



MODELS 1171 AND 2171

BACK PRESSURE / RELIEF REGULATORS

SECTION I

I. DESCRIPTION AND SCOPE

Models 1171 and 2171 are back pressure/relief regulators used to control upstream (inlet or P_1) pressure. Sizes are 1/4" and 3/8" (DN8 and DN10). The Model 2171 is also available in 1/2" (DN15) size. The 1171 is a bronze bodied unit; the 2171 incorporates a stainless steel body. With proper trim utilization, both units are suitable for liquid, gaseous and steam service (the 2171 can also be used with various chemicals). Refer to Technical Bulletins 1171-TB and 2171-TB for specific design conditions and selection recommendations.

The instructions in this manual will refer to both models, unless otherwise stated.



CAUTION A

This is not a safety device and must not be substituted for a code approved pressure safety relief valve or rupture disc.

SECTION II

II. INSTALLATION



CAUTION B

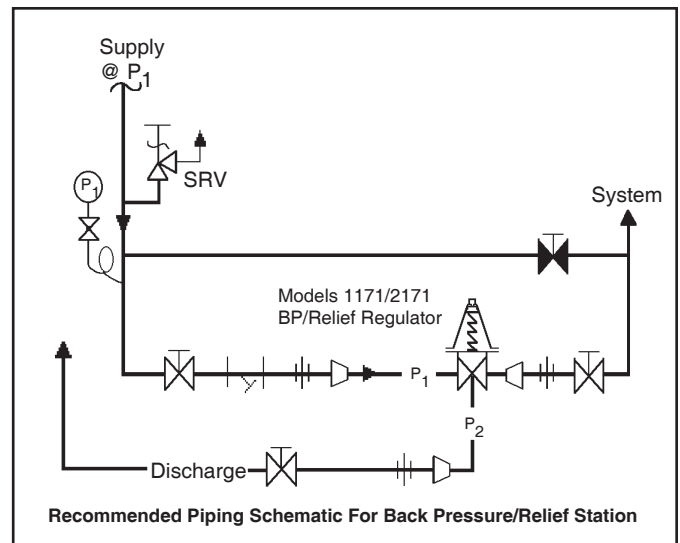
For welded installations, all internal trim parts, seals and diaphragm(s) must be removed from regulator body prior to welding into pipeline. The heat of fusion welding will damage non-metallic parts if not removed. NOTE: This does not apply to units equipped with extended pipe nipples.

1. An inlet block valve should always be installed.
2. If service application is continuous such that shutdown is not readily accomplished, it is recommended that an inlet block valve, outlet block valve, and a manual bypass valve be installed.
3. Pipe unions should be installed to allow removal from piping.
4. An inlet pressure gauge should be located approximately ten pipe diameters upstream, and within sight. An outlet pressure gauge is optional.



CAUTION C

The maximum inlet pressure is equal to 1.5 times the larger number of the stated range spring on the nameplate, and is the recommended "upper operative limit" for the sensing diaphragm. Higher pressures could damage the diaphragm. (Field hydrostatic tests frequently destroy diaphragms. DO NOT HYDROSTATIC TEST THRU AN INSTALLED UNIT; ISOLATE FROM TEST.)



5. All installations should include an upstream relief device if the inlet pressure could exceed the pressure rating of any equipment or the maximum inlet pressure rating of the unit.
6. Clean piping of all foreign material including chips, welding scale, oil, grease and dirt before installing the regulator. Strainers are recommended.
7. In placing thread sealant on pipe ends prior to engagement, assure that excess material is removed and not allowed to enter regulator upon startup.

8. Flow Direction: Install so the flow direction matches the arrow cast on the body. Connect the inlet pressure to the body side connection(s). Fluid will relieve out of the bottom connection. The double inlet connections are for in-line installation (plug one side connection if in-line installation is not required).
9. Regulator may be installed in a vertical or horizontal pipe. If it is a steam system, assure the piping is properly trapped and oriented.
- 10.A. Basic Regulator - (Refer to Figure 1, Model 1171 or 2171): Regulator may be rotated around the pipe axis 360°. Recommended position is with spring chamber vertical upwards. Orient such that the spring chamber vent hole does not collect rainwater.
- 10.B. Cryogenic Regulator - Options 1171-5 and 2171-36 (Refer to Figure 2, Model 1171 or 2171):
 - a. Recommended installation is with spring chamber hanging directly below the body in a vertical downwards orientation. Allows water to drain; etc.
 - b. Recommend inert purge gas to spring chamber through vent hole and out drain hole.
11. Regulators are not to be direct buried underground.
12. For insulated piping systems, recommendation is to not insulate regulator.
13. Spring Chamber Vent Tap – Option -25: Pipe spring chamber vent opening to remote location.



CAUTION D

Installation of adequate overpressure protection is recommended to protect the regulator from overpressure and all downstream equipment from damage in the event of regulator failure.

SECTION III

III. PRINCIPLE OF OPERATION

1. Movement occurs as pressure variations register on the diaphragm. The registering pressure is the inlet, P_1 , or upstream pressure. The range spring opposes diaphragm movement. As inlet pressure drops, the range spring pushes the dia-

phragm down, closing the port; as inlet pressure increases, the diaphragm pushes up and the port opens.

2. A complete diaphragm failure will cause the regulator to fail closed.

SECTION IV

IV. START-UP

1. Start with the block valves closed. A bypass valve may be used to maintain inlet pressure in the upstream system without changing the following steps.
2. Relax the range spring by turning the adjusting screw counter clockwise (CCW) a minimum of three (3) full revolutions. This reduces the inlet (upstream) pressure setpoint.
3. If it is a “hot” piping system, and equipped with a bypass valve, slowly open the bypass valve to pre-heat the system piping and to allow slow expansion of the piping. Assure proper steam trap operation if installed. Closely monitor inlet (upstream) pressure via gauge to assure not over-pressurizing. **NOTE:** *If no bypass valve is installed, extra caution should be used in starting up a cold system; i.e. do everything slowly.*
4. Crack open the inlet (upstream) block valve.
5. Slowly open the outlet (downstream) block valve observing the inlet (upstream) pressure gauge. Determine if the regulator is flowing. If not, slowly rotate the regulator adjusting screw counter clockwise (CCW) until flow begins.
6. Continue to slowly open the outlet (downstream) block valve until fully open.

7. Observing the inlet (upstream) pressure gauge, rotate the adjusting screw clockwise (CW) slowly until the inlet pressure begins to rise. Rotate CW until the desired setpoint is reached.
8. Continue to slowly open the inlet (upstream) block valve. If the inlet (upstream) pressure exceeds the desired setpoint pressure, rotate the adjusting screw CCW until the pressure decreases.
9. When flow is established steady enough that both the outlet and inlet block valves are fully open, begin to slowly close the bypass valve, if installed.
10. Develop system flow to a level near its expected normal rate, and reset the regulator setpoint by turning the adjusting screw CW to increase inlet pressure, or CCW to reduce inlet pressure.
11. Using a downstream valve, reduce system flow to a minimum level and observe setpoint. Inlet pressure will rise from the setpoint of Step 9. (Ensure this rise does not exceed the stated upper limit of the range spring (16) by greater than 50%, i.e. 20-80 psig (1.4 - 5.5 Barg) range spring, at maximum flow the inlet pressure should not exceed 1.5 x 80 psig (5.5 Barg), or 120 psig (8.3 Barg). If it does, consult factory).
12. Increase flow to maximum level, if possible. Inlet (upstream or P_1) pressure should fall off. Readjust setpoint as necessary at the normal flow rate.

SECTION V

V. SHUTDOWN

1. On systems with a bypass valve, and where system pressure is to be maintained as the regulator is shut down, slowly open the bypass valve while closing the inlet (upstream) block valve. Fully close the inlet (upstream) block valve. (When on bypass, the system pressure must be constantly observed and manually regulated. Close the outlet (downstream) block valve.



CAUTION E

Do not walk away and leave a bypassed regulator unattended.

2. If the regulator and system are to both be shut down, slowly close the inlet (upstream) block valve. Close the outlet (downstream) valve only if regulator removal is required.

SECTION VI

VI. MAINTENANCE



WARNING 1

SYSTEM UNDER PRESSURE. Prior to performing any maintenance, isolate the regulator from the system and relieve all pressure. Failure to do so could result in personal injury.

A. General:

1. Maintenance procedures hereinafter are based upon removal of the regulator unit from the pipeline where installed.
2. Owner should refer to owner's procedures for removal, handling, cleaning and disposal of nonreusable parts, i.e. gaskets, etc.
3. Refer to Figure 1, Model 1171 or 2171 for the basic regulator and Figure 2, Model 1171 or 2171 for the cryogenic regulator. Blow-ups of options and the composition seat trim are on either drawing.

B. Diaphragm Replacement - Model 1171:



CAUTION F

To prevent damage to body, use lead jaws when placing body in a vise. Position so that vise closes over inlet and outlet of the body.

1. Securely install the body (1) in a vise with the spring chamber (2) directed upwards.

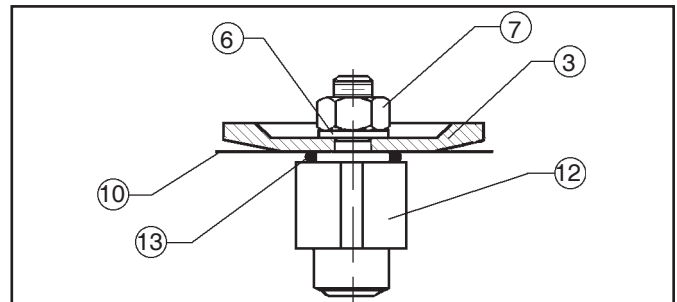


WARNING 2

SPRING UNDER COMPRESSION. Prior to removing spring chamber, relieve spring compression by backing out the adjusting screw. Failure to do so may result in flying parts that could cause personal injury.

2. Relax range spring (16) by turning adjusting screw (5) CCW until removed from spring chamber (2).

3. Loosen spring chamber (2) by placing wrench on "flats" and rotating CCW making sure not to use the flats on either side of the vent hole.
4. Remove spring chamber (2), range spring (16), spring button (4) and diaphragm gasket (11), (if metal diaphragms (10) are used, there will be one diaphragm gasket (11) on top and one below the diaphragm(s) (10). If a composition diaphragm (10) is used, there will be only one diaphragm gasket (11) above the diaphragm (10)).
5. Remove the diaphragm subassembly consisting of the pressure plate nut (7), lock washer (6), pressure plate (3), diaphragm (10), piston O-ring (13) and piston (12).
NOTE: Refer to the quantity of diaphragms (10) incorporated per the bill of materials. Depending on inlet pressure level, multiple metal diaphragms (10) may be "stacked".



Model's 1171/2171 Diaphragm Subassembly

6. Loosen pressure plate nut (7) and separate all parts (3, 6, 7, 10, 12 & 13) of the diaphragm subassembly.
7. Inspect pressure plate (3) to ensure no deformation due to over-pressurization. If deformed, replace.
8. Remove diaphragm gasket (11) for metal diaphragm (10). **NOTE:** No diaphragm gasket (11) with composition diaphragm (10).
9. Clean body (1) and diaphragm flange.
NOTE: On regulators originally supplied as

“oxygen clean”, Option s 1171-5 & -55, 2171-36 & -55, maintenance must include a level of cleanliness equal to Cashco's cleaning standard #S-1134. Contact factory for details.

10. Reassemble diaphragm subassembly by placing piston O-ring (13), diaphragm(s) (10), pressure plate (3) and lock washer (6) over threaded post of piston(12). Assure the pressure plate (3) is placed with curved outer rim down next to the diaphragm (10) surface. Place a thread sealant compound similar to Loctite #271 on the threads of the piston's post (12) prior to tightening the pressure plate nut (7) to the following torques:

Sizes	Diaphragm	Torque	
		ALL	Metal
	Composition	15 In-lbs	(1.7 N-m)

11. Place diaphragm gasket (11) over diaphragm gasket seating surface, then insert the diaphragm subassembly into the body (1). If metal diaphragm(s) (10) is used, place second diaphragm gasket (11) on top of diaphragm.
12. Place the range spring (16) over the pressure plate nut (7) of the diaphragm subassembly.
13. Place multipurpose, high temperature grease into depression of spring button (4) where adjusting screw bears. Set spring button (4) onto range spring (16); assure spring button is laying flat.
14. Rotate the spring chamber (2) CW by hand into the threaded portion of the body (1) assuring not to cross thread. **NOTES:** Inspect and clean threads prior to reassembly. For the Model 2171 apply an appropriate thread lubricant to the spring chamber (2) threads prior to reassembly to prevent seizing together with body (1). Continue hand rotating CW until firmly seated against the upper diaphragm gasket (11). Tighten the spring chamber (2) and body (1) connection to the following torque value: **All sizes - 30-35 Ft. lbs (41-47 Nm).**
15. Reinstall adjusting screw (5) with locknut (8) into the spring chamber (2).
16. Pressurize with air and spray liquid leak detector to test for leakage around body (1) and spring chamber (2). Ensure that an inlet pressure is maintained during this leak test of at least mid-range spring level; i.e. 20-80 psig (1.4-5.5 Barg) range spring, 50 psig (3.4 Barg) test pressure minimum.

C. Diaphragm Replacement - Model 2171:

1. Procedures are the same as Model 1171, except that the 1171's lower diaphragm flat

gasket (11) is replaced with an O-ring type gasket. The O-ring diaphragm gasket is used with both metal and composition diaphragms.

2. For SST body (1) and SST spring chamber (2), place thread lubricant to minimize potential of seizing threads.

D. Special Instructions for Diaphragm Removal:

1. If the TFE coated diaphragm is utilized on the Model 2171, the TFE coating is the wetted side of the diaphragm.
2. If the Option -2 handwheel is utilized, the adjusting screw (5) and locknut (8) are replaced with a knob (17) and lock nut (8). With the Option-22 panel mounting w/handwheel, the adjusting screw and lock nut are replaced with a knob (17), lock nut (8) and a panel mounting nut (18).
3. Use only those gaskets manufactured and supplied by Cashco, Inc. for these products.

E. Piston Replacement:

1. Trim removal requires that diaphragm subassembly be removed. Refer to previous procedure, Section VI.B.
2. Inspect inside surface of cylinder. **(NOTE: The cylinder is an integral part of the body of the 1171. Replace the regulator should any damage be noted on the cylinder).** If seat shows no erosion/wear on seating surfaces, piston (12) alone may be replaced.
3. Clean body (1) cavity. Clean all parts to be reused. **NOTE: On regulators originally supplied as “oxygen clean”, Option's 1171-5-55, 2171-36-55, maintenance must include a level of cleanliness equal to Cashco's cleaning standard #S-1134. Contact factory for details.**
4. Use special care cleaning the body (1) and cylinder shoulder, as this pressurized joint is metal-to-metal with no gasket.
5. Reinstall diaphragm subassembly per Section VI.B., Diaphragm Replacement.
6. Bench test unit for suitable operation. **NOTE: Regulators are not tight shut off devices.** Even if pressure falls below setpoint, a regulator may or may not develop bubble tight shut off. In general, tighter shut off can be expected with composition seat.
7. Spray liquid leak detector to test for leakage around body (1) and spring chamber (2). Test pressure should be the maximum allowed by the range spring (16) at the inlet.

SECTION VII

VII. TROUBLE SHOOTING GUIDE

1. Erratic operation; chattering.

Possible Causes	Remedies
A. Oversized regulator.	A1. Check actual flow conditions, re-size regulator for minimum and maximum flow. A2. Increase flow rate. A3. Decrease regulator pressure drop; decrease inlet pressure by placing a throttling orifice in inlet piping union. A4. Install next step higher range spring. Contact factory A5. Before replacing regulator, contact factory.
B. Worn piston; inadequate guiding.	B. Replace regulator.

2. Regulator inlet (upstream) too high:

Possible Causes	Remedies
A. Regulator undersized.	A1. Confirm by opening bypass valve together with regulator. A2. Check actual flow conditions, re-size regulator; if regulator has inadequate capacity, replace with larger unit.
B. Incorrect range spring (screwing in CW of adjusting screw does not allow bringing pressure level up to proper level.	B. Replace range spring with proper lower range. B.2 Contact factory.
C. Too much rise (build).	C1. Review rise (build) expected. C2. Contact factory.

3. Leakage through the spring chamber vent hole.

Possible Causes	Remedies
A. Normal-life diaphragm failure.	A1. Replace diaphragm.
B. Abnormal short-life diaphragm failure.	B1. Can be caused by excessive chattering. See No. 1. to remedy chatter. B2. Can be caused by corrosive action. Consider alternate diaphragm material. B3. For composition diaphragms, ensure not subjecting to over temperature conditions. B4. Upstream (inlet) pressure build-up occurring that overstresses diaphragms. Relocate regulator or protect with safety relief valve.

4. Sluggish operation.

Possible Causes	Remedies
A. Plugged spring chamber vent.	A. Clean vent opening.
B. Fluid too viscous.	B. Heat fluid. Contact factory.

SECTION VIII

VIII. ORDERING INFORMATION: NEW REPLACEMENT UNIT vs PARTS "KIT" FOR FIELD REPAIR

To obtain a quotation or place an order, please retrieve the Serial Number and Product Code that was stamped on the metal name plate and attached to the unit. This information can also be found on the Bill of Material (parts list) that was provided when unit was originally shipped.) (Serial Number typically 6 digits). Product Code typical format as follows: (last digit is alpha character that reflects revision level for the product).

□□□□ - □□□□ 7 - □□□□□□□□□□

NEW REPLACEMENT UNIT:

Contact your local Cashco, Inc., Sales Representative with the Serial Number and Product code. With this information they can provide a quotation for a new unit including a complete description, price and availability.



CAUTION

Do not attempt to alter the original construction of any unit without assistance and approval from the factory. All purposed changes will require a new name plate with appropriate ratings and new product code to accomodate the recommended part(s) changes.

PARTS "KIT" for FIELD REPAIR:

Contact your local Cashco, Inc., Sales Representative with the Serial Number and Product code. Identify the parts and the quantity required to repair the unit from the Bill of Materials sheet that was provided when unit was originally shipped.

NOTE: *Those part numbers that have a quantity indicated under "Spare Parts" in column "A" reflect minimum parts required for inspection and rebuild, - "Soft Goods Kit". Those in column "B" include minimum trim replacement parts needed plus those "Soft Goods" parts from column "A".*

If the "BOM" is not available, refer to the cross-sectional drawings included in this manual for part identification and selection.

Local Sales Representative will provide quotation for appropriate Kit Number, Price and Availability.

MODEL 1171

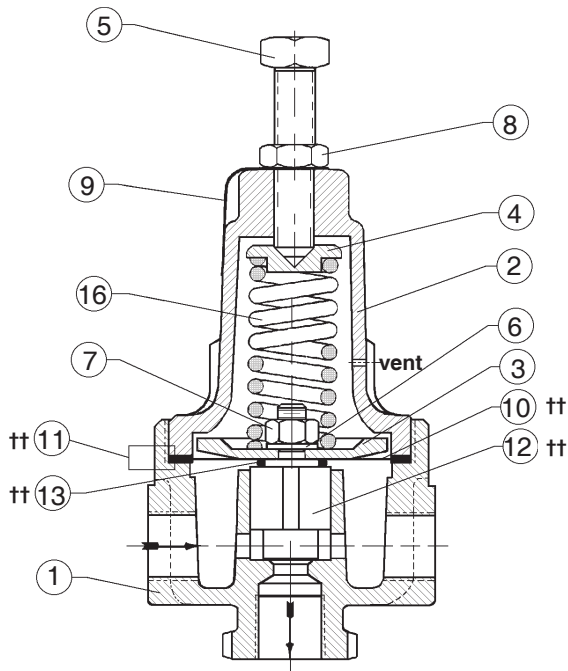


Figure 1: Basic Model 1171 with Metal Seat Design

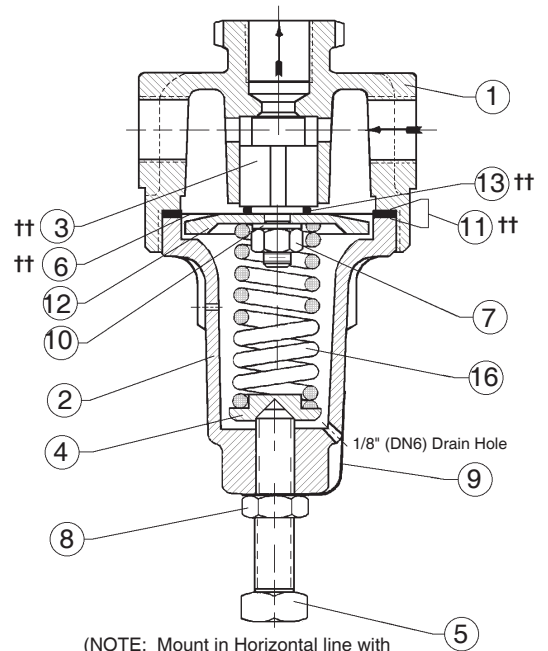
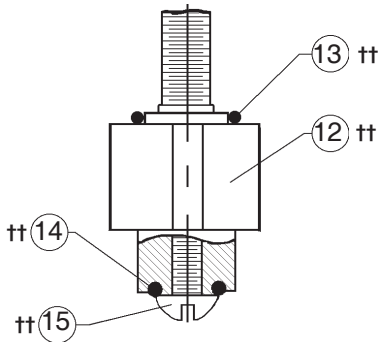
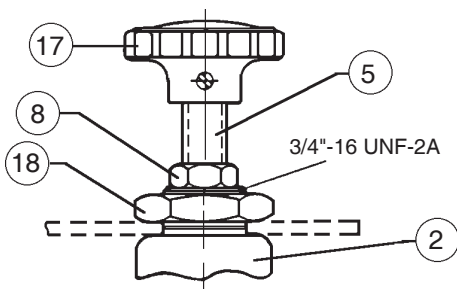


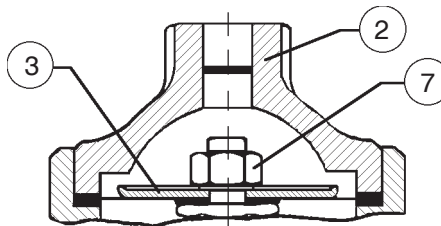
Figure 2: Option -5 Cryogenic, Model 1171, Metal Seat Design



Composition Seat Design



Option -22 Panel Mounting (handwheel portion is same for Option -2 Handwheel)



Option -20, Dome Loaded

Item No.	Description	Repair Kit B
1	Body	
2	Spring Chamber	
3	Pressure Plate	
4	Spring Button	
5	Adjusting Screw or Handwheel Assy	
6	Lock Washer	
7	Pressure Plate Nut	
8	Adjusting Screw Lock Nut	
9	Nameplate	
10	Diaphragm(s)	††
11	Diaphragm Gasket(s)	††
12	Piston	††
13	Piston O-ring	††
14	Seat O-ring	††
15	Seat Screw	††
16	Range Spring	
17	Knob	
18	Mounting Nut	

MODEL 2171

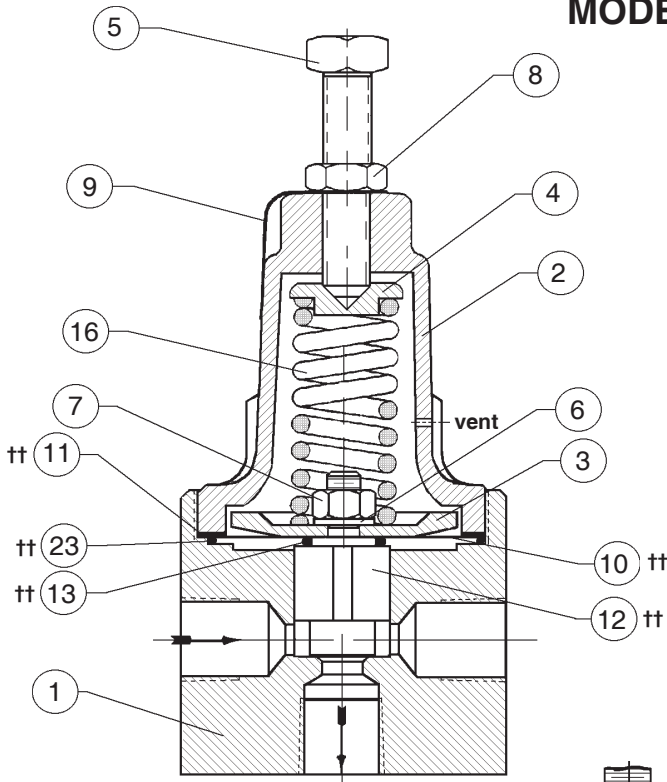
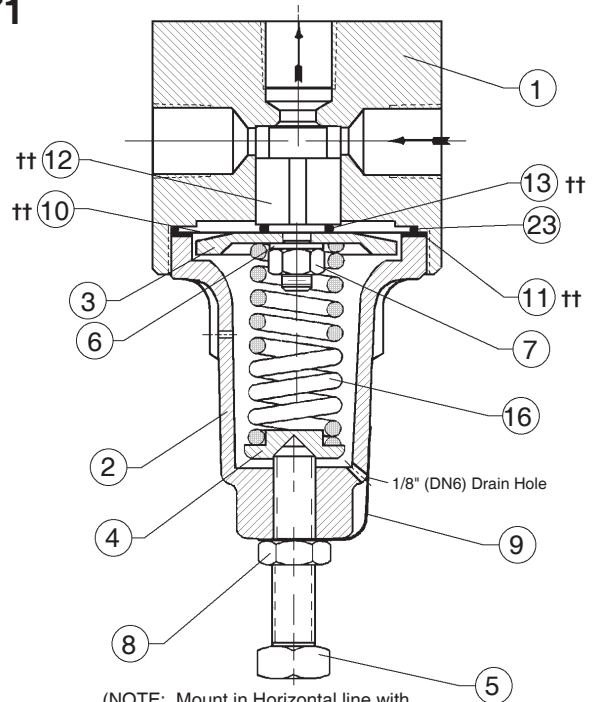
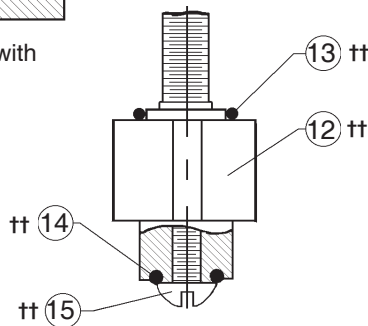


Figure 1: Basic Model 2171 with Metal Seat Design

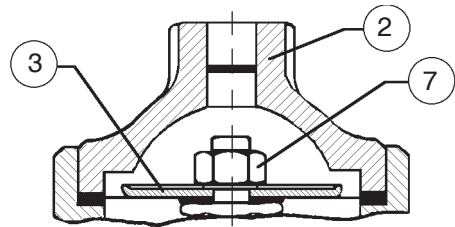


(NOTE: Mount in Horizontal line with Adjusting Screw down as shown.)

Figure 2: Option -36 Cryogenic, Model 2171, Metal Seat Design

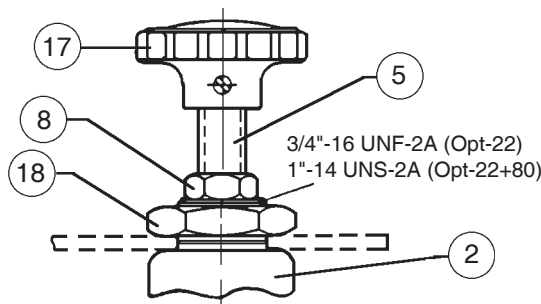


Composition Seat Design

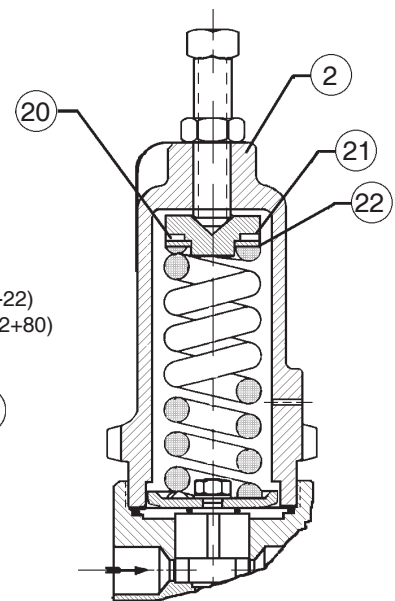


Option -20, Dome Loaded

Item No.	Description	Repair Kit B
1	Body	
2	Spring Chamber	
3	Pressure Plate	
4	Spring Button	
5	Adjusting Screw or Handwheel Assy	
6	Lock Washer	
7	Pressure Plate Nut	
8	Adjusting Screw Lock Nut	
9	Nameplate	
10	Diaphragm(s)	††
11	Diaphragm Gasket(s)	††
12	Piston	††
13	Piston O-ring	††
14	Seat O-ring	††
15	Seat Screw	††
16	Range Spring	
17	Knob	
18	Mounting Nut	
20	Thrust Bearing	
21	Upper Bearing Washer	
22	Lower Bearing Washer	
23	Diaphragm O-ring	††



Option -22 Panel Mounting (handwheel portion is same for Option -2 Handwheel)



Option -80, High Pressure Spring Chamber Construction

Cashco, Inc.
P.O. Box 6
Ellsworth, KS 67439-0006
PH (785) 472-4461
FAX (785) 472-3539
www.cashco.com
E-mail: sales@cashco.com
exportsales@cashco.com
Printed in U.S.A. IOM-1171/2171