

# installation, operating and maintenance instructions

# model 120-7

## GENERAL DESCRIPTION

The OCV Model 120-7 is specifically designed for fuel loading systems, and used in conjunction with a two-stage preset meter, it performs the following functions:

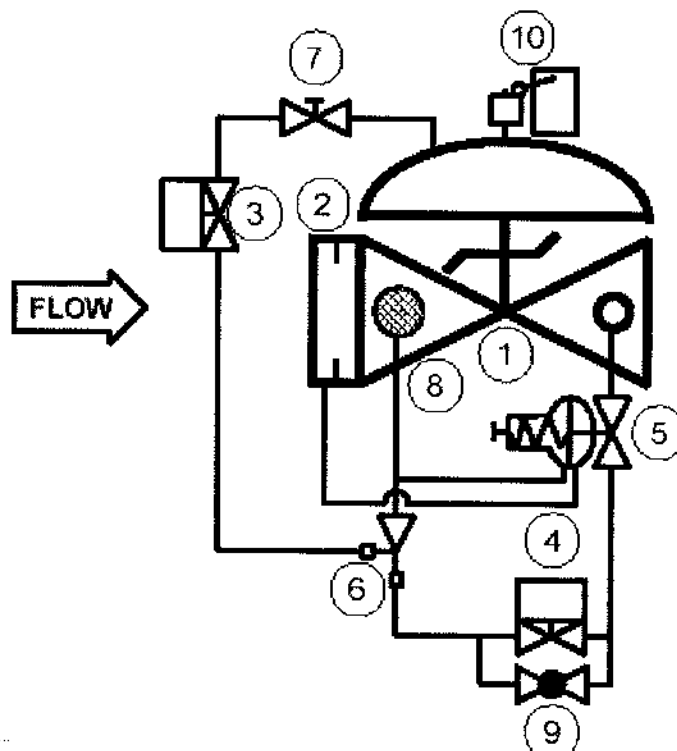
1. **RATE OF FLOW CONTROL:** While in the full flow mode, the 120-7 will modulate as necessary to prevent the flow rate from exceeding a predetermined maximum and overspeeding the meter.
2. **TWO-STAGE SHUTDOWN:** Working off electrical signals from the preset meter, the 120-7 will close to the low flow position near the end of the load for "topping off" flow. At the end of the load, the valve will go fully closed.

The 120-7 consists of the following components, arranged as shown on the schematic diagram:

1. **Model 65 Basic Valve Assembly**, a hydraulically operated, diaphragm actuated, pilot controlled, globe valve which closes with an elastomer-on-metal seal.
2. An **orifice plate**, integrally installed in the valve inlet flange that produces a differential pressure, proportional to flow rate, for sensing the rate of flow control pilot.
3. **Model 450 Two Way, Normally Open Solenoid Pilot**. This pilot is energized to its closed position by the control circuit to enable the valve to hold its low flow startup and shutdown positions.
4. **Model 451 Two Way, Normally Closed Solenoid Pilot**. This pilot is energized to its open position by the control circuit to enable the valve to hold its low flow startup and shutdown positions.

**noid Pilot.** This pilot is the primary electrical control device on the valve. It is energized to its open position to enable the main valve to open, and deenergized to its closed position to make the main valve close.

5. **Model 2450 Rate of Flow Control Pilot**, a two-way, normally-open valve which senses the orifice plate differential across its diaphragm and balances it against an adjustable spring load. An increase in differential (flow rate) above the set point will tend to close the pilot.



6. **Model 126 Ejector**, a simple tee fitting with an orifice installed in its inlet port. It provides the necessary pressure balance to enable the remainder of the pilot system to properly control the main valve.
7. **Model 141-2 Needle Valve** that controls the opening and closing speed of the main valve.
8. **Model 123 Inline Strainer** that protects the pilot system from solid contaminants in the line fluid.
9. **Model 141-4 Ball Valve (optional)** that functions as a manual override device for the N.C. solenoid, enabling the valve to be opened in the absence of electrical power.
10. **Model 150 Limit Switch Assembly or Model 150-1 Limit Switch/Junction Box Assembly.** This assembly includes a DPDT switch unit actuated by movement of the valve stem. It routes the electrical signals required for the two-stage closing function. The junction box provides an explosion-proof enclosure with terminals for field wiring from the meter and to the limit switch and solenoids.

### THEORY OF OPERATION

In order to understand the hydraulic operation of the 120-7, it is best to start with the **ejector (6)**. The orifice in its inlet port may be thought of as a fixed supply. The remainder of the pilot system, consisting of the **N.C. solenoid pilot (4)** and the **rate of flow control pilot (5)**, is installed on the downstream run port of the ejector, and may be thought of as a variable exhaust. Note that the branch port of the ejector, which is downstream of the orifice, is connected to the main valve diaphragm chamber through the **N.O. solenoid (3)** and the **speed controls (7A and 7B)**. With all this in mind, general action of the pilot system may be summarized as follows:

1. If all the components downstream of the ejector are open enough to allow exhaust to exceed supply, pressure is lowered on the main valve diaphragm chamber, which allows the valve to open.
2. If any of the components downstream of the ejector are closed enough so that exhaust is less than supply, pressure is increased on the main valve diaphragm chamber, which causes the valve to close.

3. If the N.O. solenoid pilot is closed, isolating the diaphragm chamber from the ejector, there can be no change in pressure on the diaphragm chamber. This holds the valve in position.

**RATE OF FLOW CONTROL ACTION:** Under normal conditions, with flow rate below the set point of the **rate of flow control pilot (5)**, the pilot is wide open. Ejector exhaust thus exceeds supply, and the main valve opens as described above. However, if the flow rate increases to the set point of the pilot, the pilot begins to close until exhaust no longer exceeds supply, and the main valve begins to close. The net result is a modulating (throttling) action of the pilot and main valve to prevent the flow rate from exceeding the set point.

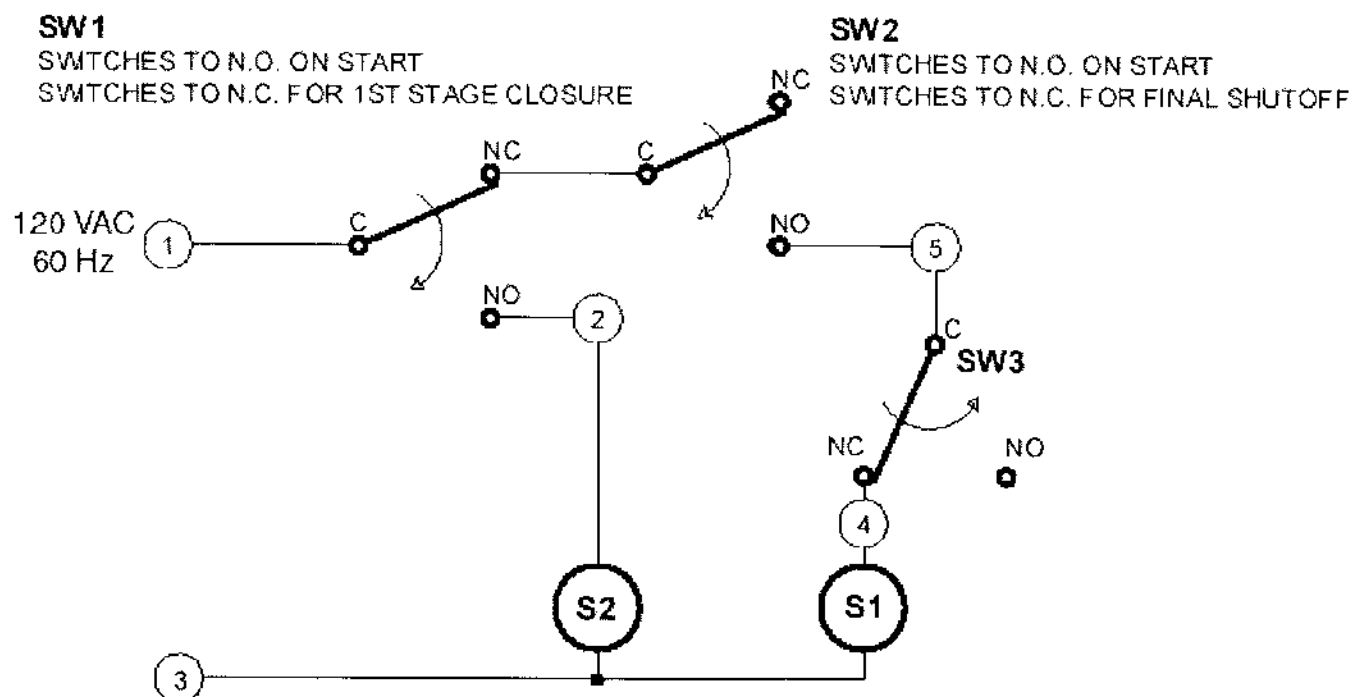
Now refer to the appropriate wiring diagram to follow the description of the electrical function. On these diagrams, the normally-open solenoid (3) is referred to as **S1**, the normally-closed solenoid (4) as **S2**, and the limit switch as **SW3**. **SW1** and **SW2** are the switches in the preset counter.

### LIQUID CONTROLS METER WITH LIQUID CONTROLS PRESET

**OPENING:** A loading run is initiated by pulling the lever on the preset counter, which places **SW1** and **SW2** in their "N.O." positions. **SW1** immediately energizes **S2**. The valve opens until modulated by the rate of flow control pilot.

**TWO-STAGE CLOSING:** Shutdown is initiated by the preset counter a certain number of gallons before the end of the load when **SW1** switches back to N.C. This deenergizes **S2**, which starts the valve closed. When the valve is nearly closed, **SW3** switches back to N.C. This energizes **S1**, which closes, locking pressure in the main valve diaphragm chamber, thus holding the valve in the low flow position. When the preset counter reaches zero, **SW2** switches back to N.C., deenergizing **S1** and allowing the valve to go fully closed.

### LIQUID CONTROLS METER WITH VEEDER-



### WIRING DIAGRAM - LIQUID CONTROLS PRESET

- SW1, SW2 = LIMIT SWITCH, SPDT (IN PRESET)  
 SW3\* = LIMIT SWITCH, SPDT (VALVE MOUNTED)  
 S1\* = SOLENOID PILOT, N.O.  
 S2\* = SOLENOID PILOT, N.C.

IDENTIFIES J-BOX TERMINAL NUMBERS (WHEN USED)

\* PROVIDED BY OCV

### ROOT PRESET

**OPENING:** A loading run is initiated by pulling the lever on the preset counter, which places SW1 in the "N.C." position and SW2 in the "N.O." position. SW2 immediately energizes S2. The valve opens until modulated by the rate of flow control pilot.

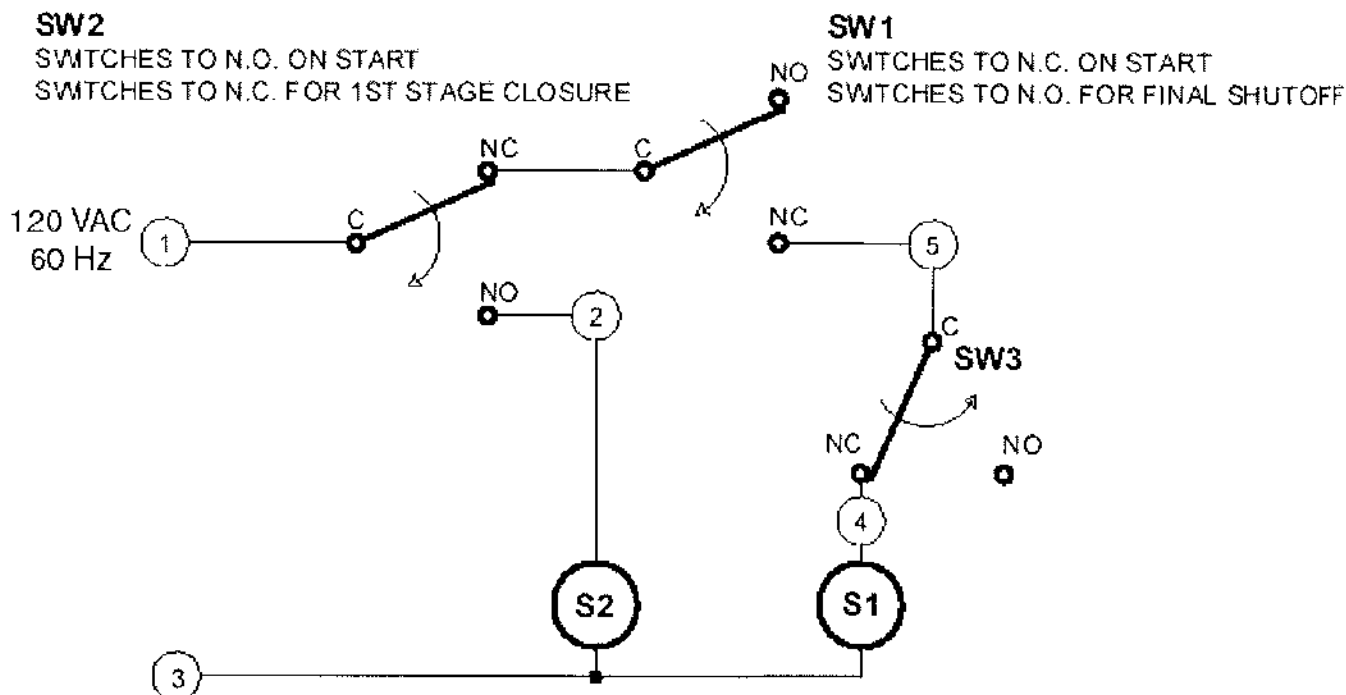
**TWO-STAGE CLOSING:** Shutdown is initiated by the preset counter a certain number of gallons before the end of the load when SW2 switches back to "N.C." This deenergizes S2, which starts the valve closed. When the valve is nearly closed, SW3 switches back to N.C. This energizes S1, which closes, locking pressure in the main valve diaphragm chamber, thus holding the valve in the low flow position. When the preset counter reaches zero, SW1 switches back to "N.O.", deenergizing S1

and allowing the valve to go fully closed.

### INSTALLATION

The 120-7 is furnished fully factory-assembled including all control line tubing.

1. Install the 120-7 on the discharge of the meter, observing the following:
  - (a) Before installing the valve, make sure there is no foreign material inside the valve.
  - (b) Make sure all tubing connections are secure.
  - (c) For ease of maintenance service of the valve and meter, it is recommended that an isolation valve be installed upstream of the meter.
2. Check to make sure which type of preset counter is



SW1, SW2 = LIMIT SWITCH, SPDT (IN PRESET)  
 SW3\* = LIMIT SWITCH, SPDT (VALVE MOUNTED)  
 S1\* = SOLENOID PILOT, N.O.  
 S2\* = SOLENOID PILOT, N.C.

① IDENTIFIES J-BOX TERMINAL NUMBERS (WHEN USED)

\* PROVIDED BY OCV

### WIRING DIAGRAM - VEEDER-ROOT PRESET

being used, then complete all wiring between the meter and valve as shown on the appropriate wiring diagram. **Make sure that the wiring and conduiting is appropriate for hazardous locations.**

### STARTUP AND ADJUSTMENTS

The following procedures should be followed in the order presented in order to effect an initial startup of the 120-7.

1. Remove the adjusting screw cap from the rate of flow pilot (5). Turn the adjusting screw fully **counterclockwise**.
2. Loosen the jam nut on the adjusting screw of the

needle valve (7). Turn the adjusting screw fully **clockwise**, then **counterclockwise** five full turns.

3. Make sure ball valve (9) is closed.
4. Connect the loading arm to a truck or other appropriate receiving vessel.
5. Start the system by dialing in the number of gallons to be loaded and actuating the lever on the preset counter. The valve should open a small amount.
6. Carefully loosen a pipe plug in the main valve bonnet until fluid appears around the threads. When only clear fluid (no air) is discharging, re-tighten the plug.
7. Slowly turn the adjusting screw of the rate of flow pilot (5) **clockwise** until flow rate increases

to the set point. Replace the plastic cap.

8. Allow the load to continue to its ends, observing that the valve closes in two stages.

### SUMMARY OF ADJUSTMENTS

1. Rate of flow pilot (5): **Clockwise** to **increase** flow rate; **counterclockwise** to **decrease** flow rate.
2. Needle valve (7): **Clockwise** to decrease valve response speed; **counterclockwise** to increase valve response speed. *CAUTION: Do NOT close the needle valve fully; to do so will keep the main valve from operating.*
3. Low flow position: The valve's low flow position may be adjusted by loosening the set screw in the collar on the indicator stem. **Lower** the collar to **increase** the low flow rate. **Raise** the collar to **decrease** the low flow rate.

### MAINTENANCE

Required maintenance of the 120-7 is minimal. However, the following steps, periodically performed, will do much to keep the valve operating efficiently and properly.

1. Check for leaks at fittings and around flanges. Tighten as required.
2. Check for chipped or peeling paint. Touch up as required.
3. Check that all electrical wiring is secure.

### TROUBLESHOOTING

In the event of malfunction of the 120-7, the following outline should enable the technician to isolate the cause of the problem and to take the appropriate corrective action.

#### MAIN VALVE FAILS TO OPEN

1. N.C. solenoid (4) not energized — Check control signals from meter.
2. Open ball valve (9). If main valve opens, the N.C. solenoid (4) is stuck closed or its coil is burned out — Replace coil. See the Solenoid Valve section of this manual.
3. Diaphragm of main valve (1) ruptured or stem binding — See Model 65 Basic Valve section of this manual.

#### MAIN VALVE FAILS TO CLOSE

1. N.C. solenoid (4) not deenergized — Check control signals from meter.
2. Ball valve (9) open — Close as required.
3. N.C. solenoid (4) stuck open — Disassemble and determine cause. See the Solenoid Valve section of this manual.
4. N.O. solenoid (3) energized — Check control signals from meter.
5. N.O. solenoid (3) stuck closed — Disassemble and determine cause. See the Solenoid Valve section of this manual.
6. Stem of main valve (1) binding — See the Model 65 Basic Valve section of this manual.

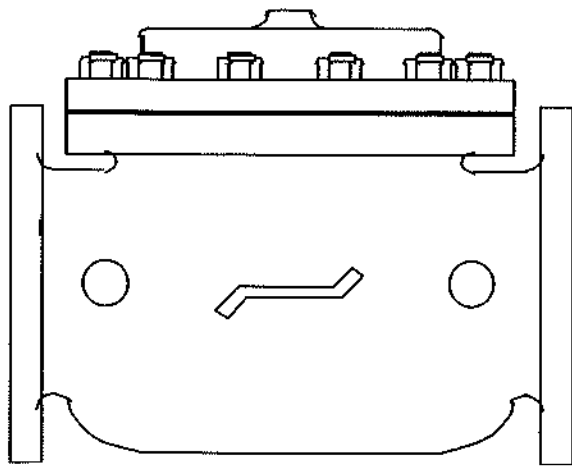
#### VALVE SKIPS LOW FLOW POSITION ON SHUTDOWN

1. N.O. solenoid not being energized. — Check signals from meter.
2. Coil of N.O. solenoid (3) burned out — Replace coil. See the Solenoid Valve section of this manual.
3. N.O. solenoid (3) stuck open — Disassemble and determine cause. See the Solenoid Valve section of this manual.

#### VALVE DOES NOT GO TO FULL SHUTOFF

1. N.O. solenoid (3) not being deenergized — Check signals from meter.
2. N.O. solenoid (3) stuck closed — Disassemble and determine cause. See the Solenoid Valve section of this manual.
3. Seat of main valve (1) damaged. — See the Model 65 Basic Valve section of this manual.





# installation, operating, and maintenance instructions

## series 65

### basic control valve

#### GENERAL DESCRIPTION

The OCV Series 65 is a hydraulically-operated, diaphragm-actuated valve. It is available in either a globe (Model 65) or angle (Model 65A) configuration. The diaphragm is nylon-fabric bonded with synthetic rubber and forms a sealed chamber in the upper portion of the valve, separating operating pressure from line pressure. An elastomeric seat disc forms a tight seal with the valve seat when pressure is applied above the diaphragm.

#### FUNCTIONAL DESCRIPTION

Because the Series 65 is a hydraulically operated valve, it requires a minimum line pressure of approximately 5 psig in order to function. The valve functions on a simple principle of pressure differential. The line pressure at the inlet of the valve is bypassed through the pilot control piping to the diaphragm chamber of the valve. This pressure, together with the valve spring, works against the pressure under the valve seat. Because the effective area of the diaphragm is greater than that of the seat, the valve is held tightly closed. As the controlling pilot(s) allow the pressure to bleed off the diaphragm chamber, the two opposing pressures begin to balance and the valve will begin to open. The valve can be used to perform a simple on-off function, or with the proper pilot system, a modulating, or regulating function.

In cases where the line fluid is unusually dirty, or is otherwise unsuitable for operating the valve, an independent operating pressure source may be employed. The pressure available from such a source must be equal to, or greater than, line pressure.

#### INSTALLATION

In order to insure safe, accurate and efficient operation of the OCV control valve, the following list of checkpoints and procedures should be followed when installing the

valve.

1. Make a careful visual inspection of the valve to insure that there has been no damage to the external piping, fittings or controls. Check that all fittings are tight.
2. Thoroughly flush all interconnecting piping of chips, scale and foreign matter prior to mounting the valve.
3. Install the valve in the line according to the flow arrow on the inlet flange. The arrow should point downstream.
4. Allow sufficient room around the valve for ease of adjustment and maintenance service.

In addition, it is highly recommended that:

1. Isolation valves (eg., gate or butterfly) be installed on the inlet and discharge sides of the valve to facilitate isolating the valve for maintenance.
2. Pressure gauges be installed at the inlet and outlet sides of the valve to provide monitoring of the valve during initial start-up and during operation. The body side ports, if unused by the pilot system, provide a convenient connection for the gauges.
3. All valves larger than 6" be installed horizontally, i.e., with the bonnet pointed up, for ease of adjustment and maintenance servicing.

#### MAINTENANCE

The OCV control valve requires no lubrication and a minimum of maintenance. However, a periodic inspection should be established to determine how the fluid being handled is affecting the efficiency of the valve. In a water system, for example, the fluid velocity as well as the substances occurring in natural waters, such as dissolved minerals and suspended particles, vary in every installation. The effect of these actions or substances must be determined by inspection. It is recommended that an annual inspection, which includes ex-

amination of the valve interior, be conducted. Particular attention should be paid to the elastomeric parts, i.e., the diaphragm and seat disc. Any obviously worn parts should be replaced.

## REPAIR PROCEDURES

In the event of malfunction of the OCV control valve, troubleshooting should be conducted according to the procedures outlined for the specific model of valve. Then, if those steps indicate a problem with the main valve, this section will outline the procedures necessary to correct the problem.

Problems with the main valve can be classed in three basic categories:

1. VALVE FAILS TO OPEN
  - a. Diaphragm damaged\* - See Procedure A
  - b. Stem binding - See Procedure B
2. VALVE FAILS TO CLOSE
  - a. Diaphragm damaged\* - See Procedure A
  - b. Stem binding - See Procedure B
  - c. Object lodged in valve - See Procedure B
3. VALVE OPENS AND CLOSES BUT LEAKS WHEN CLOSED
  - a. Seat disc damaged - See Procedure C
  - b. Seat ring damaged - See Procedure D

*\*A diaphragm failure can prevent the valve from either opening or closing, depending on the flow direction. Most water service valves flow "under the seat", in which case a diaphragm failure will keep the valve from closing. On the other hand, most fuel service valves flow "over the seat", in which case a diaphragm failure will keep the valve from opening. To determine which you have, examine the bridge mark cast into the side of the valve body, then compare it with the figures below.*

### PROCEDURE A : DIAPHRAGM REPLACEMENT

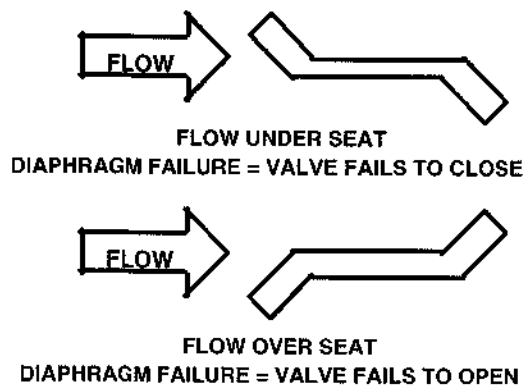
1. Isolate the valve from the system by closing upstream and downstream block valves.
2. Loosen one of the tubing connections on the bonnet. Allow any residual pressure to bleed off.
3. Remove all tubing connected at the bonnet.
4. Remove the bonnet nuts.
5. Remove the bonnet. If the bonnet sticks in place, it may be loosened by rapping sharply around its edge with a rubber-headed mallet. **NOTE:** 8" and larger valves are equipped with eye bolts through which a chain can be fastened to aid in

*lifting the bonnet.*

6. Remove the spring.
7. Remove the diaphragm plate capscrews and the diaphragm plate.
8. Remove the old diaphragm.
9. Making sure the dowel pin holes are in the proper location, place the new diaphragm over the studs and press down until it is flat against the body and spool.
10. Replace the diaphragm plate and the diaphragm plate capscrews.
11. Tighten all diaphragm plate capscrews snugly.
12. Replace the spring.
13. Replace the bonnet and reinstall the bonnet nuts.
14. Tighten the bonnet nuts snugly using a criss-cross tightening pattern.
15. Reinstall the control tubing.
16. Reopen the upstream and downstream block valves.
17. Before placing the valve back in service, perform the air bleed procedure described in the first section of this manual.

### PROCEDURE B: CORRECTION OF BINDING STEM

1. Perform Steps 1 thru 6 of Procedure A, above.
2. Remove the spool assembly from the valve. **NOTE:**



*On smaller valves, this can be accomplished simply by grasping the stem and pulling upward. Valves 6" and larger have the top of the stem threaded to accept an eyebolt to aid in lifting the spool out of the body. 6" thru 12" valves are threaded 3/8-16. 14" and 16" valves are threaded 5/8-11.*

3. Carefully examine both ends of the stem for deep scratches, scoring or buildup of mineral deposits.

Polish the stem if necessary using a fine grade of emery cloth.

4. Similarly, examine and polish the upper bushing (in the bonnet) and the lower guide (in the seat ring).
5. Reinstall the spool assembly.
6. Reassemble the valve, following Steps 12 thru 17 in Procedure A.

#### PROCEDURE C: SEAT DISC REPLACEMENT

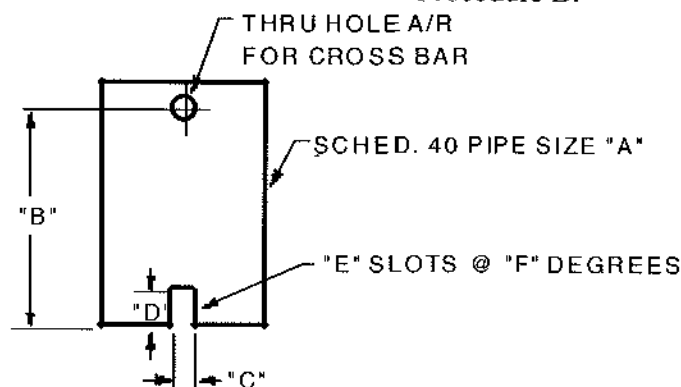
1. Perform Steps 1 and 2 of Procedure B, above.
2. With the spool assembly removed from the body, remove the seat retainer screws.
3. Slide the seat retainer off the lower end of the stem.
4. Remove the seat disc from its groove in the spool.  
*NOTE: The seat disc may fit quite tightly in the groove. If necessary, it may be pried out using a thin-bladed screwdriver or similar tool.*
5. Install the new seat disc in the groove.
6. Reinstall the seat retainer and tighten the seat retainer screws.
7. Reassemble the valve, following Steps 5 and 6 of Procedure B.

#### PROCEDURE D: SEAT RING REPLACEMENT

*NOTE: It is rare for a seat ring to require replacement. Minor nicks and scratches in the seating surface can usually be smoothed out with emery cloth.*

1. Perform Steps 1 and 2 of Procedure B, above.
2. If you are working on a 4" or smaller valve, follow Steps 3 thru 9, below.
3. If you are working on a 6" or larger valve, follow Steps 10 thru 16, below.

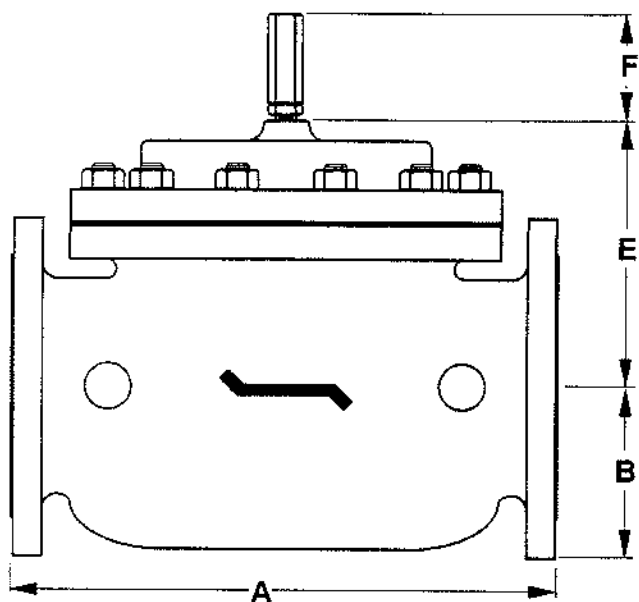
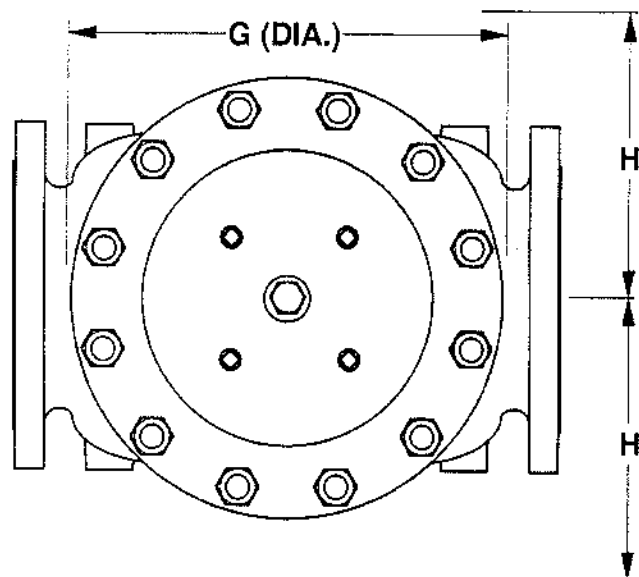
4. Seat rings in valves 4" and smaller are threaded into the valve body. To remove, you will need a special seat ring tool. You may fabricate one using standard pipe as shown in the sketch below, or one may be purchased from OCV.
5. Using the seat ring tool, unthread the seat ring from the body.
6. Remove the old o-ring from the counterbore in the body.
7. Install the new o-ring in the counterbore.
8. Using the seat ring tool, install the new seat ring.
9. Reassemble the valve, following Steps 5 & 6 of Procedure B.
10. Seat rings in valves 6" and larger are bolted into the body with socket head capscrews. In addition you will note that the seat ring is equipped with additional threaded holes that may be used for "jacking" the seat ring out of the body.
11. Remove the socket head capscrews.
12. Remove the old seat ring from the body by temporarily installing two or more of the capscrews in the "jacking" holes.
13. Install a new o-ring in the groove of the new seat ring. Lubricate the o-ring and outer seat ring wall with Vaseline® or similar lubricant.
14. Install the new seat ring in the body, making sure that the capscrew holes line up.
15. Replace and tighten all the capscrews.
16. Reassemble the valve, following Steps 5 and 6 of Procedure B.



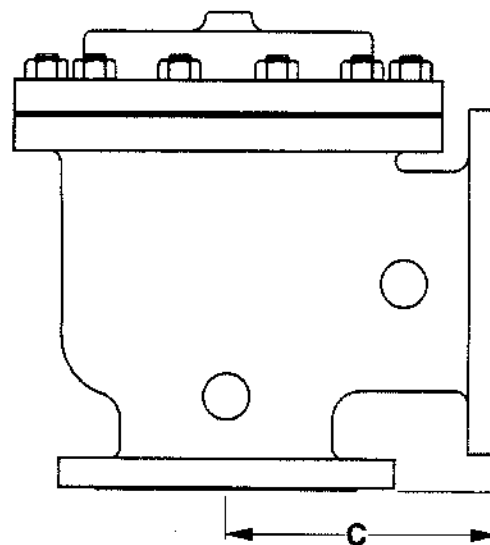
| VALVE SIZE | "A"<br>PIPE SIZE | "B"<br>MIN. LENGTH | "C"<br>SLOT WIDTH | "D"<br>SLOT DEPTH | "E"<br>NO. OF SLOTS | "F"<br>SLOT SPACING |
|------------|------------------|--------------------|-------------------|-------------------|---------------------|---------------------|
| 1-1/4"     | 3/4"             | 6"                 | 3/8"              | 3/8"              | 2                   | 180°                |
| 1-1/2"     | 3/4"             | 6"                 | 3/8"              | 3/8"              | 2                   | 180°                |
| 2"         | 1-1/2"           | 7"                 | 3/8"              | 3/8"              | 2                   | 180°                |
| 2-1/2"     | 2"               | 8"                 | 1/2"              | 1/2"              | 3                   | 120°                |
| 3"         | 2-1/2"           | 9"                 | 5/8"              | 5/8"              | 2                   | 180°                |
| 4"         | 3"               | 10"                | 5/8"              | 5/8"              | 2                   | 180°                |

REVISED 3-17-97





| DIM | ANSI CLASS | VALVE SIZE |       |       |       |       |       |       |       |       |       |       |       |       |
|-----|------------|------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|     |            | 1 1/4      | 1 1/2 | 2     | 2 1/2 | 3     | 4     | 6     | 8     | 10    | 12    | 14    | 16    | 24    |
| A   | SE         | 8.75       | 8.75  | 9.88  | 10.50 | 13.00 | —     | —     | —     | —     | —     | —     | —     | —     |
|     | 150        | 8.50       | 8.50  | 9.38  | 10.50 | 12.00 | 15.00 | 17.75 | 25.38 | 29.75 | 34.00 | 39.00 | 40.38 | 62.00 |
|     | 300        | 8.75       | 8.75  | 9.88  | 11.12 | 12.75 | 15.62 | 18.62 | 26.38 | 31.12 | 35.50 | 40.50 | 42.00 | 63.75 |
| B   | SE         | 1.44       | 1.44  | 1.69  | 1.88  | 2.25  | —     | —     | —     | —     | —     | —     | —     | —     |
|     | 150        | 2.31       | 2.50  | 3.00  | 3.50  | 3.75  | 4.50  | 5.50  | 6.75  | 8.00  | 9.50  | 10.62 | 11.75 | 16.00 |
|     | 300        | 2.62       | 3.06  | 3.25  | 3.75  | 4.12  | 5.00  | 6.25  | 7.50  | 8.75  | 10.25 | 11.50 | 12.75 | 18.00 |
| C   | SE         | 4.38       | 4.38  | 4.75  | 6.00  | 6.50  | —     | —     | —     | —     | —     | —     | —     | —     |
|     | 150        | 4.25       | 4.25  | 4.75  | 6.00  | 6.00  | 7.50  | 10.00 | 12.69 | 14.88 | 17.00 | —     | 20.81 | —     |
|     | 300        | 4 3/8      | 4.38  | 5.00  | 6.38  | 6.38  | 7.81  | 10.50 | 13.19 | 15.56 | 17.75 | —     | 21.62 | —     |
| D   | SE         | 3.12       | 3.12  | 3.88  | 4.00  | 4.50  | —     | —     | —     | —     | —     | —     | —     | —     |
|     | 150        | 3.00       | 3.00  | 3.88  | 4.00  | 4.00  | 5.50  | 6.00  | 8.00  | 11.38 | 11.00 | —     | 15.69 | —     |
|     | 300        | 3.25       | 3.25  | 4.12  | 4.38  | 4.38  | 5.81  | 6.50  | 8.50  | 12.06 | 11.75 | —     | 16.50 | —     |
| E   | ALL        | 6.00       | 6.00  | 6.00  | 7.00  | 6.50  | 7.92  | 10.00 | 11.88 | 15.38 | 17.00 | 18.00 | 19.00 | 27.00 |
| F   | ALL        | 3.88       | 3.88  | 3.88  | 3.88  | 3.88  | 3.88  | 3.88  | 6.38  | 6.38  | 6.38  | 6.38  | 6.38  | 8.00  |
| G   | ALL        | 6.00       | 6.00  | 6.75  | 7.69  | 8.75  | 11.75 | 14.00 | 21.00 | 24.50 | 28.00 | 31.25 | 34.50 | 52.00 |
| H   | ALL        | 10.00      | 10.00 | 11.00 | 11.00 | 11.00 | 12.00 | 13.00 | 14.00 | 17.00 | 18.00 | 20.00 | 20.00 | 28.50 |



NOTE: 3" VALVE DIMENSIONS  
ARE FOR NEW MODEL 3100

4" VALVE DIMENSIONS ARE FOR  
NEW MODEL 4400

REV. A SDJ 6-6-02  
REV. B SDJ 2-3-03

|                                              |         |                                                                                                                                           |                |      |
|----------------------------------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------|----------------|------|
| TOLERANCES                                   |         |  <b>OCV Control Valves</b><br>TULSA, OKLAHOMA U.S.A. |                |      |
| UNLESS NOTED                                 |         |                                                                                                                                           |                |      |
| FRACTIONAL $\pm 1/64$                        |         | GENERAL VALVE DIMENSIONS                                                                                                                  |                |      |
| DECIMAL $\pm .005$                           |         |                                                                                                                                           |                |      |
| MACH. FINISH 125/<br>ANGULAR $\pm 1/2^\circ$ |         |                                                                                                                                           |                |      |
| DRAWN BY                                     | DATE    | SIZE                                                                                                                                      | DRAWING NUMBER | REV. |
| SDJ                                          | 10-6-97 |                                                                                                                                           |                |      |
| CHKD. BY                                     | DATE    |                                                                                                                                           |                |      |
|                                              |         | A                                                                                                                                         | 65D            | B    |

THIS SPECIFICATION APPLIES TO: 640742  
 SOLENOID VALVE, 2-WAY, NORMALLY-OPEN  
 EXPLOSION PROOF  
 A.C. CONSTRUCTION  
 ASCO EF8262G148

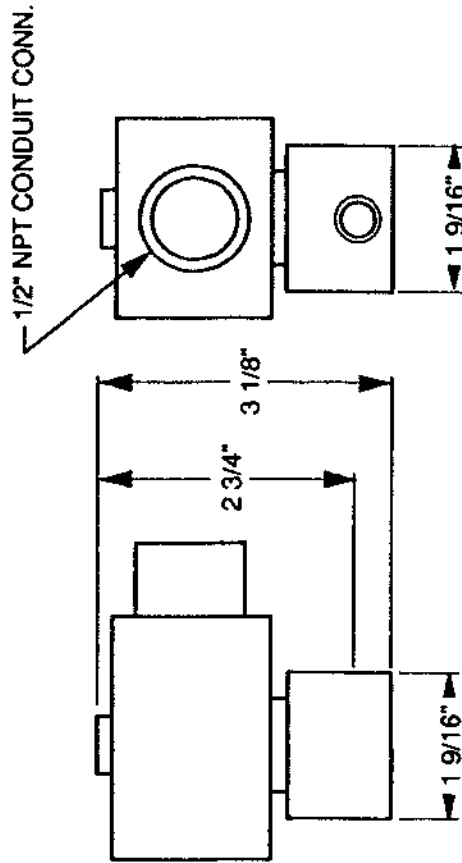
BODY MATERIAL: STAINLESS STEEL  
 INTERNALS: STAINLESS STEEL, NYLON  
 ELASTOMERS: BUNA-N  
 COIL ENCLOSURE: NEMA 3, 3S, 4, 4X, 6, 6P, 7, 9  
 COIL: CLASS F, MOLDED

PIPE SIZE: 1/4"  
 ORIFICE SIZE: 7/32"  
 Cv FACTOR: 0.83  
 OP. PRESSURE DIFFERENTIAL: 0 - 45 PSI  
 FLUID TEMPERATURE, MAX. 180°F  
 NOM. AMBIENT TEMPERATURE: 32 - 125°F

POWER CONSUMPTION:  
 50 V-A INRUSH  
 25 V-A HOLDING

OPERATING VOLTAGE:  
☐ 24V/60Hz  
☐ 120V/60Hz, 110V, 50Hz  
☐ 208V/60Hz  
☐ 240V/60Hz, 220V/50Hz  
☐ 480V/60Hz, 440V/50Hz

OPERATION:  
 COIL ENERGIZED: VALVE CLOSED  
 COIL DE-ENERGIZED: VALVE OPEN



| REVISIONS  |          | REF DWG NO'S      |        |
|------------|----------|-------------------|--------|
| CHG        | E.C. NO. | DATE              | BY     |
| NO. REQ'D  |          | SCALE             | FULL   |
| DRAWN BY   |          | CHKD. BY          | DATE   |
| SDJ        |          |                   | 6-1-93 |
| TOLERANCES |          | UNLESS NOTED      |        |
|            |          | FRACTIONAL ±1/64  |        |
|            |          | DECIMAL ±.005     |        |
|            |          | MACH. FINISH 125/ |        |
|            |          | ANGULAR ±1/2° ✓   |        |
| MATERIAL   |          | NO. REQ'D         |        |
|            |          | DATE              |        |

**OCV Control Valves**  
 TULSA, OKLAHOMA U.S.A.

SOLENOID VALVE  
 AC 2W NO SS ASCO EF8262G148

SIZE A DRAWING NUMBER 640742 REV.



# rate of flow control pilot

## installation, operating, and maintenance instructions

### model 2450

#### GENERAL DESCRIPTION

The OCV Model 2450 Rate of Flow Control Pilot is a direct-acting, spring-loaded, diaphragm-type control pilot. It is available in bronze or stainless steel (stainless steel internals) construction, with either Buna-N or Viton elastomers. It is designed to maintain a constant, preset rate of flow through the main valve. It is manually adjustable by means of an adjusting screw located on top of the pilot. The 2450 is a constant-throttling device, maintaining precise, positive control of the main valve.

#### FUNCTIONAL DESCRIPTION

Basically, the 2450 controls the amount of pressure in the upper chamber of the main valve, hence the degree of opening or closing of the valve. The pilot senses the pressure differential across an orifice plate located on the inlet of the main valve. The upstream, or high pressure, side of the orifice plate is sensed under the pilot diaphragm and the downstream, or low pressure, is sensed above the diaphragm. The low pressure sense is assisted by the pilot spring. As the flow through the orifice plate increases, the differential pressure increases and begins to close the pilot. As the pilot closes, the pressure in the upper chamber of the main valve increases, causing the valve to close a proportionate amount in order to maintain the preset rate of flow. Conversely, as the rate of flow decreases, the pilot opens, allowing the main valve to open and compensate for the decrease in flow.

#### INSTALLATION AND ADJUSTMENT

The 2450 should be installed in the main valve control piping between either the ejector or the accelerator pilot (depending on valve model) and the downstream body tap. Flow should be in the direction indicated on the pilot body. Sensing lines (1/4" O.D. tubing) are installed from the downstream orifice flange tap to the

upper sense tap of the pilot and from the upstream orifice flange tap to the lower sense tap of the pilot. Pilot adjustment is made with the adjusting screw located on top of the bonnet. Increase flow through the valve by turning the screw clockwise; decrease flow by turning the screw counterclockwise.

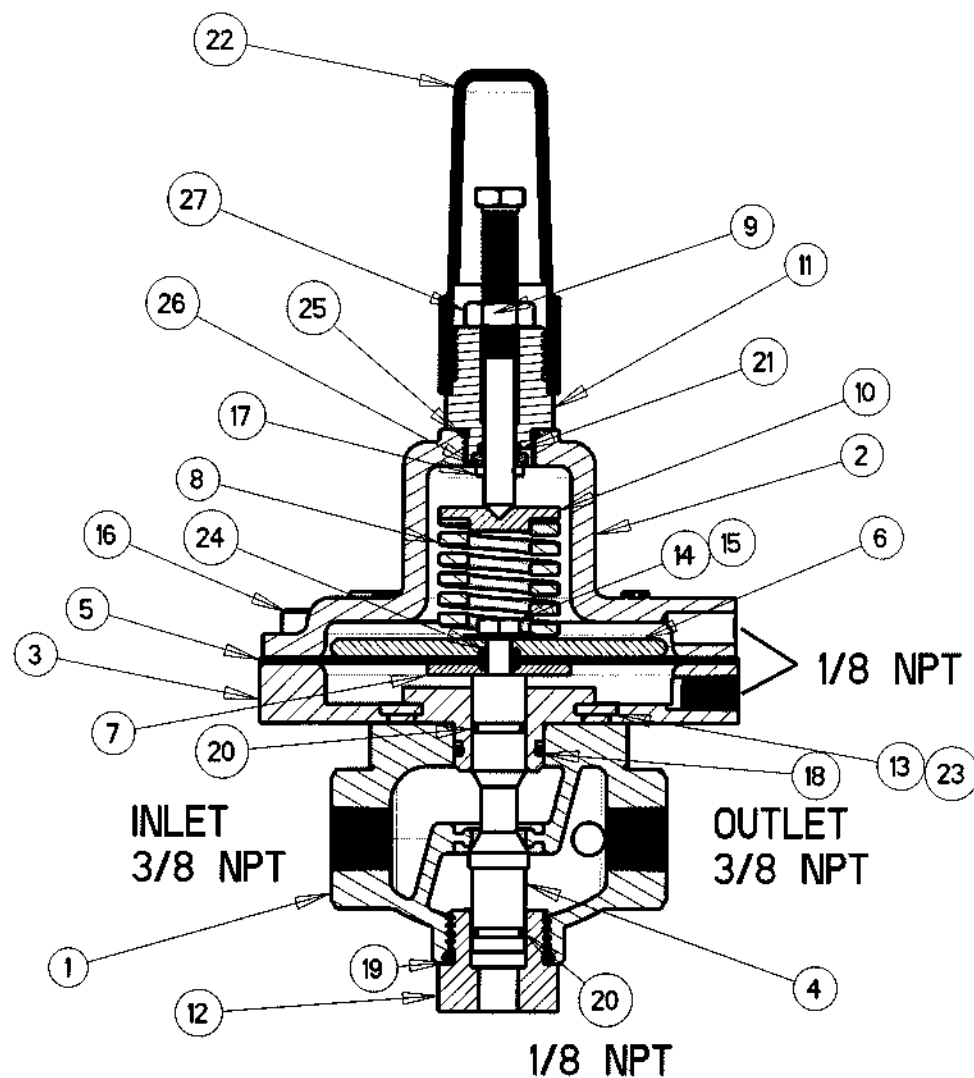
#### MAINTENANCE

Because of the simplicity of design of the 2450 pilot, required maintenance is minimal. Fitting and bolts should be periodically checked for tightness and the body should be inspected for damage or excessive buildup of foreign material.

#### TROUBLESHOOTING

Troubleshooting of the 2450 is equally simple. Major troubleshooting points are as follows:

1. To check for ruptured diaphragm, disconnect the low pressure sense line from both the pilot and the valve flange. Plug the flange tap and pressurize the valve. A continuous discharge of fluid at the open sense port indicates a ruptured diaphragm.
2. An indication of the pilot stem binding may be checked by removing the pilot bonnet and moving the stem by hand. If excessive drag is evident, disassemble and pilot and determine the cause.
3. An erratic pilot action can result from a blockage in the port area of the valve stem or in the counterbalance area. Detach the sense line on the bottom plug and remove the plug. Clean out the counterbalance chamber as required. To remove the stem, hold the bottom of the stem with screwdriver in slot and remove the screw securing the diaphragm plates. The seat/stem assembly may now be removed through the bottom body port. Clean as necessary.



| 27   | 590717   | 1   | HEX NUT               | STN. STEEL   |
|------|----------|-----|-----------------------|--------------|
| 26   | 320718   | 1   | BUSHING               | STN. STEEL   |
| 25   | 610017   | 1   | O-RING                | BUNA-N       |
| 24   | 611010   | 1   | O-RING                | VITON        |
| 23   | 611011   | 4   | O-RING                | VITON        |
| 22   | 692002   | 1   | CAP                   | BUTYRATE     |
| 21   | 611011   | 1   | O-RING                | VITON        |
| 20   | 611013   | 2   | O-RING                | VITON        |
| 19   | 610912   | 1   | O-RING                | BUNA-N       |
| 18   | 611116   | 1   | O-RING                | VITON        |
| 17   | 620712   | 1   | CODDER PIN            | STN. STEEL   |
| 16   | 530701   | 8   | SKT HD CAPSCREW       | STN. STEEL   |
| 15   | 685700   | 1   | LOCK WASHER           | STN. STEEL   |
| 14   | 531700   | 1   | HEX HD CAPSCREW       | STN. STEEL   |
| 13   | 532702   | 4   | FLAT HD SCREW         | STN. STEEL   |
| 12   | 310725   | 1   | PLUG                  | STN. STEEL   |
| 11   | 320816   | 1   | ADJUSTING SCREW ADAP. | STN. STEEL   |
| 10   | 300710   | 1   | SPRING RETAINER       | STN. STEEL   |
| 9    | 320724   | 1   | ADJUSTING SCREW       | STN. STEEL   |
| 8    | 651408   | 1   | SPRING                | CR-V STEEL   |
| 7    | 308702   | 1   | LOWER DIAPH. PLATE    | STN. STEEL   |
| 6    | 308720   | 1   | UPPER DIAPH. PLATE    | STN. STEEL   |
| 5    | 694004   | 1   | DIAPHRAGM             | BUNA-N/NYLON |
| 4    | 314720   | 1   | STEM                  | STN. STEEL   |
| 3    | 300706   | 1   | ADAPTER               | STN. STEEL   |
| 2    | 304730   | 1   | BONNET                | STN. STEEL   |
| 1    | 302702   | 1   | BODY                  | STN. STEEL   |
| ITEM | PART NO. | QTY | DESCRIPTION           | MATERIAL     |

|           |     |      |    | MATERIAL     | TOLERANCES                                                                                     | OCV Control Valves         |                |  |      |
|-----------|-----|------|----|--------------|------------------------------------------------------------------------------------------------|----------------------------|----------------|--|------|
| E         |     |      |    |              | UNLESS NOTED<br>XX $\pm .015$<br>XXX $\pm .005$<br>ANGULAR $\pm 0.5^\circ$<br>MACH. FINISH 125 | TULSA OKLAHOMA USA         |                |  |      |
| D         |     |      |    |              |                                                                                                | RATE-OF-FLOW CONTROL PILOT |                |  |      |
| C         |     |      |    |              |                                                                                                |                            |                |  |      |
| B         |     |      |    |              |                                                                                                | SIZE                       | DRAWING NUMBER |  | REV  |
| A         |     |      |    |              | NO. REQ'D                                                                                      | DRAWN BY                   | DATE           |  |      |
| CHG       | ECN | DATE | BY |              | SCALE                                                                                          | B.K.                       | 11-9-07        |  |      |
| REVISIONS |     |      |    | REF DWG NO'S | 1/2                                                                                            | CHKD BY                    | DATE           |  |      |
|           |     |      |    |              |                                                                                                |                            | A              |  | 2450 |

# differential control pilot

installation, operating,  
and  
maintenance instructions

## model 1356

### GENERAL DESCRIPTION

The Model 1356 Differential Control Pilot is a normally-closed, direct-acting, spring-loaded, diaphragm-type control pilot. It is designed primarily for use in systems using LPG or other high vapor pressure liquids to maintain valve inlet pressure a constant, preset amount higher than storage tank vapor pressure in order to prevent flashing in the system. It is manually adjustable by means of an adjustment screw located under the cap on top of the pilot. It is a constant throttling device, maintaining precise positive control of the Main Valve.

### FUNCTIONAL DESCRIPTION

Basically, the Model 1356 controls the amount of pressure in the upper chamber of the main valve, hence, the degree of opening or closing of the main valve. The main valve inlet pressure is sensed under the pilot diaphragm and balances against both tank vapor pressure and spring loading above the diaphragm. As valve inlet pressure increases (or vapor pressure decreases), the pilot opens wider, decreasing the pressure in the upper chamber of the main valve and allowing it to open a proportionate amount in order to maintain a constant differential. As valve inlet pressure decreases (or vapor pressure increases), the pilot begins to close, increasing the pressure in upper chamber of the main valve and allowing it to close. This is a constant modulating action compensating for any changes in either inlet pressure or vapor pressure.

### INSTALLATION & ADJUSTMENT

The Model 1356 should be installed in the Main Valve Control Piping between the ejector and the downstream body tap. Flow should be in the direction indicated by the arrow on the pilot body. A sensing line (1/4" O.D. tubing) should be installed from the pilot high pressure sensing port (see drawing) to a point upstream of the main valve. A

second sensing line should be installed from the pilot low pressure sensing port to a point on the storage tank located to sense vapor pressure. To aid in accurate setting of the pilot, two pressure gauges—one measuring inlet pressure and one measuring vapor pressure—should be installed. Prior to start up, set the pilot to its fully closed position by turning the adjustment screw all the way clockwise. Start the pump. At this point the main valve will be fully closed or else open slightly, flowing at an inlet pressure higher than desired. Turn the adjustment screw slowly counterclockwise until inlet pressure falls to the desired point in excess of vapor pressure.

Tighten the lock nut on the adjustment screw and reinstall the cap. If adjustments are needed later, turning the adjustment clockwise increases the differential; turning it counterclockwise decreases the differential.

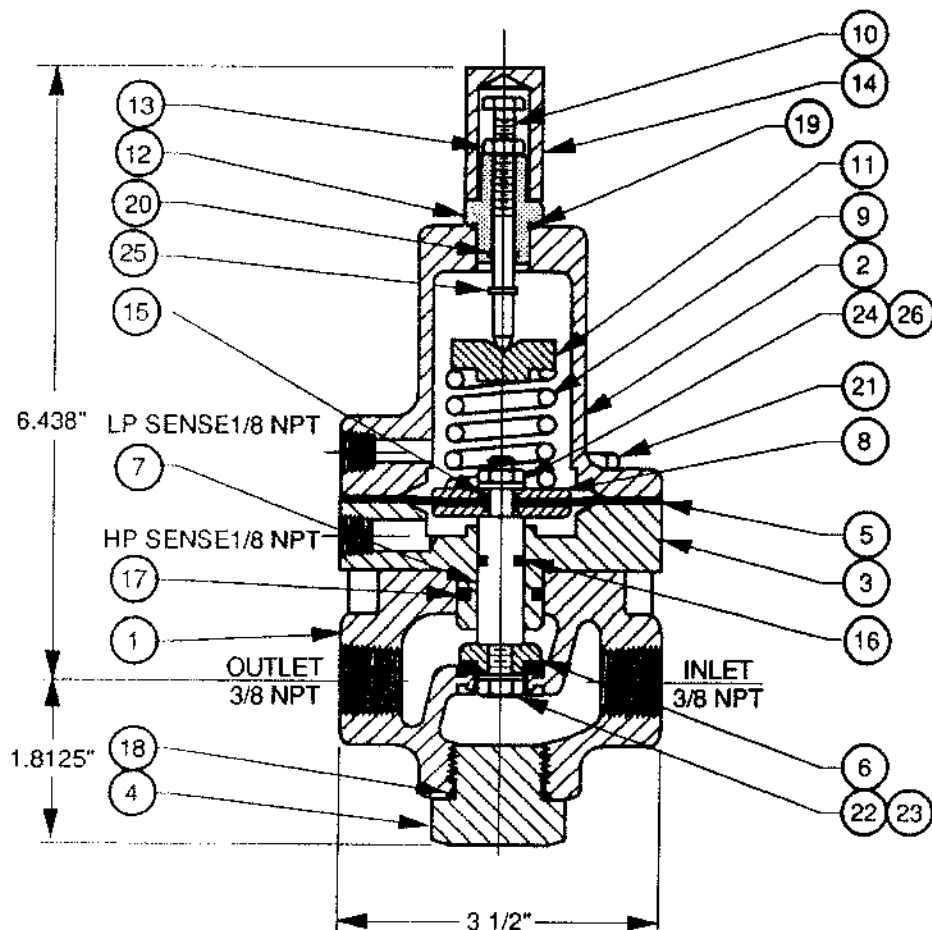
### MAINTENANCE

Because of the simplicity of design of the 1356 Pilot, required maintenance is minimal. Fittings and bolts should be periodically checked and the body should be inspected for damage or excessive build-up of foreign material.

### TROUBLESHOOTING

Troubleshooting the 1356 is equally simple. Major troubleshooting points are as follows:

1. To check for a ruptured diaphragm, disconnect the low pressure sense line from the pilot. Plug this line to prevent loss of vapor from tank. Pressurize the valve. A continuous discharge of fluid at the open sense port on the pilot indicates a ruptured diaphragm.
2. An indication of the pilot stem binding may be checked by removing the pilot bonnet and moving the stem by hand. If excessive drag is evident, disassemble the pilot and determine the cause.



| SPRING CHART |             |        |
|--------------|-------------|--------|
| 651701       | 5-30 PSI    | GREEN  |
| 651703       | 20-80 PSI   | RED    |
| 651704       | 65-180 PSI  | YELLOW |
| 651702       | 100-300 PSI | BLUE   |

▲ - RECOMMENDED SPARE PARTS  
VITON ELASTOMERS AVAILABLE  
1/2" NPT AVAILABLE

|   |      |          |     |                 |              |
|---|------|----------|-----|-----------------|--------------|
|   | 26   | 685700   | 1   | LOCKWASHER      | STN. STEEL   |
|   | 25   | 630715   | 1   | E-RING          | STN. STEEL   |
|   | 24   | 590712   | 1   | HEX NUT         | STN. STEEL   |
| ▲ | 23   | 685760   | 1   | LOCKWASHER      | STN. STEEL   |
|   | 22   | 531700   | 1   | HEX HD CAPSCREW | STN. STEEL   |
|   | 21   | 531701   | 4   | HEX HD CAPSCREW | STN. STEEL   |
| ▲ | 20   | 611008   | 2   | O-RING          | VITON        |
| ▲ | 19   | 611906   | 1   | O-RING          | VITON        |
| ▲ | 18   | 610119   | 1   | O-RING          | BUNA-N       |
| ▲ | 17   | 611116   | 1   | O-RING          | VITON        |
| ▲ | 16   | 611012   | 1   | O-RING          | VITON        |
| ▲ | 15   | 611010   | 2   | O-RING          | VITON        |
|   | 14   | 300137   | 1   | CAP             | BRASS        |
|   | 13   | 300709   | 1   | NUT             | STN. STEEL   |
|   | 12   | 300716   | 1   | ADJ SCREW GUIDE | STN. STEEL   |
|   | 11   | 300729   | 1   | SPRING RETAINER | STN. STEEL   |
|   | 10   | 300724   | 1   | ADJUSTING SCREW | STN. STEEL   |
|   | 9    | CHART    | 1   | SPRING          | STN. STEEL   |
|   | 8    | 308702   | 2   | DIAPHRAGM PLATE | STN. STEEL   |
|   | 7    | 314002   | 1   | STEM            | MONEL        |
| ▲ | 6    | 310703   | 1   | SEAT DISC       | BUNA-N/SS    |
| ▲ | 5    | 694002   | 1   | DIAPHRAGM       | BUNA-N/NYLON |
|   | 4    | 310730   | 1   | PLUG            | STN. STEEL   |
|   | 3    | 300719   | 1   | ADAPTER         | STN. STEEL   |
|   | 2    | 304705   | 1   | BONNET          | STN. STEEL   |
|   | 1    | 302702   | 1   | BODY            | STN. STEEL   |
|   | ITEM | PART NO. | QTY | DESCRIPTION     | MATERIAL     |

|           |          |      |    | MATERIAL                         | TOLERANCES                                                                                                    |
|-----------|----------|------|----|----------------------------------|---------------------------------------------------------------------------------------------------------------|
|           |          |      |    | STN STL / BUNA-N /<br>MONEL STEM | UNLESS NOTED<br>FRACTIONAL $\pm 1/64$<br>DECIMAL $\pm .005$<br>MACH. FINISH 125/<br>ANGULAR $\pm 1/2^\circ$ ✓ |
|           |          |      |    | NO. REQ'D                        | DRAWN BY<br>RON                                                                                               |
|           |          |      |    | SCALE<br>1/2                     | DATE<br>4-11-95                                                                                               |
| CHG       | E.C. NO. | DATE | BY |                                  | CHKD. BY<br>DATE                                                                                              |
| REVISIONS |          |      |    | REF DWG NO'S                     |                                                                                                               |

**OCV Control Valves**  
TULSA, OKLAHOMA U.S.A.

### DIFFERENTIAL CONTROL PILOT

| SIZE     | DRAWING NUMBER | REV. |
|----------|----------------|------|
| <b>A</b> | <b>1356</b>    |      |

## DESCRIPTION



### MODEL 126 EJECTOR

The Model 126 ejector is a simple tee fitting with a fixed orifice in its inlet port. It provides the proper supply pressure to the main valve diaphragm chamber, allowing various two-way control pilots to control the valve position.

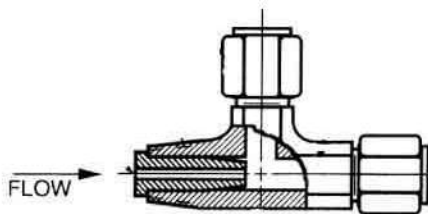
## MODEL 126 EJECTOR DIAGRAM

Brass Construction / Stainless Steel Construction

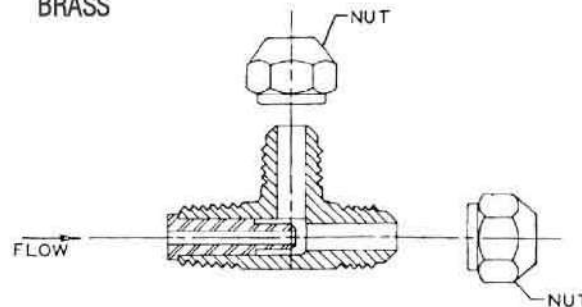
| MATERIAL       | PART NUMBER | P (NPT) | T-TUBE O.D. | STD. ORIFICE | USED ON VALVE SIZES |
|----------------|-------------|---------|-------------|--------------|---------------------|
| Brass          | 213100      | 3/8"    | 3/8"        | .125"        | 1 1/4"-6"           |
| Brass          | 214100      | 1/2"    | 1/2"        | .188"        | 8"-10"              |
| Brass          | 215100      | 3/4"    | 3/4"        | .188"        | 12"-16"             |
| 316 Stn. Steel | 213700      | 1/4"    | 3/8"        | .090"        | 1 1/4"-6"           |
| 316 Stn. Steel | 214700      | 3/8"    | 1/2"        | .125"        | 8"-10"              |
| 316 Stn. Steel | 215700      | 1/2"    | 3/4"        | .188"        | 12"-16"             |

Orifice bushings are stainless steel.

STAINLESS

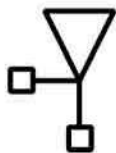


BRASS

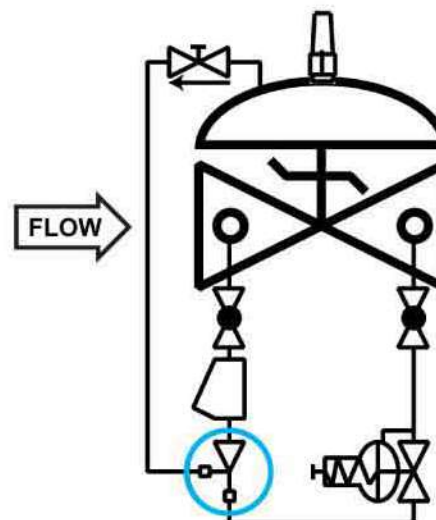


## SCHEMATIC SYMBOL

The Model 126 Ejector is shown on OCV Valve Schematics as:



EXAMPLE: Shown here on a MODEL 127-3 Pressure Reducing Valve





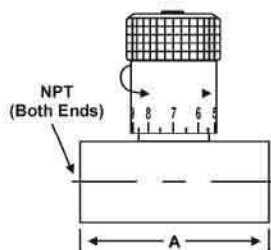
## DESCRIPTION

The Model 141-2 Needle Valve is an adjustable restriction device installed in the control circuit tubing. The setting of the needle valve meters the flow into and out of the main valve diaphragm chamber, thus controlling the response speed of the main valve. Depending on the application, the needle valve may be used as a closing speed control, opening speed control, or both simultaneously.



◀ Needle Valves shown  
Sizes: 3/4" & 1/4"

## MODEL 141-2 MATRIX

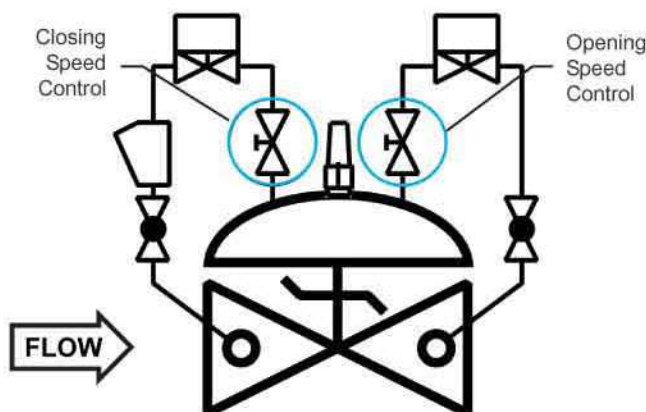
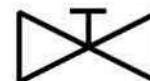


| MATERIAL   | PART NUMBER | INLET/OUTLET (NPT) | A     | USED ON VALVE SIZE* |
|------------|-------------|--------------------|-------|---------------------|
| Brass      | 683100      | 1/4                | 2     | 1 1/4"-2"           |
| Brass      | 683101      | 3/8                | 2 1/4 | 2 1/2"-6"           |
| Brass      | 683102      | 1/2                | 2 5/8 | 8"-10"              |
| Brass      | 683103      | 3/4                | 3 1/4 | 12"-16"             |
| Stn. Steel | 683700      | 1/4                | 2     | 1 1/4"-2"           |
| Stn. Steel | 683702      | 3/8                | 2 1/4 | 2 1/2"-6"           |
| Stn. Steel | 682704      | 1/2                | 2 5/8 | 8"-10"              |
| Stn. Steel | 683703      | 3/4                | 3 5/8 | 12"-16"             |

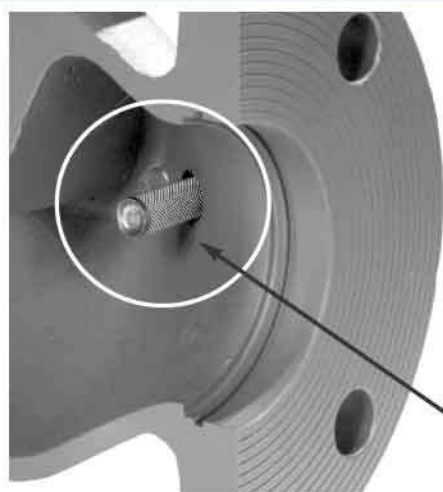
Note: Needle valve size may vary on valve application. Consult factory.

## SCHEMATIC SYMBOL

The Model 141-2 Needle Valve is shown on OCV Valve Schematics as:



EXAMPLE: Shown here on a MODEL 115-3 DIGITAL VALVE as separate opening and closing speed controls.



Strainer Shown Installed

## DESCRIPTION

The 123 Inline Strainer installs in the inlet side port of the main valve, and protects the pilot system from solid contaminants in the line fluid. The screen prevents the entrance of particles into the pilot system piping while flow through the main valve washes the screen clean. Recommended use on petroleum valve applications where flushing or removal of the screen for cleaning is not practical or may be considered hazardous.

## DIMENSIONS

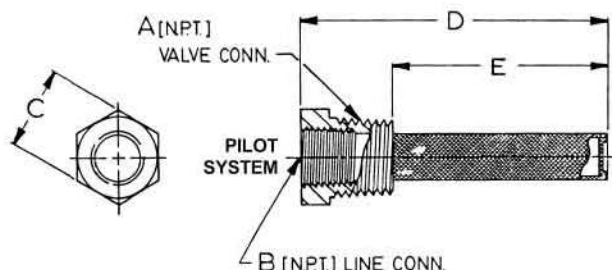
| PART NUMBER | A   | B   | C     | D      | E     | USED ON VALVE SIZE |
|-------------|-----|-----|-------|--------|-------|--------------------|
| 660704      | 3/8 | 1/4 | 11/16 | 2 3/16 | 1 1/2 | 1 1/4"-6"          |
| 660705      | 1/2 | 3/8 | 7/8   | 2 1/4  | 1 1/2 | 8"-10"             |
| 660706      | 3/4 | 1/2 | 1 1/8 | 2 3/8  | 1 1/2 | 12"-16"            |

## MATERIALS

Inline strainers are all-stainless steel construction.

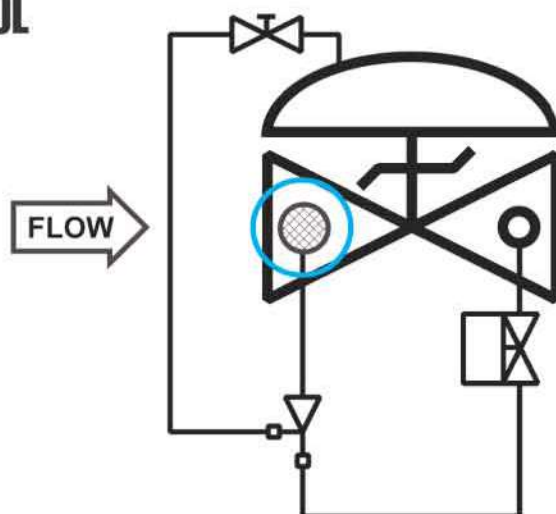
## SCREEN SIZE

Standard screen is 40 mesh. Other mesh sizes are available.



## SCHEMATIC SYMBOL

The Model 123 Inline Strainer is shown on OCV Valve Schematics as:



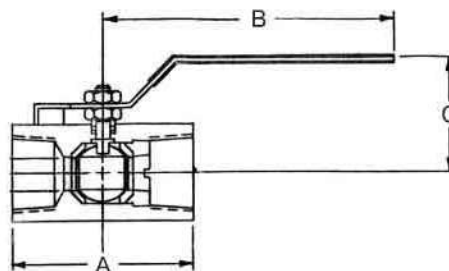
EXAMPLE: Shown here on a MODEL 115-2 Solenoid Valve.

## DESCRIPTION



The Model 141-4 Ball Valve is a 1/4-turn shutoff device used for isolating the pilot system from the main valve. They are extremely useful for performing routine maintenance and troubleshooting.

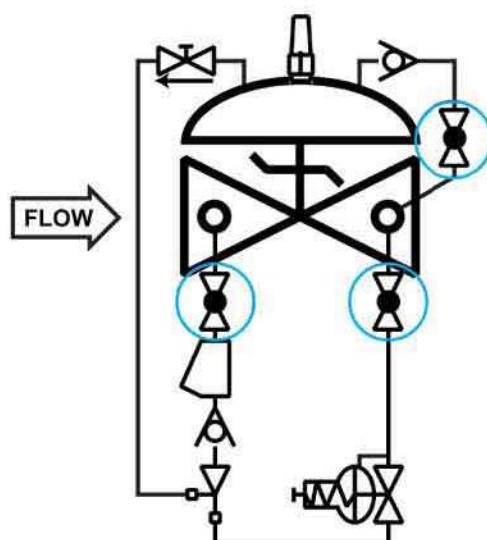
Ball valves are standard on water service valves; optional on fuel service valves.



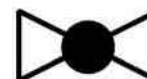
## MODEL 141-4 MATRIX

| MATERIAL   | PART NUMBER | INLET/OUTLET (NPT) | A     | B     | C     | USED ON VALVE SIZE* |
|------------|-------------|--------------------|-------|-------|-------|---------------------|
| Bronze     | 680100      | 3/8                | 1 3/4 | 3 1/2 | 1 7/8 | 1 1/4"-6"           |
| Bronze     | 680101      | 1/2                | 2     | 3 1/2 | 2 1/4 | 8"-10"              |
| Bronze     | 680102      | 3/4                | 3     | 4 3/4 | 2 1/4 | 12"-16"             |
| Stn. Steel | 680700      | 3/8                | 2     | 3 3/4 | 2 1/8 | 1 1/4"-6"           |
| Stn. Steel | 680701      | 1/2                | 2 1/4 | 3 3/4 | 2 1/2 | 8"-10"              |
| Stn. Steel | 680702      | 3/4                | 3     | 4 3/4 | 2 1/4 | 12"-16"             |

## SCHEMATIC SYMBOL



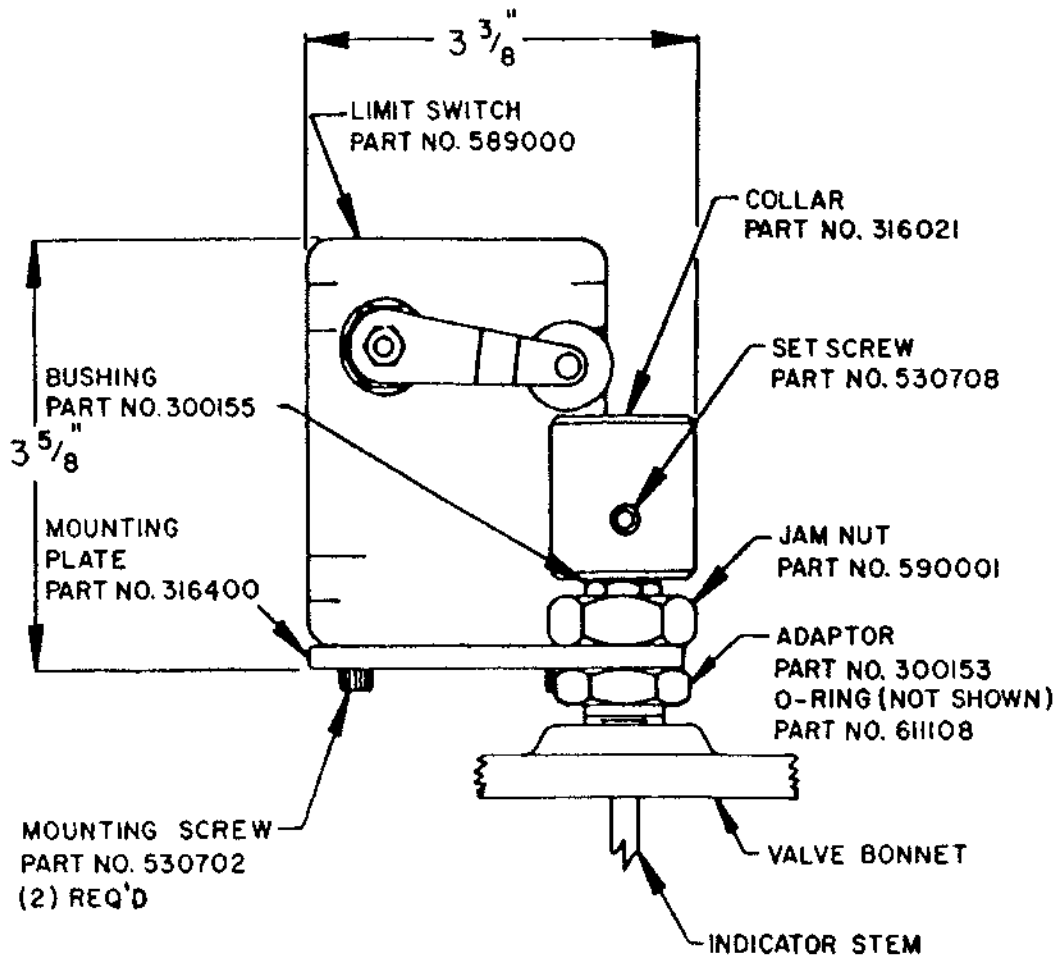
The Model 141-4 Ball Valve is shown on OCV Valve Schematics as:



EXAMPLE: Shown here on a MODEL 127-4 Pressure Reducing / Check Valve.



7400 East 42nd Place / Tulsa, Oklahoma 74145-4744 USA / (918) 627-1942 / 888-OCV-VALV / FAX 918-622-8916  
e-mail: sales@controlvalves.com / website: www.controlvalves.com



## MODEL 150 LIMIT SWITCH ASSEMBLY



