MODEL C-PRV
PRESSURE REDUCING REGULATOR

SECTION I

I. DESCRIPTION AND SCOPE

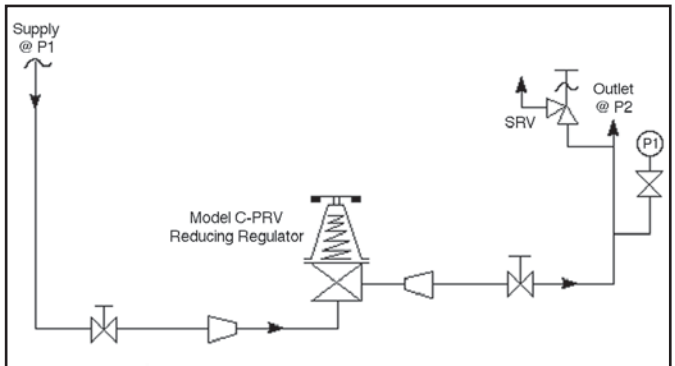
Model C-PRV is a pressure regulator used to control downstream (outlet or P_2) pressure. Inlet and outlet sizes are 1", 1-1/2", 2" and 3" with Tri-Clamp® fitting connections. This regulator is only suitable for liquids and gases at temperatures less than 300°F (149°C). Refer to Technical Bulletin C-PRV-TB for specific design conditions.

SECTION II

II. INSTALLATION

A. General:

1. An inlet block valve should always be installed upstream of the regulator.
2. An outlet pressure gauge should be located approximately ten pipe diameters downstream and within sight.
3. All installations should include a downstream relief device if the inlet pressure could exceed the pressure rating of any downstream equipment.
4. Flow Direction: Install so flow enters through the bottom connection and exits the side connection.
5. Install with spring chamber (2) in the vertical up position to allow for proper draining.



Recommended Piping Schematic for Pressure Reducing Station

⚠ CAUTION

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

A. General:

1. Movement occurs as pressure variations register on the diaphragm. The registering pressure is the outlet, P_2 or downstream pressure. The range spring opposes diaphragm movement. As the outlet pressure drops, the range spring pushes the diaphragm down, opening the port; as outlet pressure increases, the diaphragm pushes up and the port opening closes.
2. A complete diaphragm failure will cause the regulator to fail open

⚠ CAUTION

<u>The Model C-PRV should never be used as a shutoff device.</u>

SECTION IV

IV. START-UP

A. General:

1. Ensure that lock-open pin (10) and hitch pin (15) are in proper position. See Section VII.
2. Confirm that the proper range spring is indicated to be within the regulator by inspection of the unit's nameplate. Apply setpoint pressures that are only within the stated range.

3. When stating direction of rotation of the nut or handle (6), the view is with respect to looking down towards the spring chamber or its' normal location.

4. Start with the block valve closed.

5. Relax range spring (7) by turning nut or handle (6) counter-clockwise (CCW) until rotation stops. Rotate nut or handle (6) clockwise (CW) three (3) full revolutions to maintain spring (7) to diaphragm assembly (16) contact. This reduces the outlet pressure setpoint.

6. Slowly open the inlet (upstream) block valve observing the outlet (downstream) pressure gauge. Determine if the regulator is flowing and the downstream equipment is operative. Rotate the regulator nut or handle (6) CW slowly until flow begins.

7. Continue to slowly open the inlet (upstream) block valve until fully open.

8. Develop system flow to a level near its expected normal rate and reset the regulator setpoint by turning the nut or handle (6) CW to increase outlet pressure or CCW to reduce outlet pressure.

SECTION V

V. SHUTDOWN

A. In all cases the regulator should be shutdown by slowly closing the inlet (upstream) block valve.

⚠ CAUTION

DO NOT DEAD-END FLOW DOWNSTREAM of the Model C-PRV as internals may be damaged.

SECTION VI

VI. MAINTENANCE

⚠ WARNING

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

A. General:

1. Unit's lock-open feature allows this regulator to be cleaned in-line, see Section VII.

2. Maintenance procedures hereinafter are based upon removal of regulator unit from the pipeline where installed.

3. Owner should refer to owner's procedures for removal, handling, cleaning and disposal of non-reuseable parts.

NOTE: *For those fluids which could create a potential hazard to personnel working on this unit, owner must provide an OSHA approved MSDS (Material Safety Data Sheet), and a signed statement attesting to the fact that the unit has been flushed out, for a specific period of time, using an OSHA acceptable neutralizing agent. The name of the agent, manufacturer's name and total concentration level must also be included for both the service medium as well as the neutralizing agent. Returns WILL NOT BE ACCEPTED by Cashco, Inc. without an MSDS form attached to the outside of shipping carton.*

4. Refer to Figure 3 for basic regulator item number reference ( ) and description.

B. Trim Replacement:

1. Securely install the bottom portion of the plug (17) in a smooth jawed vise with the spring chamber (2) directed upwards and the face of the inlet flange of the body (1) resting on the vise.

⚠ WARNING

SPRING UNDER COMPRESSION. Prior to removing the clamp (13), relieve spring (7) compression. Failure to do so may result in flying parts that could cause personal injury.

2. Relax range spring (7) by turning nut or handle (6) CCW until rotation stops. Count and record the number of revolutions in the box below.

Number of revolutions required to relax range spring: _____

3. Remove socket head set screw (27) CCW from top end of guide post (18).

4. Pull hitch pin (15) and lift up nut or handle (6) to remove.

⚠ CAUTION

Do not apply spring load or operate regulator <u>with hitch pin (15) removed</u> from top of guide post (18). Premature diaphragm failure will result.

5. Loosen thumbclamp screw (13) and remove.
   a. **<u>For Opt-80:</u>** 2 piece clamp (13A): Loosen and remove clamp nuts (13B), washers (13D), bolts (13C) and clamps (13A). See Figure 1.

6. Place matchmarks between body (1) and spring chamber(2) to assist in final orientation when reassembled.

7. Lift spring chamber (2) vertically up and off guide post (18) and body (1) and set aside. ***NOTE alignment of spring button (4) tab (ears) with slot guides inside spring chamber (2).***

8. Remove bearing seal (22). Lift up to remove adjusting screw assembly (5), spring button (4) and spring (7) off guide post (18).

9. Grasp cap (5.1) of adjusting screw assembly with hand and lift up to separate cap (5.1) from (5.3) to reveal and remove two u-cup seals (5.4). Do Not remove dowel pin (5.2).

10. Install two new u-cup seals (5.4) into the adjusting screw cap (5.1). Insert the first u-cup with the open side with the spring showing into the hole in the cap. Ensure that the u-cup is pressed all the way in. Look into the hole to confirm that the white seal material is showing and not the spring material. Then press second u-cup seal with white seal material side in first into the hole all the way in next to the first u-cup. (Spring side of u-cup should be visible.

11. Slide adjusting screw cap (5.1) with new u-cup seals (5.4) and adjusting screw (5.3) together, use the dowel pin (5.2) for alignment. ***NOTE;*** *Top end of pin (5.2) should be flush with top surface of adjusting screw cap (5.1).* Place new seal (22) on adjusting screw cap (5.1). Set parts aside for final assembly later.

12. Remove set screw (19) rotate CCW. Rotate guidepost (18) CCW and remove.

    <u>For 1" Investment Cast Body:</u>
    a. Remove spacer (21).
    b. Remove set screw (24) CCW.

13. Place a wrench on flats of the adapter nut(20) and rotate CCW to remove.

14. Remove pressure plate (3), diaphragm (16) and diaphragm spacer (26). ***NOTE:*** *Correct orientation of spacer (26) has the side with the I.D. radius facing towards the clamping surface of the plug (17).*

15. Inspect seating surface of plug. Replace plug if surface is worn or damaged.

16. Clean parts in accordance with owner's specifications.

⚠ CAUTION

Owner's cleaning solution must be compatible with regulator trim materials.

17. Install diaphragm spacer (26) on plug (17). Place new diaphragm (16) with convolution side facing up, onto plug (17) and fit it around the diaphragm spacer (26). Align tab on O.D. of diaphragm (16) with the tab slot cut in the body flange lip.

18. Lay pressure plate (3) on top of diaphragm (16).

19. Apply Emhart Bostic White Food Grade "Never Seeze" or equivelant to threaded end of plug (17). Thread adapter nut (20) onto plug (17) and tighten to 60 in-lbs of torque.

    <u>For 1" Investment Cast Body:</u>
    a. Install spacer (21).
    b. Apply Loctite 242 or equivelant to set screw (24). Thread set screw into adapter nut (20) secure tight against plug (17).
    c. Apply Emhart Bostic White Food Grade "Never Seeze" or equivelant to the external threads of the adapter (20) and thread guide post (18) securely to the adapter.

20. Thread guide post (18) onto end of plug (17), thighten firmly into place.

21. Apply Loctite 242 or equivelant to set screw (19). Thread set screw tight into guide post (18).

22. Position spring (7) over guide post (18) - resting flat on pressure plate (3).

23. Place spring button(4) with adjusting screw assembly (5) and bearing (22) down over guide post (18) into spring (7) cavity. Align one tab (ear) on spring button (4) directly above tab slot cut into the body flange lip.

NOTE: *Apply a small amount of Emhart Bostic White Food Grade "NEVER-SEEZ®" or equivalent to threads of adjusting screw (5) .*

24. Align the two ribs inside the spring chamber (2) with the tabs (ears) on the spring button (4) and place the spring chamber (2) over assembled parts directly on body (1). Refer to step 6 previous for alignment of match marks for final orientation.

25. Position the Tri-Clamp (13) around the mating flanges of the body (1) and the spring chamber (2) with the threaded fastener aligned with the tab slot cut in the body flange lip. Clamp should be tightened to approximately 4 to 6 ft-lbs.

    a. **For Opt.-80:** Position the clamp (13) halves around the mating flanges of the body (1) and the spring chamber (2). Insert clamp bolts (13C), washers (13D) and tighten clamp nuts (13B) in alternating pattern. The clamp should be tightened to approximately 4 to 6 ft-lbs.

NOTE: *Gap between clamp (13A) halves should be equal in size.* See Figure 1.

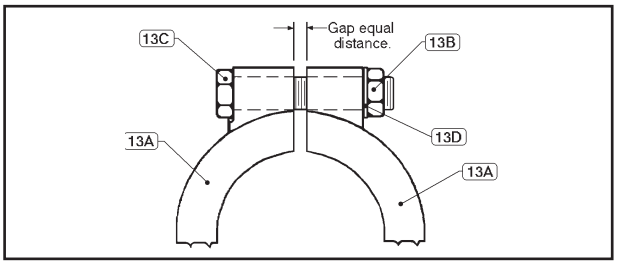


Figure 1: Clamp Arrangement.

26. Place nut or handle (6) onto square end of adjusting screw assembly (5).

27. Insert hitch pin (15) through hole near the top of the guide post (18). Apply Loctite 242 or equivelant to set screw (27) and secure tight into the top of the guide post (18).

28. Return to Section II. for Installation, Section IV. for Start-up, and Section VII for cleaning procedure.

SECTION VII

VII. CLEANING PROCEDURE

A. Pre-Sanitation:

1. Owner should refer to owner's operating procedures for system shutdown to include relieving all system pressure.

2. Refer to Figure 3 for item number reference ().

3. Remove the lock-open pin (10) from the pin retainer hole in the spring chamber (2). (See Figure 2.)

4. System internal pressure must be at/near 0 psig (0 Barg). This will ensure plug (17) is fully open. ***NOTE: Do not change range spring (7) setting by rotating nut or handle (6).***

5. Insert pin (10), jostle nut or handle (6) lift up or push down to secure pin (10) thru adjusting screw (5).

B. Sanitation:

1. Flush, drain and sanitize system in accordance to owner's specifications.

⚠ CAUTION

Owner's cleaning solution must be compatible with regulator's trim materials.

NOTE: *CIP is limited to 50 psig (3.45 Barg) maximum cleaning solution pressure at 300°F (149°C). SIP is recommended to 20 psig (1.38 Barg) saturated steam pressure; can withstand 30 psig (2.07 Barg), but may reduce elastomer life expectancy.*

C. Post-Sanitation:

1. Prior to system start-up, remove the lock-open pin (10) from the adjusting screw (5) and insert it into the pin retainer hole. Unit is again operative at the setpoint established prior to cleaning.

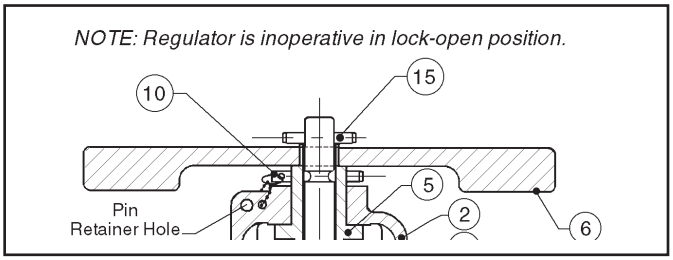
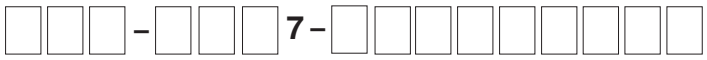


Figure 2: Spring Chamber in Lock-Open Position

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).



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.

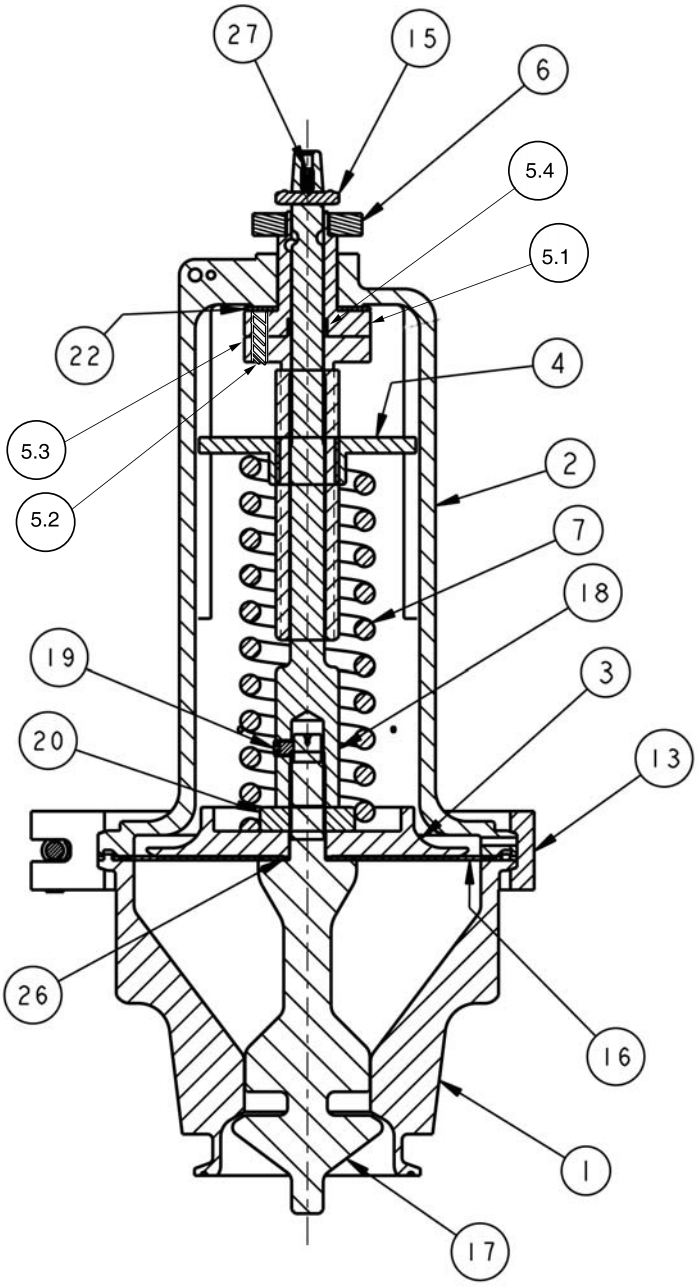


Figure 3
Forged Body shown above

See the next page for Item Number Descriptions.

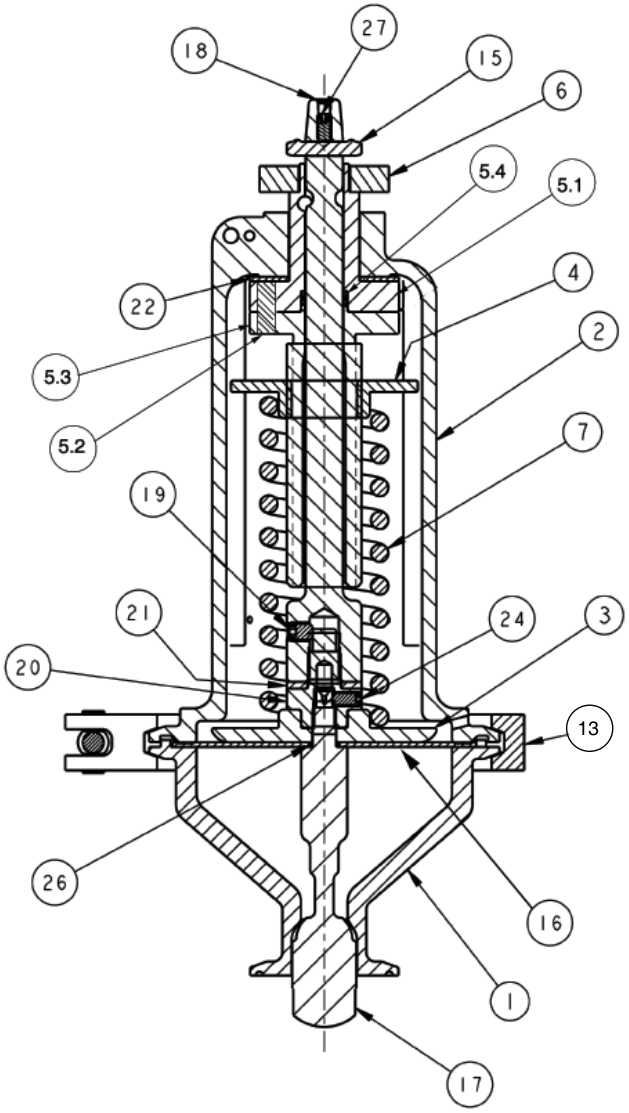


Figure 4
1" Investment Cast Red. Port shown above

NOTE: *This product is to be installed with the spring chamber in the vertical position.*

Item No.	Description
1	Body
2	Spring Chamber
3	Pressure Plate
4	Spring Button
5	Adjusting Screw
5.1	Adjusting Screw Cap
5.2	Pin
5.3	Adjusting Screw
5.4	U-Cup Seal (2 pcs.)
6	Nut - Handle
7	Spring
13	Clamp
15	Pin (Cotterless Hitch)

Item No.	Description
16	Diaphragm
17	Plug
18	Guide Post
19	Set Screw
20	Adapter / Nut
21	Guide (Spring) / Spacer (1" & 1-1/2" Red. Port Only)
22	Bearing (Soft Seal)
24	Set Screw (Investment cast only.) (Set Screw not needed for C-PRV with comp seat.)
26	Diaphragm Spacer
27	Set Screw

Not Shown:

Item No.	Description
8	Connector
9	Ball Chain
10	Quick Release Pin
11	Name Plate
12	Drive Screw
14	3A Symbol Plate
23	Diaphragm Cover
25	Diaphragm Gaskt (LG Trim)

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