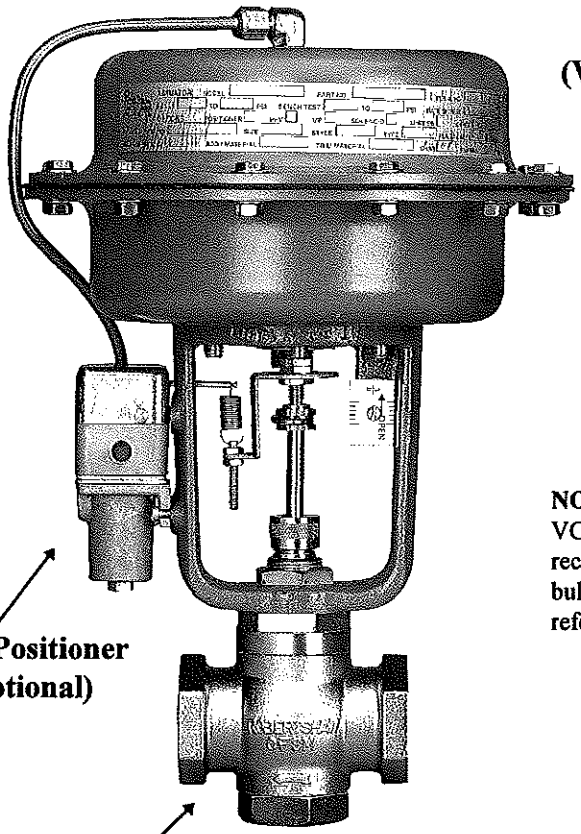
INSTRUCTION MANUAL

for

DIAPHRAGM CONTROL VALVES USING VC-230A and VC-231A MULTI-SPRING ACTUATORS



P2 - Positioner (optional)

(Shown with a CSS Valve)

(VC-230A DIRECT-ACTING ACTUATOR)

Model No. _____

Serial No. _____

Order No. _____

NOTE TO INSTALLER: Before installing VC-230A and VC-231A Diaphragm control valves, read instructions carefully and record model number and serial number. After installing, give this bulletin to operating personnel or see that it is filed for future reference.

INSTRUCTION MANUAL
P-2181 (Rev. C)

Robertshaw
INDUSTRIAL PRODUCTS

Robertshaw Industrial Products Division
1602 Mustang Drive
Maryville, TN 37801
Phone: (865) 981-3100 Fax: (865) 981-3168

OPERATION

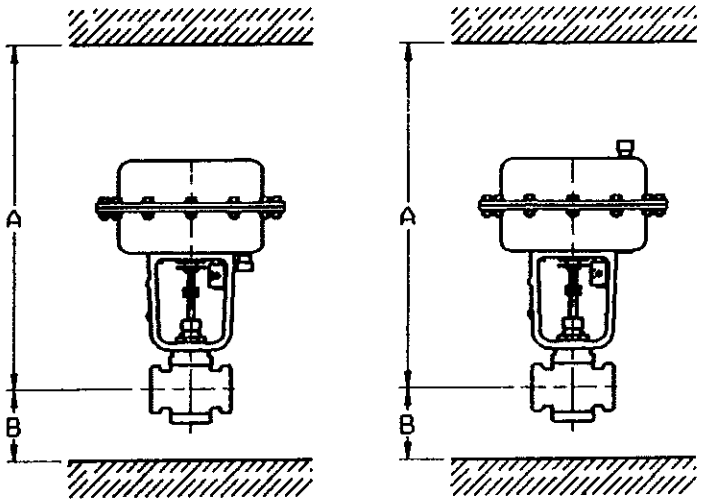
These Diaphragm Control Valves are designed to control the flow of the medium passing through the valve by responding to a signal from an instrument or pilot controller which utilized air or gas as the operating medium. The opening, closing or throttling action of the valve is controlled by changes of the instrument output pressure in response to changes in the controlled system. The variable being controlled may be pressure, temperature, liquid level, flow, etc.

INSTALLATION

These instructions apply for all VC-230A and VC-231A Series Control Valves. All operate in the same manner and differ only in the body style, valve plug construction and actuator operation (direct- or reverse-action).

Valve Plug Removal Clearances:

Table I shows clearances above the valve centerline for removal of the actuator and below the valve body centerline for removal of the valve plug or disc.



VC-230A VC-231-A

FIGURE 1 — DIMENSIONS

DIMENSIONS (See Figure 1)

Valve Size, In.	Single-Seated Valves												Double-Seated Valves							
	MA, MAS				BC				BG				FA				FAR			
	A		B		A		B		A		B		A		B		A		B	
	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm
½"									17	432	3	76								
¾"	18	457	3	76					17	432	3	76	17	432	4	102	17	432	10	254
1"	18	457	3	76	17	432	3	76	18	457	4	102	18	457	4	102	18	457	11	279
1¼"	19	482	3	76	17	432	3	76	18	457	4	102	18	457	4	102	18	457	11	279
1½"	19	482	3	76	17	432	3	76	18	457	4	102	18	457	5	127	18	457	13	330
2"	20	508	7	178	17	432	4	102					19	482	5	127	18	457	13	330
2½"													20	508	5	127	19	482	15	381
3"													20	508	5	127	19	482	17	432
4"													21	533	6	152	20	508	19	483

Valve Size, In.	Three-Way Valves											
	WA				WD				WE			
	A		B		A		B		A		B	
	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm
½"	17	432	9	229					17	432	8	203
¾"	17	432	10	254					17	432	9	229
1"	17	432	10	254					18	457	11	279
1¼"	18	457	10	254					18	457	12	305
1½"	18	457	11	279					18	457	12	305
2"					19	482	10	254	18	457	14	356
2½"					19	482	11	279				
3"					19	482	11	279				
4"					19	482	13	330				
5"					24	609	16	406				
6"					26	660	18	457				

Valve Piping:

The size of a diaphragm control valve is computed to give full throttling action under certain specific conditions of flow and pressure drop. To ensure obtaining maximum performance, the control valve should not be placed in the main line adjacent to elbows, bends or plug cocks where abnormal velocities may occur. The size of the main line is usually one or two nominal sizes larger than the size of the control valve. When it is desired to use plug cocks for shutoff valves, they should be the same size as the main line and not the size of the control valve.

Inspect all parts of the control valve for any foreign material that may have collected during shipment. Clean and blow out all pipe lines to remove pipe scale and chips.

If it is desirable to have continuous system operation when necessary to inspect or replace any control valve parts, install a conventional three-valve bypass around the control valve.

When installing the body in the line, observe the following precautions: If the body has screwed connections, make sure the male threads are sharp. Use a good grade of pipe compound, apply only above the second or third male threads in moderate amounts. If the body is of flanged construction, be careful to draw the bolts up evenly to prevent placing a strain on the valve body and to avoid the possibility of cracking a flange. Make sure the flow through the valve body is in the direction indicated by the arrow on the side of the valve body.

The control valve may be installed with actuator in any position. Table I lists the clearances necessary to remove and replace valve plugs when inspection or replacement of parts is necessary.

It is recommended that pressure taps be installed upstream and downstream of the control valve for use when it is desirable to check the flow capacity or pressure drop across the control valve.

Air Piping to actuator:

Run ¼" or ⅜" tube or pipe from the connection on the upper housing of the actuator (lower casing for reverse-acting actuator) to the outlet fitting of the instrument or pilot controller. To avoid excessive delay in response, it is recommended that the distance should be less than 150 ft. from the instrument to the valve. If excessive distances are necessary, one or more booster relays, Robertshaw CR-100-A1, may be used to speed the response. If the control valve is equipped with a positive positioner, connection from the controller is made at the positioner (See "Control Valve with Positioner").

Packing:

Proper compression of the packing to prevent leakage is provided by a spring within the packing box. (Tightening the packing nut "finger-tight" is usually sufficient to obtain the required compression.) To make certain there is no leakage from the packing box in starting up, check the valve stem to see that there are no cuts or abrasions where it goes into the packing box.

U-cup packing is available for water service when specified on order or when Teflon* V-rings prove to be ineffective.

* *Registered trade name of E. I. DuPont Company.*

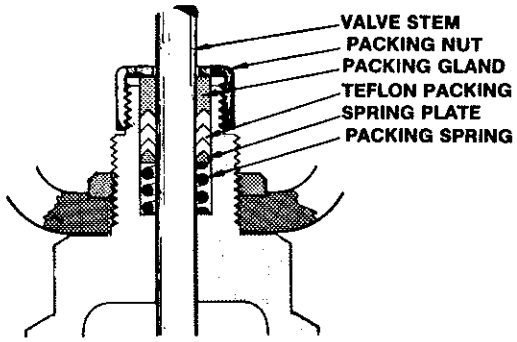


Figure 2 - **PACKING BOX**

Control Valve with Positioner:

The purpose of a valve positioner is to provide additional force to the actuator when required to ensure accurate positioning of the valve in response to the changes in controller or instrument output pressure; also, to handle higher close-off pressure drops and for split-range operation.

The positioner, when ordered, will come attached and with all necessary piping installed. Connect clean, reduced air supply to the positioner supply port and connect a line from the instrument or controller to the instrument tap on the positioner connection block. ¼" or ⅜" tubing or pipe should be used. See Instruction Bulletin P-2108 for P-2 positioner.

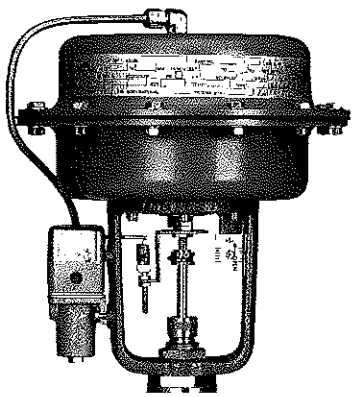


Figure 3-POSITIONER

ADJUSTMENTS

The size of the diaphragm control valve is computed to give full throttling action.

The diaphragm control valve is shipped from the factory with the range spring adjustment properly set for the operating conditions specified on your order.

Under actual service conditions, pressure drops can differ. This is particularly noticeable on single-ported bodies, but is usually of little consequence on double-seated bodies. For this reason the spring may have to be adjusted in order to compensate for the pressure drop so that full valve travel may be obtained over the diaphragm pressure range.

Direct-Acting, VC-230A:
Load spring adjustment is accomplished by loosening the nut below the indicator washer. Apply signal air to the diaphragm and move the stem enough to free the plug from any tension. Turn the connector to the right to increase spring compression and to the left to decrease spring compression (See Figure 4).

Reverse-Acting VC-231A:
Load spring adjustment is accomplished by loosening the nut below the indicator washer. Apply signal air to the diaphragm and move the stem enough to free the plug from any tension. Turn the connector to the right to decrease spring compression and to the left to increase spring compression (See Figure 4).

When valve is completely installed and connected to the instrument or controller, open the manual downstream valve and close the bypass valve. Slowly open the upstream manual control valve. Allow the controller sufficient time to assume normal operation before checking for proper control action.

Every valve should be checked on or before startup for correct stroke, free movement, correct location, and proper flow direction through the body.

In all cases of trouble, always check first the air lines and fittings for leaks and make sure you have the correct assembly for desired action.

For successful performance of this equipment, the valve stem must move freely in response to air pressure change on the diaphragm. If this type of action is not being obtained, check the following.

1. *Valve Plug* — Examine the valve guides for "scoring" as a result of foreign material or misalignment.

2. *Packing Box* — Teflon packing will not usually cause trouble unless it is damaged by burrs on the stem during stem insertion or removal through packing. Prior to removing stem through packing, loosen packing nut sufficiently to relieve spring load on V-rings, thereby increasing internal diameter, thus avoiding damage to Teflon V-rings.

3. *Diaphragm* — A diaphragm that is no longer pliable or is ruptured must be replaced.

Refer to "Maintenance" section for procedure on checking and replacing these parts. If the above three parts are performing correctly, any trouble that may be encountered will likely be found in the controller.

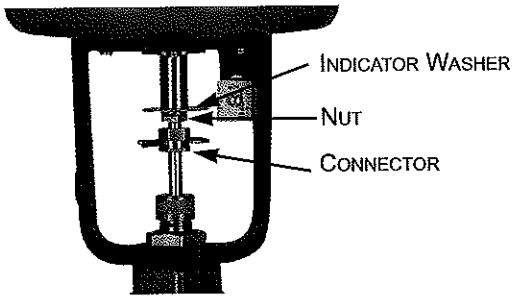


Figure 4-ADJUSTMENT
(Direct Acting) (Reverse Acting)

MAINTENANCE

GENERAL:

The actuator and valve are shipped completely assembled with all adjustments made. However, step-by-step procedures are given in the following paragraphs should it be necessary to disassemble the unit for maintenance or inspection.

DISASSEMBLING ACTUATOR FROM VALVE (Figure 6)

WARNING: To avoid personal injury and damage to the process system, isolate the control valve from the pressure system and release all pressure from the valve body and actuator before attempting disassembly.

Apply signal air to the actuator and move the valve stem until it is at mid-stroke. The stem connection can now be easily disengaged by removing the hairpin connector. Shut off signal air to the actuator.

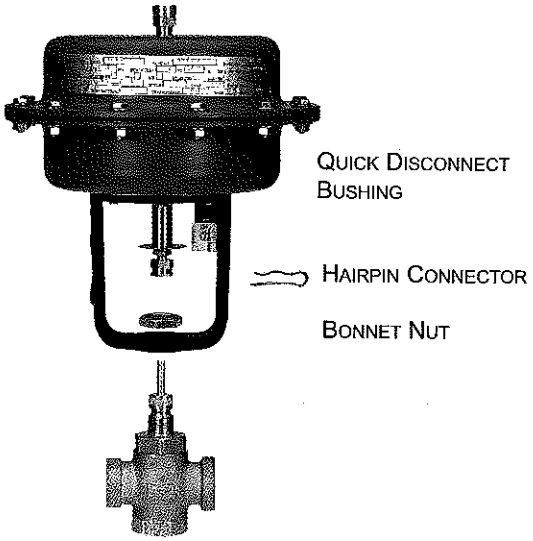


Figure 6-ACTUATOR AND VALVE

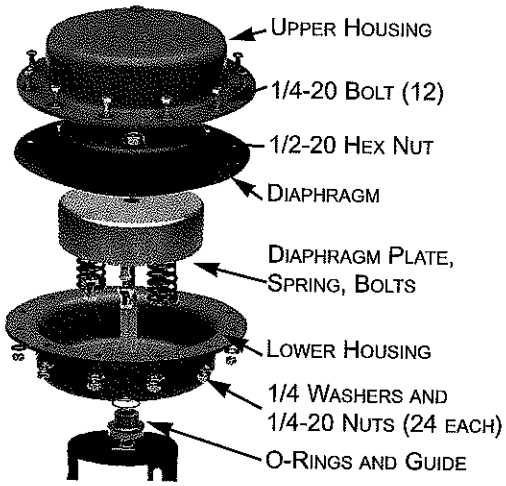


Figure 7-DIAPHRAGM REMOVAL (Direct Acting)

The valve is secured to the frame by means of a locknut. To remove the actuator from the valve, disengage the locknut and air line.

REPLACEMENT OF DIAPHRAGM

Direct-Acting (Figure 7)

1. REMOVE AIR PRESSURE
2. Remove the cap screws and nuts holding the upper housing to the lower housing.
3. Remove the hex nut and seal washer which allows the diaphragm to be removed.

Reverse-Acting (Figure 8):

1. REMOVE AIR PRESSURE
2. Remove the cap screws and nuts holding the upper housing to the lower housing.
3. Remove the springs.
4. Remove the hex nut and diaphragm plate which allows the diaphragm to be removed.

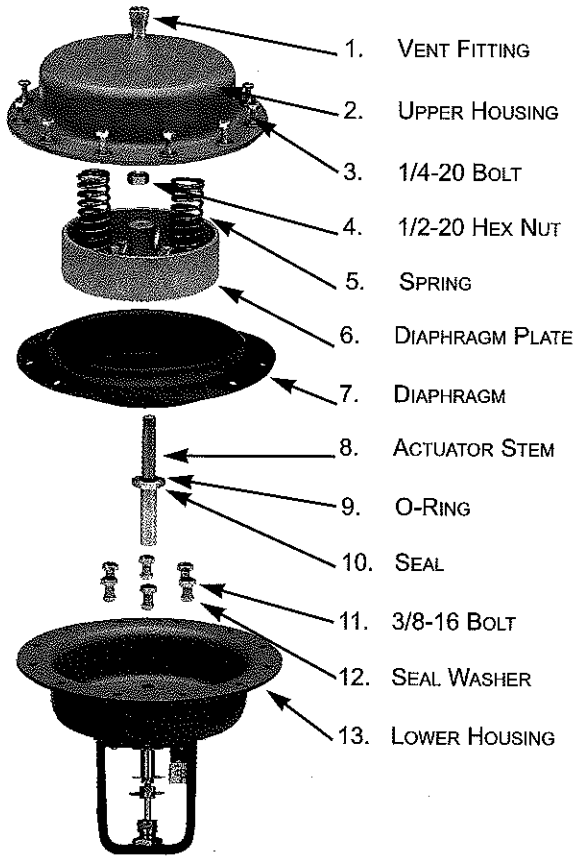


Figure 8- DIAPHRAGM REMOVAL (Reverse Acting): O-RING STEM SEAL REMOVAL

REPLACEMENT OF O-RING SEAL
(Reverse-Acting Only, Figure 8):

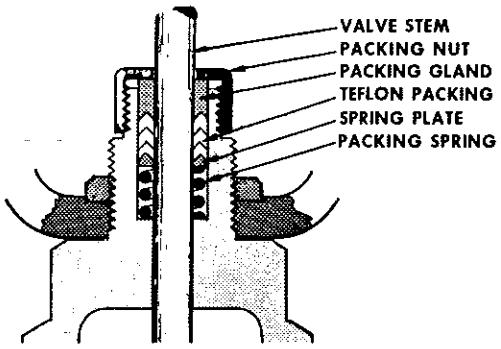
In rare instances the O-ring stem seal may be worn or mutilated which will result in loss of diaphragm pressure. If O-ring stem seal is to be replaced, follow these steps:

1. REMOVE AIR PRESSURE.
2. Remove the cap screws and nuts holding the upper housing to the lower housing.
3. Loosen the jam nut and remove the stem connector.
4. Lift the diaphragm and stem assembly out of the lower housing.
5. Remove 6 cap screws from the lower housing which allows the lower housing to be removed.
6. Remove the guide and remove O-rings. Clean out O-ring groove.
7. Apply O-ring lube to new O-rings before installing.
8. Wipe off lower actuator stem with a clean, dry cloth. Do not attempt to polish, if stem is scratched or nicked, it should be replaced.
9. Reassemble in reverse order.

REPLACEMENT OF PACKING (Figure 9)
(See Parts List for Packing Kits)

Valve stem packing nut should be kept only finger-tight. If valve stem packing must be replaced, follow steps below.

1. Remove hairpin connector.
2. Remove locknut and separate actuator valve.
3. Remove packing nut and packing gland.
4. Remove bonnet from valve.
5. Remove packing spring plate and spring.
6. Clean out packing box with a clean cloth or soft paper.
7. Wipe off stem with a clean cloth. **DO NOT** attempt to polish. If stem is scratched or nicked around packing area, it should be replaced.
8. Replace bonnet on valve.
9. Carefully place new packing in packing box. In an emergency, if chevron packing is not available, repack with a good grade of graphited string packing. Put a small amount of good packing lubricant in the packing box while repacking. This packing, however, should be replaced with Teflon chevron packing as soon as possible. Lubricate Teflon rings by dipping in Dow Corning 710.
10. Replace packing gland.
11. Replace packing nut and tighten.
12. Connect valve to actuator and tighten locknut.
13. Insert hairpin connector.



REPLACEMENT OF VALVE PLUG

1. Detach actuator from valve (See Figure 6).
2. Loosen packing nut (See Figure 9).
3. On direct-acting valves, unscrew bonnet (Figure 10) or remove cap screws and bonnet.
4. On reverse-acting valves, unscrew bottom cap (Figure 10) or remove cap screws and bottom cap.
5. Remove stem and poppet assembly from valve.
6. On **BC, BG, WA, WD** and **WE** valves, we recommend that the stem and poppet be replaced as one unit. On **MA** valves (Figure 11), remove snap ring and separate stem and poppet.

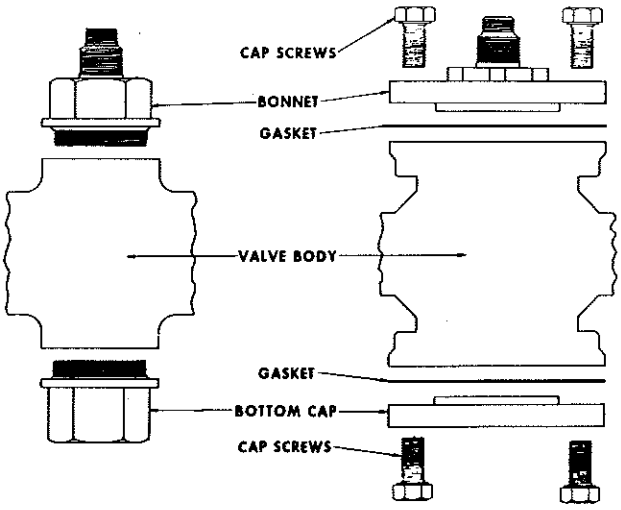


Figure 10 - **BONNET AND CAP**

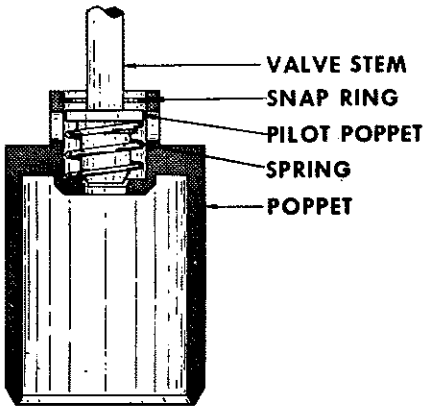
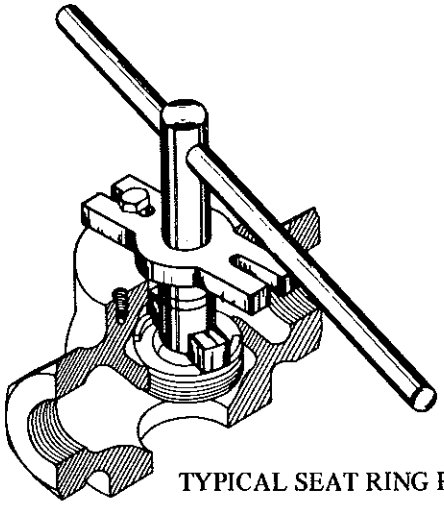


Figure 11 - **SNAP RING REMOVAL**

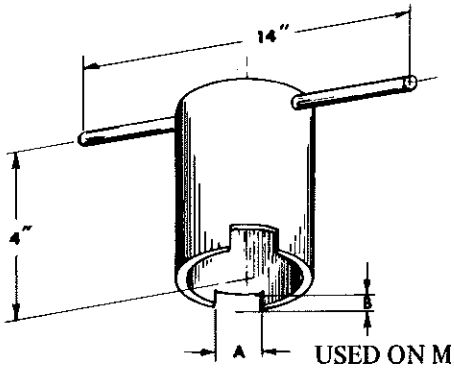
REPLACEMENT OF SEAT RINGS

1. Detach actuator from valve (See Figure 6).
2. For removal of valve plug, see "Replacement of Valve Plug."
3. The seat ring may be found "frozen" in the body. A lathe or boring mill can be used to good advantage in loosening them. However, where it is not desired to remove the body from the line, or heavy machine shop tools are not available, a seat ring puller as shown in Figure 12 may be fabricated in your own shop.

   Use of penetrating oil and an extended "cheater" arm on the seat ring puller may be needed to free tight rings. When this procedure doesn't work, however, heat the body with a torch or cover the ring with a cold material such as dry ice. In a short time the rings will loosen and may be removed. After the rings have been removed, thoroughly clean the body and port threads.
4. To install new rings: Apply a moderate amount of pipe joint compound to the male seat ring threads. In double-port bodies, note that one of the seat rings is smaller than the other. This ring should be installed first in the bottom port of push-down-to-close valves. On push-down-to-open valves, the smaller ring should be inserted first, from the bottom of the body into the upper port. The seat ring puller, lathe or boring mill can be used to tighten the rings in the body. Remove all excess pipe joint compound after drawing the rings up tight.



TYPICAL SEAT RING PULLER



USED ON MA VALVE ONLY

Figure 12 - **SEAT RING PULLERS**

GRINDING-IN SEAT RINGS

Following is the procedure found most effective for grinding-in seats on double-port valves with stainless steel trim.

Grinding Compound — Use one measure of No. 280 grain emery flour and one measure of rottenstone, mixed with machine oil to produce a medium texture compound. To prevent galling, when grinding-in seats, be sure to apply white lead to seating surfaces and then apply grinding compound. Do not mix white lead with grinding compound. It is known from experience that the top seat generally grinds faster. Under such circumstances, continue to use the grinding compound with white lead on the bottom seat, but simply use a polishing mixture of rottenstone and machine oil for the top port. When grinding-in seats, the bonnet should be placed on the body to ensure proper alignment.

After both seats have been fully ground, polish with the mixture of rottenstone and machine oil.

If either of the ports continues to leak, use more grinding compound on the seat that is not leaking and use polishing compound on the other until both seats touch their mating surfaces at the same time.

It is possible and generally is preferred to grind the valve while in the line. By doing this, the problem of leakage due to line stresses and distortion when installing valve in line will be minimized. If tight seating is required, it is advisable to heat the body if the control valve is being used on high temperature service.

To grind-in single-port valves with stainless steel trim, use a similar procedure by first applying white lead to seat and then applying grinding compound as outlined above. However, single-port valves require less grinding. It is generally found that finer emery flour, taking a smaller bite, will do a smoother job. The use of No. 400 or No. 600 emery flour on single-port valves is recommended. If a large nick is present on the seat ring, it should be machined out rather than ground out.

To grind-in single- or double-port valves furnished with stellite or bronze trim, use the same procedure as outlined above, except that white lead is not required, since galling is not a problem on these materials.

Seat Ring Puller Dimensions

Valve Size, In.	Pipe Size, In.	Dim. A		Dim. B	
		Inches	mm	Inches	mm
¾, 1 & 1¼	1½	7/16	11.1	¼	6.35
1½	2	½	12.7	¼	6.35
2	2½	½	12.7	¼	6.35

NOTE: Used on MA valves only.

REASSEMBLY

DIRECT-ACTING ACTUATOR

Direct-Acting Valve:

1. Set valve plug on its seat.
2. Screw the bonnet into the valve body or place the gasket and bonnet on the valve body. On larger valves, tighten the cap screws evenly since undue strain could crack the flange or cause binding between the valve plug and seat rings.
3. Assemble the inner parts of the packing box. Do not tighten the packing nut since the resulting friction would prevent turning the valve stem in the quick-disconnect bushing.
4. Place the actuator assembly on the valve and tighten the locknut.
5. With no pressure on the actuator, raise valve stem until hole in stem is aligned with hole in quick-disconnect bushing and insert hairpin connector.
6. Apply pressure to the diaphragm to check operation.
7. Tighten packing nut.

Reverse-Acting or Three-Way Valve:

1. Insert the valve plug and stem, stem first, into the body.
2. Screw the bottom cap into the valve or place the gasket and bottom cap on the valve. Tighten cap screws evenly since undue strain could crack the bottom cap or cause binding between the valve plug and seat rings.
3. Assemble the inner parts of the packing box. Do not tighten the packing nut, since the resulting friction would prevent turning the valve stem in the quick-disconnect bushing.
4. Place the actuator assembly on the valve and tighten locknut.
5. With no pressure on the actuator, raise valve stem until valve plug assembly moves against seat.
6. Apply air pressure to diaphragm until the holes in the stem and quick-disconnect bushing are aligned. Insert hairpin connector.
7. Check actuator for operation.
8. Tighten packing nut.

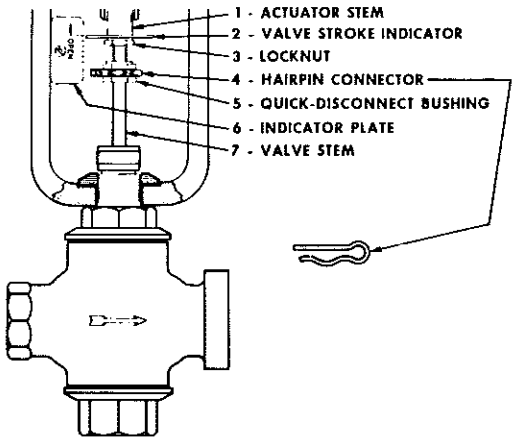


Figure 13 - **VALVE STEM STROKE ADJUSTMENT**

REVERSE-ACTING ACTUATOR

Direct-Acting Valve:

1. Set valve plug on its seat.
2. Screw the bonnet into the valve body or place the gasket and bonnet on the valve body. Tighten cap screws on larger valves evenly since undue strain could crack the flange or cause binding between the valve plug and seat rings.
3. Assemble the inner parts of the packing box. Do not tighten the packing nut since the resulting friction would prevent turning the valve stem in the quick-disconnect bushing.
4. Place the actuator assembly on the valve and tighten the locknut.
5. Apply sufficient pressure to the actuator to align the hole in the valve stem with hole in quick-disconnect bushing and insert hairpin connector.
6. Apply air pressure to the diaphragm to check operation.
7. Tighten packing nut.

Reverse-Acting or Three-Way Valve:

1. Insert the valve plug and stem, stem first, into the body.
2. Screw the bottom cap into the valve or place the gasket and bottom cap on the valve. Tighten cap screws evenly since undue strain could crack the bottom cap or cause binding between the valve plug and seat rings.
3. Assemble the inner parts of the packing box. Do not tighten the packing nut since the resulting friction would prevent turning the valve stem in the quick-disconnect bushing.
4. Place the actuator assembly on the valve and tighten locknut.
5. With no pressure on the actuator, align the hole in the valve stem with hole in quick-disconnect bushing and insert hairpin connector.
6. Apply air pressure to the diaphragm to check operation.
7. Tighten packing nut.

VALVE STEM STROKE ADJUSTMENT

DIRECT-ACTING ACTUATOR

Direct-Acting Valve:

These valves close with a downward stem motion which is produced with increasing air pressure on the VC-230 actuator. (See Figure 13.)

1. With valve installed, insert end of Valve Stem 7 into Quick-disconnect Bushing 5 and fasten with Hairpin Connector 4.
2. Increase air pressure on the diaphragm until the valve is fully closed. Set Valve Stroke Indicator 2 opposite the bottom mark on the Indicator Plate 6. Be sure the indicator plate for a new valve is graduated to correspond with the proper valve stroke. New indicator plates may be obtained from the factory.
3. Remove air pressure from actuator diaphragm, allowing the valve to move to a full-open position. Measure distance stem has traveled and compare with proper valve stroke found in Table II. To get longer valve stroke, loosen Locknut 3 and turn Quick-disconnect Bushing 5 into Actuator Stem 1 until proper stroke is obtained. Tighten Locknut 3. To shorten stroke, turn Quick-disconnect Bushing 5 out of Actuator Stem 1 until valve stroke is obtained. Tighten Locknut 3.

Reverse-Acting or Three-Way Valve:

Reverse-acting valves close with an upward stem movement produced with decreasing air pressure on the VC-230 actuator. Since spring thrust provides the closing force on reverse-acting valves, care must be taking to be sure the diaphragm is free of upward stop when the valve is closed. (See Figure 13.)

1. Loosen Locknut 3 and turn Quick-disconnect Bushing 5 out of Actuator Stem 1 a sufficient distance to allow diaphragm to move upward against stop.
2. With valve installed, insert end of Valve Stem 7 into Quick-disconnect Bushing 5 and fasten with Hairpin Connector 4.
3. Turn Quick-disconnect Bushing 5 into Actuator Stem 1 until the resistance of the valve poppet reaching seat can be felt. On a three-way valve this is obviously upper seat. Turn Quick-disconnect Bushing 5 into Actuator Stem 1 one more full turn to pull diaphragm slightly away from stop. Tighten Locknut 3.
4. Set Valve Stroke Indicator 2 opposite first mark at top of Indicator Plate 6.
5. Apply pressure on diaphragm sufficient to move valve through downward stroke to be sure valve can move a distance equal to that specified in Table II for the valve being installed. For reverse-acting valves, this would represent the full-open position, while on three-way valves, it is the distance to the lower seat.
6. Remove pressure from diaphragm and check to see that Valve Stroke Indicator 2 returns to fully closed position on reverse-acting valves (upper seat on three-way valves).

REVERSE-ACTING ACTUATORS

Direct-Acting or Three-Way Valve:

These valves close with a downward stem movement which is provided with decreased air pressure on the VC-231 actuator (See Figure 13). Since spring thrust provides the closing force on direct-acting valves, care must be taken to be sure diaphragm is just free of downward stop when the valve is closed.

1. With no air pressure on the diaphragm, and with adjusting spring compressed to hold diaphragm against stop, poppet should be on seat. If not, turn Quick-disconnect Bushing 5 out of the actuator stem until the resistance of the valve poppet reaching the seat can be felt. Turn Quick-disconnect Bushing one more turn to make sure poppet is properly seated and raise diaphragm slightly off stop. Set Valve Stroke Indicator 2 opposite the bottom mark on Indicator Plate 6. Be sure that indicator plate for a new valve is graduated to correspond with the proper valve stroke. New indicator plates may be obtained from the factory.
2. Apply air pressure to the actuator diaphragm, allowing the valve to move to full-open position - (upper-seat on three-way valves). Measure distance stem has traveled and compare with proper valve stroke found in Table II. To get longer valve strokes, loosen Locknut 3 and turn Quick-disconnect Bushing 5 into Actuator Stem 1 until proper stroke is obtained. Tighten Locknut 3. To shorten stroke, turn Quick-disconnect Bushing 5 out of Actuator Stem 1 until valve stroke is obtained. Tighten Locknut 3.

Reverse-Acting Valve:

The reverse-acting valve close with an upward stem movement produced with increasing air pressure on the VC-231 actuator. (See Figure 13).

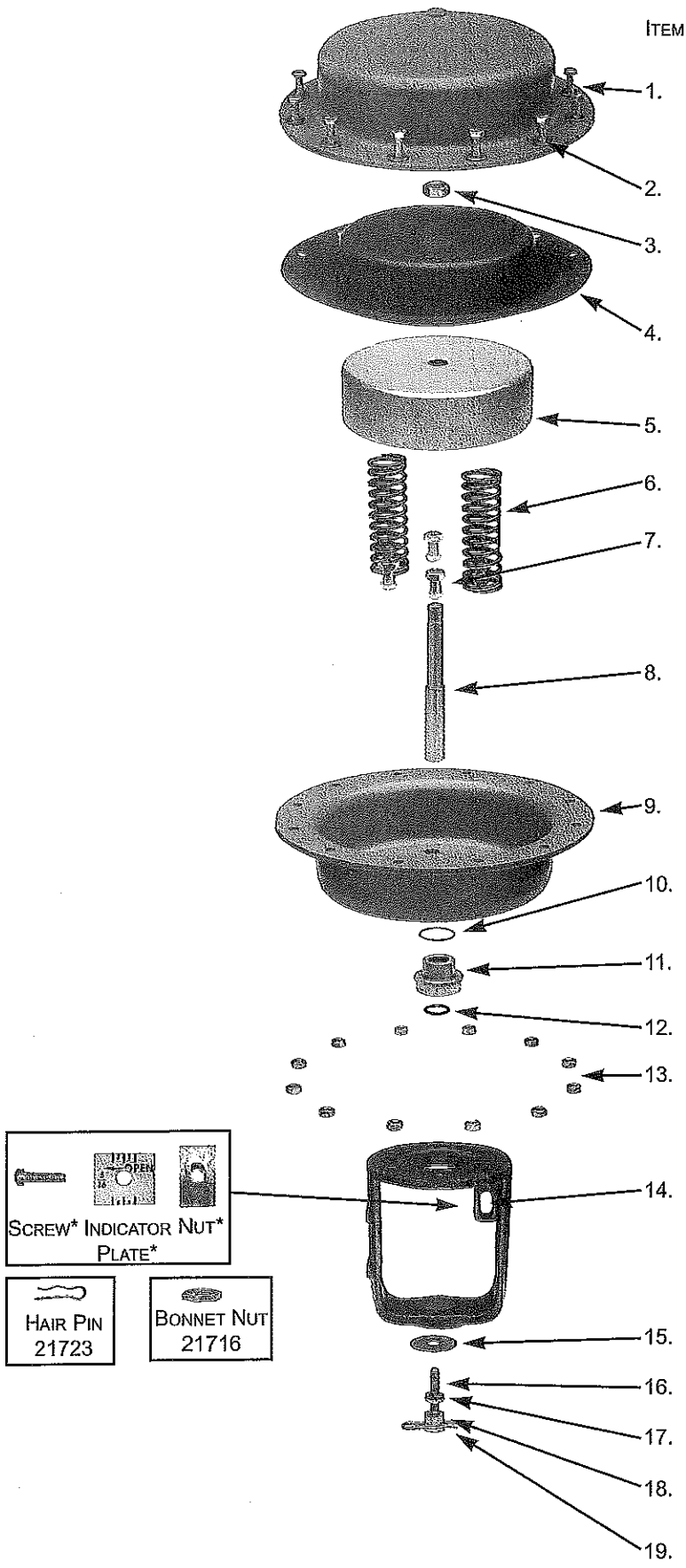
1. With valve installed, insert end of Valve Stem 7 into Quick-disconnect Bushing 5 and fasten with Hairpin Connector 4.
2. Increase air pressure on the diaphragm until the valve is fully closed. Set Valve Stroke Indicator 2 opposite the top mark on Indicator Plate 6. Be sure the Indicator Plate for a new valve is graduated to correspond with the proper valve stroke. New indicator plates may be obtained from the factory.
3. Remove pressure from diaphragm and check to see that Valve Stroke Indicator 2 returns to full-open position.

NOTE:

In actual operation, system pressure acting on the unbalanced area of single-seated valves, valve stroke and diaphragm area for a specified control valve, and controller signal range are used to determine the actuator spring. Hence, it is not practical to stipulate diaphragm pressures for checking reverse-acting and three-way valve strokes on bench tests. Therefore, these instructions are limited to assuring that the valve is on seat and that the actuator can move the required distance for full-open reverse-acting valve position, and seat-to-seat distance on three-way valves.

TABLE II - Valve Stem Stroke, Inches (mm)

Valve Type	Valve Port Size, Inches (mm)										
	½(12.7)	¾(19.1)	1(25.4)	1¼(31.8)	1½(38.1)	2(50.8)	2½(63.5)	3(76.2)	4(102)	5(127)	6(152)
BC			3/8(9.5)	3/8(9.5)	5/8 (15.9)						
BG	3/8(9.5)	3/8 (9.5)	5/8(15.9)	5/8(15.9)	5/8(15.9)						
FA,FAR		5/32(4.0)	3/16(4.7)	7/32(5.6)	¼(6.4)	5/16(7.9)	3/8(9.5)	7/16(11.1)	9/16(14.3)		
MA		¼(6.4)	5/16(7.9)	3/8(9.5)	7/16(11.1)	9/16(14.3)					
MAS		¼ (6.4)	5/16(7.9)		7/16(11.1)	9/16(14.3)					
WA	3/16(4.7)	¼(6.4)	5/16(7.9)	3/8(9.5)	7/16(11.1)						
WD						5/16(7.9)	7/16(11.1)	5/8(15.9)	5/8(15.9)	23/32(18.3)	1-1/32(26.2)
WE	3/8(9.5)	3/8(9.5)	5/8(15.9)	5/8(15.9)	5/8(15.9)	5/8(15.9)					



ITEM NO.	DESCRIPTION	PART NO.
1.	UPPER HOUSING	39836-B1
2.	1/4-20 BOLT (12 REQ'D)	39855-A1
3.	1/2-20 HEX NUT	36602-62600
4.	DIAPHRAGM	27744-C1
5.	DIAPHRAGM PLATE	27758-C1
6.	SPRING*	
7.	3/8-16 BOLT (6 REQ'D)	36621-E1501
8.	ACTUATOR STEM	27750-B1
9.	LOWER HOUSING	39836-C1
10.	O-RING	36240-N22
11.	GUIDE	27751-A1
12.	O-RING	36240-V114
13.	1/4-20 NUT (24 REQ'D)	36603-A25
14.	FRAME	27742-A1
15.	STEM INDICATOR	24742-A4
16.	STEM CONNECTOR	22725-A1
17.	LOCKWASHER	36600-F1020
18.	LOCK NUT*	
19.	HAIR PIN	21723

Figure 14- ACTUATOR PARTS
VC-230 (Direct Acting)

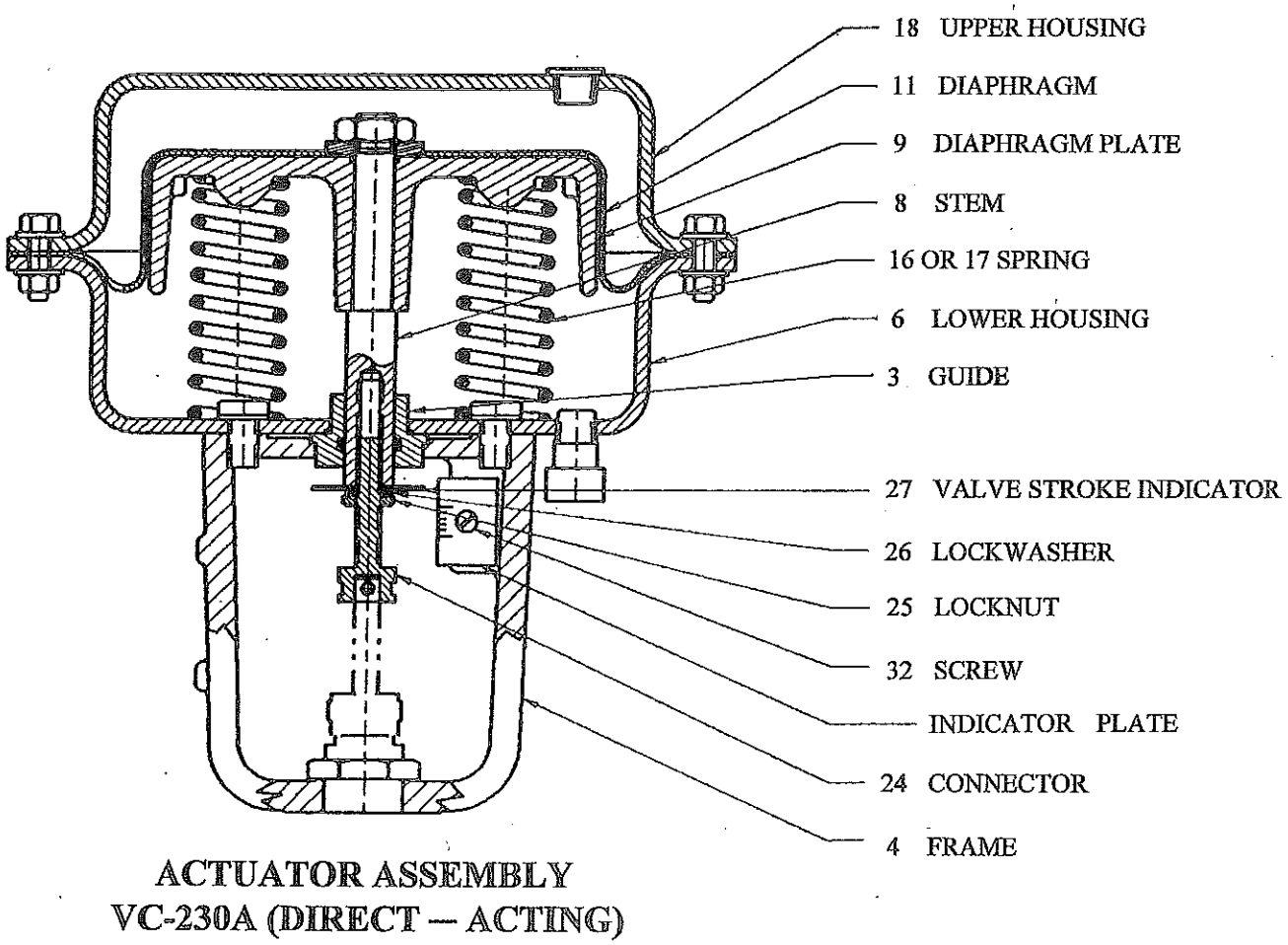
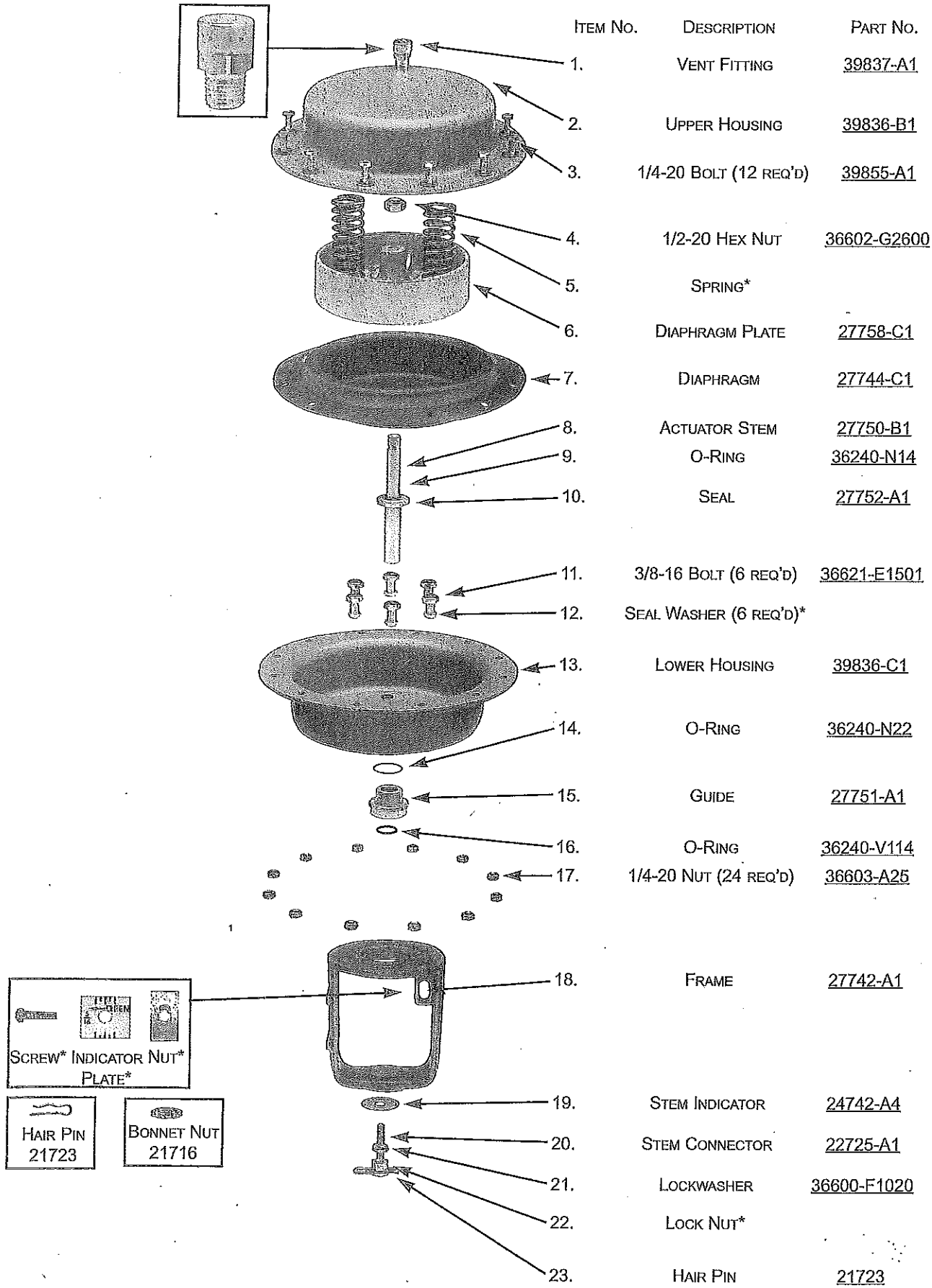


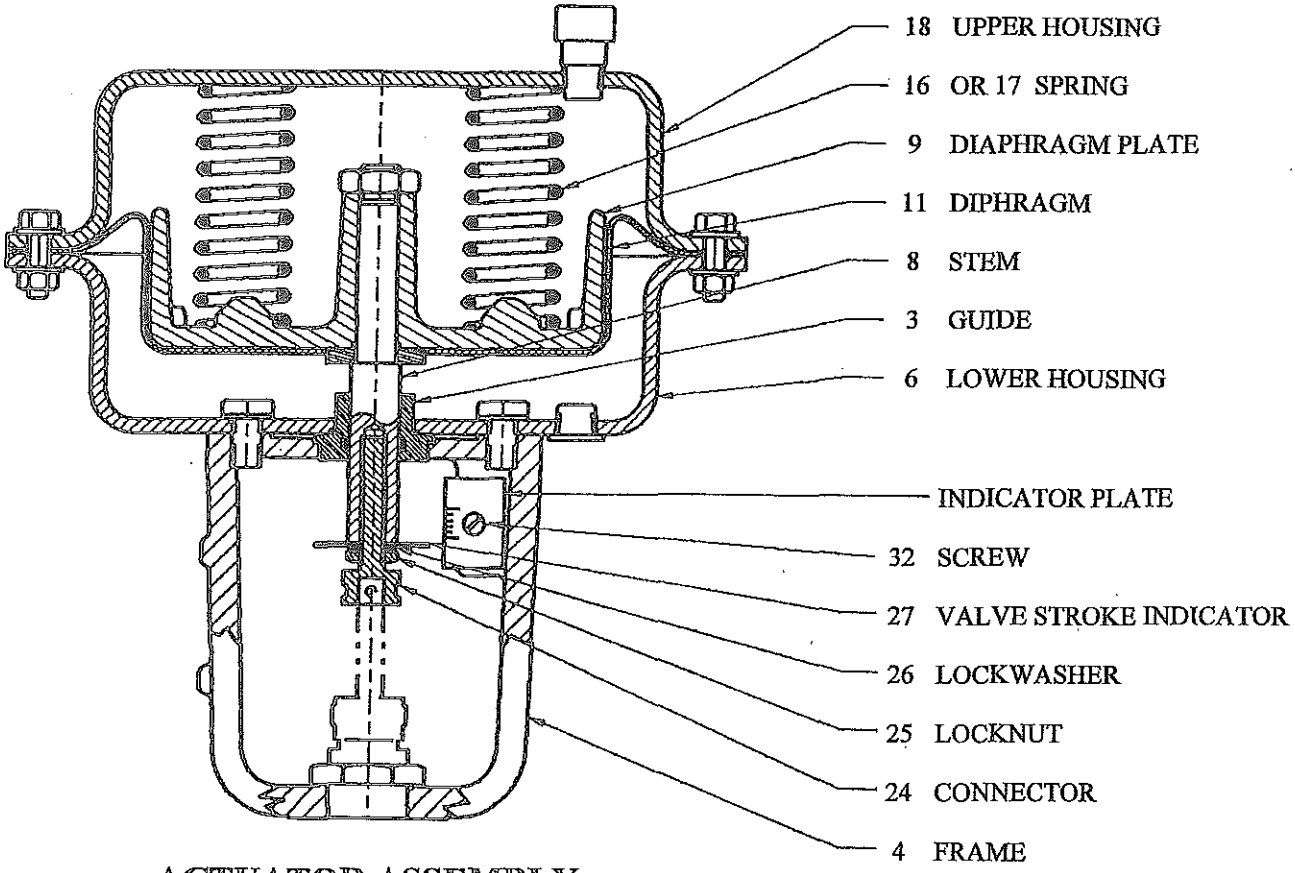
Figure 15 - ACTUATOR ASSEMBLY
VC-230 (Direct-Acting)



ITEM NO.	DESCRIPTION	PART NO.
1.	VENT FITTING	39837-A1
2.	UPPER HOUSING	39836-B1
3.	1/4-20 BOLT (12 REQ'D)	39855-A1
4.	1/2-20 HEX NUT	36602-G2600
5.	SPRING*	
6.	DIAPHRAGM PLATE	27758-C1
7.	DIAPHRAGM	27744-C1
8.	ACTUATOR STEM	27750-B1
9.	O-RING	36240-N14
10.	SEAL	27752-A1
11.	3/8-16 BOLT (6 REQ'D)	36621-E1501
12.	SEAL WASHER (6 REQ'D)*	
13.	LOWER HOUSING	39836-C1
14.	O-RING	36240-N22
15.	GUIDE	27751-A1
16.	O-RING	36240-V114
17.	1/4-20 NUT (24 REQ'D)	36603-A25
18.	FRAME	27742-A1
19.	STEM INDICATOR	24742-A4
20.	STEM CONNECTOR	22725-A1
21.	LOCKWASHER	36600-F1020
22.	LOCK NUT*	
23.	HAIR PIN	21723

*Consult factory

Figure 16 - ACTUATOR PARTS
VC-231 (Reverse-Acting)



ACTUATOR ASSEMBLY
VC-231A (REVERSE-ACTING)

Figure 17 - ACTUATOR ASSEMBLY
VC-231 (Reverse-Acting)

TABLE A

Rated Valve Travel	Indicator Plate (Item 14, VC-230) (Item 25, VC-231)
3/32	24743-L1*
7/64	24743-L1*
1/8	24743-L1
9/64	24743-L1*
5/32	24743-K1*
3/16	24743-K1
7/32	24743-E1
1/4	24743-E1
5/16	24743-N1
3/8	24743-D1
7/16	24743-M1
1/2	24743-G1
9/16	24743-P1
5/8	24743-B1
11/16	24743-Q1
3/4	24743-A1
13/16	24743-S1
7/8	24743-H1
1	24743-C1

* Travel Indicator Plate listed is the Closest one available (within 1/16").

Packing Kits	
Teflon	81900-B3
U-cup	81900-E1

Robertshaw
Industrial Products

U.S.A. and Canada
Robertshaw Industrial Products Division
1602 Mustang Drive
Maryville, TN 37801
Telephone: (865) 981-3100 Fax: (865) 981-3168
http://www.robertshawindustrial.com

Q-4139 (4/97) **Printed in U.S.A.**