



MODEL C-PRV

PRESSURE REDUCING REGULATOR

SECTION I

I. DESCRIPTION AND SCOPE

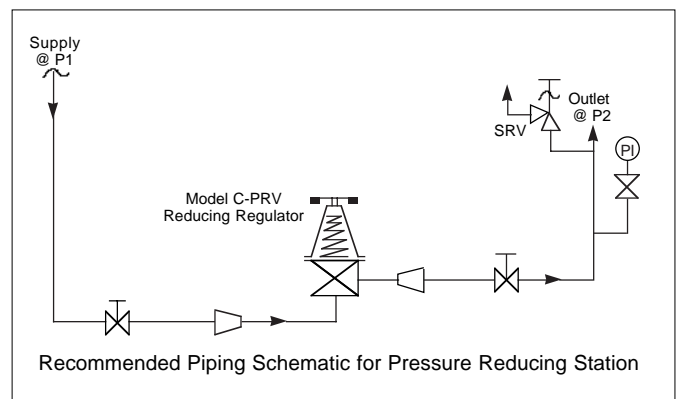
Model C-PRV is a pressure regulator used to control downstream (outlet or P_2) pressure. Inlet and outlet sizes are 1" and 1-1/2" with Tri-Clamp® fitting connections. This regulator is only suitable for liquids and gases at temperatures less than 300°F (149°C). Refer to Technical Bulletin C-PRV-TB for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

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

The Model C-PRV should never be used as a shutoff device.

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 T-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 T-handle (6) counter-clockwise (CCW) until rotation stops. Rotate T-handle (6) clockwise (CW) three (3) full revolutions to maintain spring (7) to diaphragm-stem assembly (1.3) 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 T-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 T-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
<u>DO NOT DEAD-END FLOW DOWNSTREAM</u> 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 2 for item number reference ().

B. Trim Inspection:

1. Securely install the body (1) in a vise with the spring chamber (2) directed upwards. Ensure that the body (1) is not held in the vise by the edge of the end connection flange.

 WARNING
SPRING UNDER COMPRESSION. Prior to removing the clamp (13), relieve spring compression by rotating the T-handle (6) assembly CCW until rotation stops. Failure to do so may result in flying parts that could cause personal injury.

2. Relax range spring (7) by turning T-handle (6) CCW until rotation stops.
3. Loosen clamp (13) and remove.
4. Lift spring chamber (2) and T-handle (6) with captured parts off of body assembly (1).
5. Lift and roll back edge of diaphragm (1.3) to inspect and clean body (1.1) cavity. Extend plug (1.2) down through inlet connection to inspect and clean. If excessive wear is apparent, replace with new parts. (See Subsection C). **NOTE:** Diaphragm (1.3) is molded to stem and plug (1.2) assembly.

- Clean in accordance to owner's specifications.


 **CAUTION**

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

- Align diaphragm/stem (1.3) assembly in center of the body (1) cavity. Ensure that "tab" on diaphragm (1.3) is positioned in recess of body (1.1) flange lip.
- Position spring chamber (2) and T-handle (6) with captured parts on to body assembly (1).
- Re-position clamp (13) around body assembly (1) and spring chamber (2) and hand tighten.
- Return to Section II. for Installation, Section IV. for Start-up and Section VII. for Cleaning Procedure.

C. Trim Replacement:

- Securely install the body (1.1) in a vise with the spring chamber (2) directed upwards. Ensure that the body (1.1) is not held in the vise by the edge of the end connection flange.

 **WARNING**


SPRING UNDER COMPRESSION. Prior to removing the clamp (13), relieve spring compression by rotating the T-handle (6) assembly CCW until rotation stops. Failure to do so may result in flying parts that could cause personal injury!

- Relax range spring (7) by turning T-handle (6) CCW until rotation stops.
- Loosen clamp (13) and remove.
- Lift spring chamber (2) and T-handle (6) with captured parts off of body assembly (1).
- Lift and roll back edge of diaphragm (1.3). Using a knife or scissors, trim/cut back diaphragm (1.3) diameter to allow removal thru bottom connection of the body (1.1).
- Inspect and clean body (1.1) cavity. If excessive wear is apparent, replace with new body (1.1).
- Clean in accordance to owner's specifications.

 **CAUTION**

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

- Insert new diaphragm/stem subassembly through large I.D. of body (1.1) until stem end of diaphragm/stem subassembly (1.3) protrudes through lower port of body (1.1).
- Prepare 2-step epoxy adhesive as per instructions on adhesive packet which is included in the Parts Kit (See Section VII.).

 **CAUTION**

Unreacted Epoxy Resins and Hardeners are strong sensitizing agents. DO NOT GET IN EYES. AVOID PROLONGED OR REPEATED CONTACT WITH SKIN. Store in a cool place. Follow instructions according to the enclosed MSDS forms found in the Parts Kit.

NOTES: 1. Epoxy adhesive shelf life is printed on the packet. If expiration date has passed, dispose of ingredients as per MSDS guidelines and purchase new adhesive.
2. Pot-life of the two-part mixed ingredients is 75 minutes.
3. Mixing of epoxy adhesive causes onset of an exothermic chemical reaction that properly cures the adhesive through its own self-generated heat. Ensure that temperature of adhesive is at all times above 77°F (25°C) from time of mixing until placing in contact at actual joint. The cure time can be reduced by use of a heat blanket or heat lamp.

The following Steps 10. & 11. apply to R1 & R3 Trims:

- Completely fill plug (1.2) cavity with adhesive. Also apply adhesive to O.D. of stem end of diaphragm/stem subassembly (1.3).
- Insert stem end of diaphragm/stem subassembly (1.3) into plug (1.2) cavity with a 1/2 revolution twisting action. Stem (1.3) to plug (1.2) joint surfaces must fit up tight against each other.

The following Steps 12. & 13. apply to LC & LE Trims (See Figure 3):

- Apply a thin coat of adhesive (1.4) to male threaded end of stem (13.) assembly.
- Grasp plug (1.2) between thumb and forefinger of other hand and hand-tighten plug (1.2)

on stem (1.3) and engage with CW rotation (viewed from plug's "hex" end). Stem (1.3) to plug (1.2) joint surfaces should fit against each other with a minimum of adhesive (1.4).

14. Wipe off excess adhesive to obtain a smooth joint and reposition plug (1.2) back into lower port.
15. Align the diaphragm/stem subassembly (1.3) in center of the body (1.1) cavity. Ensure that "tab" on diaphragm (1.3) is positioned in recess of body (1.1) flange lip.
16. Place the body assembly (1) diaphragm flange surface face down on a flat surface in an enclosed, temperature controlled environment.

The following Step 17. applies to R1 & R3 Trims only:

17. Position a small (.5 lb.) weighted object on the flat surface of the plug which protrudes out of the body (1.1).

NOTE: Contact pressure between the two joined parts must be maintained until adhesive is fully cured.

18. Adjust temperature setting of the controlled environment. Refer to Table 1 for recommended temperature(s) and curing time(s).

NOTE: No harm will occur to the integrity of the joint if over-cured. However, to under-cure the joint may cause an under-design-strength joint. Prevention of the required chemical exothermic reaction temperature from being reached and maintained throughout the curing process renders the adhesive to be severely under required joint strength.

CAUTION

Ensure that joint is exposed to a temperature greater than or equal to 77°F (25°C) for the time indicated in Table 1.

Table 1

Curing Conditions			
Temperature		Time (Hours)	
°F	°C	Max.	Min.
150	66	4	—
77	25	72	18

19. Re-clean body subassembly (1) in accordance with owner's specifications after adhesive has cured.

CAUTION

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

20. Securely install the body (1) in a vise with the bottom port directed downwards. Ensure that the body (1) is not held in the vise by the edge of the end connection flange. For LC & LE trims, use a spacer to help elevate the plug so diaphragm surface is in same plane as flange surface (i.e. lays flat).
21. Align diaphragm/stem (1.3) subassembly in center of the body (1.1) cavity. Ensure that "tab" on diaphragm (1.3) is positioned in recess of body (1.1) flange lip.
22. Position spring chamber (2) and T-handle (6) with captured parts on to body assembly (1).
21. Reposition clamp (13) around body assembly (1) and spring chamber (2) and hand tighten.
22. Return to Section II. for Installation, Section IV. for Start-up and Section VII for Cleaning Procedure.

D. Changing Range Springs:

WARNING

SPRING UNDER COMPRESSION. Prior to removing the clamp (13), relieve spring compression by rotating the T-handle (6) assembly CCW until rotation stops. Failure to do so may result in flying parts that could cause personal injury.

1. Relax range spring (7) by turning T-handle (6) CCW until rotation stops.
2. Remove hitch pin (15) and lift T-handle (6) off of post end of adjusting screw (5).
3. Loosen clamp (13) and remove.
4. Lift spring chamber (2) off of body assembly (1).
5. Remove the adjusting screw (5), spring button (4) and spring (7).
6. Install new spring (7) on to hub of pressure plate (3). Refer to Table 3 for spring selection.
7. Place spring button (4) and adjusting screw (5) over post end of pressure plate (3) and into spring (7) cavity.

NOTE: Apply a small amount of Emhart Bostic White Food Grade “NEVER-SEEZ®” or equivalent to threads of adjusting screw (5) and the shoulder of adjusting screw where it makes contact with the spring chamber (2).

- Align slot guides inside spring chamber (2) with spring button (4) “ears” and position on to body (1).

- Place T-handle (6) on post end of adjusting screw (5) and insert hitch pin (15).
- Reposition clamp (13) around body assembly (1) and spring chamber (2) and hand tighten.
- 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:

- Owner should refer to owner’s operating procedures for system shutdown to include relieving all system pressure.
- Refer to Figure 2 for item number reference ().
- Remove the lock-open pin (10) from the pin retainer hole in the spring chamber (2). (See Figure 1.)
- System internal pressure must be at/near 0 psig (0 Barg). This will ensure plug (1.2) is fully open. **NOTE:** Do not change range spring (7) setting by rotating T-handle (6).

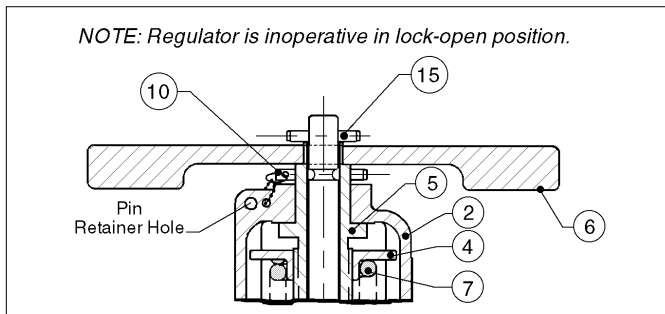


Figure 1: Spring Chamber in Lock-Open Position

- Insert pin (10) and jostle T-handle (6); lift up or push down to secure pin (10) thru adjusting screw (5).

B. Sanitation:

- 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:

- 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.

SECTION VIII

VIII. PARTS ORDERING INFORMATION

Selection of parts is minimal due to the regulator’s basic construction. Refer to the three methods below to obtain parts ordering information/numbers.

METHOD A – USE OF PRODUCT CODE.

- Step 1. If available, obtain the 18 character product code number from:
- The Bill of Materials sheet attached herein.
 - The metal tag attached to the regulator.

□□□-□□□7-□□□□□□□□□□

NOTE: Some regulators may not have the product code located on the metal tag.

- Step 2. Identify which parts are desired from the Bill of Materials sheet or the Parts Kit Nos. Table 2. Kit "B" contains diaphragm/stem assembly, plug and adhesive.

- Step 3. Contact your local Cashco, Inc., Sales Representative and specify the product code number and the part numbers required.

METHOD B – NO PRODUCT CODE AVAILABLE – DISASSEMBLED REGULATOR.

- Step 1. Determine all available information from regulator's metal tag.
- Serial number.
 - Regulator "Type" or "Model" number.
 - Size.
 - Trim.
 - Spring range.
- Step 2. Contact your local Cashco, Inc., Sales Representative for proper identification numbers.

METHOD C – NO PRODUCT CODE AVAILABLE – ASSEMBLED REGULATOR IN SERVICE.

- Step 1. Determine all available information from metal tag using Step 1, Method B.
- Step 2. Contact your local Cashco, Inc., Sales Representative with the above information.
- Step 3. Sales Representative will contact the factory to determine the original internal construction. Factory will relay information to the Sales Representative.
- Step 4. Await the Sales Representative's return contact with the proper part numbers.

**TABLE 2
MODEL C-PRV
PARTS KIT NUMBERS
(Kit Nos. Shaded)**

Trim Design Number	Kit Abbr.	Size	
		1"	1-1/2"
R1	B	CL6-BR1K-B	CL8-BR1K-B
R3	B	CL6-BR3K-B	CL8-BR3K-B
LC	B	CL6-BLCK-B	CL8-BLCK-B
LE	B	CL6-BLEK-B	CL8-BLEK-B

**TABLE 3
MODEL C-PRV
COLOR-CODED SPRING CHART ***

Stainless Steel Range Spring		
Size	Range Spring psig	Part Number/Color
ALL	10-30	830-78-5-00107-00 (Red)
	10-75	830-78-5-00109-00 (Blue)

* **NOTE:** If it becomes necessary to change a regulator's range spring and install a new spring for a different pressure range, A NEW CASHCO, INC. NAMEPLATE MUST BE AFFIXED TO THE REGULATOR. Contact your local Cashco, Inc. Sales Representative and specify the new pressure range and the serial number off the existing name plate. They will contact the factory who will review unit's original internal construction and determine new operating pressure limits. Await the Sales Representative's return contact with the proper part numbers and cost.

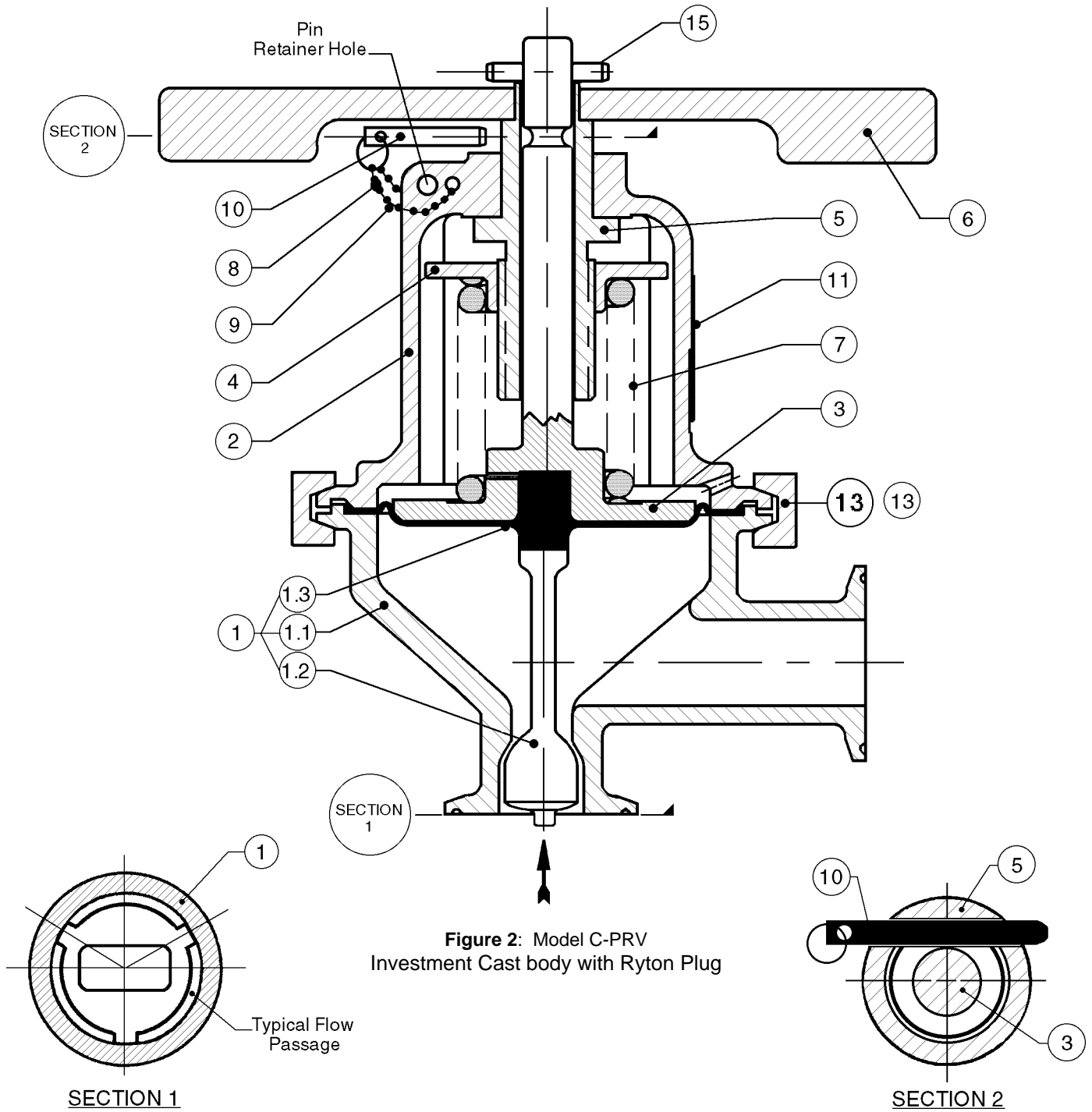


Figure 2: Model C-PRV Investment Cast body with Ryton Plug

Item No.	Description
1	Body Assembly
1.1	Body
1.2	Plug
1.3	Diaphragm/Stem Subassembly
2	Spring Chamber

Item No.	Description
6	Handle
7	Spring
8	Connector
9	Ball Chain
10	Lock Open Pin
11	Nameplate
13	Clamp
15	Hitch Pin

Not Shown:	
Item No.	Description
12	Drive Screw

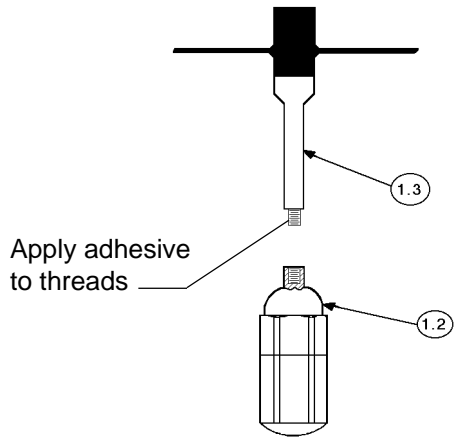
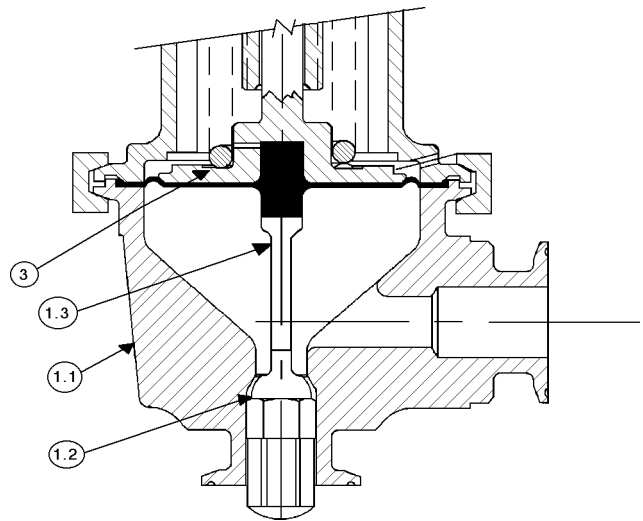


Figure 3: SST Plug/Stem Subassembly



**Figure 4: Model C-PRV
Forged Body**

Item No.	Description
1	Body Assembly
1.1	Body
1.2	Plug
1.3	Diaphragm/Stem Subassembly
2	Spring Chamber
3	Pressure Plate
4	Spring Button
5	Adjusting Screw

Item No.	Description
6	Handle
7	Spring
8	Connector
9	Ball Chain
10	Lock Open Pin
11	Nameplate
13	Clamp
15	Hitch Pin

Not Shown:	
Item No.	Description
12	Drive Screw
1.4	Adhesive



IOM-MODEL “C-PRV”-ADDENDUM


Applies to the following IOM: IOM-C-PRV - Model C-PRV, Pressure Reducing Regulator

Subject of Addendum: Add Trim Replacement Instructions to include Assembly and Disassembly of new Metal Plug and Stem Trim Nos. “LE” & “LC”.

Replaces: Section VI.C with added text as follows.

C. Trim Replacement for “LE” & “LC” Trims:

1. Securely install the body (1.1) in a vise with the spring chamber (2) directed upwards. Assure that the body (1.1) is not held in the vise by the edge of the end connection flange.

 **WARNING**

SPRING UNDER COMPRESSION. Prior to removing the clamp (13), relieve spring compression by rotating the T-handle (6) assembly CCW until rotation stops. Failure to do so may result in flying parts that could cause personal injury!

2. Relax range spring (7) by turning T-handle (6) CCW until rotation stops.
3. Loosen clamp (13) and remove.
4. Lift spring chamber (2) and T-handle (6) with captured parts off of body assembly (1).
5. Lift and roll back edge of diaphragm (1.3). Using a knife or scissors, trim/cut back diaphragm (1.3) diameter to allow removal thru bottom of the body (1.1). Discard removed parts (1.3) (1.2).

NOTE: Diaphragm material identification by color—
 EPDM - Blue
 Silicone - Orange-red.


6. Inspect and clean body (1.1) cavity. If excessive wear is apparent, replace with new body (1.1).

7. Clean in accordance to owners specifications.

 **CAUTION**

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

8. Prepare 2-Step epoxy adhesive (1.4) as per instructions on adhesive packet which is included in the Parts Kit (See Section VII.).

 **CAUTION**

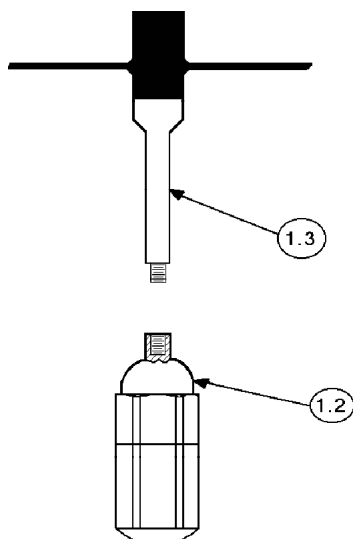
Unreacted Epoxy Resins and Hardeners are strong sensitizing agents. DO NOT GET IN EYES. AVOID PROLONGED OR REPEATED CONTACT WITH SKIN. Store in a cool place. Follow instructions according to the enclosed MSDS forms found in the Parts Kit.

NOTES: 1. Epoxy adhesive (1.4) shelf life is printed on the packet. If expiration date has passed, dispose of ingredients as per MSDS guidelines and purchase new adhesive (1.4).
 2. Pot-life of the two-part mixed ingredients is 75 minutes.
 3. Mixing of epoxy adhesive (1.4) causes onset of an exothermic chemical reaction that properly cures the adhesive through it’s own self-generated heat. Assure that temperature of adhesive is at all times above 77 ° F (25 ° C) from the time of mixing until placing in contact to actual joint. The cure time can be reduced by use of a heat blanket or heat lamp.



9. Insert new diaphragm/stem subassembly (1.3) through diaphragm flange opening of body (1.1) until male threaded stem end of diaphragm/stem subassembly (1.3) protrudes through lower port of body.
10. Grasp hub protruding from diaphragm (1.3) top-side between thumb and forefinger of one hand and push towards the inlet port.
11. Apply a thin coat of adhesive (1.4) to male threaded end of stem (1.3) assembly.
12. Grasp plug (1.2) between thumb and forefinger of other hand and hand-tighten plug (1.2) on stem (1.3) and engage with CW rotation (viewed from plug's "hex" end). Stem (1.3) to plug (1.2) joint surfaces should fit against each other with a minimum of adhesive (1.4).
13. Wipe off excess adhesive (1.4) to obtain a smooth joint and reposition plug (1.2) back into lower port.
14. Place the body assembly (1) diaphragm flange surface face down on a flat surface in an enclosed temperature controlled environment to allow sufficient cure time.
15. Adjust temperature setting of the controlled environment. Refer to Table 1 for recommended temperature(s) and curing time(s).

NOTE: No harm will occur to the integrity of the joint if over-cured. However, to under-cure the joint may cause an under-design-strength joint. Prevention of the required chemical exothermic reaction temperature from being reached and maintained throughout the curing process renders the adhesive (1.4) to be severely under required joint strength.



Item No./Description

1. Body Assembly
 - 1.1 Body
 - 1.2 Plug
 - 1.3 Diaphragm/
Stem Subassembly
 - 1.4 Adhesive (not shown)
3. Pressure Plate

! **CAUTION**

Assure that joint is exposed to a temperature greater than or equal to 77°F (25°C) for the time indicated in Table 1.

Table 1
Curing Conditions

Temperature		Time (Hours)	
°F	°C	Max.	Min.
150	66	4	—
77	25	72	18

16. Re-clean the body sub-assembly (1) after cure of adhesive (1.4).

! **CAUTION**

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

17. Securely place the body (1) in a vise with the spring chamber on top. Assure that the body (1) is not held in the vise by the edge of the end connection flange.
18. Align diaphragm/stem (1.3) subassembly in center of the body (1.1) cavity. Assure that the "tab" on diaphragm (1.3) is positioned in recess of body (1.1) flange lip.
19. Position spring chamber (2) and T-handle (6) with captured parts onto body assembly (1).
20. Reposition clamp (13) around body assembly (1) and spring chamber (2) and hand tighten.
21. Return to IOM-C-PRV for Installation, start-up, cleaning procedure.

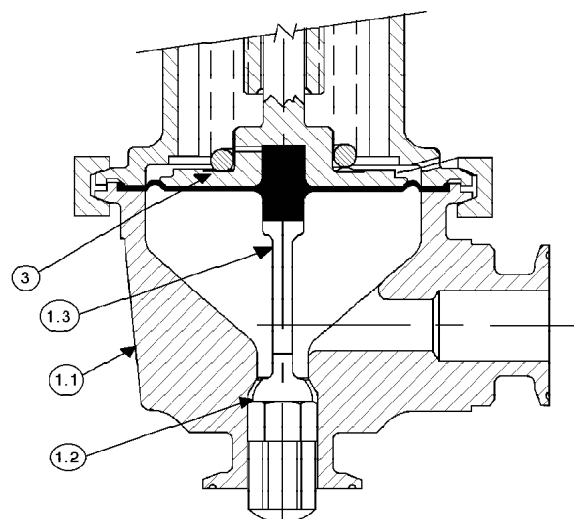


FIGURE 1: Plug/Diaphragm/Stem Subassembly

FIGURE 2: Model C-PRV Forged Body