

Removing the Actuator for Valve Repair

!!!CAUTION! Safety Precautions!!!

AUTOMATED VALVES

Disconnect all electrical sources and supply air pressure sources from automated valves.

NEVER open or in any way tamper with an electric actuator, solenoid or any other electrically operated field device before checking and understanding the area rating. Terms like: NEMA-7, Hazardous Area Rating, Class and Division Statements all indicate that the area is specially classified and is potentially hazardous and that THE IGNITION OF HAZARDOUS ATMOSPHERE IS POSSIBLE.

DO NOT perform maintenance on any automated valve assembly that utilizes a Spring Return actuator before determining that the supply air pressure has been completely exhausted. Spring Return actuators utilize the powerful mechanical force of the springs to operate the valve upon loss of air.

Tools

No special tools are required for maintenance of SVF Flow Controls, Inc. actuators. **NOTE: Actuator nuts and bolting may be Metric or Imperial. Always check this manual for fastener information.**

Before removing the actuator use this form to record information about the automated package:

TAG# _____

ACTUATOR MODEL: _____

SPRING RETURN OR DOUBLE ACTING: _____

IF SPRING RETURN, IS THE PACKAGE SETUP SO THAT THE VALVE FAILS CLOSED OR OPEN? _____

DOES THE PACKAGE HAVE ANY CONTROL ACCESSORIES?

LIMIT SWITCH? _____ **PILOT VALVE?** _____

POSITIONER? _____ **OTHER?** _____

OTHER INFORMATION/NOTES: _____

Removing the Actuator for Valve Repair

IMPORTANT! READ THIS BEFORE PROCEEDING!

Before proceeding with the removal of an actuator from a valve it is important to know the “Fail Position” of the package.

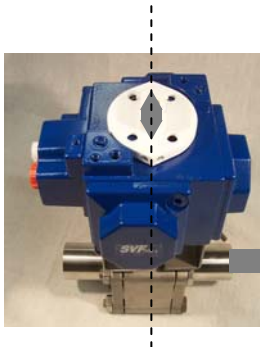
When a valve is fitted with a spring return actuator, the actuator is mounted to the valve in the “Fail” position. The “Fail” position is that condition of the actuator that it “Springs to” when there is no air pressure applied to it.

Always note the failure position of the valve before removing the actuator. For instance, with no air pressure applied to the actuator, note the position of the valve (OPEN or CLOSED). Make a notation of this condition by marking the valve or by noting the process tag number of the assembly.

This will be important when reassembling the package after maintenance is completed.

In general, a ball valves is **OPEN** when the actuator indicator (top of actuator) is positioned **PARALLEL** to the direction of the process line.

Conversely, the valve is **CLOSED** when the actuator indicator (top of actuator) is positioned **PERPENDICULAR** to the direction of the process line. (See below)



For **automated valves** the Top Mounted indicator rotates with the actuator drive shaft.

In these examples the position of the indicator is **PERPENDICULAR** to the line of flow.

Therefore they are indicating that the valves are in the **CLOSED** position.



Removing the Actuator for Valve Repair (Tools)

The following table provides the tapped hole dimensions for various brands of actuators offered by SVF. Actuators are fitted to valves using hex cap bolts.

ACTUATOR MOUNTING BOLT DIMENSIONS					
ACTUATOR MODEL	TAPPED HOLES		ACTUATOR MODEL	TAPPED HOLES	
COMPACT4 NAMUR	UNC	QTY	AERO SERIES	UNC	QTY
H20	10-24	4	A11	10-32	4
H25	1/4-20	4	A14	1/4-20	4
H30	5/16-18	4	A16	1/4-20	4
H35	3/8-16	4	A19	5/16-18	4
H45	1/2-13	4	A21	5/16-18	4
H60	5/8-11	4	A26	5/16-18	4
H75	5/8-11	4	A31	5/16-18	4
COMPACT4 NON-NAMUR			A36	5/16-18	4
H15	10-24	4	A41	5/16-18	4
H20	10-24	4	A46	5/16-18	4
H25	1/4-20	4	A56	1/2-13	4
H30	5/16-18	4			
H35	3/8-16	4			
H45	1/2-13	4			
H60	5/8-11	4			
H75	5/8-11	4			

Valve Size	SB7-ISO MOUNTING PAD HOLES	
	MTG Tapped Holes	QTY
1/2"	M5-0.8P X 0.23" DP.	4
3/4"	M5-0.8P X 0.23" DP.	4
1"	M5-0.8P X 0.23" DP.	4
1-1/2"	M6-1.0P X 0.43" DP.	4
2"	M6-1.0P X 0.48" DP.	4
2-1/2"	M8-1.25P X 0.52" DP.	4
3"	M10-1.5P X 0.60" DP.	4
4"	M10-1.5P X 0.60" DP.	4

Removing the Actuator for Valve Repair

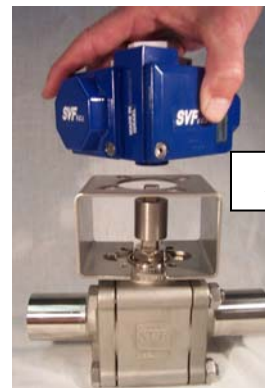
To remove the actuator:

- 1- Using the proper tools, remove the mounting hardware bolts from both the top (Actuator) and bottom (Valve) sides of the mounting bracket.
- 2- Carefully remove the actuator and place it in a clean area. Note the location/orientation of the actuator with respect to the process line or valve. This will assist with aligning the assembly for reconnection to the supply air lines and electrical later.
- 3- Remove the bracket and coupling. Place in an area for easy retrieval.

Mounting Actuator to the Valve

Reassembly of the actuator to the valve is done in the reverse order as above.

Loosely thread all bolts into the assembly. Confirm that the assembly is properly aligned and orientated and then tighten all fasteners securely.





SVF Flow Controls
I N C O R P O R A T E D

**TECHNICAL
INSTRUCTIONS**

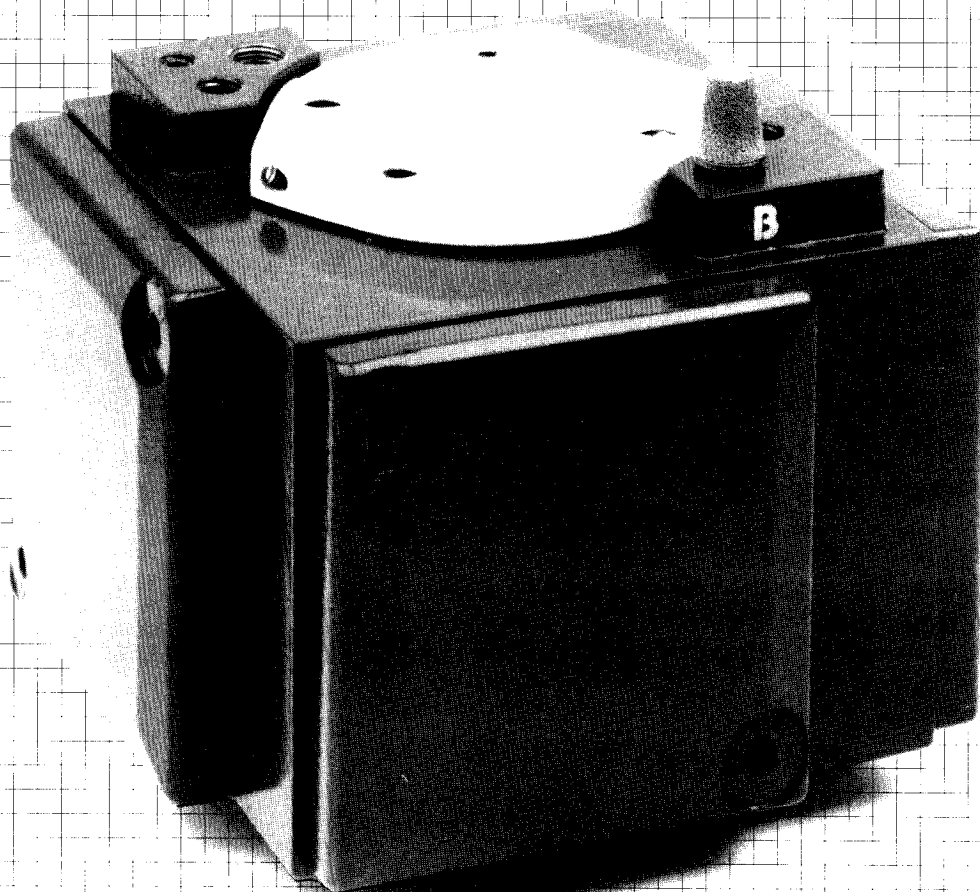
13560 Larwin Circle, Santa Fe Springs, Ca. 90670
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COMPACT 4

INSTALLATION, OPERATION AND MAINTENANCE

COMPACT
Quarter Turn Actuator

The actuator that delivers maximum
torque for minimum air consumption



INTRODUCTION

The COMPACT Pneumatic Actuator is a 4-piston rack and pinion actuator, available in Double Acting (DA) and Spring Return (SR) versions. The unique design of four balanced pistons and center gear enables the actuator to operate without wear on the

bearings, thus ensuring longer life and fewer maintenance problems. However in the event that maintenance is required, we recommend that maintenance personnel read this manual carefully before handling the actuator.

GENERAL INFORMATION

1. Line pressure:
Standard operation pressure 40 -100 psi (3 - 7 bar), but the actuator will operate at any pressure from 20 -120 psi (1.5 - 8 bar). The spring models can produce very small torques at low air pressure, requiring special spring configurations. Always ensure that the correct size of actuator is used for its particular application.

Maximum overload pressure: 150 psi (10 bar).

2. Rotation:
The actuator as delivered is adjusted to 90° rotation. The rotation can be adjusted between 80° and 93° at both ends of the stroke.

3. Operating temperature:
From -4°F (-20°C) to 180°F (82°C). At sub-zero temperatures, the air must be dry and clean. For high or low temperature applications, consult the manufacturer.
4. Operating media:
The recommended operating media for the actuator is unlubricated air. Non-corrosive gas is also acceptable. Filtration is recommended for humid air.

MOUNTING INSTRUCTIONS

The unique square design of the actuator makes it possible to mount it in any required position, Fail Close or Fail Open (FC or FO), without affecting the space requirement of the actuator. The actuator can be placed above, beneath or beside the valve.

It is recommended to mount the actuator so that the position of the valve is shown by indicating the stop on top of the actuator.

A standard sole plate, incorporating 4 holes corresponding to the ISO 5211 and DIN 3337 standards, can be supplied. Sole plates with different mounting hole configurations are available on request.

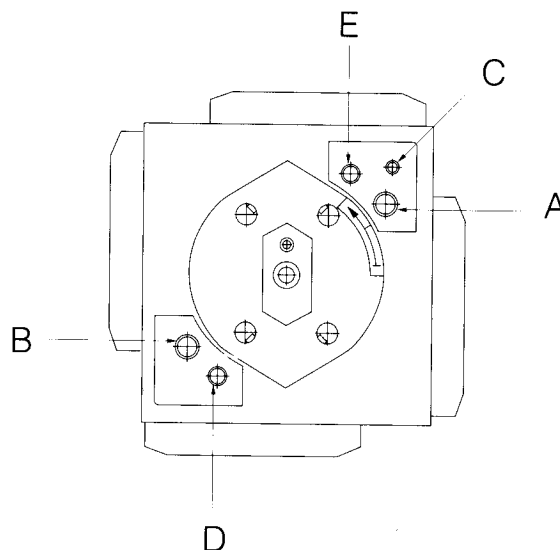
Valve Assembly

1. Rotate the valve to the desired position -FC or FO.
2. Connect the adapter to the actuator and place the valve to check the orientation of the bracket.

3. Attach the bracket to the actuator. Do not tighten the bolts as yet.
4. Lower the actuator bracket assembly on to the valve, making sure the actuator fits completely over the valve stem.
5. Connect the bracket to the valve using the appropriate bolts.
6. Check that the actuator is in the right mode (FC or FO) and tighten all the bolts.
7. Pressurize the actuator. Check that the shaft of the actuator and the stem of the valve are properly aligned, thus eliminating side loads.
8. In the event of misalignment, loosen the bolts and adjust the assembly until a perfect fit has been obtained.

AIR CONNECTION

1. The actuator has 3 upper air ports (A, B and C) and 2 threaded mounting holes (D and E).
2. Double Acting actuators are connected through Ports A and B. Pressurizing A causes a counter-clockwise rotation, while pressurizing B causes a clockwise rotation. Port C is internally connected to Port B and is used for solenoid valves. Port C is usually sealed.
3. Spring Return actuators are connected to Port A and pressurized for counter clockwise rotation. Removal of the air pressure causes a clockwise rotation of the output shaft.



MOUNTING BLOCK

The actuator is designed to accept special mounting blocks that direct the top entry ports to the side, thus allowing other accessories (e.g. limit switches) to be mounted.

The mounting blocks come in 1/8" and 1/4" versions to correspond to the size of the actuator. The mounting blocks are identical in size to solenoid valves and other pneumatic devices, and mount on the actuators in the same manner.

The mounting blocks come in the following sizes:
01 - For actuators 15, 20, 25, 30, with 1/8" NPT thread.
02 - For actuators 35, 45, with 1/4" NPT thread.
60 - For actuators 60, 75 with 1/4" NPT thread.

The mounting block is fixed to the actuator by means of one large screw and a locating pin. The locating pin locates itself in the air port (A or B) on top of the actuator. The large counter-sunk head screw holds the block down (D or E) and leaves a flat surface on top for mounting accessories.

SOLENOID VALVE

The actuator can be supplied with its own direct mounted 4-way or 3-way solenoid valve. Like the mounting block, the solenoid valve comes in 1/8" and 1/4" sizes to fit on the corresponding air port sizes of the actuators.

When a solenoid valve is used, only one additional mounting block is needed to fit the top accessories.

Two versions of solenoid valves are supplied: a 4-way for Double Acting actuator and a 3-way for Spring Return actuator.

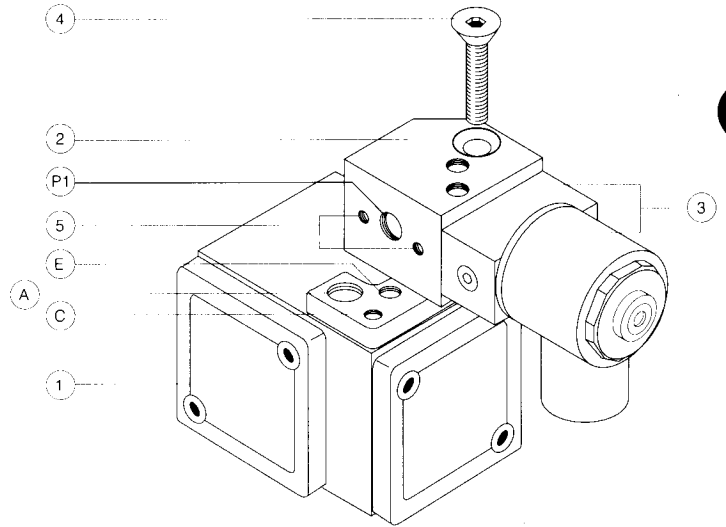
The air supply is connected to the main Port on the solenoid valve.

Note: The 3-way and 4-way solenoid valves use the same pilot valves.

CONNECTING THE SOLENOID VALVE

1. To fit a 4-way valve on the COMPACT DA actuator, plug Port B with an appropriate pipe plug and unplug Port C. Connect the solenoid valve (see drawing) and bolt it down on mounting Hole E. The solenoid valve will center itself on Port A.
2. To fit a 3-way valve on the COMPACT SR actuator, connect as above to Port A, leaving Port C plugged and Port B to breathe atmospheric air.
3. The DA actuator can be supplied with two 3-way valves by connecting one valve to Port A and the other to Port B.

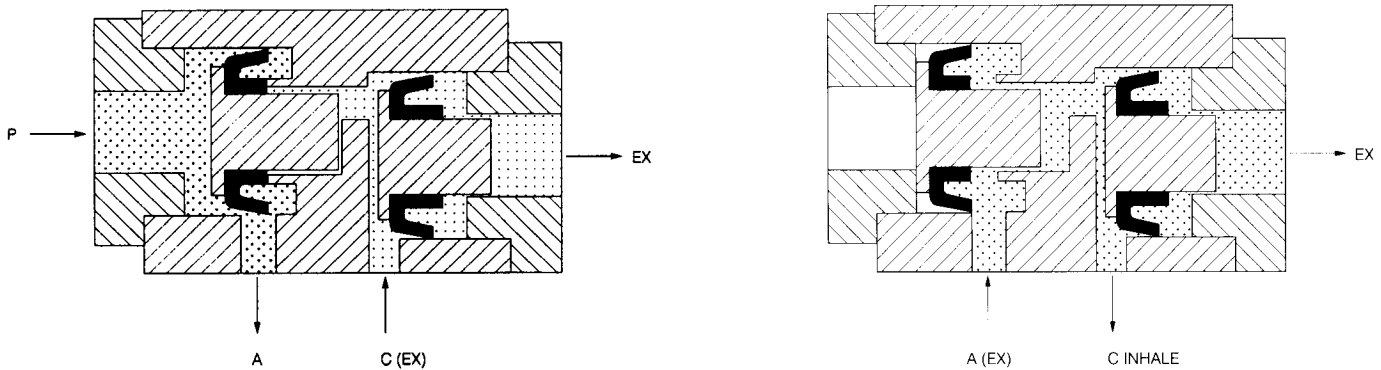
ITEM	QTY	DESCRIPTION
1.	1	Actuator
2.	1	Solenoid Valve Body
3.	1	Solenoid Valve Coil
4.	1	Fixing Screw
5.	2	Exhaust Port
P1.	-	Solenoid Valve Air Entry
A.	-	Actuator Air Port
C.	-	Secondary Air Port for DA Model
E.	-	Actuator Fixing Thread



For additional information refer to Solenoid Valve brochure.

BREATHER BLOCK

The breather block mounted on Ports A and C is a device that diverts the exhaust air from Port A to Port C on SR actuators, thus preventing corrosive atmospheric air from entering the spring chamber. To connect the breather block to the actuator, plug Port B and unplug Port C. Then connect the breather block to the actuator as you would connect a solenoid valve.



Note: When using the 4-way valve or breather block and an additional mounting block, plug the air entry of the mounting block that mounts on Port B.

ELECTRICAL FAILURE

In the event of electrical failure, a solenoid operation COMPACT actuator will turn clockwise.

AIR FAILURE

In the event of air failure, an SR COMPACT actuator will turn clockwise, while a DA COMPACT actuator will remain in its last position.

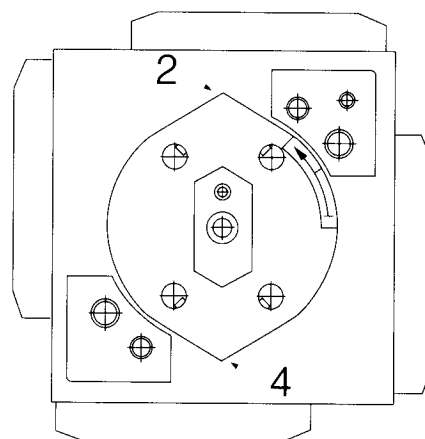
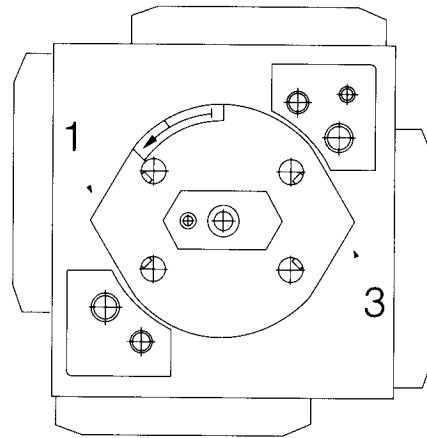
STROKE ADJUSTMENT

The actuator is factory adjusted to provide 90° rotation. The indication stop should be adjusted only if the setting has been disturbed or if a different setting is required.

To adjust the stroke, observe the following:

- a) The stop has 4 adjustment screws, one pair at each end of stroke.
- b) Turn actuator counter-clockwise, pressurizing port A. Loosen screws 1 and 3.
- c) Turn screw 1 to the desired rotation point.
- d) If needed, depressurize Port A for ease of setting.
- e) After setting, pressurize Port A and tighten screw 3 so that it makes the same contact as screw 1.
- f) It is recommended to use thread glue to prevent the loosening of the screws.
- g) Pressurize Port B (or allow spring return rotation) and repeat for screws 2 and 4.

Note: Stroke adjustment can be performed before or after mounting the actuator on the valve.



MANUAL OPERATION

In the event of air failure, the actuator can be cycled manually via the exposed top shaft by using a wrench to turn in the required direction.

Large actuators should be cycled by using a declutchable gear override.

When performing a routine check on an actuator equipped with the solenoid control block, use the integral manual override screw on the solenoid body. Turn the screw 90° and the actuator will cycle. If the air supply is still switched on, the actuator will cycle to its original position when the screw is turned back.

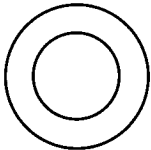
CAUTION! DISCONNECT AIR SUPPLY BEFORE ANY ATTEMPT TO MANUALLY OVERRIDE THE ACTUATOR.

SPRING CONFIGURATION

The SR actuator is supplied with a full load of springs for operation at pressures of 100 psi (7 bar) and above.

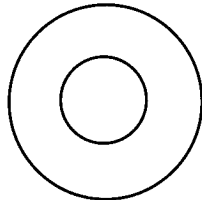
Every end cover contains 2C spring configuration. Different spring configurations are required for lower air pressures. The torque charts list the following spring configurations:

2A



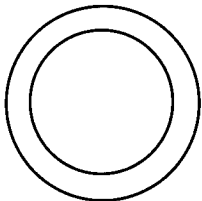
Outer Spring Removed

2B



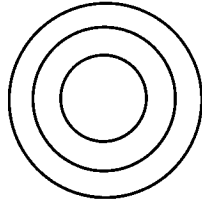
Middle Spring Removed

2C



Inner Spring Removed

3



Full Set

For low air pressures or better flexibility of output, a single spring can be used.

Replacing Springs

When replacing or removing springs, dismantle the end covers by loosening the screws so that each screw advances the other by one full turn. Before the final thread is removed, the end cover should be pushed in slightly to prevent a sudden release of springs. After the springs have been replaced, reassemble the spring cover by gradually tightening each screw. Final tightening should provide good sealing to prevent moisture and dirt from entering the spring chambers.

Note:

1. If one spring needs replacing due to failure, replace all the springs in the actuator, as well as other parts which may have been damaged.
2. An equal number of springs must be used on each opposing piston.

WARNING: NEVER ATTEMPT TO REMOVE SPRING COVERS WHILE PORT "A" IS PRESSURIZED

MAINTENANCE

1. It is recommended that periodic checks be performed to make sure that all fasteners remain tight.
2. The actuator is supplied ready-lubricated, no further lubrication is required. If lubrication is deemed necessary, use EP-1 grease.
3. Under certain working conditions (heavy duty, non-compatible operation media or abnormal operating conditions) internal seals should be checked periodically and replaced when necessary. A repair kit can be supplied for each actuator.
4. On Spring Return actuators, spring fatigue may set in requiring the replacement of springs. Springs should always be replaced in full sets.

CAUTION: BEFORE BEGINNING ANY MAINTENANCE OPERATIONS, MAKE CERTAIN THAT THE ACTUATOR IS PNEUMATICALLY AND ELECTRICALLY DISCONNECTED.

TROUBLESHOOTING

Problem:

Actuator fails to function on a valve.

Action:

1. Check that the valve rotates freely (see MANUAL OPERATION - p.5).
2. Check that the actuator size is correct.
3. Ensure that the correct voltage is supplied to the solenoid which operates this actuator.
4. Make certain that sufficient air supply is available at the solenoid valve inlet. (Inlet pressure on a 4-way solenoid valve should be at least 40 psi - 3 bar).

Problem:

Voltage and air pressure have been verified, valve is free, but actuator does not function.

Action:

1. Turn on signal voltage and check the solenoid for clicking sound.
2. If solenoid functions:
 - a) Remove the valve block, connect to reduced air supply (50 psi) and the correct voltage.
 - b) Turn on the signal voltage and check that air flows from one output port only, (you may need to obstruct the outlet ports in order to move the valve spool).
 - c) If air comes out of more than one output port, replace the solenoid valve.
3. If solenoid does not function, i.e. no sound is detected, unscrew the solenoid and stem from the block and reapply the signal voltage. If the solenoid plunger does not retract, replace solenoid.

Problem:

Actuator functions but exhibits leakage and/or power loss.

Action:

1. Check that voltage is +/- 10% of the specified voltage.
2. Check that there is no sharp drop in air supply caused by a solenoid valve failure when unit is cycled.
3. If the piston seal leaks, the leakage will be detected on each cycle of the actuator. Remove

the solenoid valve, pressurize Port A, and check for leakage on Port B. Then do the opposite, pressurize port B and check Port A for leakage.

4. If leakage continues, replace all the parts of the actuator with the aid of the repair kit.

Problem:

Actuator fails to function (actuator without solenoid control block, or block and solenoid operating correctly).

CAUTION: REMEMBER THAT ACTUATOR SHOULD NEVER BE REMOVED FROM THE VALVE WHILE UNDER PRESSURE!

Action:

1. Remove the actuator from the valve.
2. Apply air pressure (10 -15 psi for DA; 20 -30 psi for SR). If actuator cycles in no-load mode, the problem is in the valve. Consult valve manufacturer.
3. If actuator does not cycle, follow actuator disassembly instructions.
4. Check that all internal ports are unobstructed.
5. Check that the actuator is lubricated. If not, apply EP-I generously, (if actuator is prepared for high or low temperature operation, consult manufacturer for the appropriate lubricant).
6. Check for presence of congealed grease between the pinion and piston racks. Clean, dry, regrease and reassemble where required.
7. Check whether actuator pinion shaft and/or pistons are bound. If so, follow reassembly instructions.
8. Check unit for excessive backlash and check whether the piston rack teeth are worn. Replace piston gear rack if necessary.
9. Check body bore of SR actuator for misplaced or broken springs. Replace if necessary.
10. Once the actuator and valve are free, and the control block (where appropriate) is shifting air properly, reassembly and retest. If unit still fails to operate, consult manufacturer.

ACTUATOR DISASSEMBLY

CAUTION: BEFORE ATTEMPTING TO DISASSEMBLE THE ACTUATOR, AIR CONNECTIONS MUST BE DEPRESSURIZED AND DISCONNECTED.

Note: Before disassembly, make certain that you are fully conversant with the following reassembly instructions:

1. Each end cover is held to the body by two screws. Loosen the screws and remove the end

cover from the actuator. To remove SR end cover (see REPLACING SPRINGS p. 6).

2. The stop on top is held by a single screw. Ease the actuator out of its locked end stroke and remove the screw and stop from the actuator.
3. Hold the lower part of the gear and rotate the body clockwise (driving the 4 pistons outwards).
4. Remove the gear assembly from the lower end of the actuator.

SPARE PARTS REPLACEMENT

A STANDARD REPAIR KIT contains the following:

- 2 output shaft O-rings
- 4 piston O-rings
- 4 cover O-rings
- 2 shaft bearings
- 4 back bearing - pads

This spare kit is identical for DA and SR models. It is recommended that an extra set of springs be kept for SR models.

SPRINGS SHOULD ALWAYS BE REPLACED IN FULL SETS.

Spare parts replacement procedure

1. Replace all the soft seals and bearings.
2. The pads inside the body (in the center of each of the bores) are pushed in. Insert new pads from the inside of body by using the tip of your finger through the lower hole in the body.
3. The O-rings are glued to the cover. If they are damaged and need to be replaced, dip them in an appropriate glue solvent and glue new ones with cyanoacrylic glue.
4. Now lubricate the entire actuator assembly, using EP-I grease. Apply the grease around the rack and pinion assembly and around all the O-rings and bearings.

ACTUATOR REASSEMBLY

1. Place the shaft in a vice which grips the lower side. Grease the shaft, mainly inside the teeth gap.
2. Place the lower O-ring and shaft bearing in the body and lower the body on the shaft.
3. Turn the body so that the flats on top point in the direction of the lugs - about 25° from the body center line.
4. Grease one piston and place in the bore. Push the piston inward while rotating the body counter-clockwise. While the piston is in the body, check that the movement of the piston produces 90° rotation of the body and that the flats are parallel to the body side at each end of the stroke.
5. Turn the body clockwise so that the piston just leaves the bore. Grease the other 3 pistons and

insert them into their bores. Slightly push the pistons upwards and inwards, and rotate the body counter-clockwise, making sure that all pistons have made contact. Rotate within same 90° segment, checking that the flats are parallel to the body at each end of the stroke.

6. Place the upper O-ring and shaft bearing on top of the shaft, carefully pushing them into the body. Place the stop on top, and tighten the screw all the way, using a locking agent (e.g. LOCTITE).

Note: On earlier version actuators, the shaft bearing is a flat ring. After tightening the stop, release the screw a 1/4 to a 1/2 turn.

7. Replace the actuator end covers, making sure that the O-rings are in good condition and in place. Tighten gradually, especially on SR models.