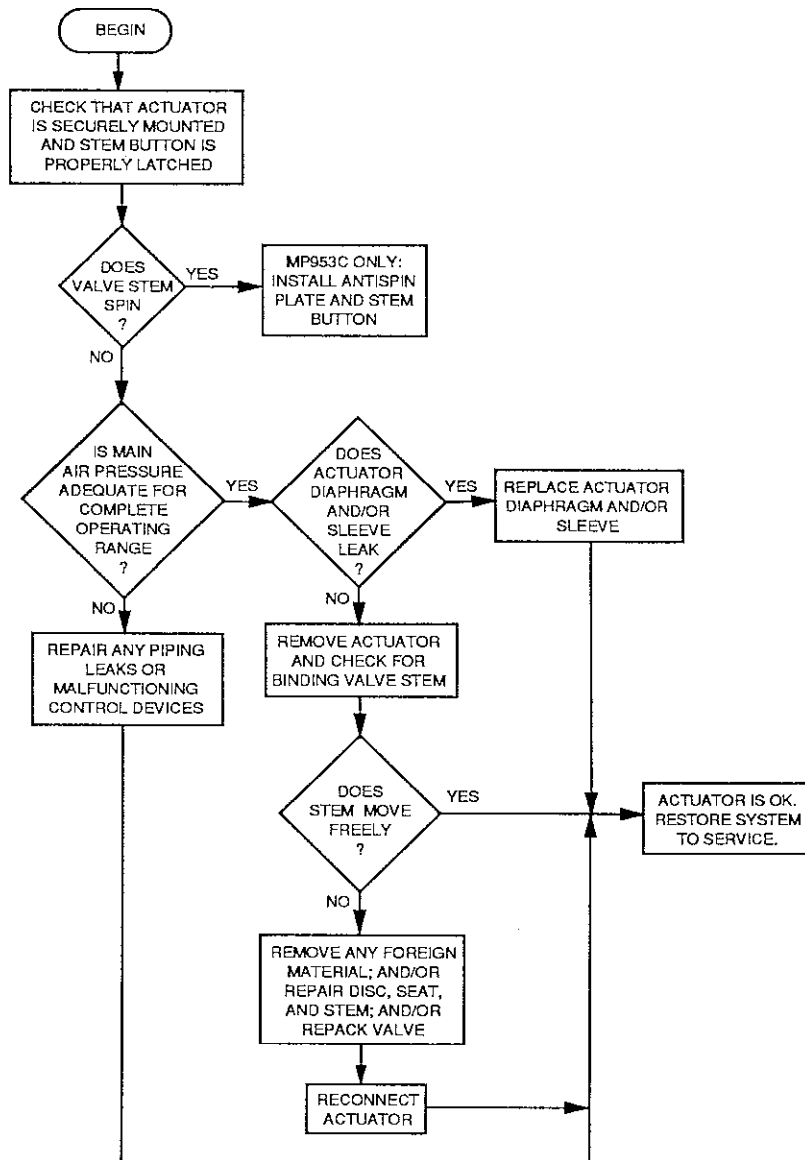


Fig. 3. Troubleshooting Flowchart for MP953A, B, E, F (with Gradutrol Relay/Positioner).

C4202



C4203

Fig. 4. Troubleshooting Flowchart for MP953C, D (without Gradutrol Relay/Positioner).

REPAIR

GENERAL

This section lists tools needed to disassemble and reassemble Actuators and gives procedures for replacing parts of actuators. See PARTS AND ACCESSORIES for parts diagrams and lists.

EQUIPMENT NEEDED

Tables 2 through 5 list basic repair tasks and the tools required for each.

Table 2. Removing and Replacing Actuator Covers.

Device		Actuator Dia (In.)	Tools Required
Model	Series		
MP953A	All	5	1/4-in. hex socket
MP953C		8	— 3/8-in hex socket — Two 1/4-20 x 3 in. hex-head bolts, threaded to within 1/2-in. of bolt head
MP953E		13	— 3/8-in. hex socket — Four 5/16-18 x 3 in. hex-head bolts, threaded to within 1/2-in. of bolt head
MP953B	All	7	5/16-in. hex socket
MP953D			
MP953F			

Table 3. Removing and Replacing Actuator Bases.

Device		Actuator Dia (In.)	Tools Required
Model	Series		
MP953A	2	5	5/16-in. hex socket
MP953C	2		5/16-in. hex socket or T-25 Torx bit NOTE: Series number does not indicate type of fastener.
MP953E	1		
MP953A	All	8	9/16-in., six-point, deep socket (3/8-in. drive preferable)
MP953C		13	3/8-in. hex allen wrench (bit)
MP953E			
MP953B	2	7	3/16-in. hex allen wrench (bit)
MP953D	2	7	3/16-in. hex allen wrench (bit) or T-25 Torx bit NOTE: Series number does not indicate type of fastener.
MP953F			

Table 4. Loosening and Removing Actuator Bases from Valve Bonnets.

Device		Actuator Dia (In.)	Tools Required
Model	Series		
MP953A	2	5	3/16-in hex allen wrench (bit) or T-25 Torx bit NOTE: Series number does not indicate type of fastener.
MP953C	2		
MP953E	1		
		8	1/4-in hex allen wrench (bit)
MP953C	2	13	1/4-in allen wrench (bit) NOTE: Used only on 3/4-in. stroke actuators with 1989 or later date code.
MP953E	1		
MP953A	2	13	5/16-in. hex allen wrench (bit), used on all 1-1/2-in.-stroke actuators regardless of date code
MP953C	2		
MP953E	1		
MP953B	2	7	3/16-in. allen wrench (bit)
MP953D	2	7	3/16-in. hex allen wrench (bit) or T-25 Torx bit NOTE: Series number does not indicate type of fastener.
MP953F	1		

Table 5. Miscellaneous Tasks.

Task	Tools Required
Removing MP953A Gradutrol Relay positioner	Crescent wrench with jaw opening to at least 2-5/8 in. (67 mm). Narrow-jaw pipe wrench or large adjustable pliers may be substituted as long as they do not distort the setpoint knob.
Removing MP953E positive positioner	Adjustable crescent wrench with jaw opening to at least 2-5/8 in. (67 mm).
Removing MP953B Gradutrol Relay positioner bracket assembly	5/16-in. hex socket
Removing MP953F positive positioner bracket assembly	
Removing and replacing MP953B, D, F sleeve diaphragm	— Small-blade screwdriver — 3/16-in. hex socket — 1-3/8-in. adjustable hex socket (crescent wrench is acceptable substitute)
Replacing feedback-spring cup on MP953A, E main diaphragm	Pliobond glue or equivalent
Unlatching actuator from valve stem button	Medium- to large-blade screwdriver
Lubricating MP953A Gradutrol Relay positioner O-ring	Lubricant or silicone grease obtained locally
Lubricating MP953E positive positioner O-ring	

MO953 CONVERSION

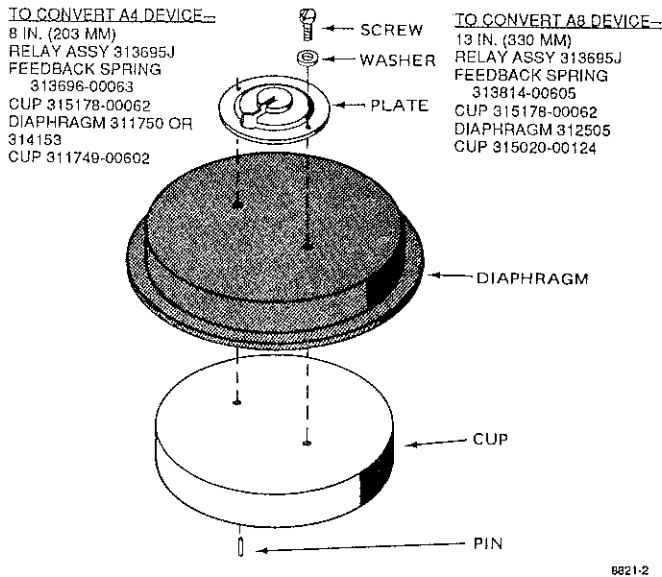


Fig. 6. MO953 Conversion.

YOKE ASSEMBLY

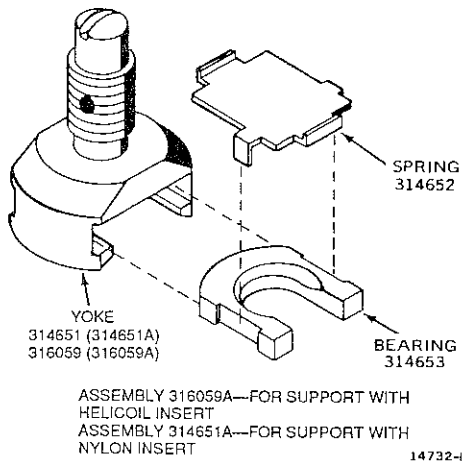


Fig. 7. Yoke Assembly.

REPLACE MAIN DIAPHRAGM

GENERAL

Before replacing the diaphragm, determine the type and material of the existing diaphragm according to its color:

- Black: Neoprene
Maximum temperature 160F (71C)
Used on MP953A, C, and E

- Black with white spot: Ethylene Propylene (EPR)
Maximum temperature 250F (121C)
Used on MP953B, D and F
- White: Silicone
Maximum temperature 250F (121C)
Used on MP953A and C and may be installed on MP953E

Flat diaphragms and beaded-roll diaphragms are not interchangeable. Neoprene and EPR diaphragms are interchangeable but must meet maximum temperature requirements.

MP953A, C, E DIRECT-ACTING ACTUATORS

Direct-acting Actuators are subject to extremely high internal spring loads. Therefore, Actuator covers must be removed very carefully before the the main diaphragm can be replaced.

When using the following procedures, see Figures 8 and 10 for exploded diagrams and Tables 6 and 8 for parts.

REMOVE ACTUATOR COVER



WARNING

Use extreme caution when disassembling Actuators. Actuator assemblies are under spring load which can reach 550 pounds.

1. Disconnect all air lines, including any connected to Gradutrol Relay or positive positioner, if present.
2. MP953A and E only: Remove Relay/positioner from Actuator cover by turning counterclockwise.
3. Remove exposed feedback spring.
4. See WARNING in this section. Loosen cover setscrews sequentially 1-1/2 turns each.
5. Check whether cover can be squeezed back to frame by hand. If so, continue sequentially loosening screws until cover is free. Remove cover, diaphragm, and go to REPLACE DIAPHRAGM.
6. If cover cannot be squeezed back to frame, use the following guides according to Actuator size.

NOTES:

- a. Bolts should be threaded to within approximately 1/2 in. of their heads.
- b. In each case, turn the long bolt in until its head contacts the cover flange.
 - 8-in. Actuator: Remove two cover screws that are directly opposite each other. Replace cover screws with 1/4-20 x 3 in. bolts.

- 13-in. Actuator: Sequentially remove and replace every second cover screw with a 5/16-18 x 3 in. bolt.
- 7. Continue sequentially loosening all bolts/screws until all original (short) bolts/screws are disengaged.
- 8. Continue to loosen remaining long bolts alternately until no more spring load exists. Remove bolts, cover, and diaphragm.

REPLACE DIAPHRAGM

1. Fit new diaphragm over Actuator cup. Position cover over diaphragm.
2. Reinstall Actuator cover following procedure in REMOVE ACTUATOR COVER in reverse order.
NOTE: In some cases, cup and diaphragm will be forced above top of frame. As cover is tightened, check that diaphragm bead is properly positioned in its retention groove.
3. MP953A and E only: Cement positioner feedback spring cup to new diaphragm. Cup must be centered in hole of Actuator cover.
4. Reassemble feedback spring and Relay/positioner. Make certain that each end of spring is located in a spring cup (one end on diaphragm and the other end in Relay/positioner) before screwing Relay/positioner back into position.
5. Reinstall air lines and restore system to service.

MP953B, D, F REVERSE-ACTING ACTUATORS

Reverse-acting Actuators are not subject to high internal spring loads. Therefore, the Actuator cover can be removed routinely.

Replace diaphragm and sleeve (inner seal) together. Use SERVICELINE Kit 14003124-002 for all Actuators. Parts are rated at 250F (121C).

When using the following procedure, see Figures 9 and 11 for exploded diagrams and Tables 7 and 9 for parts.

1. Disconnect all air lines, including any connected to Gradutrol Relay or positive positioner, if present.
2. Remove cover screws, cover (on MP953B and F, Relay/positioner remains attached to cover), feedback spring (MP953B, F), large nut, lockwasher, cup, and diaphragm.
3. Remove small sleeve cup, screws, ring, and sleeve diaphragm.
4. Install new sleeve diaphragm, checking for proper seating in its locating groove.

5. Reinstall small sleeve cup, ring, and screws.
6. Install new main diaphragm, checking that it is properly located.
7. Reinstall cup, lockwasher, and nut. Tighten nut enough to seal diaphragm against cup.
8. Reinstall feedback spring. Check that spring is securely seated in grooves on lever and cup support.
9. Reinstall cover and cover screws.
10. Reinstall air lines and restore system to service.

REPLACE ACTUATOR BASE

MP953A, C, E DIRECT-ACTING ACTUATORS

When using the following procedure, see Figures 8 and 10 for exploded diagrams and Tables 6 and 8 for parts.



WARNING

Use extreme caution when disassembling Actuators. Actuator assemblies are under spring load which can reach 550 pounds.

1. To eliminate internal forces in Actuator assembly and remove Actuator cover, refer to REMOVE ACTUATOR COVER under MP953A, C, E DIRECT-ACTING ACTUATORS in REPLACE MAIN DIAPHRAGM section.
2. Remove Actuator cup, spring, retainer, plate, mainspring, and ring (5-in. models only).
3. Remove fasteners securing base to frame.
4. Install new base assembly and reinstall fasteners.
5. Reassemble Actuator assembly by following procedure in Steps 1 and 2 in reverse order.
6. Reinstall air lines and restore system to service.

MP953B, D, F REVERSE-ACTING ACTUATORS

When using the following procedure, see Figures 9 and 11 for exploded diagrams and Tables 7 and 9 for parts.



WARNING

To safely disassemble and reassemble reverse-acting Actuators with 8 psi start point, a mechanical advantage is required due to the high compression of the main spring (200 pounds). For safety, use a large bench vise or C-clamp and two blocks of wood.

1. To release support assembly from Actuator cup, refer to Steps 1 through 3 in MP953B, D, F REVERSE-ACTING ACTUATORS under REPLACE MAIN DIAPHRAGM.

2. See WARNING in this section. Sequentially loosen fasteners securing base to frame. *Base pops up from frame when fasteners disengage.*
3. When tension is relieved, remove fasteners and base.
4. Install new base assembly.
5. Reinstall fasteners.
6. Reassemble Actuator assembly by following procedure in Steps 1 and 2 in reverse order.
7. Reinstall air lines and restore system to service.

REPLACE ACTUATOR MAIN SPRING

MP953A, C, E DIRECT-ACTING ACTUATORS

Remove the main spring on direct-acting Actuators safely by following the procedure in REMOVE ACTUATOR COVER under MP953A, C, E DIRECT-ACTING ACTUATORS in REPLACE MAIN DIAPHRAGM section. This procedure relieves all internal spring force and makes the spring fully accessible.

See PARTS for the proper replacement spring.

MP953B, D, F REVERSE-ACTING ACTUATORS

Remove the main spring on reverse-acting Actuators safely by following the procedure in MP953B, D, F DIRECT-ACTING ACTUATORS in REPLACE MAIN DIAPHRAGM section. This procedure relieves all internal spring force and makes the spring fully accessible.

See PARTS for the proper replacement spring.

REPLACE GRADUTROL RELAY/ POSITIVE POSITIONER

MP953A, E DIRECT-ACTING ACTUATORS

When using the following procedure, see Figure 8 for an exploded diagram and Table 6 for parts.

CAUTION

To prevent damage to the MP953E, wrench force must only be applied to the protruding bottom plate edges on the positive positioner.

1. Disconnect all air lines.
2. Unscrew Relay/positioner counterclockwise from Actuator cover and remove.

NOTE: Considerable force may be required before the positioner begins to turn because of the large O-ring that seals the Relay/positioner to the Actuator cover.

3. Remove feedback spring. Retain old spring for MP953A.
4. Install original feedback spring in diaphragm cup when Relay/positioner is being replaced with an identical device.
5. When replacing Gradutrol Relay with a new-style positive positioner, discard original spring and install feedback spring with proper range from appropriate retrofit kit. For part number, see POSITIONER RETROFIT AND SPRING KITS in PARTS AND ACCESSORIES.
6. Position new O-ring in groove of Relay/positioner base and install new Relay/positioner in Actuator cover.

NOTE: Compress feedback spring as the Relay/positioner is screwed in place. Check that both ends of the feedback spring are located in the spring cups, one in the Relay/positioner and one cemented to the Actuator diaphragm.
7. Tighten Relay/positioner only enough to seat large O-ring.

CAUTION

Do not stroke MP953A or E unless installed on valve to prevent overstroke. Feedback spring may fall out of position and damage Actuator diaphragm and feedback spring when unit is destroyed.

8. Reinstall air lines and restore system to service.
9. Adjust range (MP953A only) and/or start point. See MAINTENANCE.

MP953B, F REVERSE-ACTING ACTUATORS

When using the following procedure, see Figure 9 for an exploded diagram and Table 7 for parts.

1. Disconnect all air lines, including short tube from Relay/positioner to side of Actuator cover.
2. Remove three screws that locate the Relay/positioner bracket assembly on the Actuator cover.
3. Remove bracket assembly. Retain original bias and feedback springs when Relay/positioner is being replaced with an identical device.
4. When replacing Gradutrol Relay assembly with new-style positive positioner assembly, discard original bias and feedback springs and install springs with proper range from appropriate retrofit kit. For part number, see POSITIONER RETROFIT AND SPRING KITS in PARTS AND ACCESSORIES.

5. Check that ends of bias and feedback springs are properly located. Install new Relay/positioner bracket assembly on Actuator cover.
6. Replace short tube from Relay/positioner branch port to fitting on side of Actuator cover.
7. Reinstall remaining air lines and return system to service.
8. Adjust range (MP953B only) and/or start point. See MAINTENANCE.

REPLACE GRADUTROL RELAY/ POSITIVE POSITIONER FEEDBACK SPRING

See appropriate part of REPLACE GRADUTROL RELAY/POSITIVE POSITIONER for correct feedback spring replacement procedures.

REPLACE GRADUTROL RELAY/ POSITIVE POSITIONER FILTER

MP953A, B WITH GRADUTROL RELAY

When using the following procedure, see Figures 5, 8, and 9 for exploded diagrams and Tables 6 and 7 for parts.

1. Remove tubing.
2. Remove Gradutrol Relay air fittings.
3. Remove filters from Relay ports with pointed tool such as an awl.
4. Install foam filters, taking care not to fold filters or bunch them together.
5. Reinstall fittings and tubing. Restore system to service.

MP953E, F WITH POSITIVE POSITIONER

When using the following procedure, see Figures 8 and 9 for exploded diagrams and Tables 6 and 7 for parts.

1. Remove tubing.
2. To remove positioner from Actuator cover, follow appropriate procedures under REPLACE GRADUTROL RELAY/POSITIVE POSITIONER.
3. Remove service plate (Fig. 12 through 14) from positioner.
4. Replace filter assembly with Filter Assembly 14001865-001.

5. Replace service plate and reinstall positioner.
6. Reconnect tubing and restore system to service.

INSTALL STEM ANTISPIN FEATURE (MP953A, C, E)

GENERAL

A valve stem will not spin when it is locked to the Actuator. The antispin feature is built into 13-inch MP953A, C, and E and can be added to the 5- and 8-inch MP953A, C, and E. Adding the antispin feature involves modifying the latching mechanism in the Actuator then replacing the stem button on top of the valve.

When using the following procedures, see Figures 8 and 10 for exploded diagrams and Tables 6 and 8 for parts.

MODIFY ACTUATOR

1. Disconnect air lines.
2. Loosen two Actuator base/valve bonnet setscrews and release stem button latch located on underside of Actuator cup.
3. Remove Actuator from valve.
4. On Relay/positioner equipped Actuators (MP953A and E), refer to appropriate procedures under REPLACE GRADUTROL RELAY/POSITIVE POSITIONER. Remove feedback spring.
5. Remove Actuator cover, diaphragm, cup, spring, retainer, and plate. Refer to appropriate procedures under REPLACE MAIN DIAPHRAGM for disassembly.
6. Replace plate with Antispin Plate 311975A.
7. Reassemble retainer, spring, cup, diaphragm, cover, and positioner.

REPLACE VALVE STEM BUTTON

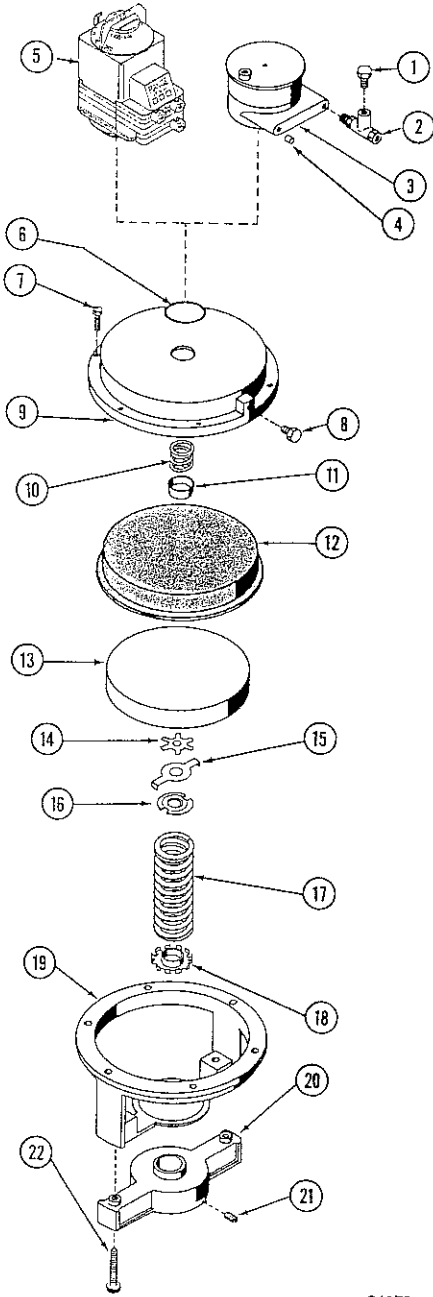
Use the following procedure to replace the stem button on 1/2- to 3-inch V5011 Valves and 1/2- to 2-inch V5013A Valves. The procedure requires Stem Button 312495.

1. Remove existing stem button.
2. Replace old button with new button, checking that the new button is installed at the same height as the old button.
3. Reinstall Actuator on valve.
4. Reconnect air lines and restore system to service.

PARTS AND ACCESSORIES

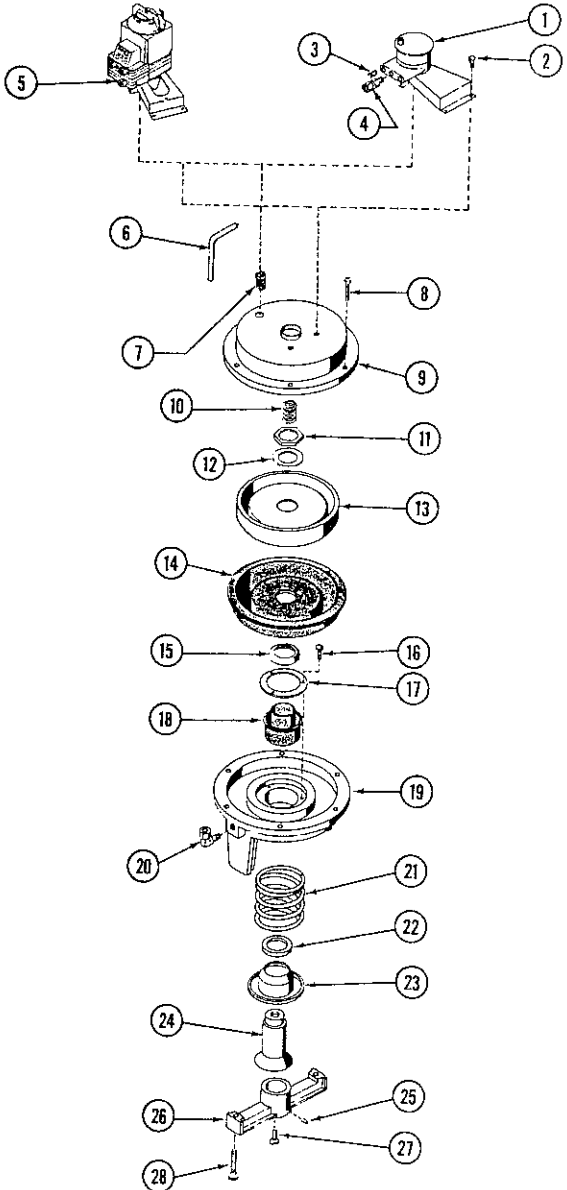
PARTS

Figures 8 through 11 show exploded diagrams of MO953A-D and MP953A-F Actuators. Tables 6 through 11 list parts shown in the figures.



24076

Fig. 8. MO/MP953A and MP953E Exploded View.



24077

Fig. 9. MO/MP953B and MP953F Exploded View.

Table 6. MO/MP953A and MP953E Parts.

Key No.	Part Number	Description
1	Obtain locally	Plug, 1/8 NPT, 8- and 13-in. models only
2	Obtain locally	Tee, 1/8 NPT, 8- and 13-in. models only
3	Retrofit Kit 14004139, 14004140, or 14004214	Universal Relay Assembly from kit
4	316579	Filter (2)
5	14004139-001	Positive positioner for MP953E, includes filter 14001865-001
6	312602	O-ring
7	Obtain locally	Fillister-head screw, 6-32 x 1/2 in. for 5-in. MO953A
	Obtain locally	Fillister-head screw, 8-32 x 1/2 in. for 5-in. MP953A (4)
	Obtain locally	Fillister-head screw, 1/4-20 x 3/4 in. for 8-in. models (6)
	Obtain locally	Fillister-head screw, 5/16-18 x 7/8 in. for 13-in. models (8)
8	Obtain locally	Plug, 1/8 NPT, for 8- and 13-in. models
9	312821	Cover for 5-in. models
	312579	Cover for 8-in. models
	312580	Cover for 13-in. models
10	313815-00064	Feedback spring for 1/2-in. stroke MP953A (see NOTE 2)
	313814-00065	Feedback spring for 1-1/2-in. stroke MP953A (see NOTE 2)
	313696-00063	Feedback spring for 3/4-in. stroke MP953A (see NOTE 2)
11	315178-00062	Cup
12	310673	Main diaphragm for old 5-in. models A1, A5, A9; 160F (71C), neoprene black
	312760	Main diaphragm for 5-in. models neoprene black
	310668	Main diaphragm for old 5-in. models A2 and A6; 250F (121C), silicone white
	313745	Main diaphragm for 5-in. models (121C), silicone white
	311750	Main diaphragm for 8-in. models, 160F (71C), neoprene black
	314153	Main diaphragm for 8-in. models, 250F (121C), silicone white
	312505	Main diaphragm for 13-in. models, 160F (71C), neoprene black
13	309284-00021	Cup for 5-in. models
	311749-00605	Cup for 8-in. models
	315020	Cup for 13-in. models
14	310664	Spring for 5- and 8-in. models
15	310502-00767	Retainer for 5-in. models
	311863	Retainer for 8-in. MP953A and E, 3/4-in. stroke
	314667-00605	Retainer for 8-in. MP953A and E, 1-1/2-in. stroke
	314683-00062	Retainer for 13-in. MP953A and E, 3/4- and 1-1/2-in. stroke
16	310501	Plate for 5- and 8-in. models, 3/4-in. stroke
	311975A	Plate for 8-in. models, 1-1/2-in. stroke, with antispin
	314646A-00062	Plate for 13-in. models
17	311393-00123	Mainspring for 5-in. models, 3/4-in. stroke
	311854-00123	Mainspring for 8-in. models, 3/4-in. stroke
	313477-00123	Mainspring for 8-in. models, 1-1/2-in. stroke
	14004700-001	Mainspring for 13-in. models, 3/4-in. stroke
	312471	Mainspring for 13-in. models, 1-1/2-in. stroke
18	310655	Ring for 5-in. model
19	14004613-001	Frame for 5-in. models, includes screws
	14004611-001	Frame for 8-in. models, includes screws
	312101	Frame for 13-in. models
20	14004577-001	Base for 5-in. models, includes screws
	311744	Base for 8-in. models
	14004698-001	Base for 13-in. models, 3/4-in. stroke
	312099	Base for 13-in. models, 1-1/2-in. stroke
21	14004298-005	Replace with 1/4-20 x 5/8 in. cap-head machine screw (2) for 5-in. models
	14003034-261	Replace with 5/16-18 x 1-1/4 in. cap-head machine screw (2) for 8-in. models
	14003034-264	Replace with 5/16-18 x 1-3/4 in. cap-head machine screw (2) for 13-in. models, 3/4-in. stroke
	14003034-313	Replace with 3/8-16 x 1-1/2 in. cap-head machine screw (2) for 13-in. models, 1-1/2-in. stroke
22	14004383-418	Base screw (2), 1/4-20 x 3/4 in. for 5-in. models
	14004383-562	Base screw (2), 1/2-13 x 1-1/2 in. for 8-in. models
	304621-00605	Base screw (2), 1/2-13 x 2 in. for 13-in. models

NOTES:

- For metric conversion: Model sizes— 5 in. (127 mm) 8 Stroke—1/2 in. (13 in. (203 mm) 13 mm) 3/4 in. (19 in. (330 mm) 1-1/2 in. (38 mm) 1-1/2 in. (38 mm)

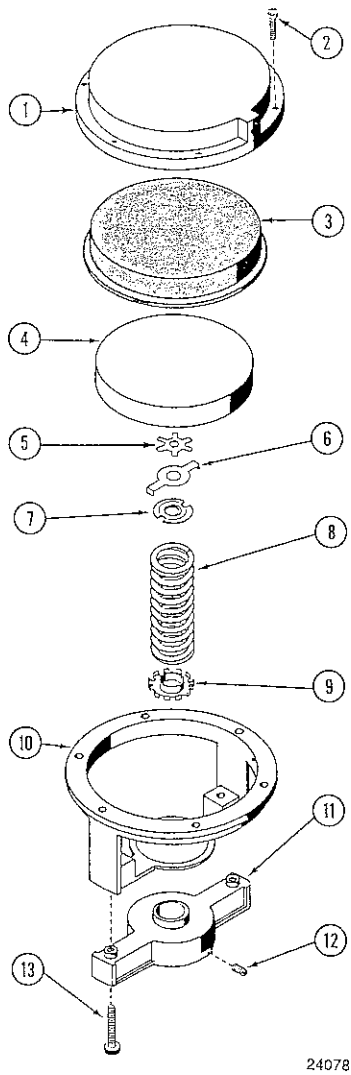
- For MP953E feedback spring, see Table 13.

Table 7. MO/MP953B and MP953F Parts.

Key No.	Part Number	Description
1	—	Gradutrol Relay assembly for MP953B, use 14004138-001 Positive Positioning Retrofit Kit.
2	Obtain locally	Hex-head screw (2), 10-24 x 5/16 in.
3	316579	Filters (3)
4	Obtain locally	Tubing connector, 1/8 NPT, for MP953B
5	14004080-001	Positive positioner and bracket assembly for MP953F, includes filter 14001865-001
6	Obtain locally	Copper or plastic tubing, 1/4 in.
7	314420-01508	Bias spring for Gradutrol Relay
	14004015-001	Bias spring for positive positioner
8	Obtain locally	Hex-head screw (6), 10-24 x 3/4 in.
9	14004665-001	Cover (casting stamped 14004660-001)
10	313918-00064	Feedback spring for 1/2-in. stroke MP953B (see NOTE 1)
	313919-00063	Feedback spring for all other MP953Bs (see NOTE 1)
11	312205	Nut
12	304733	Lockwasher
13	312199	Cup
14	14002040-002	Diaphragm for all temperature ranges (see NOTE 2)
15	312201	Cup
16	14004298-001	Round-head screw (3) 4-40 x 3/8 in., 3/16-in. hex head with Torx recess
17	312180	Ring
18	14002039-001	Sleeve (seal), 200F (93C), ethylene polypropylene, black with white dot (see NOTE 2)
19	14004612-001	Frame
20	Obtain locally	Tubing ell for 1/4-in. copper or plastic tubing, 1/8-in. NPT
21	312792-00115	Mainspring for 1/2-in. stroke models
	312203-00017	Mainspring for 3/4-in. stroke models
22	312794-00062	Washer for 1/2-in. stroke models
	314524	Washer for 3/4-in. stroke models
23	312200-00767	Cup
24	31465A	Support Assembly with helicoil insert for Series 2 model only. Convert MO/MP953B Series 1 to Series 2 with this Support Assembly and 316059A Yoke Assembly.
25	Obtain locally	Replace with 1/4-20 x 5/8 in. cap-head machine screw
26	14004578-001	Base, includes set screw
27	316059A	Yoke assembly for Support Assembly with helicoil insert (see detail in Fig. 7)
	31465A	Yoke assembly for Support Assembly with nylon insert (see detail in Fig. 7)
28	14004298-001	Base screw (2) 1/4-20 x 1-3/4 in.

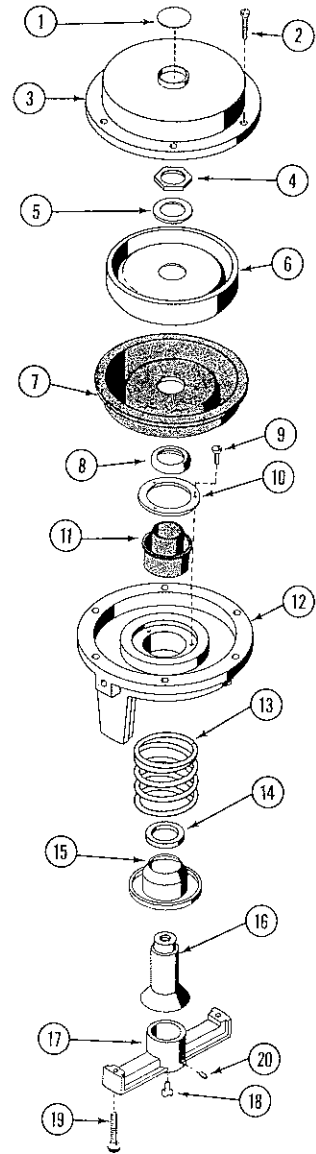
NOTES:

1. For MP953F feedback spring, see Table 13.
2. Diaphragm and Sleeve (Seal) available in Kit 14003124-002.



24078

Fig. 10. MO/MP953C Exploded View.



24079

Fig. 11. MO/MP953D Exploded View.

Table 8. MO/MP953C Parts.

Key No.	Part Number	Description	
1	312817	Cover for 5-in. Series 2 model	
	311748	Cover for 8-in. model	
	312103	Cover for 13-in. model	
2	Obtain locally	Fillister-head screw, 6-32 x 1/2 in. for early models (8)	
	Obtain locally	Fillister-head screw, 8-32 x 1/2 in. for 5-in. model (4)	
	Obtain locally	Fillister-head screw, 1/4-20 x 3/4 in. for 8-in. model (6)	
	Obtain locally	Fillister-head screw, 5/16-18 x 7/8 in. for 13-in. model (4)	
3	310673	Main diaphragm for old 5-in. models A1, A5, A9; 160F (71C), neoprene black	
	312760	Main diaphragm for 5-in. models neoprene black	
	310668	Main diaphragm for old 5-in. models A2 and A6; 250F (121C), silicone white	
	313745	Main diaphragm for 5-in. models, (121C), silicone white	
	311750	Main diaphragm for 8-in. models, 160F (71C), neoprene black	
	314153	Main diaphragm for 8-in. models, 250F (121C), silicone white	
4	312505	Main diaphragm for 13-in. models, 160F (71C), neoprene black	
	309284-00021	Cup for 5-in. model	
	311749-00605	Cup for 8-in. model	
5	315020-00124	Cup for 13-in. model	
	310664	Spring for 5- and 8-in. models only	
	6	310502-00767	Retainer for 5-in. model
		311863	Retainer for 8-in. model, 3/4-in. stroke
314667-00605		Retainer for 8-in. model, 1-1/2-in. stroke	
314683-00062		Retainer for 13-in. model	
7	310501-00021	Plate for 5- and 8-in. models, 3/4-in. stroke	
	311975A	Plate for 8-in. model, 1-1/2-in. stroke, with antispin	
	314646-00062	Plate for 13-in. model	
8	See Table 10	Mainspring	
9	310665-00062	Ring for 5-in. model	
10	14004613-001	Frame for 5-in. model, includes screws	
	14004611-001	Frame for 8-in. model, includes screws	
	312101	Frame for 13-in. model	
11	14004577-001	Base for 5-in. model, includes screws	
	311744	Base for 8-in. model	
	14004698-001	Base for 13-in. model, 3/4-in. stroke	
	312099	Base for 13-in. model, 1-1/2-in. stroke	
12	Obtain locally	Replace with 1/4-20 x 5/8 in. cap-head machine screw (2) for 5-in. model	
	Obtain locally	Replace with 5/16-18 x 1-1/4 in. cap-head machine screw (2) for 8-in. model	
	Obtain locally	Replace with 5/16-18 x 1-3/4 in. cap-head machine screw (2) for 13-in. model, 3/4-in. stroke	
	Obtain locally	Replace with 3/8-16 x 1-1/2 in. cap-head machine screw (2) for 13-in. model, 1-1/2-in. stroke	
13	14004298-003	Base screw (2), 1/4-20 x 3/4 in. for 5-in. model	
	14004383-562	Base screw (2), 1/2-13 x 1-1/2 in. for 8-in. model	
	304621-00605	Base screw (2), 1/2-13 x 2 in. for 13-in. model	

NOTE: For metric conversion: Model sizes— 5 in. (127 mm)

8 in. (203 mm)

13 in. (330 mm)

Stroke—1/2 in. (13 mm)

3/4 in. (19 mm)

1-1/2 in. (38 mm)

Table 9. MO/MP953D Parts.

Key No.	Part Number	Description
1	313541-0060	Button
2	Obtain locally	Hex-head screw with lockwasher (6), 10-24 x 3/4 in.
3	14004660-001	Cover
4	312205	Nut
5	304733-00021	Lockwasher
6	312199	Cup
7	14002040-002	Diaphragm for all temperature ranges (see NOTE 1)
8	312201	Cup
9	Obtain locally	Round-head screw (3), 4-40 x 3/8 in.
10	312180	Ring
11	14002039-001	Sleeve, 200F (93C), ethylene polypropylene, black with white dot (see NOTE 1)
12	14004612-001	Frame
13	See Table 11	Mainspring
14	312794-00062	Washer for 1/2-in. stroke model
	314524	Washer for 3/4-in. stroke model
15	312200-00767	Cup
16	314650A	Support Assembly with helicoil insert for Series 2 models only. Convert MO/MP953D Series 1 to Series 2 with this Support Assembly and 316059A Yoke Assembly.
17	14004578-001	Base, includes set screw
18	316059A	Yoke Assembly for Support Assembly with helicoil insert (see detail in Fig. 7)
	314651A	Yoke Assembly for Support Assembly with nylon insert (see detail in Fig. 7)
19	14004298-003	Socket-cap base screw (2), 1/4-20 x 1-3/4 in.
20	Obtain locally	Replace with 1/4-20 x 5/8 in. cap-head machine screw

NOTE 1. Diaphragm and Sleeve (Seal) available in Kit 14003124-002.

Table 10. MP953C Mainsprings.

Actuator Diameter In. (mm)	Stroke In. (mm)	Color	Pressure Range psi (kPa)	Part Number
5 (127)	1/2 (13)	Brown	2-7 (14-48)	---
		Gray	8-12 (55-83)	---
		White	4-11 (28-76)	---
	3/4 (19)	Brown	2-7 (14-48)	311616-00033
		Gray	8-12 (55-83)	311618-00034
		White	4-11 (28-76)	311393-00123*
8 (203)	3/4 (19)	Brown	2-7 (14-48)	311852-00033
		Gray	8-12 (55-83)	311855-00034
		White	4-11 (28-76)	311854-00123*
	1-1/2 (38)	White	4-11 (28-76)	313477-00123*
		Green	3-15 (21-103)	14002934-001
13 (330)	3/4 (19)	Brown	2-7 (14-48)	14004699-001
		Plated	4-11 (28-76)	14004700-001*
	1-1/2 (38)	Brn/Wht	2-7 (14-48)	312469
		White	4-11 (28-76)	312471*

*Used on MP953A and E models.

Table 11. MP953D Mainsprings.

Stroke Inches (mm)	Color	Pressure Range psi (kPa)	Part Number
1/2 (13)	White	4-11 (28-76)	314314-00123
	Black	8-13 (55-90)	312792-00017
3/4 (19)	White	4-11 (28-76)	314313-00123
	Black	8-13 (55-90)	312203-00017*
	Silver	3-7 (21-48)	314963-00605

* Used on MP953B and F models.

Tbl 11

POSITIONER RETROFIT AND SPRING KITS

Table 12. MP953 Positive Positioner Retrofit Kits.

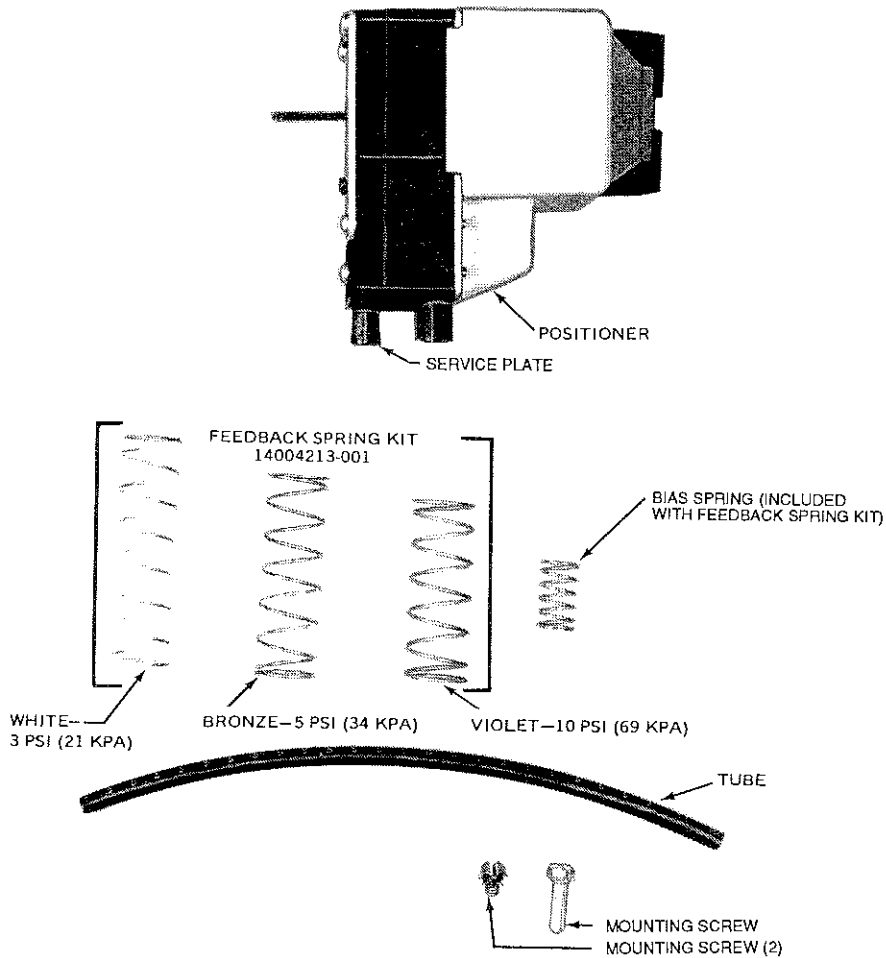
Part No.	Description*
14004138-001	For RA valve actuators (Fig 12)
14004139-001	For 8- and 13-in. (203- and 330-mm), 3/4-in. (19-mm) stroke valve actuators (Fig. 13)
14004140-001	For 8- and 13-in. (203- and 330-mm), 1-1/2 in. (38-mm) stroke valve actuators (Fig. 14)
14004214-001	For 5-in. (127-mm), 3/4-in. (19-mm) stroke valve actuators (Fig. 13). (Positioner has cream-colored lower plate.)

* Includes corresponding feedback spring kit listed in Table 13.

Table 13. MP953 Feedback Spring Kits.

Part No.	Description*
14004211-001	For 3/4-in. (19-mm) stroke DA valves
14004212-001	For 1-1/2-in. (38-mm) stroke DA valves
14004213-001	For RA valve actuators (includes bias spring)

* All kits include springs with 3-, 5-, and 10-psi (21-, 34-, and 69-kPa) range.



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Fig. 12. Positive Positioner Retrofit Kit 14004138-001.

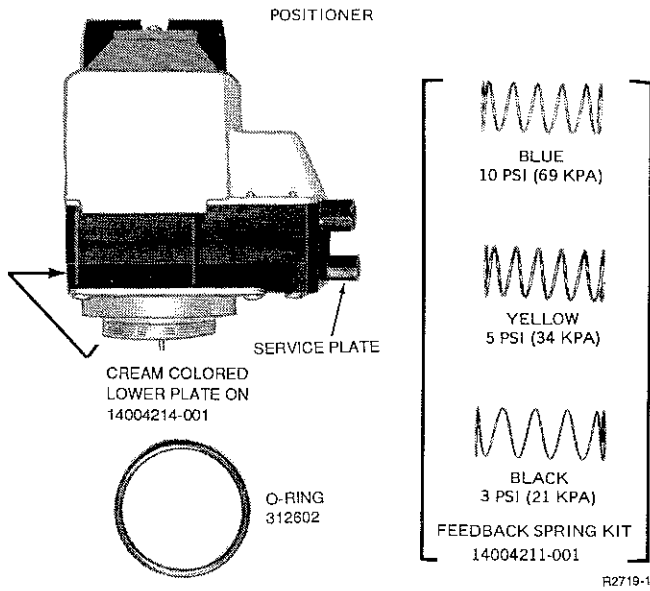


Fig. 13. Positive Positioner Retrofit Kits 14004139-001 and 14004214-001 (3/4 in. stroke).

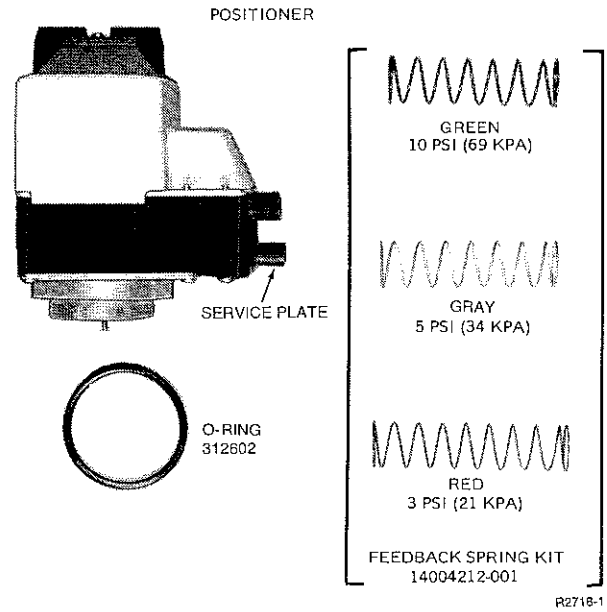


Fig. 14. Positive Positioner Retrofit Kit 14004140-001 (1-1/2 in. stroke).

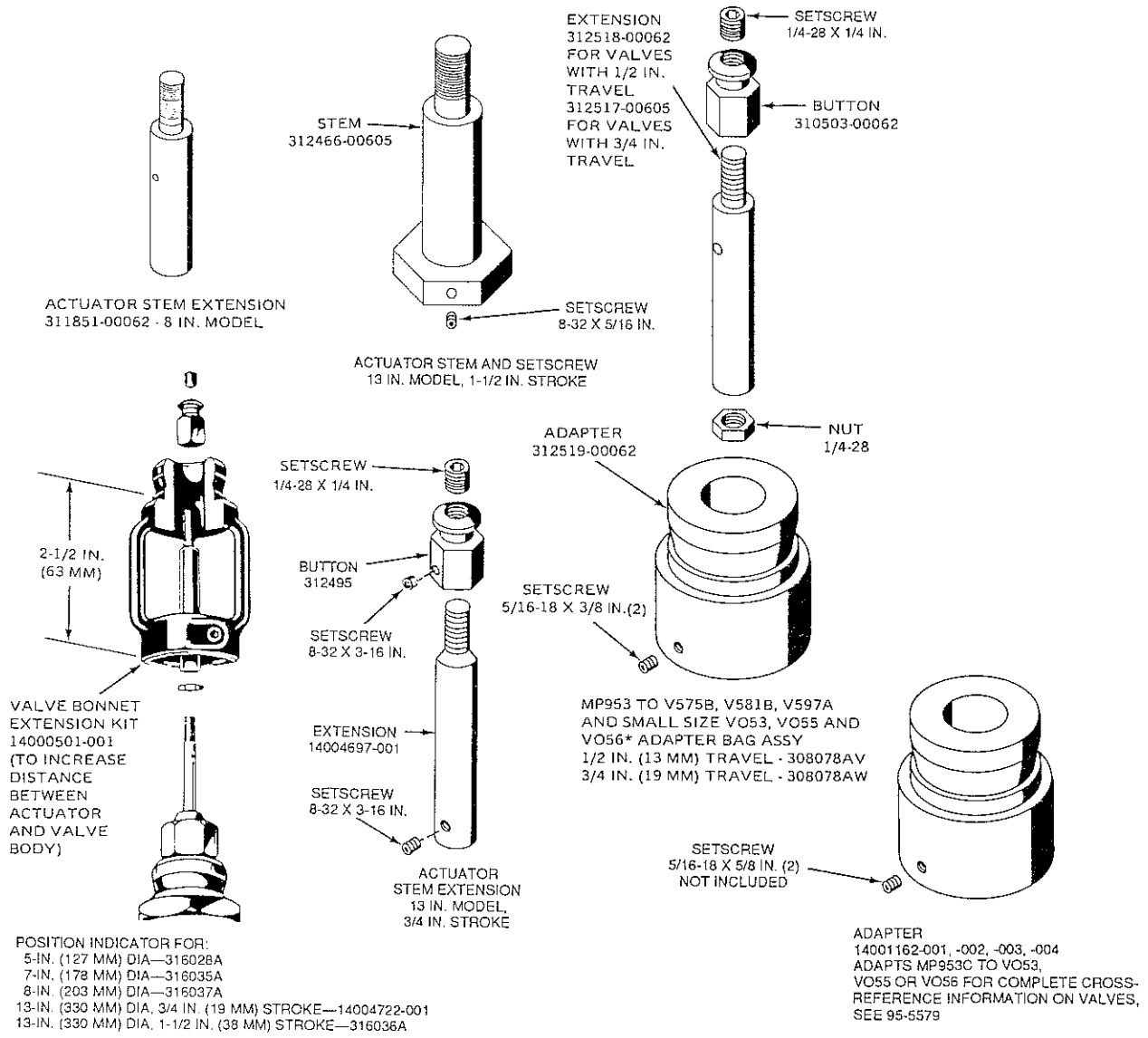


Fig. 15. MP953 Accessories.

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