

# QUALITY CONTROLS, INC.

1-603-286-3321

## ROTARY PNEUMATIC/HYDRAULIC ACTUATOR

(Max. Pressure 125 lb.)

### INSTALLATION, MAINTENANCE AND REPAIR INSTRUCTIONS

#### 1. GENERAL INFORMATION

QC 1 pneumatic/hydraulic actuators are compact, limited-rotation rotary actuators. They are designed to efficiently drive rotary loads such as quarter-turn valves thru an angle of 95° or less. Linear motion of a piston is converted to a rotary output by the efficient modified Scotch yoke linkage.

These instructions are intended as a guide for installation, maintenance, trouble-shooting and repair of the Ramcon pneumatic/hydraulic actuators listed in Table I.

TABLE I			
R16C	R120C	R960C	R6200D
R16CFS	R120CFS	R960CFS	R6200DFS
R35C	R260C	R2000D	R8400D
R35CFS	R260CFS	R2000DFS	R8400DFS
R70C	R450C	R4200D	
R70CFS	R450CFS	R4200DFS	

Model differences involve the cylinder bore, piston stroke, and single or double piston design characteristics. (See Tables II and III.)

Index numbers used in these instructions are for the most part the same index numbers used in the illustrated parts lists; there are a few differences in some models. Refer to the particular illustrated parts list.

Since the only service normally expected when operating under average conditions is O-ring replacement, most of the instructions are devoted to these procedures. Complete disassembly is given; disassemble only to the extent required to perform the required repairs.

#### 2. INSTALLATION

a. The valve or other load to be driven must be free of obstructions and must turn freely thruout its entire operating range.

b. If mechanical stops are part of the equipment, adjust to prevent contact during power operation.

c. If the actuator is to be field mounted be sure that it is positioned so that the operating range is compatible with the load; i.e., if load is at its extreme clockwise position then the actuator output shaft must also be at the same clockwise limit.

When positioning the actuator for a direct in-line connection to a valve the two shaft centerlines must coincide as well as possible to assure proper operation and to avoid excessive side loading of either shaft. The coupling will provide some compensation for small misalignment. Position so that there is no axial loading of either shaft at any point of travel.

d. The use of clean, dry, filtered and lubricated air of the correct pressure is required for proper operation.

e. Pipe air to the actuator port(s) as shown in Figure 1.

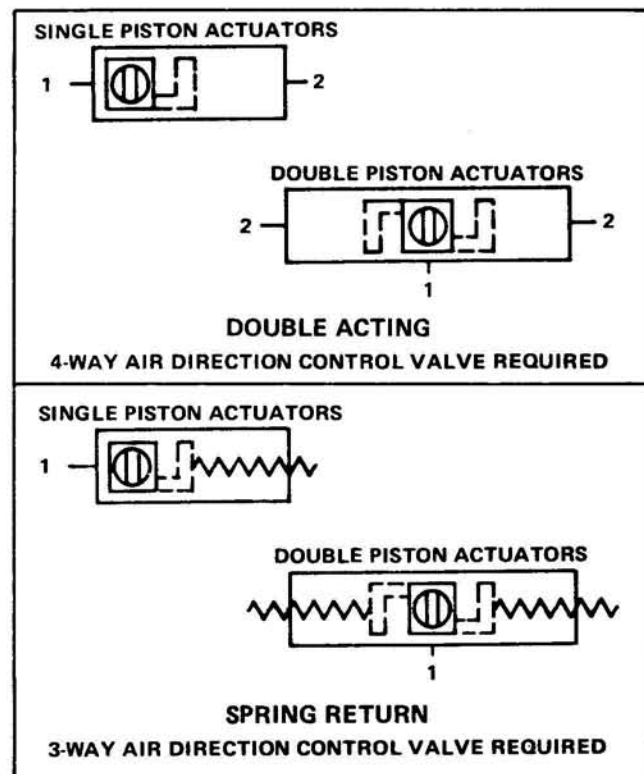


Figure 1.

For a standard mounting with the actuator body in line with the pipe, pressurize port(s) 2 of double acting actuators to put the shaft in position to mount to a closed valve.

Air piped to port 1 will open the valve. To close valve, vent port 1 and pressurize port(s) 2 for double acting actuators. For spring return actuators it is only necessary to vent port 1 to close the valve.

If the spring actuator is to open the valve, mount the actuator to the bracket of an open valve.

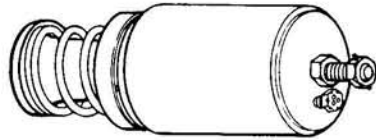
Consult factory for piping for across the line mountings and other special requirements.

TABLE II					
ACTUATOR MODELS		CYLINDER BORE	STROKE	NO. OF PISTONS	NO. OF FAIL SAFE CAPSULES
DOUBLE ACTING	FAIL SAFE				
R16C		1.75	1.37	1	
	R16CFS	1.75	1.37	1	1
R35C		2.40	1.53	1	
	R35CFS	2.40	1.53	1	1
R70C		2.40	1.53	2	
	R70CFS	2.40	1.53	2	2
R120C		3.52	2.36	1	
	R120CFS	3.52	2.36	1	1
R260C		3.52	2.36	2	
	R260CFS	3.52	2.36	2	2
R450C		5.28	3.58	1	
	R450CFS	5.28	3.58	1	1
R960C		5.28	3.58	2	
	R960CFS	5.28	3.58	2	2
R2000D		8.56	5.81	1	
	R2000DFS	8.56	5.81	1	1
R4200D		8.56	5.81	2	
	R4200DFS	8.56	5.81	2	2
R6200D		8.56	5.81	3	
	R6200DFS	8.56	5.81	3	3
R8400D		8.56	5.81	4	
	R8400DFS	8.56	5.81	4	4

TABLE III					
SPRING COLOR CODE					
MODELS	40 PSI	60 PSI	70 PSI	80 PSI	100 PSI
R16CFS		Blue		Green	Yellow
R35CFS	Red	Blue	White	Green	Yellow
R70CFS	Red	Blue	White	Green	Yellow
R120CFS	Red	Blue	White	Green	Yellow
R260CFS	Red	Blue	White	Green	Yellow
R450CFS	Red	Blue	Red + White	Blue + Green	Blue + Red
R960CFS	Red	Blue	Red + White	Blue + Green	Blue + Red
R2000DFS	Red	Blue	Red + White	Blue + Green	Blue + Red
R4200DFS	Red	Blue	Red + White	Blue + Green	Blue + Red
R6200DFS	Red	Blue	Red + White	Blue + Green	Blue + Red
R8400DFS	Red	Blue	Red + White	Blue + Green	Blue + Red

TABLE IV	
MODELS	BOLT SIZE
R-16, R-35, R-70, R-120, R-260	1/4-20
R-450 and R-960	3/8-16
R-2000, R-4200, R-6200 and R-8400 (at two places on each piston)	1/2-13
Piston heads are drilled and tapped to above sizes to accept piston removal bolts.	

TABLE V		
INDEX NO.	ITEM	INSPECT FOR:
1	End Cap	Worn or cracked retaining key groove.
2	Retaining Key	Wear, cracks, or cutting.
3	O-Ring Seal	Cuts or scuffing.
4	Piston Assembly	
5	. Piston Pin	Looseness, shearing or wear.
6	. Spacer	Wear.
7	. Roller	Wear, binding.
8	. Piston	Cracking, pits, galling, or wear on edges and legs. Elongated piston pin hole. Nicks and sharp edges in O-ring groove.
9	. Piston O-Ring	Wear, scuffing, or cuts.
10	Thrust Washer	Wear.
11	Retaining Ring	Wear, cracking, or spreading.
12	Yoke Pin	Shearing.
12A	Retaining Ring	Cracking, spreading, fit in groove.
13	Output Shaft	Nicks and sharp edges in ring grooves and yoke pin hole. Elongated yoke pin hole. Pits and galling. Condition of driving end.
14	Shaft Seals	Wear, scuffing, or cuts.
15	Piston Bearing	Flattening, binding on shaft.
16	Yoke	Excessive wear and cracks in slots. Elongation of yoke pin hole.
17	Cylinder & Bearing Assembly	
18	. Shaft Bearing	Scoring, pits, galling.
19	. Cylinder	Scoring, pits, galling, or rust in bore. Wear or cracking of retaining key groove.
20	Spring Return Assembly	Worn retaining key groove. Binding of spring in tube. Excessive rust.



### SPRING RETURN UNIT

**NOTE: DISASSEMBLY OF THIS UNIT IS NOT RECOMMENDED.**

#### WARNING

The spring is factory assembled into a locked capsule. This provides for simple and safe removal of the spring return assembly during maintenance. Do not attempt to disassemble the spring return assembly. This unit is spring-loaded under high spring pressure. An accident may cause serious personal injury!

Figure 2.

### 3. SPECIAL TOOLS AND TEST EQUIPMENT

No special tools or test equipment required.

### 4. DISASSEMBLY OF DOUBLE ACTING ACTUATORS

a. Make sure no pressure is applied to the actuator. Disconnect piping to ends of actuator. Hold end cap with spanner wrench while removing or installing fitting in end cap.

b. With spanner wrench in holes in end cap (1) turn in a counterclockwise direction so that retaining key (2) feeds out the slot in the body. (See Figure 3.) Lift tang of retaining key from hole in end cap. Repeat for opposite end of actuator.

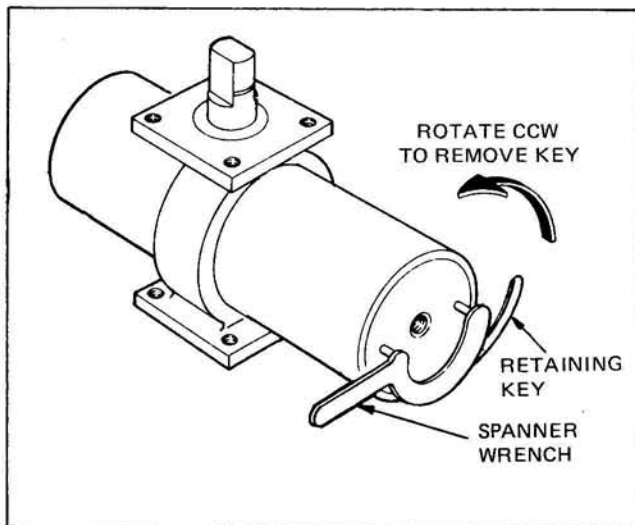


Figure 3. Removing End Cap

c. Remove end caps (1) with O-ring seals (3) from body of actuator. A threaded pipe nipple of a suitable size to fit into the tapped hole in the end cap may have to be screwed into the tapped hole in order to remove the end cap. Caution: Do not use air pressure to remove end caps. Protect actuator from physical damage, dirt, chips, or other contamination while disassembled.

### 5. DISASSEMBLY OF SPRING RETURN ACTUATORS

a. Make sure no pressure is applied to the actuator. Disconnect piping at end of actuator. Release spring pres-

sure on piston head by loosening jam nut (see Figure 2) and turning outer nut counterclockwise about four complete turns after spring compression starts. This may be noted by an increase of turning torque. If actuator has two spring return units, release spring tension in both before attempting removal of either end.

b. Turn spring housing counterclockwise either by hand or by strap wrench so that retaining key (2) feeds out the slot in body.

c. Remove tang of key (2) from hole in the spring housing.

d. Remove spring housing from actuator body. If actuator has two spring return units, repeat for opposite end. If not, follow steps 4a, b, and c.

### 6. CONTINUED DISASSEMBLY OF BOTH TYPES OF ACTUATORS

a. Remove piston assembly (or assemblies) (4) from cylinder body. Install a bolt in the hole in the piston head to serve as a pulling handle. Do not use air pressure to remove piston. See Table IV.

b. Remove retaining ring (12A) from one end of yoke pin (12). Push pin (12) to remove from the output shaft (13) and yoke (16) assembly. Use care when working inside the cylinder to avoid marring the honed bore.

c. To service output shaft seals (14) remove all nicks, burrs, and dirt from exposed portion of the shaft. Remove retaining rings (11) from shaft and carefully slide shaft out of actuator body. Make sure yoke (16) and bearings (15) do not drop against cylinder bore.

d. The piston sub-assembly (4) will normally not have to be disassembled. If disassembly is required use the following procedure:

Model R-16: Pin (5) is held by retaining rings (4A) at each end. Remove ring and push pin (5) out of hole.

Models R35 thru R260: Pin (5) is retained by staking the ends of the hole in the piston leg. Support the piston leg and drive pin from hole.

Models R450 thru R8400: Pin (5) is retained by a roll pin (4A) at each end. Support the piston legs to drive out the roll pin (4A) and also to remove the pin (5).

e. If the seals are to be re-used, remove carefully to prevent cutting or scoring.

### 7. CLEANING

Clean parts with commercial solvents such as the chlorinated solvents or light mineral spirits. Do not use alkaline aqueous solutions. Use clean solvent and clean parts individually or protect from physical damage if agitation is used. If brushed, use a brush which will not scratch the metal surfaces.

### 8. INSPECTION, REPAIR AND REPLACEMENT

After thoroughly cleaning all parts, make a visual check of all parts for wear, corrosion, or physical damage. See Table V. If damage or wear has occurred, replace damaged part or repair depending upon extent of damage. Minor nicks or sharp edges can be removed with fine emery cloth. Any corrosion must be removed or part must be replaced.

### 9. REASSEMBLY

a. If dry film lubricant has been removed from piston and cylinder bore by cleaning or wear, replace the lubricant. Use Molykote Type 8800 or equivalent. Apply a thin film in accordance with the application directions of the lubricant manufacturer. Film must be dry before reassembly.

b. Assemble O-rings (9) onto piston and end cap grooves carefully to avoid damage. Coat the O-ring lightly with a grease (grease used must be compatible with dry film lubricant) such as Lubri-Plate Mo-Lith No. 2 before assembly. Make sure no foreign materials are picked up with this grease. Lightly coat inside of bearings (15) with this same type grease. If actuator is used in a high temperature area a high temperature grease such as Lubriplate #930-2 with Molybdenum Di-Sulfide (such as Melco Moly #1444) blended in at a rate of three oz. of powder per pound of grease should be substituted for the Mo-Lith grease.

c. Assemble shaft, bearings and yoke into cylinder body as follows:

(1) Lubricate parts before assembling.

(2) Carefully push shaft (13) with O-ring (14) in groove on top end only, thru top bearing (18). *Caution: O-rings should not be pushed through any internal parts.* On double-stacked units (R-6200 and R-8400) this cannot be avoided and must be done with care to avoid O-ring damage.

(3) Add top piston bearing (15), yoke (16) and bottom bearing (15). Push shaft (13) sufficiently thru bottom bearing (18) to allow the assembly of second O-ring in groove on entry side of shaft. Be sure grease is applied to O-rings.

d. Line up hole thru yoke (16) with hole thru shaft (13), drive in pin (12) on which retaining ring (12A) has been installed on one end. Install second retaining ring on opposite end of pin. Output shaft must rotate freely with only the O-ring friction against bearings (18) resisting rotation. Piston rollers, bearings (15) must rotate freely on output shaft.

e. To assemble piston proceed as follows:

(1) Lubricate parts before assembling with Mo-Lith No. 2 or high temperature grease as noted in 7b.

(2) Place bearing (7) (and spacer (6) if used) between legs of piston (8).

(3) Drive pin (5) thru assembly and make sure bearing turns freely.

(4) Stake holes for models R16 thru R260, or install roll pins for models R450 and larger to secure pin.

f. Install piston assembly (4) in cylinder (17) as follows:

(1) Lubricate piston, yoke slot, and cylinder wall with Mo-Lith No. 2 or equivalent. Use high temperature lubricant as required by installation.

(2) With front of actuator (side with entry slot for end cap keys) toward the assembler and the top of the actuator up, position piston on right side with the legs at the front. Piston for the left side on double piston units should be positioned with the legs toward the back. The top of single piston actuator is determined by looking at front of actuator. The top is up if the long side extends toward the right. To determine the top of a double piston actuator, the flats on the top of the actuator shaft are in

line with the actuator body when the yoke slot nearest the front of the body is in the right front quadrant. On all newer units, the top is always the side opposite the retaining ring entry groove.

(3) Engage bearing on piston or pistons with slot or slots in yoke. Pushing on piston or pistons should cause shaft to rotate in a clockwise rotation when viewed from the top.

(4) Rotate shaft so that pistons slide back and forth in the cylinder. Do not rotate so far as to disengage yoke from the bearings on the piston. Rotation shall be free and smooth.

g. Final assembly of double acting actuators:

(1) Lubricate retaining key groove in cylinder and the end cap including O-ring with an anti-sieze lubricant such as Keystone No-Weld before assembly.

(2) Position end caps (1) complete with O-rings (3) in the ends of the cylinder aligned so that pin hole in retaining key groove is centered in the retaining key access slot. Use care in inserting end cap to avoid damaging the O-ring.

(3) Position tang on end of retaining key in the hole such that a clockwise rotation of the end cap will feed the key into the slot. Using a spanner wrench, turn the end cap clockwise feeding the retaining key into its seat. Repeat for the opposite end.

h. Final assembly of spring return actuator:

(1) On single piston actuators install an end cap in the short end of the cylinder as in (g) above.

(2) On the long end of the cylinder install the spring return unit in the same manner as described for regular end caps except that no O-ring is used. An anti-sieze lubricant should be applied to this joint. Use a strap wrench to turn the spring return unit.

(3) Double piston actuators should have both spring return units installed as in step (2).

(4) Turn outer nut on spring return unit clockwise until spring pressure is applied to head of the piston. This is indicated by a decrease in the amount of torque required to turn this nut. At this point turn an additional 1/2 to 1 turn maximum to assure maximum spring pressure on piston. Lock this adjustment with the inner nut provided. This bolt may be used to stop the piston travel by turning in to the required stop point. Check this adjustment by pressurizing cylinder and observing the stopping position. Lock the adjustment with the nut, as above.

## 10. TESTING

Test for leaks by applying normal operating air pressure to the air supply ports, one at a time on actuators having more than one port. At any open ports or bleed holes on the spring return units, check for leakage. Also check for leakage around the shaft seals and at the end caps on double acting actuators.



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