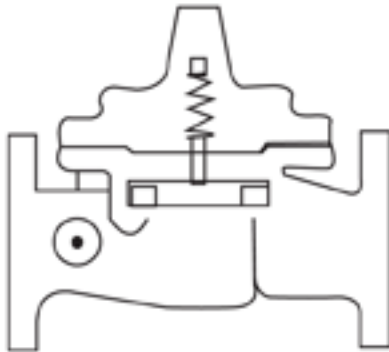


CLA-VAL

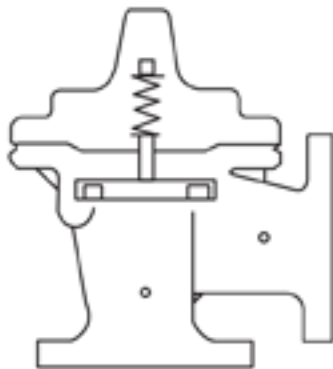
AUTOMATIC CONTROL VALVES

RP-4

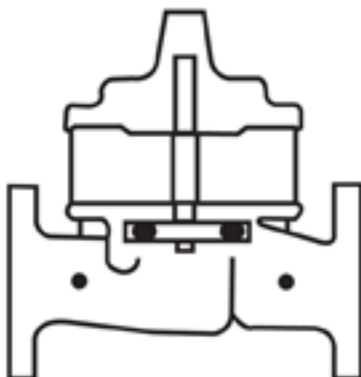
Place this manual with personal responsible
for maintenance of this valve



INSTALLATION



OPERATION



MAINTENANCE





Reduced Pressure Principle Backflow Preventer

- Meets AWWA Standard C511-89
- Extremely Low Head Loss
- Designed for Easy Field Testing



The Cla-Val Model RP-4 Backflow Preventer protects potable water lines against contamination. This assembly combines protection against backflow with exceptionally low head loss characteristics. It operates on the reduced pressure principle, which is an accepted method of safeguarding potable water supplies against the hazards of cross-connections.

The Model RP-4 is carefully constructed of corrosion resisting materials. It consists of two independently acting toggle lever check valves, an automatic pressure differential relief valve located between the two check valves, two shutoff valves and four test cocks. The levers, links and pins are rugged, simple and direct with ample clearances to insure long, trouble free operation, even in very hard water and over prolonged periods of time.



Classified by Underwriters' Laboratories Inc.® as to friction loss and body strength only. (3" Through 10")

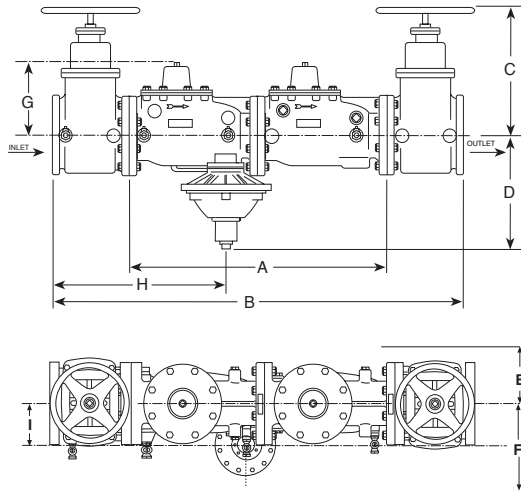
Operation

Under a normal flow condition, both check valves are open and the pressure differential relief valve is closed. During normal flow and at the cessation of flow, the pressure in the zone between the two check valves is maintained at least 2 psi less than the supply pressure by action of the pressure differential relief valve.

Under a no flow condition, both check valves are closed. When supply pressure drops to 2 psi above the "zone" pressure, then the relief valve discharges as necessary to maintain the "zone" pressure at 2 psi below supply pressure. When supply pressure drops below 2 psi above the "zone" pressure, then the relief valve opens fully.

The Model RP-4 operates efficiently at either high or low pressures. There are no pressure adjustments. The flow curves show the slight pressure drop at rated flow, (See next page.)

The assembly is required to be installed in a horizontal position and provisions for adequate drainage must be made. Right hand mount of relief valve is standard. Left hand mount is optional. Standard shut-off valves on 2 1/2" and larger are a resilient seat non-rising stem design. When used in fire service, OS&Y shut-off valves must be used, which are available at extra cost. For installation recommendations see N-BKFW Installation Data Sheet.



RP-4 Dimensions (In Inches)

Valve Size	2 1/2"	3"	4"	6"	8"	10"
A	26.06	26.06	30.06	40.06	50.81	59.56
B	42.19	42.19	48.19	61.19	73.94	85.69
C Max	13.12	15.25	17.50	21.00	24.85	29.38
D	9.44	9.44	12.56	13.56	14.75	17.06
E	4.00	4.50	5.00	6.00	8.00	10.00
F	10.75	10.75	14.38	14.38	14.38	14.38
G	7.25	7.25	8.31	11.00	13.00	15.75
H	18.56	18.56	20.56	26.81	32.94	38.31
I	7.70	7.70	9.00	9.00	9.00	9.00

Approved by the Foundation for Cross-Connection Control and Hydraulic Research at the University of Southern California. (2 1/2" Thru 10")

We recommend providing adequate space around assembly for maintenance work and testing.



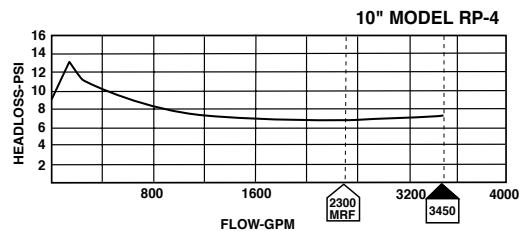
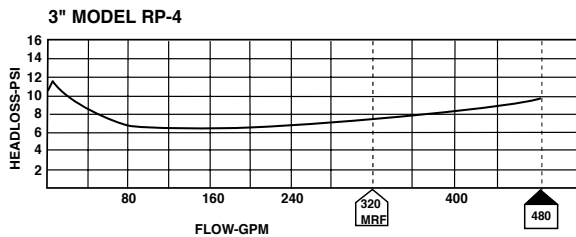
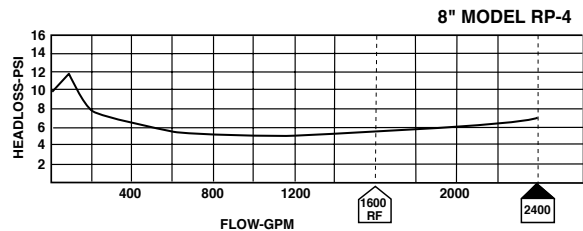
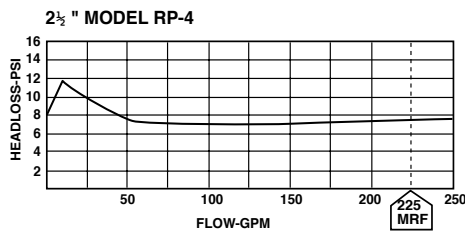
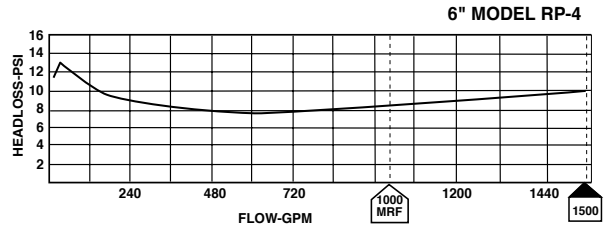
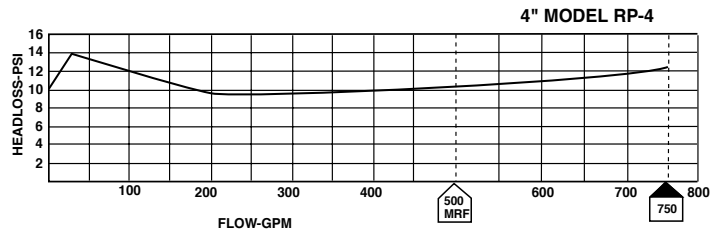
Model RP-4 Reduced Pressure Principle Backflow Preventer Flow Curves



Meter Rated Flow*



150% of Meter Rated Flow



*"Meter Rated Flow" Values adopted by the American Water Works Association and the New England Water Works Association. Flow curves generated by the Foundation for Cross-Connection Control and Hydraulic Research University of Southern California. 3" thru 10" sizes are UL Classified.

Specifications

Sizes:

2 1/2", 3", 4", 6", 8", 10"

Maximum Working Pressure:

175 psi

End Details:

2 1/2"-10" Flanged:
125 lb. ANSI 16.1

Hydrostatic Test Pressure:

350 psi

Max. Temperature:

to 110° F

Fluid

Water

Material:

2 1/2" and Larger Main Valve Body and Cover:

Cast Iron ASTM A-126 interior and exterior epoxy coated AWWA C550

Main Valve Trim:

Bronze ASTM B-61

Differential Relief Valve:

Bronze ASTM B-61 with Stainless Steel 316 Trim

Shut-off Valves:

Resilient Seat Non-Rising Stem Type

Epoxy Coated Interior and Exterior AWWA C550



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www.cla-val.com

Represented By:

RP-1 / RP-4

CLA-VAL CO. BACKFLOW PREVENTERS

IN JUNE 1991, CLA-VAL CO. COMMENCED MANUFACTURING AND SHIPPING BACKFLOW PREVENTERS WITH THE CATALOG DESIGNATION RP-4.

THE RP-4 IS AN IMPROVED DESIGN OF THE RP-1. THE MAJOR CHANGE HAS BEEN TO MOVE THE DIFFERENTIAL RELIEF VALVE TO A LOWER POSITION ON THE CHECK VALVE TO PERMIT COMPLETE DRAINING OF THE CHECK VALVE BODY.

THE MODEL NUMBERS OF THE COMPONENTS ALSO CHANGED. THE RP-1 USED 3081 CHECK VALVES AND CDHS-20 RELIEF VALVE. THE RP-4 USES 3084 CHECK VALVES AND CDHS-24 RELIEF VALVE. THIS CHANGE WAS MADE TO COMPLY WITH THE LATEST STANDARDS SET FORTH BY LEADING CROSS CONNECTION CONTROL AUTHORITIES.

THE RP-4 AND ITS PREDECESSOR THE RP-1, ARE FUNCTIONALLY THE SAME. ALL INSTALLATION, OPERATION AND TEST PROCEDURES FOR THE RP-1 APPLY TO THE RP-4.



— MODEL — **RP-1**
Backflow Preventer

DESCRIPTION

This manual titled Model RP-1 Backflow Preventer contains information for installation, operation and maintenance. The Model RP-1 combines protection against backflow with exceptionally low head loss characteristics. It operates on the reduced pressure principle, which is an accepted method of safe-guarding potable water supplies against the hazards of cross-connections.

The Model RP-1 consists of two independently acting Toggle Lever Check Valves, an automatic Pressure Differential Relief Valve located between the two check valves, two shut-off valves and four test cocks. Testing and field service are easily performed without removing the valves from the line.

INSTALLATION

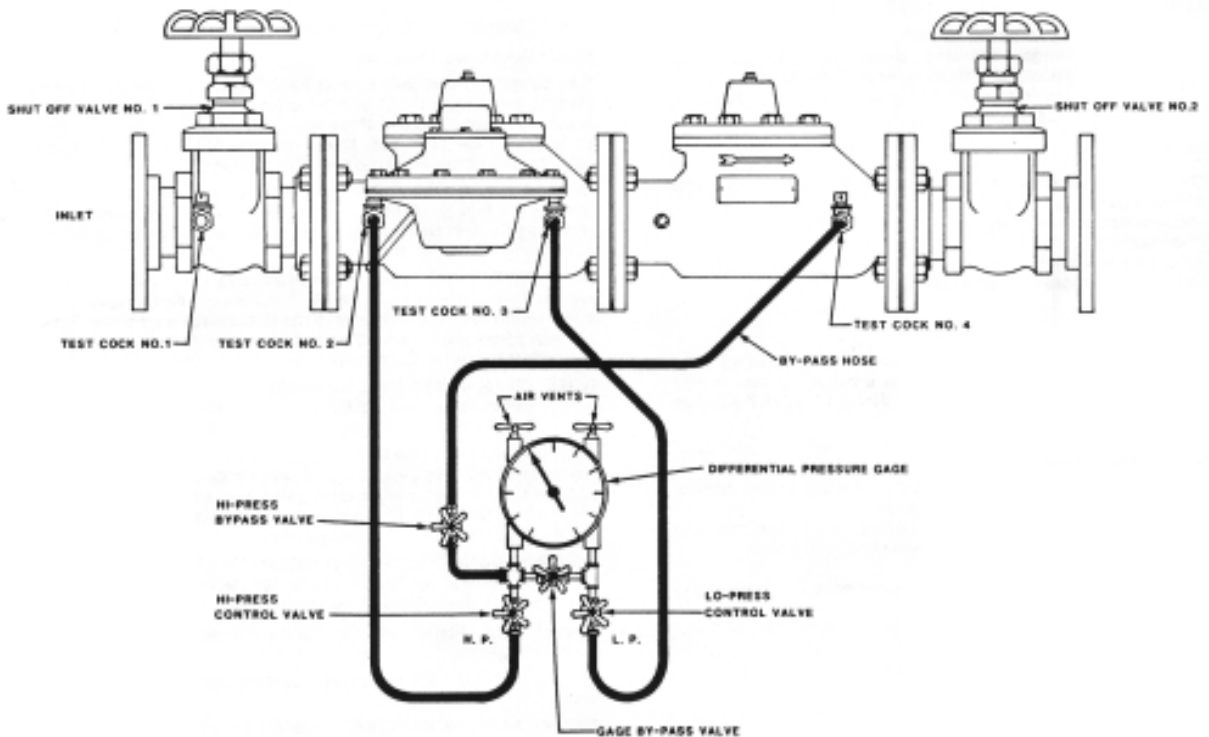
1. Check plumbing code for height of installation above highest overflow level. Normally, installations should be 12" above the surrounding ground or floor, and in a location where no part of the backflow preventer can be submerged.

Adequate drainage must be provided.

2. Close both shut-off valves
3. Before the Backflow Preventer is installed, pipe lines should be flushed of all chips, scale and foreign matter.
4. Place in line, with flow through the unit, in the direction indicated by flow arrows on the check valve body.
5. The unit must be installed in the horizontal position with valve facing up.
6. Allow sufficient clearance around the unit to conduct test procedures, and to perform inspection, or maintenance.
7. Use care during installation to prevent damage. If it is necessary to remove fittings or components be sure they are kept clean and replaced exactly as they were.

NOTE: Upon installation and prior to putting a Backflow Preventer in service, test the Backflow Preventer in accordance with local test procedures or, in absence thereof, as outlined under paragraphs "Operation and Testing" in this manual

CLA-VAL MODEL RP-1 BACKFLOW PREVENTER WITH CUSTOMER FURNISHED TEST EQUIPMENT SHOWN ATTACHED AND READY FOR TESTS NO. 1, 2 AND 3.



OPERATION

Normal Flow: During normal flow, and at the cessation of normal flow, the pressure in the zone between the two check valves is maintained at least 2 psi less than the inlet pressure.

No Flow: When there is no flow, and the pressure at the inlet drops to 2 psi or less, the pressure in the zone between check valve 1 and check valve 2 is atmospheric. The downstream check valve operates to be closed drip-tight when its inlet pressure is one psi and its outlet pressure is atmospheric.

Backflow Protection: The RP-1 Backflow Preventer provides protection against backflow in the following manners:

If the supply pressure drops, the Pressure Differential Relief Valve acts to maintain a pressure in the zone between the first and second check valves of 2 psi lower than the supply pressure by releasing just sufficient water to maintain the required difference in pressure.

If the supply pressure becomes 2 psi or less, the Pressure Differential Relief Valve opens and the pressure in the zone becomes atmospheric. When the supply pressure drops below the downstream pressure, backflow is prevented by action of the second check valve.

Should the downstream pressure rise above the inlet pressure due to action of a pump or other means in the downstream system, backflow will be prevented by the second check valve.

If a backflow condition occurs and operation of the second check valve is impaired by damage, or tight closure is prevented by a foreign object, then the Pressure Differential Relief Valve will act to discharge leakage caused by such damage. The zone pressure will, under such conditions, be lower than the supply pressure.

To Place In Service

1. SLOWLY OPEN inlet shut-off valve (No.1) which permits the Pressure Differential Relief Valve to close, preventing excessive water spillage.
 2. OPEN FULLY downstream shut-off valve (No.2).
 3. Vent all air by loosening vent plugs in the check valve and relief valve covers.
- CAUTION: Both shut-off valves (1 and 2) MUST always be fully opened when unit is in service.
4. There are no adjustments to be made on the Cla-Val Model RP-1 Backflow Preventer.

TESTING

NOTE: Check with local authorities for specific procedures. The purpose of this section is to insure the unit is functioning properly and to give notice of the need for repair.

FIELD TEST EQUIPMENT REQUIRED:

QUANTITY	DESCRIPTION
----------	-------------

- | | |
|---|---|
| 1 | Differential pressure gauge with 15 psid range. |
| | Working pressure-250 psi min. Equipped with air vents and manifold. |
| 3 | Six foot - 1/4" hoses with fittings to adapt to pipe fittings. |

TOOLS:

1. Offset box wrench. 9/16" size for 3" and smaller units. 3/4" size for 4" and larger units
2. Medium size screw driver.
3. 8" crescent wrench.
4. 10" crescent wrench.
5. Channel lock pliers or small pipe wrench.

TEST NO. 1 - To verify that the pressure differential relief valve operates to maintain the pressure in the "zone" between the two check valves at least 2 psi less than supply pressure.

- a. Install hose from #2 test cock to the high pressure control valve of the differential pressure gauge.
 - b. Install hose from the #3 test cock to the low pressure control valve of the differential pressure gauge.
 - c. Open test cocks #2 and #3, high pressure and low pressure control valves, and vent all air from the hose and gauge.
 - d. Close #2 shut-off valve.
 - e. Observe, but do not record, the apparent pressure drop across the #1 check valve.
 - f. Crack the gauge bypass valve to bypass water from #2 test cock to #3 test cock very slowly.
 - g. Watch the pressure differential drop SLOWLY to relief valve opening point -record this value.
 - h. Close the gauge bypass valve.
-

TEST NO.2 - To verify that the No.2 check valve holds tight against reverse flow under all pressure differentials.

- a. Maintain the No.2 shut-off valve in a closed position (from Test No. 1).
- b. Bleed a small amount of water from the "zone" by means of either the vent needle valve on the gauge, or through test cock #4, in order to re-establish the normal reduced pressure within the zone.
- c. Install the bypass hose from the high pressure bypass valve to #4 test cock -vent all air before final installation.
- d. Open #4 test cock, and the high pressure bypass valve.
- e. If the indicated differential pressure remains steady, then the No.2 check valve is reported as "closed tight." If the pressure differential falls, then the check valve is noted as "leaking."

TEST NO. 3 - To verify that the static pressure drop across check valve No.1 is at least 3.0 psi greater than the pressure differential between the supply pressure and the relief valve opening -Step g. of Test No.1.

- a. With the bypass hose connected to test cock #4 as in Step c. of Test No.2 (above), the steady state indicated pressure differential (not falling) Step e- of Test No.2 is the actual static pressure drop across check valve No.1, and is to be recorded as such.

Close all test cocks, open shut-off valve No.2, and remove all test equipment.

Instructions for a Leaking No.2 Shut-off Valve

In Tests No.2 and 3 above, the size of the bypass hose determines the capability of this test procedure to cope with a leaking No.2 shut-off valve- As long as the hose capacity is enough to satisfy the leak of the No.2 shut-off valve, then the above procedure will provide valid data regarding the tightness of the No.2 check valve, and also the true pressure differential across the No1 check valve. If the volume of the leak of the No.2 shut-off valve exceeds the capacity of the gage hose, then a tee may be placed in the #4 test cock to accommodate an additional bypass hose from the #1 test cock to the #4 test cock.

DISASSEMBLY (Check Valves)

Check Valve Cover Removal

It is suggested that jack screws be used when removing and replacing the covers on 8" and 10" check valves. Jack screws are made from two pieces of threaded rod 8" long with one wing nut or lever nut on each rod. Use 5/8-11 threaded rod for 8" check valves and 3/4-10 threaded rod for 10" check valves.

On 2" through 6" check valves remove all but two cover bolts, leaving the two bolts 180° apart. Press down on the cover while removing the last two bolts to prevent the cover from being force ably ejected by the spring.

On 8" and 10" check valves remove two cover bolts 180° apart and replace them with the jack screws. Run the wing nuts or lever nuts down until they seat and remove the remaining cover bolts. Back off jack screw nuts, alternating to allow cover to rise evenly until spring has extended. Remove jack screws and cover.

NOTE: Check valves 1 and 2 are identical in construction,

with the exception of the spring located in the cover cavity. The HEAVY SPRING is installed in check valve NUMBER 1.

Toggle Lever (Clapper) Assembly Removal

Removal of the two pipe plugs on each side of the check valve body above the centerline exposes the lever arm pin (item 13) and the hinge pin (item 11). Using a brass rod (smaller in diameter than the pins), gently tap out the rear pin first.

CAUTION: Support the lever arm (item 10) while completely removing the lever arm pin. Let the lever arm rest gently on the bottom of the check valve.

Grasp the yoke (item 7) with one hand while removing the front pin (hinge pin item 11).

Lift out the toggle lever (clapper) assembly, being careful that the brass seat is not dented.

Inspect the disc (item 6) and all internal parts for wear, corrosion, erosion or mineral buildup.

Thoroughly clean all parts and replace any damaged parts. A thin coat of waterproof grease should be applied to pins and bearing surfaces.

Inspect the seat (item 3) for nicks and cleanliness. In the event the seat is nicked, very fine wet or dry sandpaper may be used to "polish" out the blemish.

CAUTION: "Polish" from inside diameter of the seat, NOT ON THE SEATING AREA, as the beveled face of the seat is critical and should not be disturbed to insure a proper and continuous match with the disc.

If the seat is damaged and requires removal and replacement contact the factory for instructions and testing procedures.

Reassembly (Check Valves)

To reassemble, reverse the order of disassembly.

When installing the toggle lever (clapper) assembly back into the valve body use care that the valve seat is not nicked or otherwise damaged. Also, when the two pins that hold the toggle lever (clapper) assembly are installed, be sure to note that the knee (yoke, item 7) of the toggle lever (clapper) assembly pivots upward freely into the opening. If the toggle lever (clapper) assembly is reinstalled with the knee pivoting downward the valve will fail to function.

If both check valves 1 and 2 were disassembled simultaneously, be sure that the HEAVY SPRING is installed in the NUMBER 1 check valve cover cavity.

Disassembly (CDHS-20)

To remove cover (item 3), remove six cover screws (item 20). Remove cover.

To remove intermediate body (item 2), remove all but two intermediate body cap screws (item 14), leaving two cap screws 180° apart.

While exerting pressure downward on the intermediate body to prevent the forcible ejection of the intermediate body by the spring, remove the two remaining intermediate body cap screws, and remove the intermediate body assembly.

Examine the intermediate body assembly closely, paying particular attention to the condition of the bellofram (item 12) and diaphragm (item 13). Inspect for small pinholes, tears, cleanliness, etc.

Remove stem assembly from intermediate body using wrenches or sockets of the proper size on both upper and lower stem nuts (item 16), remove the upper stem nut. Lift off the piston (item 5), the upper stem o-ring (item 15), the bellofram (item 12) and the retainer plate (item 6). Notice the machined recess in the bottom of the piston that accommodates the upper stem o-ring. Remove the stem and diaphragm assembly from intermediate body. Remove the diaphragm assembly from the stem. Using a vice with brass jaws, or two pieces of wood between the jaws of a regular vice, or wrench, grasp the stem as near the diaphragm washer (item 7) as possible. With a wrench or socket of the proper size, remove the lower stem nut. The disc guide (item 10), the disc (item 9) and the disc retainer (item 8) are removed as an assembly. Remove the diaphragm (item 13), the lower stem o-ring (item 15) and the diaphragm washer (item 7) from the stem.

To remove the disc from disc retainer: Remove the disc guide, it should fallout. Insert a flat, blunt tool through the hole in the disc between the disc and disc retainer and pry the disc out. The disc retainer has a machined lip that holds the edge of the disc.

Lift the spring out. Clean and examine. Replace only as necessary.

Inspect the seat for nicks or dents and cleanliness. In the event the seat is nicked or dented, very fine wet or dry sandpaper may be used to polish out the blemish. Replace the seat and seat o-ring only if damage cannot be "polished" out.

Clean and replace all parts as necessary.

Reassembly (CDHS-20)

Reassembly is the reverse of disassembly.

Ensure that the disc is completely and firmly seated under the machined lip of the disc retainer on all sides

With the stem (long end up, 1 1/4" and 2" CDHS-20), held in a vice with brass jaws, install the diaphragm washer with the machined recess up to receive the o-ring. Install lower stem o-ring, the diaphragm, disc retainer assembly, disc guide and lower stem nut.

Insert the stem with diaphragm assembly intact through the delrin bushing in the intermediate body; then install the retainer plate (machined recess up), bellofram (glossy surface out, side with printing inside, next to piston), upper stem o-ring, piston and upper stem nut.

Do not over-tighten the upper and lower stem nuts. Ensure that they are both snug.

On the older 1 1/4" CDHS-20 only, ensure that the gasket is between the diaphragm and intermediate body. Gasket not required on newer versions.

Ensure that the holes in the diaphragm align with the holes in the body.

Insert two intermediate body cap screws through the intermediate body and diaphragm on opposite sides of the bolt circle.

Position the spring over the seat in the main body. Position the intermediate body (item 2) so that the alignment agrees with the illustration. Press the intermediate body down on the body and hold until the two bolts on opposite sides have been seated finger tight. Insert remaining bolts and finger tighten.

Final tightening of the body bolts should follow a criss-cross sequence.

Position the bellofram flat against the upper portion of the intermediate body. Insert and tighten the cover retaining screws.

Follow instructions "To Place In Service" and "Testing" upon completion of the RP-1

MAINTENANCE

The Model RP-1 Backflow Preventer requires minimum maintenance. However, in addition to a testing schedule, a periodic inspection should be considered to determine how the fluid handled is affecting the efficiency of the unit. In a water system the water velocity, as well as the substances occurring in natural waters, such as dissolved minerals, colloidal and suspended particles, vary in every installation. Effect of these actions or substances must be determined by inspection.

Intermittent discharge of water through the Pressure Differential Relief Valve is generally caused by fluctuation of the inlet pressure and usually occurs during a period of no flow through the unit.

Continuous discharge of water during a no flow condition indicates.

1. A leak in check valve No 1. (Refer to test No 3).
2. A backflow condition and a leak in check valve No. 2. (Refer to Test No. 2).
3. Malfunction of Pressure Differential Relief Valve. (Refer to Test No. 1).

Continuous discharge of water through the Pressure Differential Relief Valve during flowing conditions indicates:

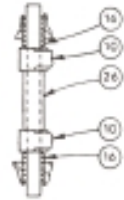
1. Check Valve No. 1 held in an open position.
2. Malfunction of Pressure Differential Relief Valve.

Refer to the testing procedure, which outlines methods to determine if check valve leakage occurs. Possible reasons for service to a check valve would be as follows:

1. Object lodged between seat and disc.
 2. Particles lodged in disc.
 3. Worn disc.
 4. Loose disc and disc guide assembly.
 5. Corrosion buildup.
 6. Damaged seat.
-

Prior to returning a Backflow Preventer to service following maintenance, test the Backflow Preventer in accordance with local test procedures or, in absence thereof, as outlined under paragraphs "Operation and Testing" in this instruction.

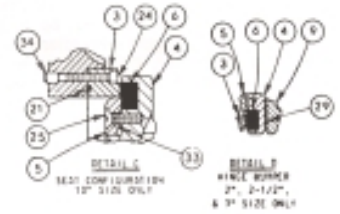
PROBLEM	PROBABLE CAUSE	SOLUTION
#1 Check Valve leaks	1. Foreign object on disc	Clean
	2. Disc swollen	Replace
	3. "O"-Ring broken or missing	Replace
	4. Seat "O"-Ring broken or missing	Replace
	5. Spring missing	Install
#2 Check Valve leaks	1. Same as above	
3/4" CDHS-20:		
CDHS blows water	1. See # check	As required
	2. Disc swollen	Replace
	3. Foreign objects on disc	Clean
	4. Lower stem "O"-Ring broken or missing	Replace
	5. Seat "O"-Ring broken or missing	Replace
CDHS will not close	1. #1 check fouled	See #1 Check Valve leaks (above)
	2. Sensing holes clogged (3/4" CDHS-20 only)	Clean
	3. Worn diaphragm lower	Replace
	4. Worn belloram upper	Replace
	5. Foreign products lodged between seat & disc	Clean



LEVER ARM SPACER
8" & 10" SIZE ONLY

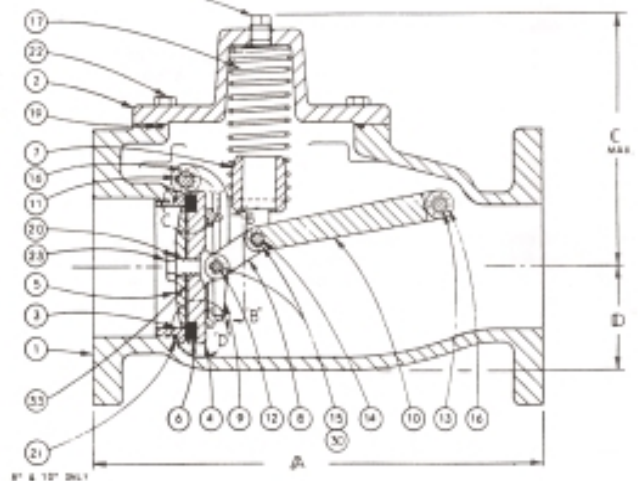
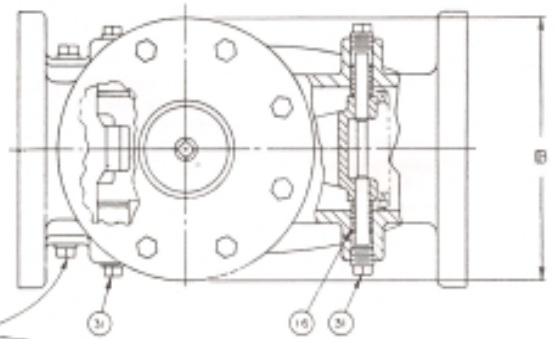


LINK SPACER
10" SIZE ONLY



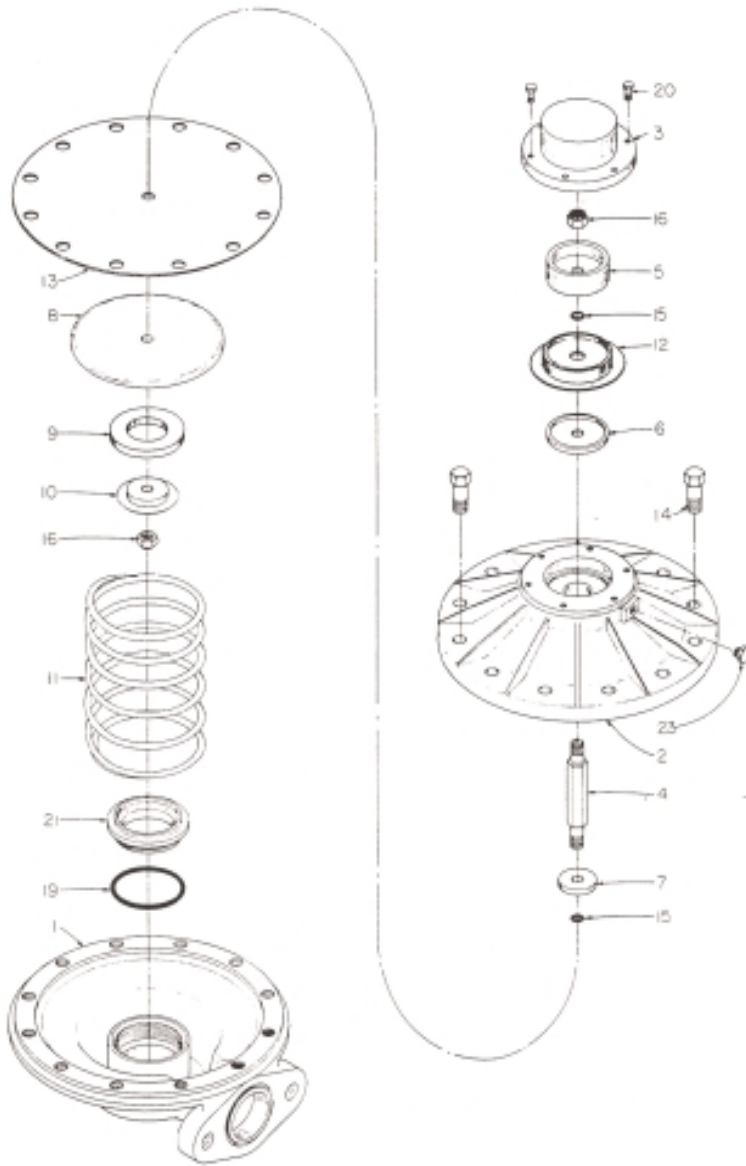
SEAT COMP. LAMINATION
10" SIZE ONLY

WINDY BURNER
2", 2-1/2", & 3" SIZE ONLY



8" & 10" ONLY

**CDHS-20 PRESSURE DIFFERENTIAL RELIEF VALVES
FOR RP-1 BACKFLOW PREVENTER
ALL PARTS TYPICAL EXCEPT AS NOTED**



ITEM NO.	DESCRIPTION
1	Body
2	Intermediate Body
3	Cover
4	Stem
5	Piston
6	Retainer
7	Diaphragm Washer
8	Disc Retainer
*9	Disc
10	Disc Guide
11	Spring
12	* Bellofram
13	Diaphragm
14	Hex Head Screw
15	Stem O-Ring
16	Self Locking Nut
19	Seat-O-Ring
20	Fil Head Screw
21	Seat
*23	Pipe Plug

Item 1 & 2 shown for use on 4" thru 10" model RP-1



ITEM 1&2 SHOWN FOR USE ON 2" THRU 3" MODEL RP-1



Technical Bulletin



October 28, 1996

CDHS-20/-24 Relief Valve Repair Notes

1. Proper installation of the upper rolling diaphragm ("Bellofram") is important on all sizes of the CDHS-20 and CDHS-24 Pressure Differential Relief Valves. These valves are used on CLA-VAL backflow preventers Model RP-1, RP-2, RP-1EX and RP-4. After a repair kit has been installed, the symptom of the relief valve leaking out of the weep hole in the cover often occurs very soon (e.g. - "I think that the diaphragm is defective. The relief valve cycled only three to 10 times after I installed the repair kit and it started leaking.").

2. This problem is due to improper re-assembly of the relief valve and not the rolling diaphragm. Please note the following tips:

1.) Be sure that the stainless steel retainer plate goes down against the shoulder of the stem (upper end) with its outer lip facing up (or 'concave' side up).

2.) The rolling diaphragm has a 'top hat' shape and is installed next on the stem upside down with the top of the 'hat' down onto the retainer plate. The rolling diaphragm is made by a rubber coating or impregnation on one side only of a fine nylon fabric as it is molded into its shape. It is this rubber coating which must be against the water pressure coming up from the intermediate body of the relief valve, otherwise, the rubber coat will be pushed away from the nylon fabric and fail. Be sure that the "shiny" side or coated side of the rolling diaphragm is down on top of the retainer plate and facing outward (OR the fabric or "dull" side is to be against the piston or inside the "top hat"). You may have to turn the rolling diaphragm inside out to install it.

3.) Next, Install the O-ring on the stem. Install the piston with the recess around the stem hole facing down towards the O-ring. Install self locking nut and tighten after installing parts on lower end of stem.

4.) After tightening stem nut, carefully push rolling diaphragm "brim" straight down over itself, so that the "brim" is flat and smooth against the intermediate body. Be sure that the rolling diaphragm is not twisted or wrinkled.

5.) Install cover so that weep hole faces out and away from backflow assembly. When installing cover screws, do not rotate cover after placing over rolling diaphragm "brim", this will twist the rolling diaphragm and cause it to fail quickly after cover screws are tightened.



— MODEL — **CDHS-20/24**

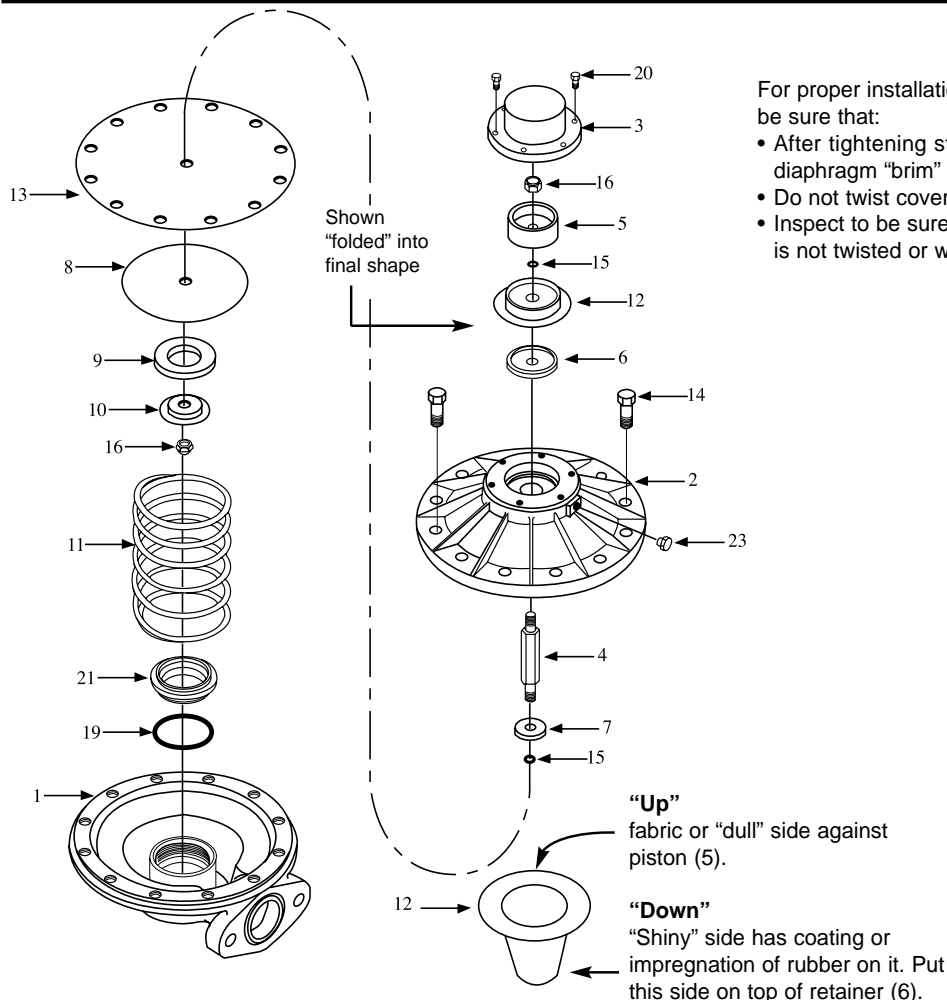
Supplemental Instructions

Proper installation of the upper rolling diaphragm ("Bellofram") is important on all sizes of the CDHS-20 and CDHS-24 Pressure Differential Relief Valves. These valves are used on CLA-VAL backflow preventers Model RP-1, RP-2, RP-1EX and RP-4. After a repair kit has been installed, the symptom of the relief valve leaking out of the weep hole in the cover often occurs very soon (e.g. - "I think that the diaphragm is defective. The relief valve cycled only a very few times after I installed the repair kit and then it started leaking"). This problem is due to improper re-assembly of the relief valve and not the rolling diaphragm. Please note the following tips:

- 1.) Be sure that the stainless steel retainer plate (6) goes down against the shoulder of the stem (4) (upper end) with its outer lip facing up (or 'concave' side up).
- 2.) The rolling diaphragm (12) has a 'top hat' shape and is installed next on the stem upside down with the top of the 'hat' down onto the retainer plate. (6) The rolling diaphragm is made with a rubber coating or impregnation on one side only of a fine nylon fabric as it is molded into its shape. It is this rubber coating which must be against the water pressure coming up from the intermediate body of the relief valve, otherwise, the rubber coat will be pushed away

from the nylon fabric and fail. Be sure that the "shiny" side or coated side of the rolling diaphragm is down on top of the retainer plate and facing outward (OR the fabric or "dull" side is to be against the piston or inside the "top hat"). You may have to turn the rolling diaphragm inside out to install it.

- 3.) Next, Install the O-ring on (15) the stem. Install the piston (5) with the recess around the stem hole facing down towards the O-ring. Install self-locking nut (16) and tighten after installing parts on lower end of stem.
- 4.) After tightening stem nut, carefully push rolling diaphragm "brim" straight down over itself, so that the "brim" is flat and smooth against the intermediate body (2). Be sure that the rolling diaphragm is not twisted or wrinkled.
- 5.) Install cover (3) so that weep hole faces out and away from backflow assembly. When installing cover screws (20), alignment of cover screw holes is critical. Do not rotate cover after placing over rolling diaphragm "brim", this will twist the rolling diaphragm and cause it to fail quickly after cover screws are tightened.



For proper installation of rolling diaphragm (12), be sure that:

- After tightening stem nut (16) carefully fold rolling diaphragm "brim" down to shape shown.
- Do not twist cover (3) when installing it.
- Inspect to be sure rolling diaphragm (12) is not twisted or wrinkled. It must be smooth as shown.

Item No.	Description
1	Body
2	Intermediate
3	Cover
4	Stem
5	Piston
6	Retainer
7	Diaphragm Washer
8	Disc Retainer
9	Disc
10	Disc Guide
11	Spring
12	Rolling Diaphragm
13	Diaphragm
14	Hex Head Screw
15	Stem O-Ring
16	Self Locking Nut
19	Seat O-Ring
20	Fill Head Screw
23	Pipe Plug



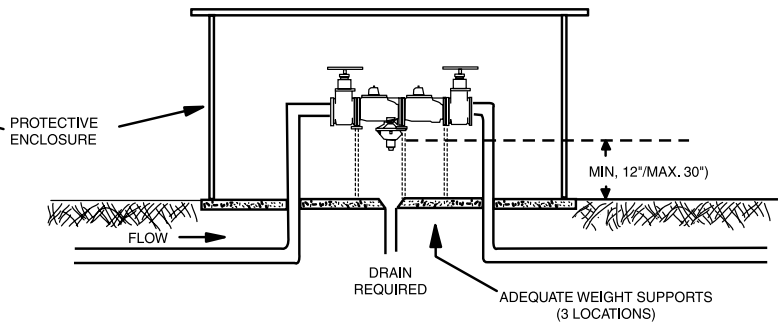
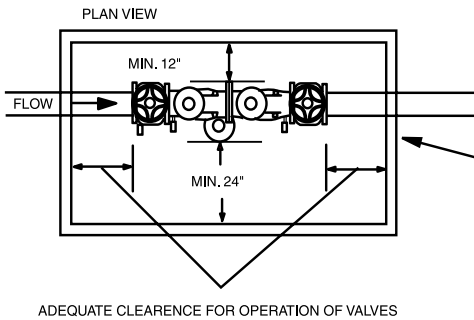
— MODEL — **Backflow Preventer**

Installation Recommendations

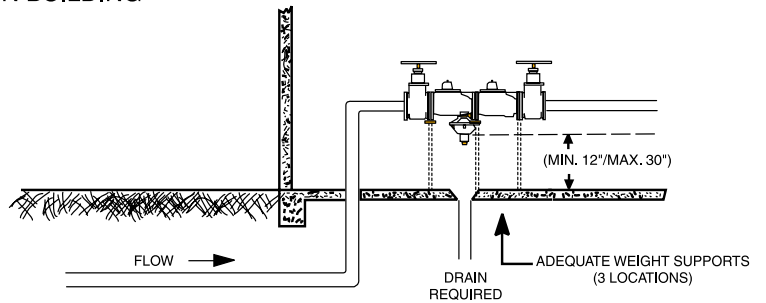
A Cla-Val Backflow Prevention Assembly must be in a horizontal run of pipe with check valve covers **up**. Provide adequate weight support at check valve inlet, middle and outlet flanges for 4-inch and larger assemblies.

- Provide adequate clearance for valve operation, testing and maintenance.
- Use proper drainage provisions (**See Over**).
- Provide adequate protection from freezing.
- Follow local codes.

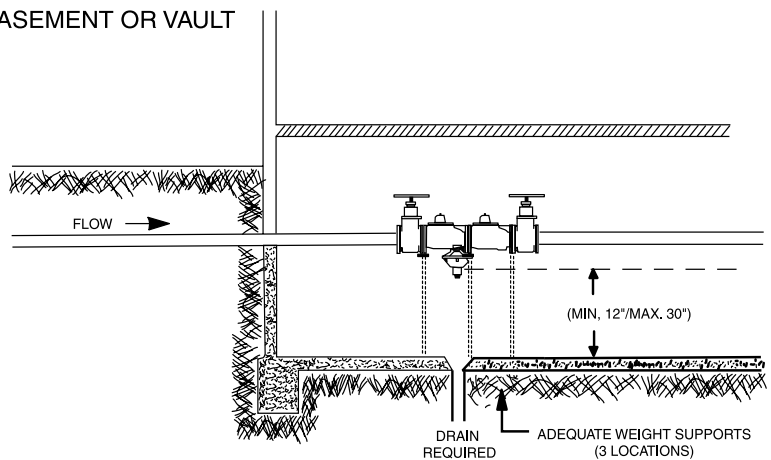
ABOVE GROUND



IN BUILDING



IN BASEMENT OR VAULT

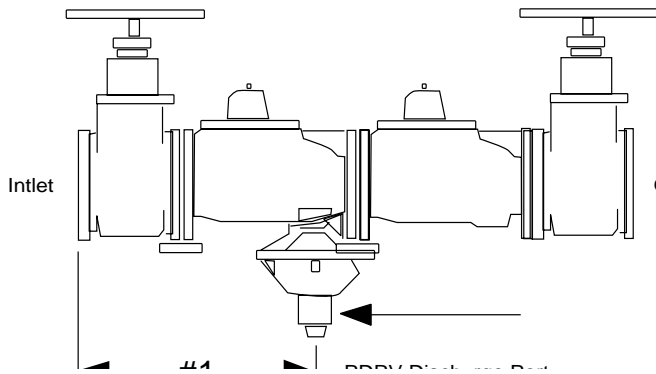


BACKFLOW PREVENTER DRAIN PROVISIONS

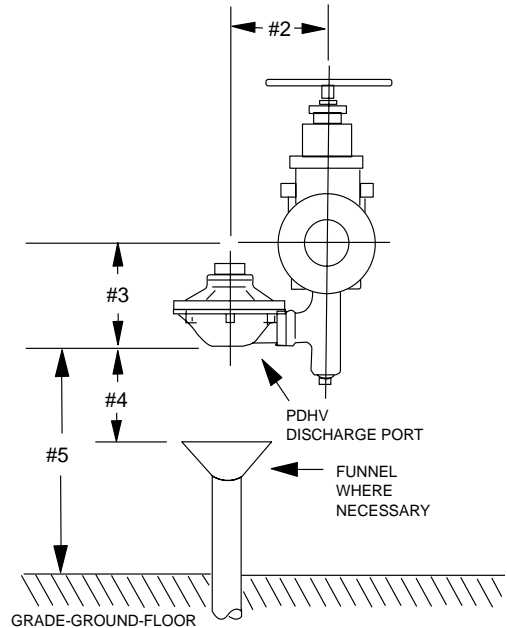
To install a drain for the discharge of the pressure differential relief valve (PDRV) on Cla-Val RP-1EX or RP-4, use the following minimum dimensions (RP1-EX uses the CDHS-20, RP-4 uses the CDHS-24).

- DIMENSION 1** Is the horizontal distance between the inlet flange of the inlet shutoff valve and the vertical centerline of the PDRV.
- DIMENSION 2** Is the horizontal distance between the vertical centerline of the check valve body and the vertical centerline of the PDRV.
- DIMENSION 3** Is the vertical distance between the horizontal centerline of the check valve body and the bottom of the PDRV.
- DIMENSION 4** Is an air gap - "the vertical distance in free atmosphere between the bottom of the PDRV and the overflow rim of the top of the drain" and is equal to at least twice the diameter of the discharge port of the PDRV.
- DIMENSION 5** Is the absolute minimum vertical distance between the bottom of the PDRV and grade-ground-floor and can be no less than 12".

ALL DIMENSIONS ARE IN INCHES						
SIZE	# 1	#2	#3		#4 MIN.	#5 MIN.
			RPI-EX	RP-4		
2" S	14.74	7.70	6.00	7.00	2.50	12.00
2" F	16.49	7.70	6.00	7.00	2.50	12.00
2-1/2"	18.56	7.70	7.00	9.00	2.50	12.00
3"	18.56	7.70	7.00	9.00	2.50	12.00
4"	20.56	9.00	10.00	11.00	4.00	12.00
6"	26.81	9.00	11.00	12.00	4.00	12.00
8"	32.94	9.00	14.00	15.00	4.00	12.00
10"	38.31	9.00	14.00	15.00	4.00	12.00



BACKFLOW PREVENTER ASSEMBLY	RP-2	RP-1EX or RP-4	RP-1EX or RP-4
SIZES	3/4"-1 1/2"	2"-3"	4"-10"
CDHS-20 /CDHS-24 SEAT SIZE	3/4"	1 1/4"	2"
RECOMMENDED MIN. DRAIN SIZE	1 1/2"	2 1/2"	4"



The general "rule of thumb" for drain sizing is that the drain must be capable of carrying away twice the amount of incoming flow (subject to local codes).



REPAIR KITS

BACKFLOW PREVENTERS

CHECK VALVE REPAIR KIT

FOR ALL 2" through 10" RP's, D's, 16's, 18's, 27's
 INCLUDES: Disc, O ring and spare clips for ONE check valve.
 Requires TWO per assembly.

MAIN VALVE REPAIR KIT

FOR 3/4" through 1 1/2" RP-2 and D-2
 INCLUDES: Discs and O Rings for BOTH main check valves.
 Requires ONE per assembly.

See back side for Repair Kit numbers.

Kit Size	Description	Stock No.
1"	Used on 3/4" and 1"	88415F
1 1/2"	Used on 1 1/4" and 1 1/2"	88416D

DIFFERENTIAL RELIEF VALVE REPAIR KIT

FOR CDHS-24 (RP-4) and CDHS-20 (RP-1, RP-1EX)
 INCLUDES: Discs, Diaphragms, and O rings as appropriate.
 Requires ONE per assembly.

FLANGE ADAPTER

For 10" Backflow Prevention Assemblies with gates.
 Adapts to 12" pipe. 1" thick. Requires two per assembly.
 10" to 12" Adapter Stock No. 1127901F

Kit Size	Description	Stock No.
3/4"	Used on all 3/4" through 1 1/2" RP2's	88417B
1 1/4"	Used on 2" through 3" RP-1, RP-1EX(CDHS-20) RP-4(CDHS-24)	88418K
2"	Used on 4" through 10" RP-1, RP-1EX(CDHS-20) RP-4(CHDS-24)	88419H

Parts for CDHS-14 differential relief valve are no longer available. Existing assemblies can be updated by the installation of a CDHS-24. Consult factory for details.

WHEN ORDERING PLEASE GIVE COMPLETE NAMEPLATE DATA INCLUDING **SERIAL NUMBER**
 OF THE BACKFLOW ASSEMBLY BEING REPAIRED.
 MINIMUM ORDER CHARGE APPLIES

BACKFLOW ASSEMBLIES CHECK VALVE REPAIR KIT

ALL NAMEPLATE DATA MUST BE SUPPLIED

(*See Note below.)

INCLUDES: Disc, O-rings, and 2 spare clips for **ONE** check valve. Requires two per assembly.

VALVE SIZE (INCHES)	3081			DISC DIMENSIONS -REFERENCE ONLY-	
	REPAIR KIT		DISC	ID (Inch)	OD (Inch)
	If Serial No. begins with "AA" to "AL" (1956) through "WA" to "WG" (1978).				
2	81319G		38609E	1.6	2.7
2 1/2	81320E		47504G	1.0	3.2
3	81321C		41579E	1.5	3.7
4	81322A		38677B	4.1	4.7
6	81323J		3925501D	6.1	6.8
8	81324G		4130101B	7.2	8.8
10	81325D		4149502K	9.2	11.0

VALVE SIZE (INCHES)	3081EX			DISC DIMENSIONS -REFERENCE ONLY-	
	REPAIR KIT		DISC	ID (Inch)	OD (Inch)
	If Serial No. begins with "XA" to "XG" (1979) through "IM" to "IX" (1990).				
2	10862B		9375901H	1.2	2.6
2 1/2	81320E		47504G	1.0	3.2
3	81321C		41579E	1.5	3.7
4	10863K		9376101D	2.4	4.6
6	10864H		9376701A	4.4	6.7
8	10865E		9377101C	6.4	8.8
10	81325D		4149502K	9.2	11.0

VALVE SIZE (INCHES)	3084			DISC DIMENSIONS -REFERENCE ONLY-	
	REPAIR KIT		DISC	ID (Inch)	OD (Inch)
	If Serial No. begins with "JM" to "JX" (1991) through Current				
2	2052601J		1297901K	1.2	2.2
2 1/2	2052603E		1195501K	1.5	3.2
3	2052603E		1195501K	1.5	3.2
4	2052604C		1298401K	2.4	4.2
6	2052605K		1154401C	4.4	6.2
8	2052606H		1195201H	6.4	8.1
10	2052607F		1196301E	9.2	10.2

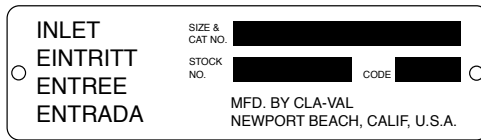
***NOTE:** The year date cast into check valve body is **NOT** the date of manufacture. The serial number uses a two-letter date code followed by one or more digits to signify when the check valve was built. Consult Cla-Val Co. for more information.

Proper Identification

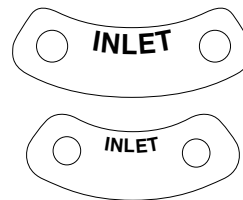
For ordering repair kits, replacement parts, or for inquiries concerning valve operation, it is important to properly identify Cla-Val products already in service by including all nameplate data with your inquiry. Pertinent product data includes valve function, size, material, pressure rating, end details, type of pilot controls used and control adjustment ranges.

Identification Plates

For product identification, cast-in body markings are supplemented by identification plates as illustrated on this page. The plates, depending on type and size of product, are mounted in the most practical position. **It is extremely important that these identification plates are not painted over, removed, or in any other way rendered illegible.**



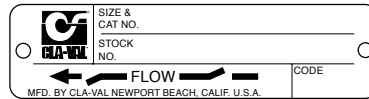
This brass plate appears on valves sized 2 1/2" and larger and is located on the top of the inlet flange.



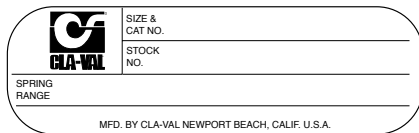
These two brass plates appear on 3/8", 1/2", and 3/4" size valves and are located on the valve cover.



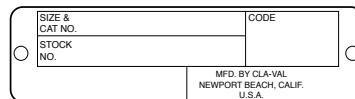
This brass plate appears on altitude valves only and is found on top of the outlet flange.



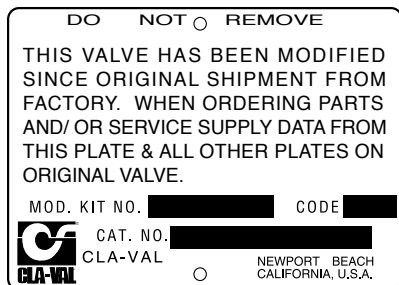
These two brass plates appear on threaded valves 1" through 3" size or flanged valves 1" through 2". It is located on only one side of the valve body.



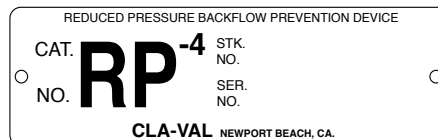
This tag is affixed to the cover of the pilot control valve. The adjustment range appears in the spring range section.



This brass plate is used to identify pilot control valves. The adjustment range is stamped into the plate.



This aluminum plate is included in pilot system modification kits and is to be wired to the new pilot control system after installation.



This brass plate is used on our backflow prevention assemblies. It is located on the side of the Number Two check (2" through 10"). The serial number of the assembly is also stamped on the top of the inlet flange of the Number One check.

HOW TO ORDER

Because of the vast number of possible configurations and combinations available, many valves and controls are not shown in published product and price lists. For ordering information, price and availability on product that are not listed, please contact your local Cla-Val office or our factory office located at:

P. O. Box 1325
Newport Beach, California 92659-0325
(949) 722-4800
FAX (949) 548-5441

SPECIFY WHEN ORDERING

- Model Number
- Globe or Angle Pattern
- Adjustment Range (As Applicable)
- Valve Size
- Threaded or Flanged
- Body and Trim Materials
- Optional Features
- Pressure Class

UNLESS OTHERWISE SPECIFIED

- Globe or angle pattern are the same price
- Ductile iron body and bronze trim are standard
- X46 Flow Clean Strainer or X43 "Y" Strainer are included
- CK2 Isolation Valves are included in price on 4" and larger valve sizes (6" and larger on 600 Series)

LIMITED WARRANTY

Automatic valves and controls as manufactured by Cla-Val are warranted for three years from date of shipment against manufacturing defects in material and workmanship that develop in the service for which they are designed, provided the products are installed and used in accordance with all applicable instructions and limitations issued by Cla-Val.

We will repair or replace defective material, free of charge, that is returned to our factory, transportation charges prepaid, if upon inspection, the material is found to have been defective at time of original shipment. This warranty is expressly conditioned on the purchaser's providing written notification to Cla-Val immediate upon discovery of the defect.

Components used by Cla-Val but manufactured by others, are warranted only to the extent of that manufacturer's guarantee.

This warranty shall not apply if the product has been altered or repaired by others, Cla-Val shall make no allowance or credit for such repairs or alterations unless authorized in writing by Cla-Val.

DISCLAIMER OF WARRANTIES AND LIMITATIONS OF LIABILITY

The foregoing warranty is exclusive and in lieu of all other warranties and representations, whether expressed, implied, oral or written, including but not limited to any implied warranties or merchantability or fitness for a particular purpose. All such other warranties and representations are hereby cancelled.

Cla-Val shall not be liable for any incidental or consequential loss, damage or expense arising directly or indirectly from the use of the product. Cla-Val shall not be liable for any damages or charges for labor or expense in making repairs or adjustments to the product. Cla-Val shall not be liable for any damages or charges sustained in the adaptation or use of its engineering data and services. No representative of Cla-Val may change any of the foregoing or assume any additional liability or responsibility in connection with the product. The liability of Cla-Val is limited to material replacements F.O.B. Newport Beach, California.

TERMS OF SALE

ACCEPTANCE OF ORDERS

All orders are subject to acceptance by our main office at Newport Beach, California.

CREDIT TERMS

Credit terms are net thirty (30) days from date of invoice.

PURCHASE ORDER FORMS

Orders submitted on customer's own purchase order forms will be accepted only with the express understanding that no statements, clauses, or conditions contained in said order form will be binding on the Seller if they in any way modify the Seller's own terms and conditions of sales.

PRODUCT CHANGES

The right is reserved to make changes in pattern, design or materials when deemed necessary, without prior notice.

PRICES

All prices are F.O.B. Newport Beach, California unless expressly stated otherwise on our acknowledgement of the order. Prices are subject to change without notice. The prices at which any order is accepted are subject to adjustment to the Seller's price in effect at the time of shipment. Prices do not include sales, excise, municipal, state or any other Government taxes. Minimum order charge \$75.00.

RESPONSIBILITY

We will not be responsible for delays resulting from strikes, accidents, negligence of carriers, or other causes beyond our control. Also, we will not be liable for any unauthorized product alterations or charges accruing there from.

RISK

All goods are shipped at the risk of the purchaser after they have been delivered by us to the carrier. Claims for error, shortages, etc., must be made upon receipt of goods.

EXPORT SHIPMENTS

Export shipments are subject to an additional charge for export packing.

RETURNED GOODS

1. Customers must obtain written approval from Cla-Val prior to returning any material.
2. Cla-Val reserves the right to refuse the return of any products.
3. Products more than six (6) months old cannot be returned for credit.
4. Specially produced, non-standard models cannot be returned for credit.
5. Rubber goods such as diaphragms, discs, o-rings, etc., cannot be returned for credit, unless as part of an unopened vacuum sealed repair kit which is less than six months old.
6. Goods authorized for return are subject to a 35% (\$75 minimum) restocking charge and a service charge for inspection, reconditioning, replacement of rubber parts, retesting, repainting and repackaging as required.
7. Authorized returned goods must be packaged and shipped prepaid to Cla-Val, 1701 Placentia Avenue, Costa Mesa, California 92627.



E-Product I.D. (R-5/05)

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