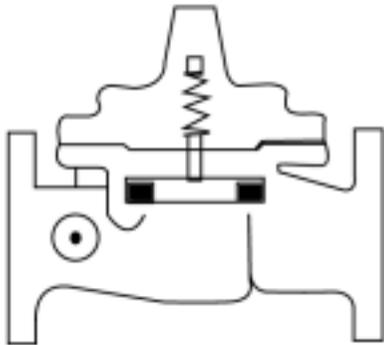


# CLA-VAL

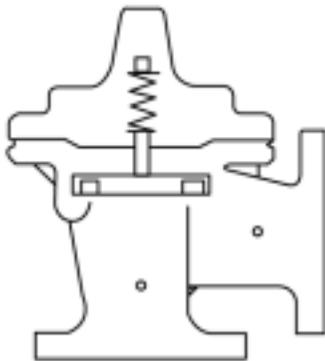
**AUTOMATIC CONTROL VALVES**

90-21 UL

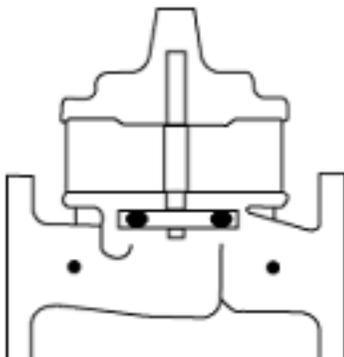
Place this manual with personal responsible  
for maintenance of this valve



## *INSTALLATION*



## *OPERATION*



## *MAINTENANCE*





NEWPORT BEACH, CALIFORNIA

CATALOG NO.

90-21

DRAWING NO.

93480

REV

M

TYPE OF VALVE AND MAIN FEATURES

PRESSURE REDUCING VALVE  
"UNDERWRITERS LABORATORIES LISTED"

DESIGN

DRAWN MGR

9-4-79

CHK'D DP

9-21-79

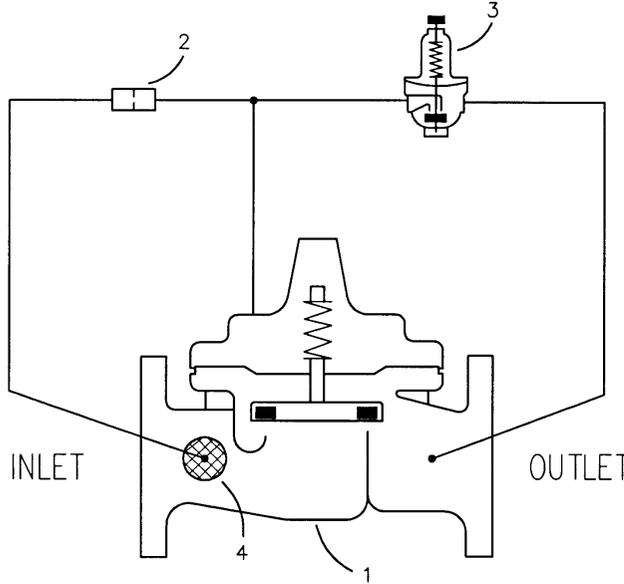
APVD HWE

9-24-79

03-05-03  
PC  
07-16-03  
PC  
ADDED GLOBE & ANGLE 300F TO TABLE (FLANGED) (NED 47715)  
ADDED APPROVAL TABLE (300) FOR GROOVED ENDS; ADDED 300F SIZES TO TABLE (FLANGED VALVE); ADDED DUCTILE IRON TO 300S & 300F TABLE; MOVED ALL TABLES TO PG 2 (ECO 19470)  
M

CAD REVISION RECORD - DO NOT REVISE MANUALLY  
DESCRIPTION  
DATE  
BY  
AK  
03-07-01  
LTR  
A-K SEE REVISION FILE.  
L ADDED NOTE 4 AND TABLE TO SH.1 (ECO 18559)

----- NOT FURNISHED BY CLA-VAL CO. ----- OPTIONAL FEATURES -----



NOTE:

FOR STEEL AND DUCTILE IRON  
300 VALVES, USE CRDKX  
[W/ SPECIAL DIAPHRAGM WASHER,  
YOKE AND SCREWS (30-165)]

\* ALL SIZES, KX = RED PAINT:  
ALSO 300F ONLY KX = HIGH-STRENGTH BOLTS/STUDS & NUTS

ITEM NO.	BASIC COMPONENTS	QTY
1	*100KX HYTROL MAIN VALVE	1
2	X58C RESTRICTION ASSEMBLY	1
3	CRD PRESSURE REDUCING CONTROL (SEE NOTE)	1
4	X46A FLOW CLEAN STRAINER	1

OPTIONAL FEATURE SUFFIX	ADDED TO CATALOG NUMBER

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**CLA-VAL CO.**

NEWPORT BEACH, CALIFORNIA

CATALOG NO.

90-21

DRAWING NO.

93480

REV

M

TYPE OF VALVE AND MAIN FEATURES

PRESSURE REDUCING VALVE  
"UNDERWRITERS LABORATORIES LISTED"

DESIGN

DRAWN	MGR	9-4-79
CHK'D	DP	9-21-79
APVD	HWE	9-24-79

OPERATING DATA

I. PRESSURE REDUCING FEATURE:

PRESSURE REDUCING CONTROL (3) IS A NORMALLY OPEN CONTROL THAT SENSES MAIN VALVE OUTLET PRESSURE CHANGES. AN INCREASE IN OUTLET PRESSURE TENDS TO CLOSE CONTROL (3) AND A DECREASE IN OUTLET PRESSURE TENDS TO OPEN CONTROL (3). THIS CAUSES MAIN VALVE COVER PRESSURE TO VARY AND THE MAIN VALVE MODULATES (OPENS AND CLOSES) MAINTAINING A RELATIVELY CONSTANT OUTLET PRESSURE. PRESSURE REDUCING CONTROL (3) ADJUSTMENT: TURN THE ADJUSTING SCREW CLOCKWISE TO INCREASE THE SETTING.

II. CHECK LIST FOR PROPER OPERATION:

- ( ) SYSTEM VALVES OPEN UPSTREAM AND DOWNSTREAM.
- ( ) AIR REMOVED FROM THE MAIN VALVE COVER AND PILOT SYSTEM AT ALL HIGH POINTS.

90G-21 AND 90A-21 APPROVALS

UL LISTED

DUCTILE IRON FLANGED VALVE  
175 PSI MAX. (CRD 30-165)

PATTERN	SIZE	P/C
GLOBE	1 1/2" - 8"	150F
ANGLE	2" - 8"	150F
GLOBE	1 1/2" - 6"	300F
ANGLE	2" - 6"	300F

CAST STEEL VALVES 300 PSI  
MAX. (CRD 30-165)

PATTERN	SIZE	P/C
GLOBE	1 1/2"	300S
GLOBE	2" - 6"	300F
ANGLE	1 1/2"	300S
ANGLE	2" - 6"	300F

UL LISTED

DUCTILE IRON GROOVED VALVE  
175 PSI MAX. (CRD 30-165)

PATTERN	SIZE	P/C
GLOBE	1 1/2" - 6"	300
ANGLE	2" - 4"	300

ULC LISTED

DUCTILE IRON VALVE:  
CLASS 150: 250 PSI MAX.  
CLASS 300: 400 PSI MAX.

PATTERN	SIZE	P/C
GLOBE	1 1/2" - 10"	150A
GLOBE	1 1/2" - 3"	300S
GLOBE	1 1/2" - 10"	300F
ANGLE	1 1/2" - 10"	150A
ANGLE	1 1/2" - 3"	300S
ANGLE	1 1/2" - 10"	300F

CAD REVISION RECORD - DO NOT REVISE MANUALLY

DATE

BY

DESCRIPTION

SEE SHEET 1

LTR

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# Fire Protection Pressure Reducing Valve



90-21 UL Listed  
 Fire Protection Valve



90-21 UL Listed  
 Grooved End  
 Fire Protection Valve



**MEA  
 Approved**



- **U.L. Listed, ULC Listed, MEA Approved**
- **Globe or Angle Pattern**
- **Proven Reliable Design**
- **Available in Cast Bronze, Ductile Iron and Cast Steel**
- **Accurate Pressure Control**
- **In Line Service**
- **Grooved Ends (1 1/2" - 6")**

Cla-Val 90G-21 (globe) and 90A-21 (angle) Pressure Reducing Valves are indispensable in any fire protection system. Our diaphragm actuated design is proven highly reliable and easy to maintain. We offer both a globe or angle pattern with a full range of adjustments. These valves are also available in a variety of material options. Epoxy coating is strongly recommended for all fire system valves (excluding bronze valves). The 90G-21 and 90A-21 can be supplied with optional internal and external epoxy coating of the main valve wetted surfaces.

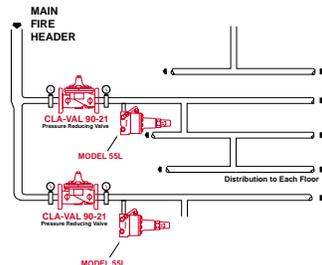
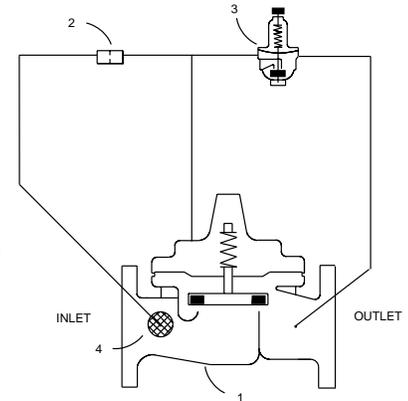
Special System Water Control Valves – Class II  
 UL Product Category VLMT – File No. Ex 2534

## Function

Cla-Val 90G-21 (globe) and 90A-21 (angle) Pressure Reducing Valves automatically reduce a higher inlet pressure to a steady lower outlet pressure regardless of changing flow rate and/or varying inlet pressure. The valves pilot control system is very sensitive to slight downstream pressure fluctuations, and will automatically open or close to maintain the desired pressure setting. The downstream pressure can be set over a wide range by turning the adjustment screw on the CRD pilot control. The adjustment screw is protected by a screw-on cover, which can be sealed to discourage tampering.

## Schematic Diagram

- | Item | Description                          |
|------|--------------------------------------|
| 1    | Model 100-01 Hytrol (Globe or Angle) |
| 2    | X58C Restriction Tube Fitting        |
| 3    | CRD Pressure Reducing Control        |
| 4    | X46A Flow Clean Strainer             |



## Typical Application

Underwriters Laboratories requires the installation of pressure gauges upstream and downstream of the Pressure Reducing Valve.

Also, a relief valve of not less than 1/2 inch in size must be installed on the downstream side of the pressure control valve. Adequate drainage for the relief valve discharge must be provided.

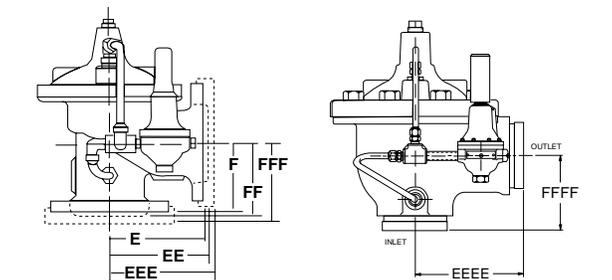
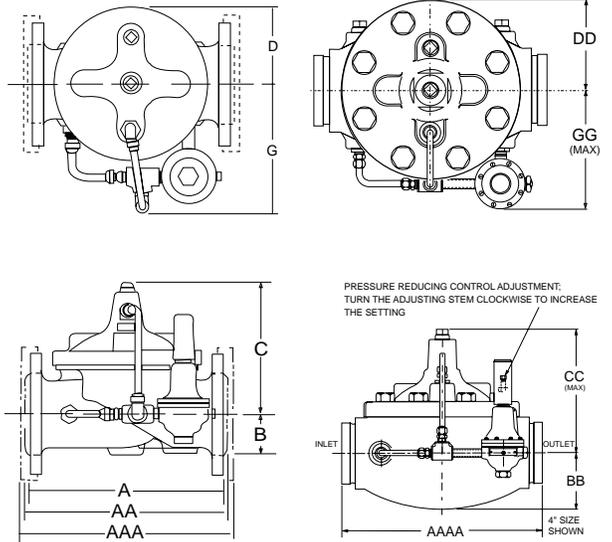
## UL / ULC Listings

Size	Ductile Iron 150# F	Ductile Iron 300# S	Ductile Iron 300 # F	Bronze 300# Threaded	Bronze 150# F	Bronze 250# F	Cast Steel 300# F	Globe Pattern	Angle Pattern
								Ductile Iron Grooved End	Ductile Iron Grooved End
1 1/2"	UL / ULC	UL / ULC	UL	UL / ULC				UL	
2"	UL / ULC	UL / ULC	UL / ULC	UL / ULC	ULC	ULC	UL	UL	UL
2 1/2"	UL / ULC	ULC	UL / ULC	UL / ULC	ULC	ULC	UL	UL	
3"	UL / ULC	UL / ULC	UL / ULC	UL / ULC	ULC	ULC	UL	UL	UL
4"	UL / ULC		UL / ULC		ULC	ULC	UL	UL	UL
6"	UL / ULC		UL / ULC				UL	UL	
8"	UL / ULC		ULC						
10"	ULC		ULC						

## Dimensions

VALVE SIZE (inches)	1½"	2"	2½"	3"	4"	6"	8"	10"
<b>A</b> SCREWED	7.25	9.38	11.00	12.50	—	—	—	—
<b>AA</b> 150 ANSI	8.50	9.38	11.00	12.00	15.00	20.00	25.38	29.75
<b>AAA</b> 300 ANSI	9.00	10.00	11.62	13.25	15.62	21.00	26.38	31.12
<b>AAAA</b> GROOVED	8.50	9.00	—	12.50	15.00	20.00	—	—
<b>B</b>	1.12	1.50	1.69	2.56	3.19	4.31	5.31	9.25
<b>BB</b> GROOVED	1.94	2.13	—	6.00	4.13	6.00	—	—
<b>C (MAX)</b>	5.50	6.50	7.56	8.19	10.62	13.38	16.00	17.12
<b>CC (MAX)</b>	4.10	5.00	—	6.50	8.80	11.10	—	—
<b>D</b>	2.81	3.31	4.00	4.56	5.75	7.88	10.00	11.81
<b>DD</b> GROOVED	2.81	3.31	—	4.56	5.75	7.88	—	—
<b>E</b> SCREWED	3.25	4.75	5.50	6.25	—	—	—	—
<b>EE</b> 150 ANSI	4.00	4.75	5.50	6.00	7.50	10.00	12.75	14.88
<b>EEE</b> 300 ANSI	4.25	5.00	5.88	6.38	7.88	10.50	13.25	15.56
<b>EEEE</b> GROOVED	—	4.75	—	6.00	7.50	—	—	—
<b>F</b> SCREWED	1.88	3.25	4.00	4.50	—	—	—	—
<b>FF</b> 150 ANSI	4.00	3.25	4.00	4.00	5.00	6.00	8.00	8.62
<b>FFF</b> 300 ANSI	4.25	3.50	4.31	4.38	5.31	6.50	8.50	9.31
<b>FFFF</b> GROOVED	—	3.25	—	4.50	5.00	—	—	—
<b>G (MAX)</b>	7.50	7.75	7.75	8.00	9.00	9.50	10.50	11.50
<b>GG (MAX)</b>	8.10	8.00	—	8.13	9.31	10.50	—	—

VALVE SIZE (mm)	40	50	65	80	100	150	200	250
<b>A</b> SCREWED	184	238	279	318	—	—	—	—
<b>AA</b> 150 ANSI	216	238	279	305	381	508	645	756
<b>AAA</b> 300 ANSI	229	254	295	337	397	533	670	790
<b>AAAA</b> GROOVED	216	228	—	318	381	508	—	—
<b>B</b>	28	38	43	65	81	109	135	235
<b>BB</b> GROOVED	52	54	—	6.00	4.13	6.00	—	—
<b>C (MAX)</b>	140	161	192	208	270	340	406	435
<b>CC (MAX)</b>	104	127	—	165	223	281	—	—
<b>D</b>	71	84	102	116	146	200	254	300
<b>DD</b> GROOVED	71	84	—	116	146	200	—	—
<b>E</b> SCREWED	83	121	140	159	—	—	—	—
<b>EE</b> 150 ANSI	102	121	140	152	191	254	324	378
<b>EEE</b> 300 ANSI	108	127	149	162	200	267	349	395
<b>EEEE</b> GROOVED	—	121	—	152	191	—	—	—
<b>F</b> SCREWED	48	83	102	114	—	—	—	—
<b>FF</b> 150 ANSI	102	83	102	102	127	152	203	219
<b>FFF</b> 300 ANSI	108	89	109	111	135	165	216	236
<b>FFFF</b> GROOVED	—	121	—	114	127	—	—	—
<b>G (MAX)</b>	191	197	197	203	228	241	267	292
<b>GG (MAX)</b>	206	203	—	207	236	267	—	—



**Size:** 175 lb. Class 1 1/2" - 8" (Globe)  
2" - 6" (Angle)  
300 lb. Class 1 1/2" - 6" (Globe)  
2" - 6" (Angle)

### End Details:

150 ANSI B16.42 (Ductile Iron)  
(Bronze)  
300# (Ductile Iron)  
300# (Cast Steel).  
300# (Ductile Grooved End).

**Pressure Differential** 10 PSI Min.

**Pressure Adjustment Range:** 30 - 165 psi

**Temperature Range:** Water to 180°F Max.

### Materials

**Main valve body & cover:**  
Ductile Iron - ASTM A536

**Main valve internal trim:**  
Bronze ASTM B61

**Pilot control system—**  
**Pilot control valve:**  
Bronze ASTM B62 with  
Stainless Steel 303 internal trim

Copper tubing with brass fittings

**Main valve and pilot valve**  
**diaphragm and disc:**  
Buna-N® synthetic rubber

SPECIAL NOTE: THE MODEL 90-21 CAN BE SUPPLIED WITH INTERNAL EPOXY COATING OF THE MAIN VALVE. THIS OPTION IS U.L. FILE NO. EX2855, C.C. NO. HNFV EPOXY COATING IS STRONGLY RECOMMENDED FOR ALL CAST VALVES.

## Selection Guidelines

### Flow Capacity Table

Valve Size	Maximum Flow Rate (GPM of Water)
1½"	160
2"	262
2½"	373
3"	576
4"	992
6"	2251
8"	3900
10"	6150

### When Ordering Please Specify

1. Model Number 90-21
2. Size
3. Globe or Angle Pattern
4. Main Valve Body and Cover Material
5. Screwed, Flanged or Grooved
6. Pressure Class
7. Optional Epoxy Coating (specify with suffix "KC")



E-90G-21 (R-9/03)

## CLA-VAL

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Fax: 949-548-5441 • Web Site: cla-val.com • E-mail: claval@cla-val.com

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Fax: 44-1892-543-423  
E-Mail: info@cla-val.co.uk

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Represented By:



— MODEL — **100-01**  
**Hytrol Valve**

**Description**

The Cla-Val Model 100-01 Hytrol Valve is a main valve for Cla-Val Automatic Control Valves. It is a hydraulically operated, diaphragm-actuated, globe or angle pattern valve.

This valve consists of three major components; body, diaphragm assembly, and cover. The diaphragm assembly is the only moving part. The diaphragm assembly uses a diaphragm of nylon fabric bonded with synthetic rubber. A synthetic rubber disc, contained on three and one half sides by a disc retainer and disc guide, forms a seal with the valve seat when pressure is applied above the diaphragm. The diaphragm assembly forms a sealed chamber in the upper portion of the valve, separating operating pressure from line pressure.

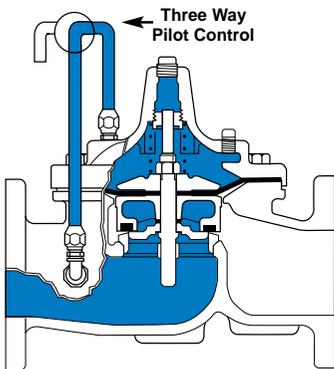


**Installation**

1. Before valve is installed, pipe lines should be flushed of all chips, scale and foreign matter.
2. It is recommended that either gate or block valves be installed on both ends of the 100-01 Hytrol Valve to facilitate isolating the valve for preventive maintenance and repairs.
3. Place the valve in the line with flow through the valve in the direction indicated on the inlet nameplate. (See "Flow Direction" Section)
4. Allow sufficient room around valve to make adjustments and for disassembly.
5. Cla-Val 100-01 Hytrol Valves operate with maximum efficiency when mounted in horizontal piping with the cover UP, however,

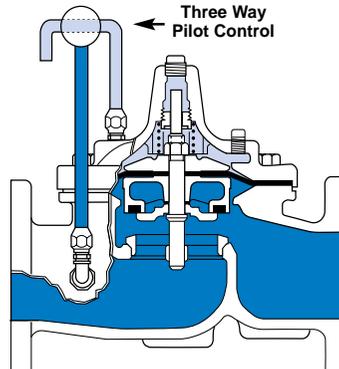
- other positions are acceptable. Due to size and weight of the cover and internal components of 8 inch and larger valves, installation with the cover UP is advisable. This makes internal parts readily accessible for periodic inspection.
6. If a pilot control system is installed on the 100-01 Hytrol Valve, use care to prevent damage. If it is necessary to remove fittings or components, be sure they are kept clean and replaced exactly as they were.
7. After the valve is installed and the system is first pressurized, vent air from the cover chamber and pilot system tubing by loosening fittings at all high points.

**Principles of Operation**



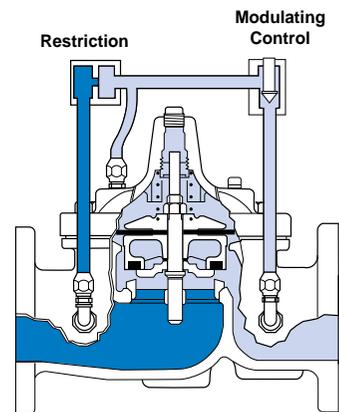
**Tight Closing Operation**

When pressure from the valve inlet (or an equivalent independent operating pressure) is applied to the diaphragm chamber the valve closes drip-tight.



**Full Open Operation**

When pressure in diaphragm chamber is relieved to a zone of lower pressure (usually atmosphere) the line pressure (5 psi Min.) at the valve inlet opens the valve.



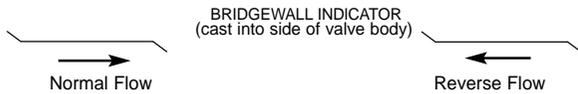
**Modulating Action**

Valve modulates when diaphragm pressure is held at an intermediate point between inlet and discharge pressure. With the use of a Cla-Val. "modulating control," which reacts to line pressure changes, the pressure above the diaphragm is varied, allowing the valve to throttle and compensate for the change.

## Flow Direction

The flow through the 100-01 Hytrol Valve can be in one of two directions. When flow is “up-and-over the seat,” it is in “normal” flow and the valve will fail in the open position. When flow is “over-the seat-and down,” it is in “reverse” flow and the valve will fail in the closed position. There are no permanent flow arrow markings.

**The valve must be installed according to nameplate data.**



## Recommended Tools

1. Three pressure gauges with ranges suitable to the installation to be put at Hytrol inlet, outlet and cover connections.
2. Cla-Val Model X101 Valve Position Indicator. This provides visual indication of valve position without disassembly of valve.
3. Other items are: suitable hand tools such as screwdrivers, wrenches, etc. soft jawed (brass or aluminum) vise, 400 grit wet or dry sandpaper and water for cleaning.

## Troubleshooting

The following troubleshooting information deals strictly with the Model 100-01 Hytrol Valve. This assumes that all other components of the pilot control system have been checked out and are in proper working condition. (See appropriate sections in Technical Manual for complete valve).

All trouble shooting is possible without removing the valve from the line or removing the cover. It is highly recommended to permanently install a Model X101 Valve Position Indicator and three gauges in unused Hytrol inlet, outlet and cover connections.

SYMPTOM	PROBABLE CAUSE	REMEDY
<b>Fails to Close</b>	Closed cocks in control system, or in main line.	Open Cocks.
	Lack of cover chamber pressure.	Check upstream pressure, pilot system, strainer, tubing, cocks, or needle valves for obstruction.
	Diaphragm damaged. (See Diaphragm Check.)	Replace diaphragm.
	Diaphragm assembly inoperative. Corrosion or excessive scale build up on valve stem. (See Freedom of Movement Check)	Clean and polish stem. Inspect and replace any damaged or badly eroded part.
	Mechanical obstruction. Object lodged in valve. (See Freedom of Movement Check)	Remove obstruction.
	Worn disc. (See Tight Sealing Check)	Replace disc.
	Badly scored seat. (See Tight Sealing Check)	Replace seat.
<b>Fails to Open</b>	Closed upstream and/or downstream isolation valves in main line.	Open valves.
	Insufficient line pressure.	Check upstream pressure. (Minimum 5 psi flowing line pressure differential.)
	Diaphragm assembly inoperative. Corrosion or excessive buildup on valve stem. (See Freedom of Movement Check)	Clean and polish stem. Inspect and replace any damaged or badly eroded part.
	Diaphragm damaged. (For valves in "reverse flow" only)	Replace diaphragm.

**After checking out probable causes and remedies, the following three checks can be used to diagnose the nature of the problem before maintenance is started. They must be done in the order shown.**

### Three Checks

The 100-01 Hytrol Valve has only one moving part (the diaphragm and disc assembly). So, there are only three major types of problems to be considered.

**First:** Valve is stuck - that is, the diaphragm assembly is not free to move through a full stroke either from open to close or vice versa.

**Second:** Valve is free to move and can't close because of a worn out diaphragm.

**Third:** Valve leaks even though it is free to move and the diaphragm isn't leaking.

#### **CAUTION:**

*Care should be taken when doing the troubleshooting checks on the 100-01 Hytrol Valve. These checks do require the valve to open fully. This will either allow a high flow rate through the valve, or the downstream pressure will quickly increase to the inlet pressure. In some cases, this can be very harmful. Where this is the case, and there are no block valves in the system to protect the downstream piping, it should be realized that **the valve cannot be serviced under pressure.** Steps should be taken to remedy this situation before proceeding any further.*

## Diaphragm Check (#1 )

1. Shut off pressure to the Hytrol Valve by slowly closing upstream and downstream isolation valves. **SEE CAUTION.**
2. Disconnect or close all pilot control lines to the valve cover and leave only one fitting in highest point of cover open to atmosphere.
3. With the cover vented to atmosphere, slowly open upstream isolation valve to allow some pressure into the Hytrol Valve body. Observe the open cover tapping for signs of continuous flow. It is not necessary to fully open isolating valve. Volume in cover chamber capacity chart will be displaced as valve moves to open position. Allow sufficient time for diaphragm assembly to shift positions. If there is no continuous flow, you can be quite certain the diaphragm is sound and the diaphragm assembly is tight. If the fluid appears to flow continuously this is a good reason to believe the diaphragm is either damaged or it is loose on the stem. In either case, this is sufficient cause to remove the valve cover and investigate the leakage. (See "Maintenance" Section for procedure.)

### COVER CHAMBER CAPACITY

(Liquid Volume displaced when valve opens)

Valve size (inches)	Displacement	
	Gallons	Liters
1 1/4	.020	.07
1 1/2	.020	.07
2	.032	.12
2 1/2	.043	.16
3	.080	.30
4	.169	.64
6	.531	2.0
8	1.26	4.8
10	2.51	9.5
12	4.00	15.1
14	6.50	24.6
16	9.57	36.2
24	29.00	109.8

## Freedom of Movement Check (#2)

4. Determining the Hytrol Valve's freedom of movement can be done by one of two methods.
5. For most valves it can be done after completing Diaphragm Check (Steps 1, 2, and 3). **SEE CAUTION.** At the end of step 3 the valve should be fully open.
6. If the valve has a Cla-Val X101 Position Indicator, observe the indicator to see that the valve opens wide. Mark the point of maximum opening.
7. Re-connect enough of the control system to permit the application of inlet pressure to the cover. Open pilot system cock so pressure flows from the inlet into the cover.
8. While pressure is building up in the cover, the valve should close smoothly. There is a hesitation in every Hytrol Valve closure, which can be mistaken for a mechanical bind. The stem will appear to stop moving very briefly before going to the closed position. This slight pause is caused by the diaphragm flexing at a particular point in the valve's travel and is not caused by a mechanical bind.
9. When closed, a mark should be made on the X101 Valve position indicator corresponding to the "closed" position. The distance between the two marks should be approximately the stem travel shown in chart.

## STEM TRAVEL

(Fully Open to Fully Closed)

Valve Size (inches)		Travel (inches)	
Inches	MM	Inches	MM
1 1/4	32	0.4	10
1 1/2	40	0.4	10
2	50	0.6	15
2 1/2	65	0.7	18
3	80	0.8	20
4	100	1.1	28
6	150	1.7	43
8	200	2.3	58
10	250	2.8	71
12	300	3.4	86
14	350	4.0	100
16	400	4.5	114
24	610	6.5	165

10. If the stroke is different than that shown in stem travel chart this is a good reason to believe something is mechanically restricting the stroke of the valve at one end of its travel. If the flow does not stop through the valve when in the indicated "closed" position, the obstruction probably is between the disc and the seat. If the flow does stop, then the obstruction is more likely in the cover. In either case, the cover must be removed, and the obstruction located and removed. The stem should also be checked for scale build-up. (See "Maintenance, section for procedure.)

11. For valves 6" and smaller, the Hytrol Valve's freedom of movement check can also be done after all pressure is removed from the valve. **SEE CAUTION.** After closing inlet and outlet isolation valves and bleeding pressure from the valve, check that the cover chamber and the body are temporarily vented to atmosphere. Insert fabricated tool into threaded hole in top of valve stem, and lift the diaphragm assembly manually. Note any roughness. The diaphragm assembly should move smoothly throughout entire valve stroke. The tool is fabricated from rod that is threaded on one end to fit valve stem and has a "T" bar handle of some kind on the other end for easy gripping. (See chart in Step 4 of "Disassembly" Section.)

12. Place marks on this diaphragm assembly lifting tool when the valve is closed and when manually positioned open. The distance between the two marks should be approximately the stem travel shown in stem travel chart. If the stroke is different than that shown, there is a good reason to believe something is mechanically restricting the stroke of the valve. The cover must be removed, and the obstruction located and removed. The stem should also be checked for scale build-up. (See "Maintenance" Section for procedure.)

## Tight Sealing Check (#3)

13. Test for seat leakage after completing checks #1 & #2 (Steps 1 to 12). **SEE CAUTION.** Close the isolation valve downstream of the Hytrol Valve. Apply inlet pressure to the cover of the valve, wait until it closes. Install a pressure gauge between the two closed valves using one of the two ports in the outlet side of the Hytrol. Watch the pressure gauge. If the pressure begins to climb, then either the downstream isolation valve is permitting pressure to creep back, or the Hytrol is allowing pressure to go through it. Usually the pressure at the Hytrol inlet will be higher than on the isolation valve discharge, so if the pressure goes up to the inlet pressure, you can be sure the Hytrol is leaking. Install another gauge downstream of isolating valve. If the pressure between the valves only goes up to the pressure on the isolation valve discharge, the Hytrol Valve is holding tight, and it was just the isolation valve leaking.

## Maintenance

### Preventative Maintenance

The Cla-Val Co. Model 100-01 Hytrol Valve requires no lubrication or packing and a minimum of maintenance. However, a periodic inspection schedule should be established to determine how the operating conditions of the system are affecting the valve. The effect of these actions must be determined by inspection.

### Disassembly

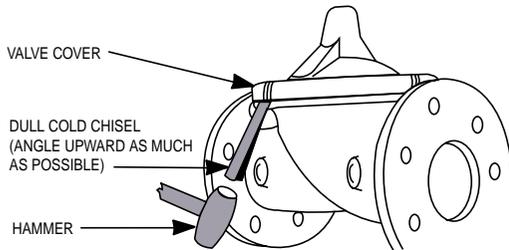
Inspection or maintenance can be accomplished without removing the valve from the line. Repair kits with new diaphragm and disc are recommended to be on hand before work begins.

**WARNING:** Maintenance personnel can be injured and equipment damaged if disassembly is attempted with pressure in the valve. **SEE CAUTION.**

1. Close upstream and downstream isolation valves **and independent operating pressure when used** to shut off all pressure to the valve.

2. Loosen tube fittings in the pilot system to remove pressure from valve body and cover chamber. After pressure has been released from the valve, use care to remove the controls and tubing. Note and sketch position of tubing and controls for re-assembly. The schematic in front of the Technical Manual can be used as a guide when reassembling pilot system.

3. Remove cover nuts and remove cover. If the valve has been in service for any length of time, chances are the cover will have to be loosened by driving upward along the edge of the cover with a **dull cold chisel**.



On 6" and smaller valves block and tackle or a power hoist can be used to lift valve cover by inserting proper size eye bolt in place of the center cover plug. On 8" and larger valves there are 4 holes (5/8" — 11 size) where jacking screws and/or eye bolts may be inserted for lifting purposes. **Pull cover straight up** to keep from damaging the integral seat bearing and stem.

#### COVER CENTER PLUG SIZE

Valve Size	Thread Size (NPT)
1 1/4"—1 1/2"	1/4"
2"—3"	1/2"
4"—6"	3/4"
8"—10"	1"
12"	1 1/4"
14"	1 1/2"
16"	2"
24"	4 1/4"

4. Remove the diaphragm and disc assembly from the valve body. With smaller valves this can be accomplished by hand by **pulling straight up on the stem so as not to damage the seat bearing**. On large valves, an eye bolt of proper size can be installed in the stem and the diaphragm assembly can be then lifted with a block and tackle or power hoist. Take care not to damage the stem or bearings. The valve won't work if these are damaged.

#### VALVE STEM THREAD SIZE

Valve Size	Thread Size (UNF Internal)
1 1/4"—2 1/2"	10—32
3"—4"	1/4—28
6"—14"	3/8—24
16"	1/2—20
24"	3-12

5. The next item to remove is the stem nut. Examine the stem threads above the nut for signs of mineral deposits or corrosion. If the threads are not clean, use a wire brush to remove as much of the residue as possible. Attach a good fitting wrench to the nut and give it a sharp "rap" rather than a steady pull. Usually several blows are sufficient to loosen the nut for further removal. On the smaller valves, the entire diaphragm assembly can be held by the stem in a vise **equipped with soft brass jaws** before removing the stem nut.

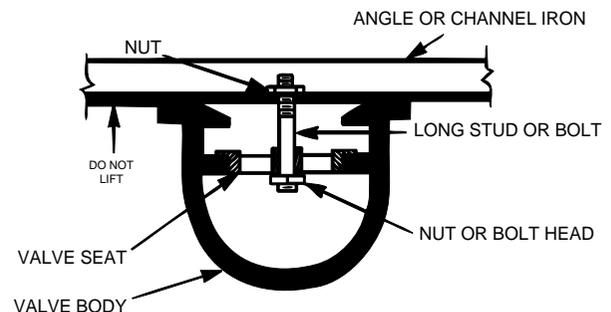
The use of a pipe wrench or a vise without soft brass jaws scars the fine finish on the stem. No amount of careful dressing can restore the stem to its original condition. Damage to the finish of the stem can cause the stem to bind in the bearings and the valve will not open or close.

6. After the stem nut has been removed, the diaphragm assembly breaks down into its component parts. Removal of the disc from the disc retainer can be a problem if the valve has been in service for a long time. Using two screwdrivers inserted along the outside edge of the disc usually will accomplish its removal. Care should be taken to preserve the spacer washers in water, particularly if no new ones are available for re-assembly.

7. The only part left in the valve body is the seat which ordinarily does not require removal. Careful cleaning and polishing of inside and outside surfaces with 400 wet/dry sandpaper will usually restore the seat's sharp edge. If, however, it is badly worn and replacement is necessary, it can be easily removed.

Seats in valve sizes 1 1/4" through 6" are threaded into the valve body. They can be removed with accessory X109 Seat Removing Tool available from the factory. On 8" and larger valves, the seat is held in place by flat head machine screws. Use a tight-fitting, long shank screwdriver to prevent damage to seat screws. If upon removal of the screws the seat cannot be lifted out, it will be necessary to use a piece of angle or channel iron with a hole drilled in the center. Place it across the body so a long stud can be inserted through the center hole in the seat and the hole in the angle iron. By tightening the nut a uniform upward force is exerted on the seat for removal.

**NOTE:** Do not lift up on the end of the angle iron as this may force the integral bearing out of alignment, causing the stem to bind.



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## Lime Deposits

One of the easiest ways to remove lime deposits from the valve stem or other metal parts is to dip them in a 5-percent muriatic acid solution just long enough for the deposit to dissolve. This will remove most of the common types of deposits. **CAUTION: USE EXTREME CARE WHEN HANDLING ACID.** Rinse parts in water before handling. If the deposit is not removed by acid, then a fine grit (400) wet or dry sandpaper can be used with water.

## Inspection of Parts

After the valve has been disassembled, each part should be examined carefully for signs of wear, corrosion, or any other abnormal condition. Usually, it is a good idea to replace the rubber parts (diaphragm and disc) unless they are free of signs of wear. These are available in a repair kit. Any other parts which appear doubtful should be replaced. **WHEN ORDERING PARTS, BE SURE TO GIVE COMPLETE NAMEPLATE DATA, ITEM NUMBER AND DESCRIPTION.**

**NOTE:** If a new disc isn't available, the existing disc can be turned over, exposing the unused surface for contact with the seat. The disc should be replaced as soon as practical.

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## Reassembly

1. Reassembly is the reverse of the disassembly procedure. If a new disc has been installed, it may require a different number of spacer washers to obtain the right amount of "grip" on the disc. When the diaphragm assembly has been tightened to a point where the diaphragm cannot be twisted, the disc should be compressed very slightly by the disc guide. Excessive compression should be avoided. Use just enough spacer washers to hold the disc firmly without noticeable compression.

2. **MAKE SURE THE STEM NUT IS VERY TIGHT.** Attach a good fitting wrench to the nut and give it a sharp "rap" rather than a steady pull. Usually several blows are sufficient to tighten the stem nut for final tightening. Failure to do so could allow the diaphragm to pull loose and tear when subjected to pressure.

3. Carefully install the diaphragm assembly by lowering the stem through the seat bearing. Take care not to damage the stem or bearing. Line up the diaphragm holes with the stud or bolt holes on the body. On larger valves with studs, it may be necessary to hold the diaphragm assembly up part way while putting the diaphragm over the studs.

4. Put spring in place and replace cover. Make sure diaphragm is lying smooth under the cover.

5. Tighten cover nuts firmly using a cross-over pattern until all nuts are tight.

6. Test Hytrol Valve before re-installing pilot valve system.

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## Test Procedure After Valve Assembly

There are a few simple tests which can be made in the field to make sure the Hytrol Valve has been assembled properly. Do these before installing pilot system and returning valve to service. These are similar to the three troubleshooting tests.

1. Check the diaphragm assembly for freedom of movement after all pressure is removed from the valve. **SEE CAUTION.** Insert fabricated tool into threaded hole in top of valve stem, and lift the diaphragm assembly manually. Note any roughness, sticking or grabbing. The diaphragm assembly should move smoothly throughout entire valve stroke. The tool is fabricated from rod that is threaded on one end to fit valve stem (See chart in Step 4 of "Disassembly" section.) and has a "T" Bar handle of some kind on the other end for easy gripping.

Place marks on this diaphragm assembly lifting tool when the valve is closed and when manually positioned open. The distance between the two marks should be approximately the stem travel shown in stem travel chart. (See "Freedom of Movement Check" section.) If the stroke is different than that shown, there is a good reason to believe something is mechanically restricting the stroke of the valve. The cover must be removed, the obstruction located and removed. (See "Maintenance" Section for procedure.)

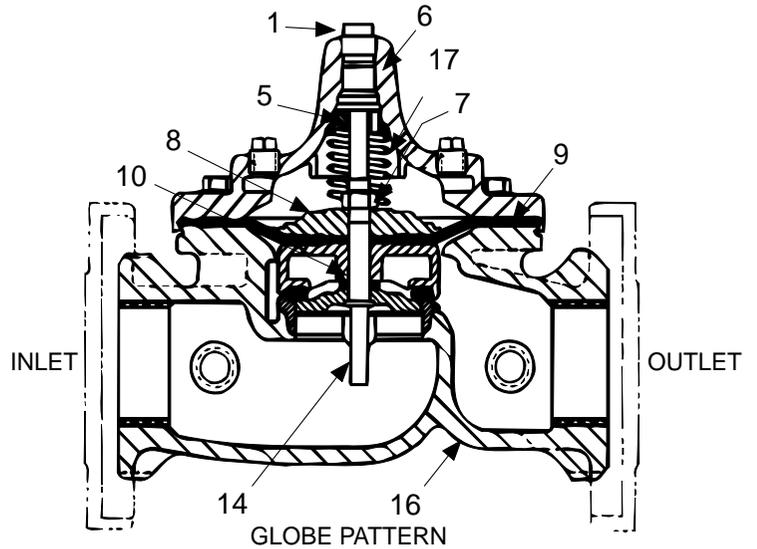
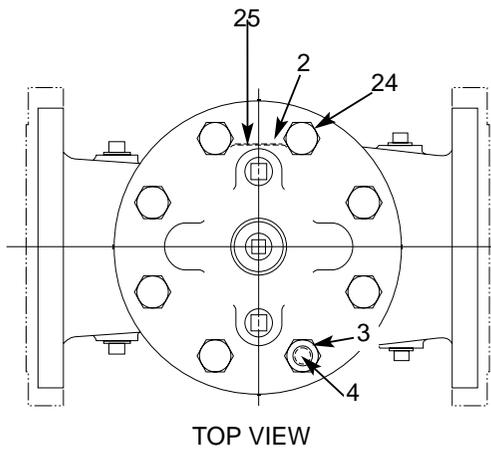
Due to the weight of the diaphragm assembly this procedure is not possible on valves 8" and larger. On these valves, the same determination can be made by carefully introducing a low pressure-less than five psi) into the valve body with the cover vented. **SEE CAUTION.** Looking in cover center hole see the diaphragm assembly lift easily without hesitation, and then settle back easily when the pressure is removed.

2. To check the valve for drip-tight closure, a line should be connected from the inlet to the cover, and pressure applied at the inlet of the valve. If properly assembled, the valve should hold tight with as low as ten PSI at the inlet. See "Tight Sealing Check" section.)

3. With the line connected from the inlet to the cover, apply full working pressure to the inlet. Check all around the cover for any leaks. Re-tighten cover nuts if necessary to stop leaks past the diaphragm.

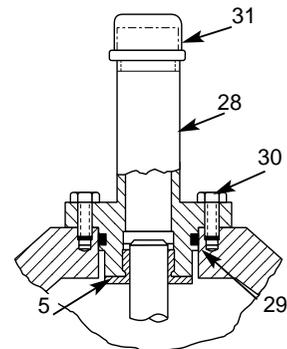
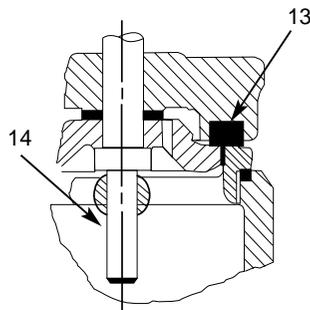
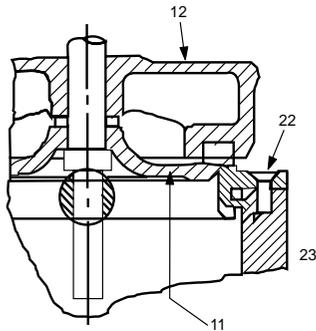
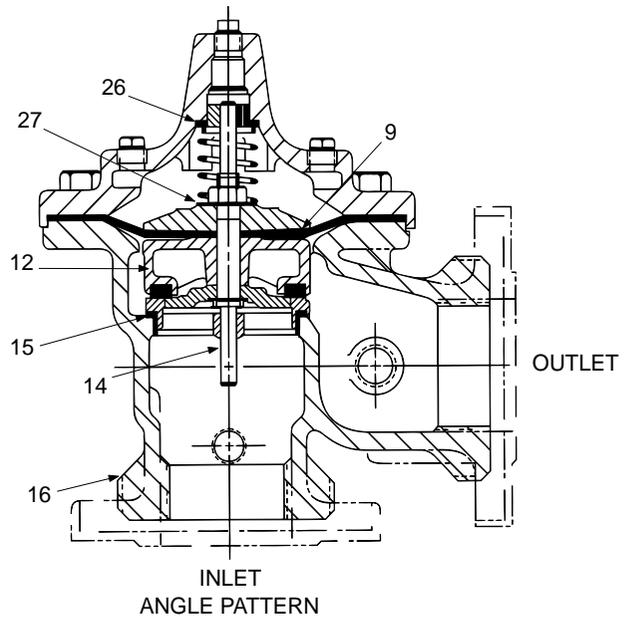
4. Remove pressure, then re-install the pilot system and tubing exactly as it was prior to removal. **Bleed air from all high points.**

5. Follow steps under "Start-Up and Adjustment" Section in Technical Manual for returning complete valve back to service.



### PARTS LIST

Item	Description
1.	Pipe Plug
2.	Drive Screws (for nameplate)
3.	Hex Nut (8" and larger)
4.	Stud (8" and larger)
5.	Cover Bearing
6.	Cover
7.	Stem Nut
8.	Diaphragm Washer
9.	Diaphragm
10.	Spacer Washers
11.	Disc Guide
12.	Disc Retainer
13.	Disc
14.	Stem
15.	Seat
16.	Body
17.	Spring
22.	Flat Head Screws (8" and larger)
23.	Seat O-Ring
24.	Hex head Bolt (1 1/4" thru 4")
25.	Nameplate
26.	Upper Spring Washer (Epoxy coated valves only)
27.	Lower Spring Washer (Epoxy coated valves only)
28.	Cover Bearing Housing (16" only)
29.	Cover O-Ring (16" only)
30.	Hex Bolt (16" only)
31.	Pipe Cap (16" only)



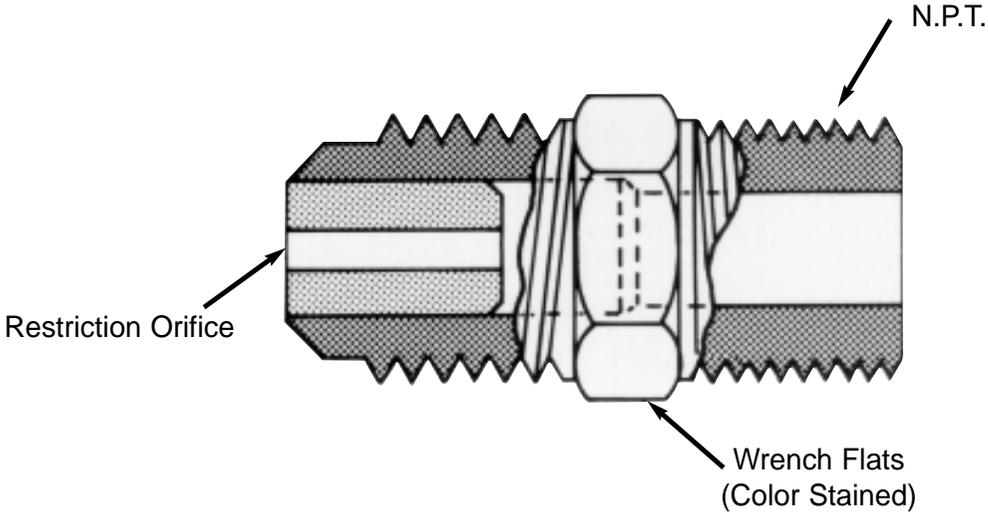


# X58C

## Restriction Assembly

**DESCRIPTION**

The Cla-Val Model X58C Restriction Assembly is composed of a modified standard (45 degree flare) tube connector with a precision delrin orifice fitting installed. Flow direction is from tube to pipe connections. Orifice size color code is stained onto brass tube connector wrench flats. The X58C is installed as a part of pilot control systems on Cla-Val Valves.



Valve Sizes	Stock No.	Orifice	Color	Tube X NPT
3" and Smaller	68565 B	.94 (3/32)	Blue	3/8" X 3/8"
4" and Larger	4673 H	.125 (1/8)	Red	3/8" X 3/8"

Note: No replacement parts available - to be sold as complete assembly only.

When ordering please specify: Valve size, Stock Number



— MODEL — **CRD**

# Pressure Reducing Control



## DESCRIPTION

The Cla-Val Model CRD Pressure Reducing Control automatically reduces a higher inlet pressure to a lower outlet pressure. It is a direct acting, spring loaded, diaphragm type control that operates hydraulically or pneumatically. It may be used as a self-contained valve or as a pilot control for a Cla-Val main valve. It will hold a constant downstream pressure within very close pressure limits.

## OPERATION

The CRD Pressure Reducing Control is normally held open by the force of the compression spring above the diaphragm; and delivery pressure acts on the underside of the diaphragm. Flow through the valve responds to changes in downstream demand to maintain a pressure.

## INSTALLATION

The CRD Pressure Reducing Control may be installed in any position. There is one inlet port and two outlets, for either straight or angle installation. The second outlet port can be used for a gage connection. A flow arrow is marked on the body casting.

## ADJUSTMENT PROCEDURE

The CRD Pressure Reducing Control can be adjusted to provide a delivery pressure range as specified on the nameplate.

Pressure adjustment is made by turning the adjustment screw to vary the spring pressure on the diaphragm. The greater the compression on the spring the higher the pressure setting.

1. Turn the adjustment screw in (clockwise) to increase delivery pressure.
2. Turn the adjustment screw out (counter-clockwise) to decrease the delivery pressure.
3. When pressure adjustment is completed tighten jam nut on adjusting screw and replace protective cap.
4. When this control is used, as a pilot control on a Cla-Val main valve, the adjustment should be made under flowing conditions. The flow rate is not critical, but generally should be somewhat lower than normal in order to provide an inlet pressure several psi higher than the desired setting

*The approximate minimum flow rates given in the table are for the main valve on which the CRD is installed.*

Valve Size	1 1/4" -3"	4"-8"	10"-16"
Minimum Flow GPM	15-30	50-200	300-650

SYMPTOM	PROBABLE CAUSE	REMEDY
Fails to open when deliver pressure lowers	No spring compression	Tighten adjusting screw
	Damaged spring	Disassemble and replace
	Spring guide (8) is not in place	Assemble properly
Fails to close when delivery pressure rises	Yoke dragging on inlet nozzle	Disassemble and reassemble properly (refer to Reassembly)
	Spring compressed solid	Back off adjusting screw
	Mechanical obstruction	Disassemble and reassemble properly (refer to Reassembly)
	Worn disc	Disassemble remove and replace disc retainer assembly
Leakage from cover vent hole	Yoke dragging on inlet nozzle	Disassemble and reassemble properly (refer to Reassembly)
	Damaged diaphragm	Disassemble and replace
	Loose diaphragm nut	Remove cover and tighten nut

## MAINTENANCE

### Disassembly

To disassemble follow the sequence of the item numbers assigned to parts in the sectional illustration.

### Reassembly

Reassembly is the reverse of disassembly. Caution must be taken to avoid having the yoke (17) drag on the inlet nozzle of the body (18). Follow this procedure:

1. Place yoke (17) in body and screw the disc retainer assembly (16) until it bottoms.
2. Install gasket (14) and spring (19) for 2-30 and 2-6.5 psi range onto plug (13) and fasten into body. Disc retainer must enter guide hole in plug as it is assembled. Screw the plug in by hand. Use wrench to tighten only.
3. Place diaphragm (12) diaphragm washer (11) and Belleville washer (20) on yoke. Screw on hex nut (10).
4. Hold the diaphragm so that the screw holes in the diaphragm and body align. Tighten diaphragm nut with a wrench. At the final tightening release the diaphragm and permit it to rotate 5° to 10°. The diaphragm holes should now be properly aligned with the body holes.

### To check for proper alignment proceed as follows:

Rotate diaphragm clockwise and counterclockwise as far as possible. Diaphragm screw holes should rotate equal distance on either side of body screw holes ±1/8".

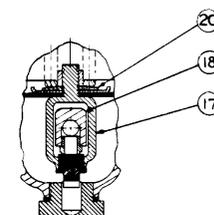
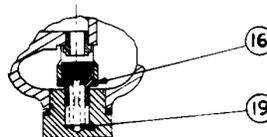
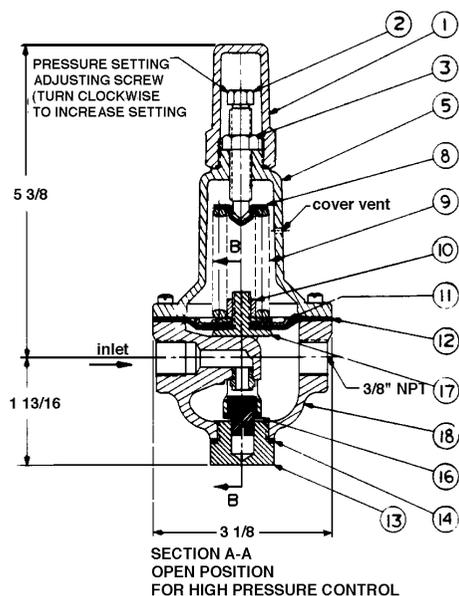
Repeat assembly procedure until diaphragm and yoke are properly aligned. There must be no contact between yoke and body nozzle during its normal movement. To simulate this movement hold body and diaphragm holes aligned. Move yoke to open and closed positions. There must be no evidence of contact or dragging.

5. Install spring (9) with spring guide (8).
6. Install cover (5), adjusting screw (2) and nut (3), then cap (1).



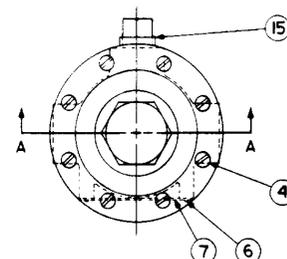
CRD

## Pressure Reducing Control



Size (Inch)	Stock Number	Adjustment Range	
		psi	Ft. of Water
3/8	71943-03K	15 - 75	35 - 173
3/8	71943-04H	30 - 300	69 - 692
3/8	71943-07A	2 - 6.5	4.5 - 15
3/8	71943-08J	2 - 30	4.5 - 69
Factory set pressure		PSI * PER TURN	
15 - 75 set @ 20 psi		9.0	
30-300 set @ 60 psi		27.0	
2 - 6.5 set @ 3.5 psi		.61	
2 - 30 set @ 10 psi		3.0	

\*APPROXIMATE- FINAL ADJUSTMENT SHOULD BE WITH A PRESSURE GAUGE AND WITH FLOW



When ordering parts specify: • All nameplate data • Item Description • Item number

ITEM	DESCRIPTION	MATERIAL	PART NUMBER	LIST PRICE
1	Cap	PL	67628J	
2	Adjusting Screw	BRS	7188201D	
3	Jam Nut (3/8 - 16)	SS	6780106J	
4*	Machine Screw (Fil.Hd.) 8 Req'd	303	6757821B	
5	Cover	BRS	C2544K	
6	Nameplate Screw	SS	67999D	
7	Nameplate (15-75 psi)	BRS	C002201G	
8	Spring Guide	302	71881H	
9	Spring (15-75 psi)	CHR/VAN	71884B	
	Spring (30-300 psi)	CHR/VAN	71885J	
	Spring (2-6.5 psi)	SS	82575C	
	Spring (2-30 psi)	SS	81594E	
10	Hex Nut	303	71883D	
11	Diaphragm Washer	302	71891G	
12*	Diaphragm	NBR	C6936D	
13	Plug, Body	BRS	V5653A	
14*	Gasket	Fiber	40174F	
15	Plug	BRS	6766003F	
16*	Disc Retainer Assy. (15-75 psi)	BZ/Rub	C5256H	
	Disc Retainer Assy (30-300 psi)	BZ/Rub	C5256H	
	Disc Retainer Assy (2-6.5 psi)	BZ/Rub	C5255K	
	Disc Retainer Assy (2-30 psi)	BZ/Rub	C5255K	
17	Yoke	VBZ	V6951H	
18	Body & 1/4" Seat Assy	BR/SS	8339702G	
19*	Bucking Spring (2-30 psi) ( 2-6.5 psi)	302	V0558G	
20	Belleville Washer	STL	7055007E	
	Repair Kit (No Bucking Spring)		9170003K	
	Repair Kit (W/Bucking Spring)		9170001D	

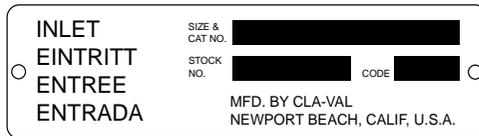
\*SUGGESTED REPAIR PARTS

### Proper Identification

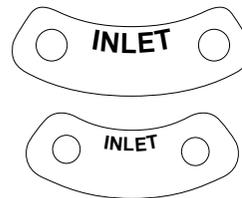
For ordering repair kits, replacement parts, or for inquiries concerning valve operation it is important to properly identify Cla-Val products already in service. Include all nameplate data with your inquiry. Pertinent product data includes valve function, size, material, pressure rating, end details, 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.**



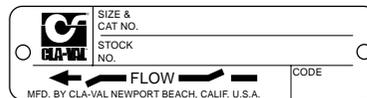
This brass plate appears on valves sized 2 1/2" and larger and is located on the top of the inlet flange.



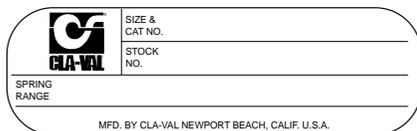
These two brass plates appear on 3/8", 1/2", and 3/4" size valves and are located on the valve cover.



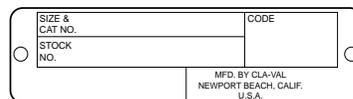
This brass plate appears on altitude valves only and is found on top of the outlet flange.



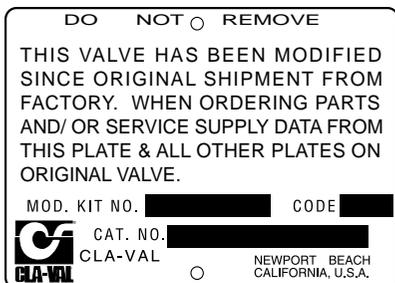
These two brass plates appear on 1" through 3" size screwed valves or 1" through 2" flanged valves. It is located on only one side of the valve body.



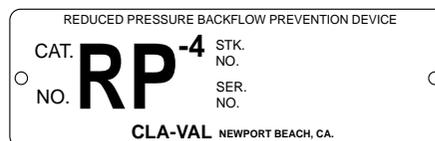
This tag is affixed to the cover of the pilot control valve. The adjustment range appears in the spring range section.



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 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

There are many valves and controls manufactured by Cla-Val that are not listed due to the sheer volume. For information 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
- Screwed 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 which 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, which is returned to our factory, transportation charges prepaid, provided that, after inspection, the material is found to have been defective at time of shipment. This warranty is expressly conditioned on the purchaser's giving Cla-Val immediate written notice 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, and 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.



## CLA-VAL

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[www.cla-val.com](http://www.cla-val.com)

Represented By: