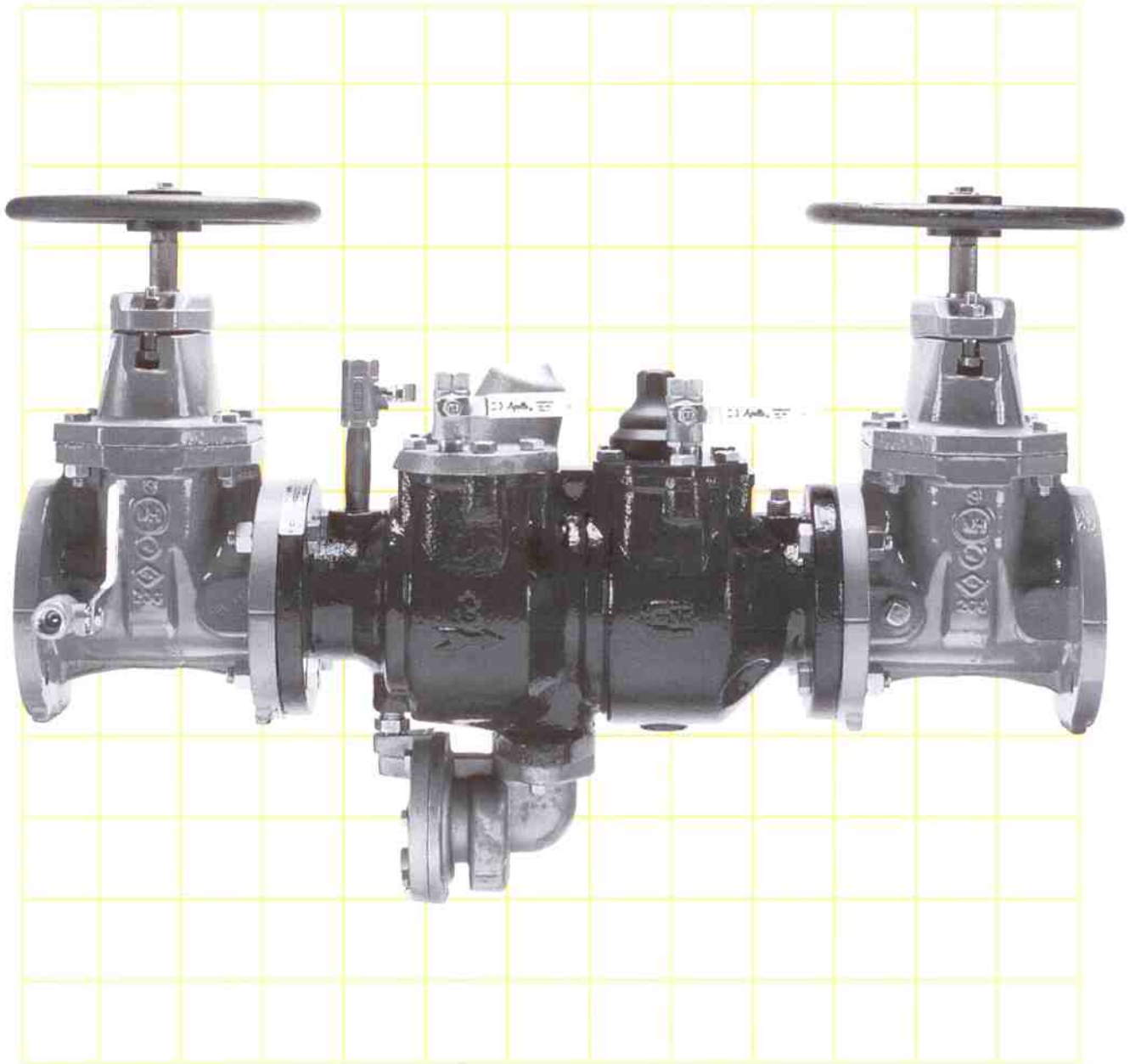


"Apollo" Valves

MAINTENANCE MANUAL



**MODEL RP (4S-200 SERIES)
REDUCED PRESSURE PRINCIPLE (RP)
BACKFLOW PREVENTERS
2-1/2" - 10"**

TABLE OF CONTENTS

REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER 2-1/2" - 10"

Section	Page
I. Description and Operation	2
II. Installation	3
III. Trouble Shooting Guide	4
IV. Check Valve Maintenance Instructions 2-1/2" – 6" RP	5
Check Valve Maintenance Instructions 8" & 10" RP	5
V. Relief Valve Maintenance Instructions 2-1/2" – 10" RP	8
VI. Testing Procedure RP	10

Part Lists

2-1/2" – 6" RP (Check Valves)	6, 7
8" & 10" RP (Check Valves)	6, 7
2-1/2" – 6" RP (Relief Valves)	9
8" & 10" RP (Relief Valves)	9
Backflow Preventer Test Kits	14

REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER

I. DESCRIPTION AND OPERATION

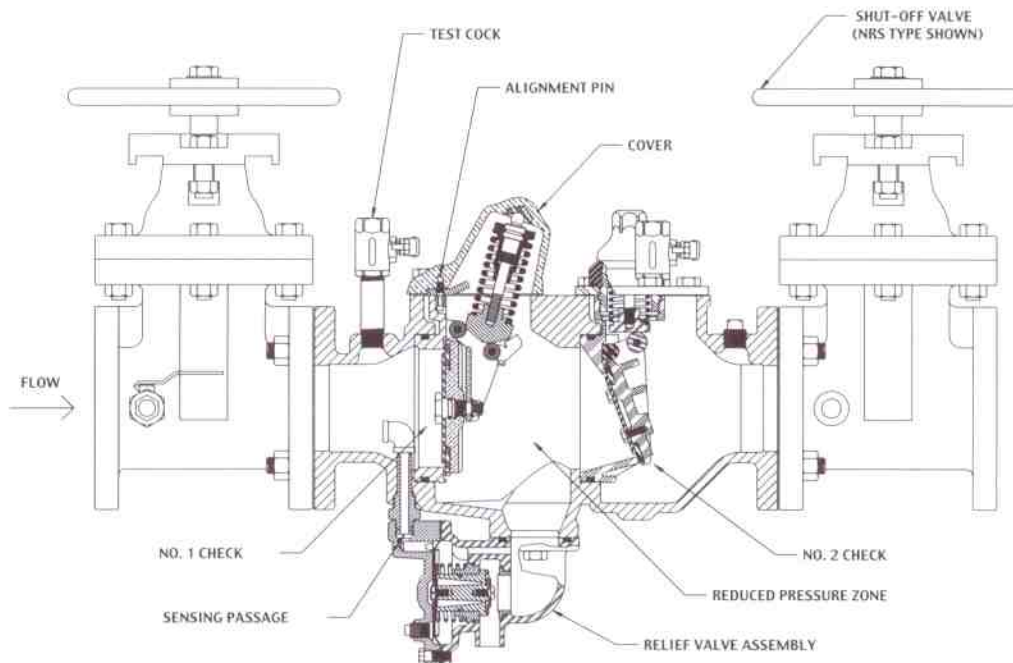
The RP assembly consists of two independently acting, spring loaded, swing-type check valves, together with a hydraulically dependent, mechanically independent pressure differential relief valve, located in the zone between the check valves. Two resilient seated shut-off valves and four test cocks complete the assembly.

During normal operation, the pressure drop across the first check valve into the "zone" area is approximately 7 PSI. The second check valve is slightly spring

loaded to provide a minimum pressure drop of 1 PSI across it. (See Figures 1 & 2)

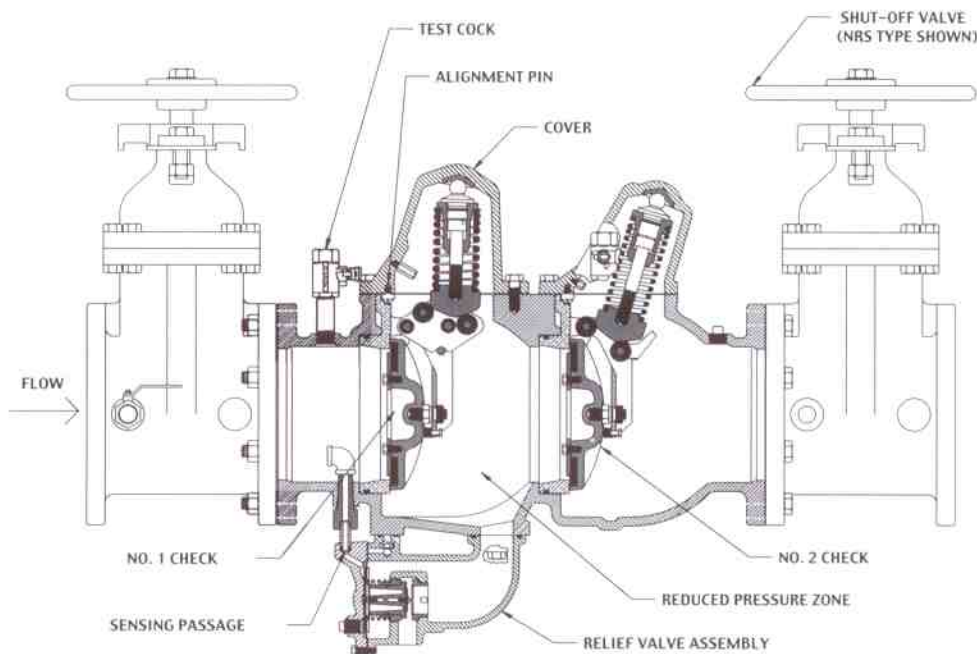
The relief valve operates on a differential pressure. Supply pressure on the upstream side of the first check valve acts against the diaphragm to close the relief valve during normal operation. In the event of backpressure, the relief valve will open to maintain the pressure in the "zone" at least 2 PSI less than the inlet pressure.

FIG. 1



2-1/2" - 4" RP

FIG. 2



6" - 10" RP

II. INSTALLATION

The RPZ assembly must be installed in an accessible location to facilitate periodic field testing and maintenance.

The location selected should have adequate drainage for relief valve discharge. Drainage may be piped away, providing an approved air gap device is used (see Fig. 3). The device should never be placed where it may be submerged in standing water.

Flush all upstream piping thoroughly to remove foreign matter prior to installing the device.

Install the device in a horizontal position with adequate clearance from walls and/or obstructions, for testing and maintenance. A 12" to 30" clearance between the lower most portion of the device and flood grade or floor should be provided.

A "Y" strainer can be installed just upstream of the RPZ assembly to eliminate any debris from entering the device and fouling the check and/or relief valve.

After installing the assembly, and with downstream or #2 shut-off valve closed, pressurize the RPZ assembly and bleed air through test cock #4. Then open #2 shut-off valve.

NOTE:

If water continues to drain from the relief valve, check the Trouble Shooting section for probable causes and solutions.

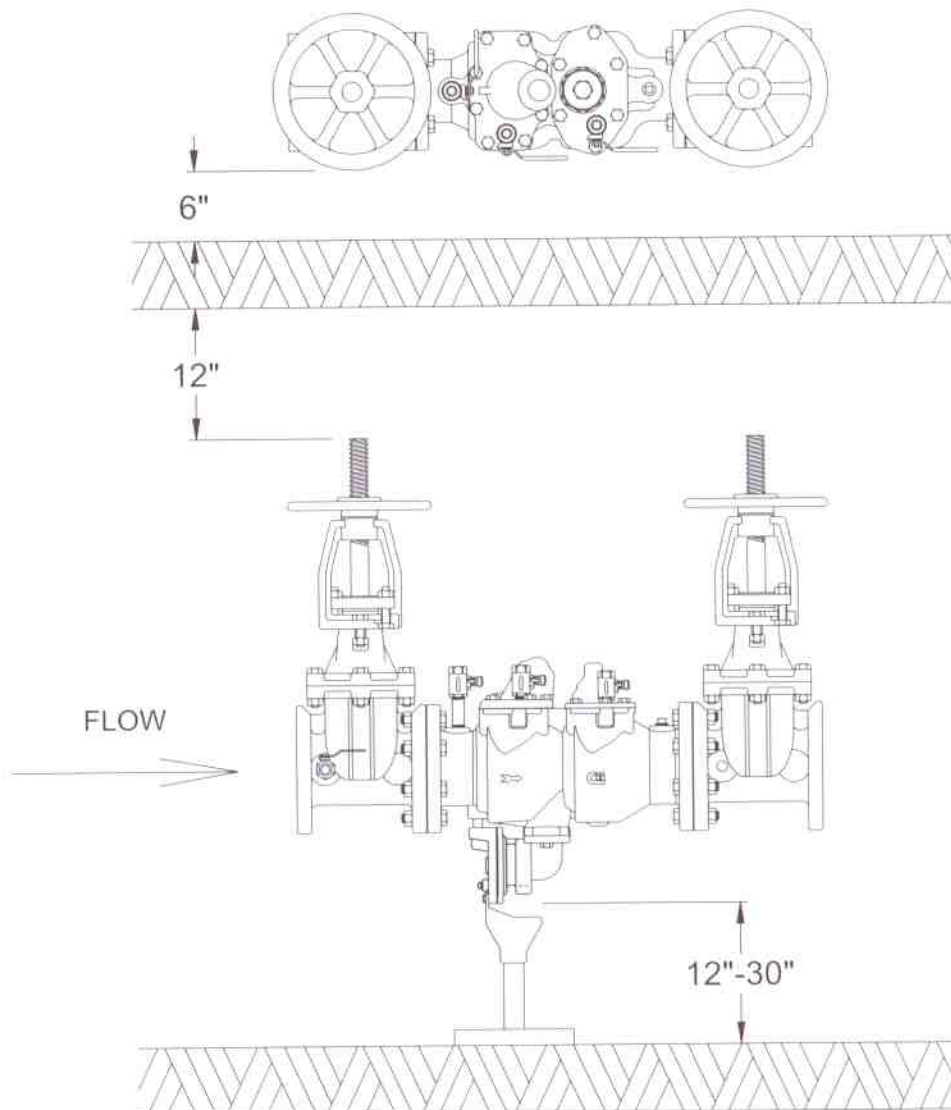


FIG. 3

III. TROUBLE SHOOTING GUIDE

SYMPTOM	CAUSE	CORRECTIVE ACTION
<p>1. Relief valve continuously discharges during no-flow condition.</p>	<p>a. #1 check valve fouled with debris. b. #2 check valve fouled with debris coupled with a backpressure condition. c. #1 check not moving freely.</p>	<p>a. Inspect and clean seat disc and seat. b. Inspect and clean seat disc and seat. c. Inspect for debris or deposit on check valve components.</p>
<p>2. Relief valve discharges continuously during flow and no-flow conditions.</p>	<p>a. Relief valve fouled with debris. b. Damaged diaphragm (allows water to pass through from inlet to zone). c. Sensing passage to inlet side of diaphragm plugged. d. #1 check not moving freely.</p>	<p>a. Inspect and clean relief valve seat disc and seat. b. Replace diaphragm. c. Inspect and clean tube. d. Inspect for debris or deposits on check valve components.</p>
<p>3. Relief valve discharges intermittently in a "spitting" action during no-flow condition.</p>	<p>a. Pressure fluctuations (water hammer) from supply.</p>	<p>a. Eliminate or reduce pressure fluctuations.</p>
<p>4. Relief valve does not open during test No. 1.</p>	<p>a. #2 shut-off valve not closed completely. b. Test equipment improperly installed.</p>	<p>a. Close #2 shut-off valve or inspect for possible through leakage. b. Recheck test procedure.</p>
<p>5. #2 check valve fails to hold backpressure.</p>	<p>a. #2 shut-off valve not closed completely. b. #2 check valve fouled with debris. c. #2 check not moving freely.</p>	<p>a. Close #2 shut-off valve or inspect for possible through leakage. b. Inspect and clean seat disc and seat. c. Inspect for debris or deposits on check valve components.</p>
<p>6. Pressure differential across #1 check valve is low during test No. 3.</p>	<p>a. #1 check valve fouled with debris. b. Upstream pressure fluctuations causing inaccurate gauge reading. c. #1 check not moving freely.</p>	<p>a. Inspect and clean seat disc and seat. b. Eliminate pressure fluctuations. c. Inspect for debris or deposits on check valve components.</p>

IV. CHECK VALVE MAINTENANCE

TO REMOVE FIRST CHECK (2-1/2" – 10"): SEE FIGURES 4 & 6

1. Remove cover bolts, cover, and gasket. Remove spring assembly.
CAUTION! DO NOT DISASSEMBLE SPRING ASSEMBLY.
2. Fold up roller/bracket assembly (8" & 10" first check assembly) or positioning bracket (2-1/2" – 6" first check assembly).
3. Pry out check with flat screwdriver or prybar and lift out.

TO REMOVE SECOND CHECK (2-1/2" – 4"): SEE FIGURE 4

1. Remove spring cap, spring cap O-ring, cover bolts, cover, and gasket.
2. Pry out complete check assembly with flat screwdriver or prybar and lift out.
CAUTION! DO NOT DISASSEMBLE SPRING MECHANISM!

TO REMOVE SECOND CHECK (6" – 10"): SEE FIGURE 6

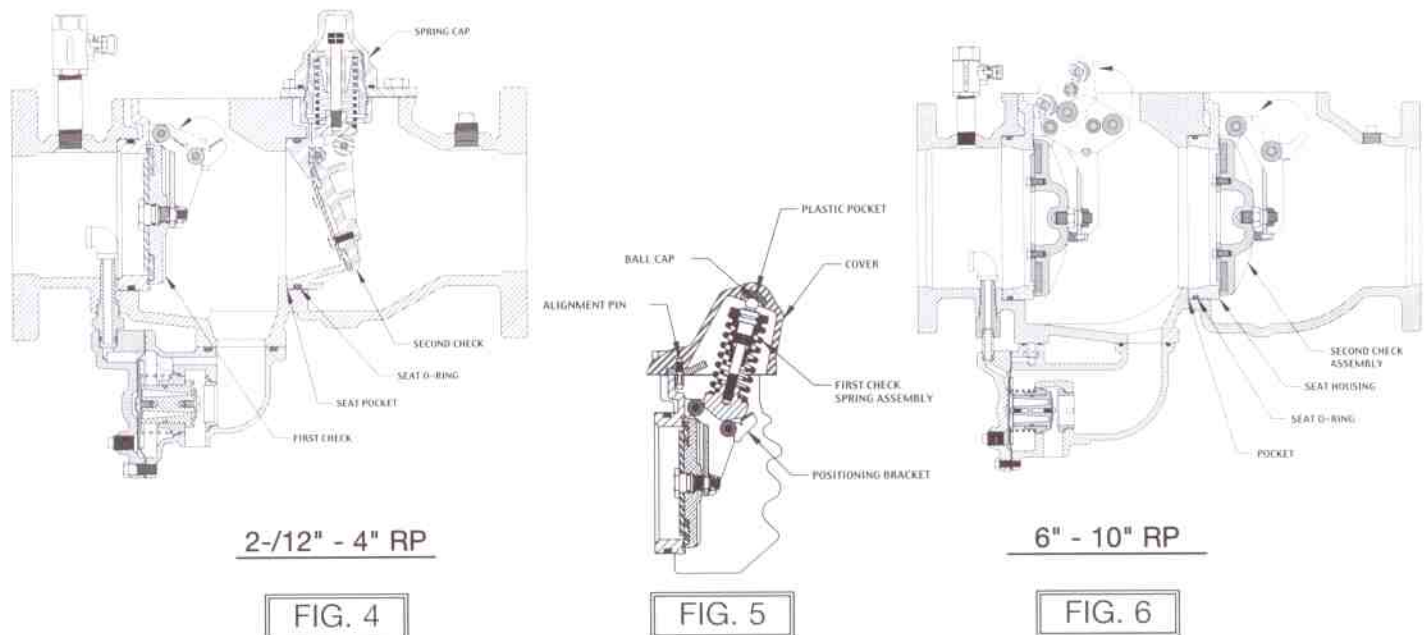
1. Fold up positioning bracket.
2. Pry out check with flat screwdriver or prybar and lift out.

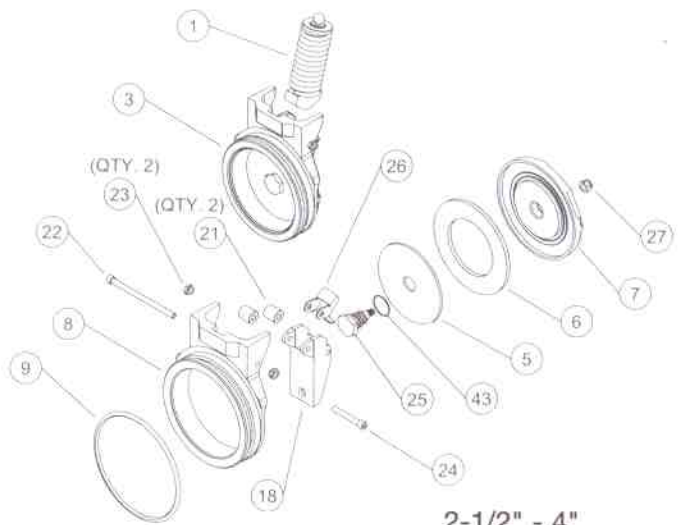
TO REPAIR CHECKS: SEE FIGURES 7, 8, & 9

1. Remove center bolt (or screws).
2. Inspect seat disc for damage and replace, if necessary.
The seat disc may be turned over for a temporary repair, but should be replaced as soon as possible.
3. Reinstall seat disc, disc washer, and center bolt (or screws).

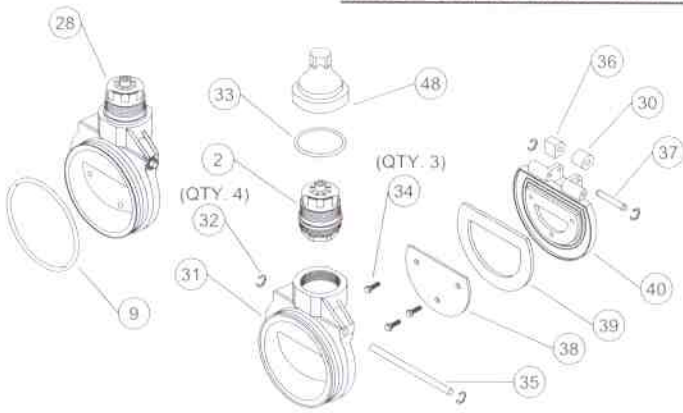
TO INSTALL CHECKS: SEE FIGURES 4 & 6

1. Lubricate seat O-ring with FDA approved lubricant.
2. Slide seat into pocket until O-ring meets pocket edge.
3. Use a prybar to work the seat side to side until the seat bottoms out in pocket.
Important! To prevent binding, keep the seat aligned as straight as possible during insertion.
4. FIRST CHECK (2-1/2" – 10") and SECOND CHECK (6" – 10"): Flip roller/bracket assembly or positioning bracket down. Place spring assembly cam on rollers. Reinstall gasket, cover, and tighten bolts. When replacing the cover, place the spring assembly ball cap in the plastic pocket provided in the cover. SEE FIGURE 5. The cover has an alignment pin that must install into the pocket provided in the top of the seat housing.
5. SECOND CHECK (2-1/2" – 4"): Reinstall gasket, cover, and tighten bolts. Lubricate cap O-ring and reinstall spring cap. CAUTION! DO NOT OVER-TIGHTEN CAP!

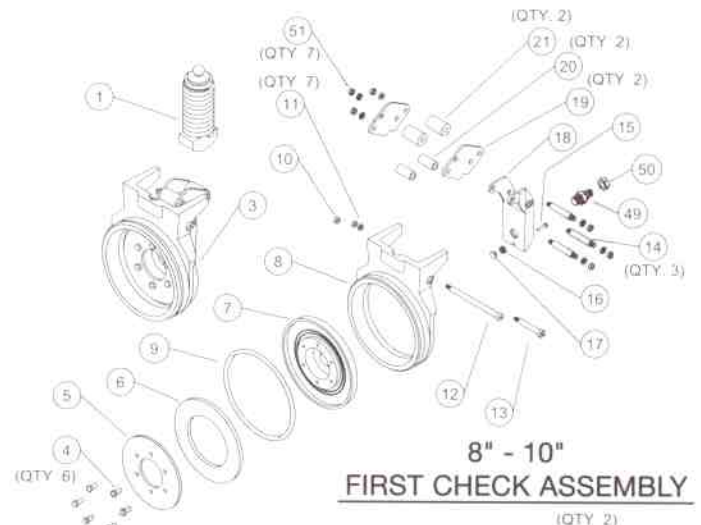




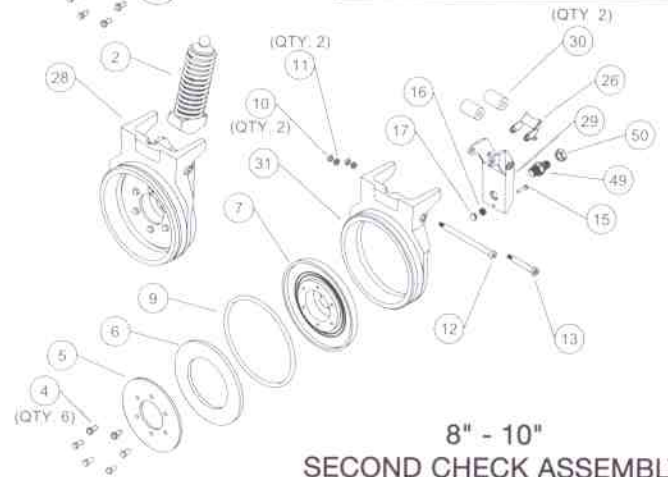
**2-1/2" - 4"
FIRST CHECK ASSEMBLY**



**2-1/2" - 4"
SECOND CHECK ASSEMBLY**



**8" - 10"
FIRST CHECK ASSEMBLY**



**8" - 10"
SECOND CHECK ASSEMBLY**

FIG. 7

FIG. 9

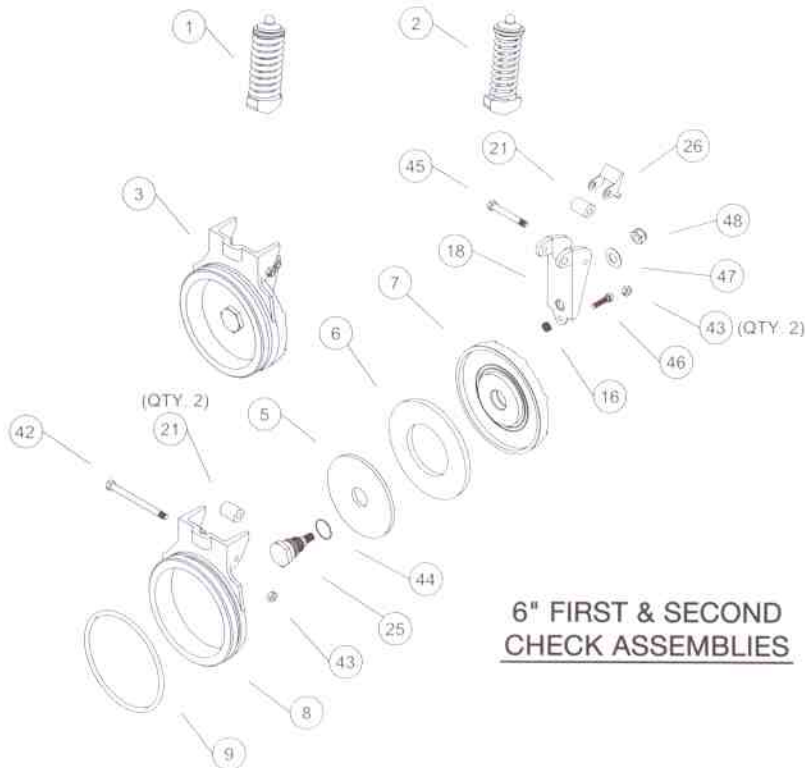


FIG. 8

**6" FIRST & SECOND
CHECK ASSEMBLIES**

CHECK VALVE PARTS LIST

ITEM	DESCRIPTION	2-1/2",3",4"	6"	8" & 10"
1	First Check Spring Assembly	W-4537-05	W-4539-05	W-4515-05
2	Second Check Spring Assembly	W-8393-00	W-4540-05	W-4373-05
3	First Check Assembly	W-4538-05	W-4708-05	W-4517-05
4	3/8-16 x 3/4" Screw	-----	-----	B-1754-00
5	Disc Plate	E-2538-00	E-2539-00	E-2494-00
6	Seat Disc	D-4011-00	D-4012-00	D-3961-00
7	Clapper	F-3226-05	F-3400-05	F-3225-05
8	First Check Seat Housing	F-3227-05	L-6400-05	L-6137-05
9	Seat O-ring	D-3507-00	D-4101-00	D-3963-00
10	1/2-13 Nut	-----	-----	CX02250
11	3/8 Lock Washer	-----	-----	E-2276-00
12	1/2-13 x 7" Shoulder Screw	-----	-----	B-1780-00
13	3/8-16 x 2.75" Shoulder Screw	-----	-----	B-2518-00
14	3/8-16 Threaded Pin	-----	-----	I-6458-06
15	Compensator Screw	-----	-----	B-2183-00
16	Compensator Spring	-----	A-1459-00	A-1459-00
17	Spring Button	-----	-----	E-2497-06
18	First Check Swing Arm	G-3950-05	G-4100-05	F-3312-05
19	Bracket	-----	-----	E-2532-00
20	Spacer	-----	-----	I-6457-06
21	First Check Roller	I-6476-00	I-6477-00	I-6456-06
22	1/4-20 x 4" HHC Screw	B-2252-00	-----	-----
23	1/4 Lock Nut	C-1900-00	-----	-----
24	1/4-20 x 1.75" HHC Screw	B-2286-00	-----	-----
25	Center Bolt	B-2544-06	B-2545-06	-----
26	Positioning Bracket	I-6480-00	I-6481-00	I-6441-00
27	5/16 Lock Nut	C-2052-00	-----	-----
28	Second Check Assembly	W-7590-05	W-4708-05	W-4374-05
29	Second Check Swing Arm	-----	G-4100-05	F-3235-05
30	Second Check Roller	I-5866-00	I-6477-00	I-6410-00
31	Second Check Seat Housing	F-3090-00	L-6400-05	L-6137-05
32	Retaining Ring	I-3144-00	-----	-----
33	Spring Cap O-ring	D-3506-00	-----	-----
34	1/4-20 x .75" HHC Screw	B-1793-00	-----	-----
35	Hinge Pin	I-5868-06	-----	-----
36	Hinge Bushing	D-3685-00	-----	-----
37	Roller Pin	I-5867-06	-----	-----
38	Disc Plate	E-2379-00	-----	-----
39	Seat Disc	D-3504-00	-----	-----
40	Clapper	G-3769-00	-----	-----
41	3/8-16 x 4.75" HH Screw	-----	B1583-00	-----
42	3/8 Lock Nut	-----	C-2053-00	-----
43	Center Bolt O-ring	D-2578-00	D-2282-00	-----
44	3/8-16 x 2.50" HH Screw	-----	B-2304-00	-----
45	5/16-18 x 1.25" HHC Screw	-----	B-2167-00	-----
46	Washer .53 ID. x 1.062 OD.	-----	E-2600-00	-----
47	1/2 Lock Nut	-----	C-2054-00	-----
48	Spring Cap	S-4877-00	-----	-----
49	Stem	-----	-----	G-3980-06
50	5/8-18 Nut	-----	-----	C-2040-00
51	3/8-16 Nut	-----	-----	C-2039-00

V. RELIEF VALVE MAINTENANCE

1. For sizes 2-1/2" – 6": Remove (2) 1/2" screws and remove relief valve body assembly by sliding off sensing tube.

For sizes 8" & 10": Loosen all four mounting screws of relief valve body assembly. This will allow removal of the relief valve cover plate.

2. Remove cover screws, cover, and diaphragm.
3. Remove relief valve cartridge assembly.
4. Remove diaphragm plate retaining screws, and seat disc retaining screws. Ensure that sensing passage is clear.
5. Inspect seat disc, diaphragm, and O-rings for damage. Damaged seat disc may be turned over, but should be replaced as soon as possible. Replace damaged O-rings or diaphragm.
6. Lubricate stem and stem O-ring with FDA approved silicone lubricant and reassemble relief valve cartridge.
7. Insert relief valve cartridge into body.
8. Replace diaphragm, cover, and cover screws.
9. Inspect sensing tube O-ring for damage and replace, if necessary. Slide assembled relief valve over sensing tube, and re-attach relief valve body to valve body.

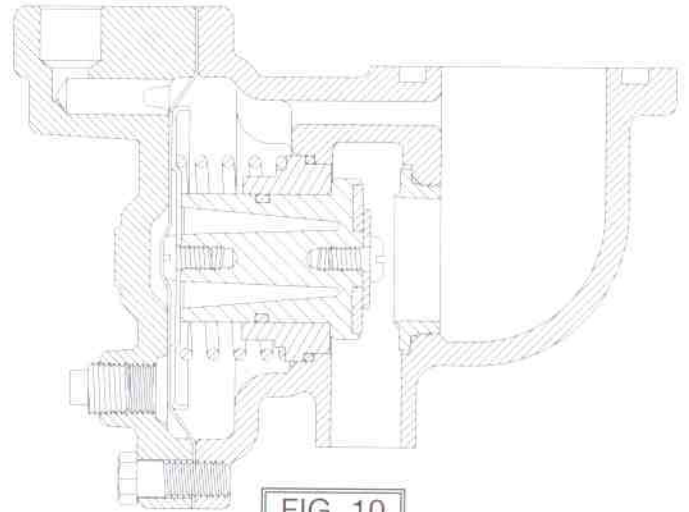


FIG. 10

2-1/2" - 4"
RELIEF VALVE BODY ASSEMBLY

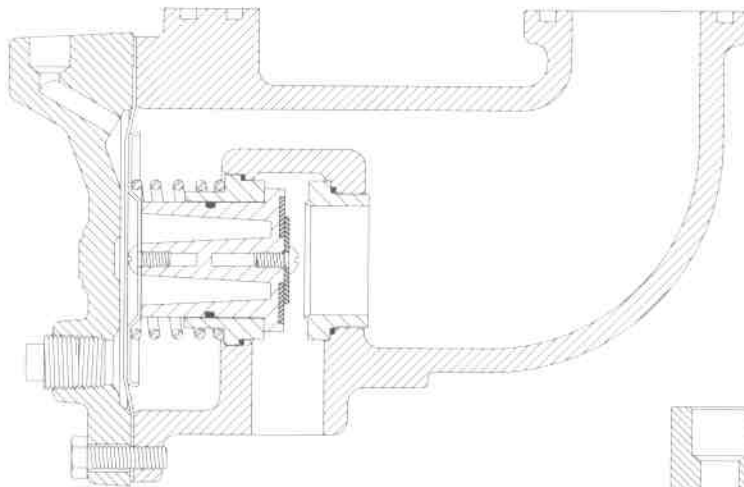


FIG. 12

8" & 10"
RELIEF VALVE BODY ASSEMBLY

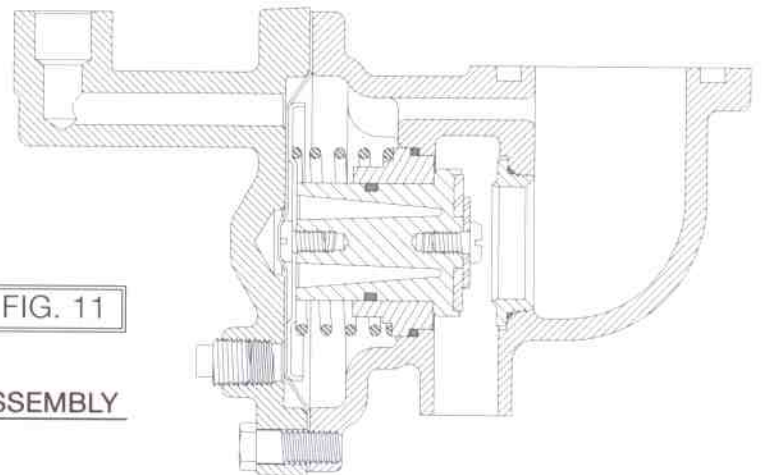


FIG. 11

6"
RELIEF VALVE BODY ASSEMBLY

RELIEF VALVE PARTS LIST

ITEM	DESCRIPTION	2-1/2",3",4"	6"	8" & 10"
1	Plug	K-3019-00	K-3019-00	K-3008-00
2	3/8 x 1" HHC Screw	B-1792-00	B-1792-00	B-1792-00
3	3/8 x 1-1/4" Long Screw	-----	-----	B-1796-00
4	Relief Valve Cover Plate	Q-5782-05	Q-5901-05	Q-5796-05
5	Relief Valve Diaphragm	D-2515-00	D-2515-00	D-2564-00
6	Sensing Tube	-----	-----	I-6462-06
7	Sensing O-ring	-----	-----	D-2099-00
8	Relief Valve Sub-Assembly	W-6622-05	W-6622-05	W-6719-05
9	1/4-20 x .5" PHM Screw	B-1753-00	B-1753-00	B-1753-00
10	Diaphragm Plate	D-2516-00	D-2516-00	E-2201-00
11	Relief Valve Spring	A-1702-00	A-1702-00	A-1742-00
12	Relief Valve Bushing	I-4257-15	I-4257-15	L-4639-15
13	Relief Valve Bushing O-ring	D-2512-00	D-2512-00	D-2565-00
14	Relief Valve Stem	G-3213-00	G-3213-00	G-3240-00
15	Relief Valve Stem O-ring	D-2513-00	D-2513-00	D-2562-00
16	Relief Valve Seat Disc	D-2514-00	D-2514-00	D-2563-00
17	Relief Valve Seat Washer	D-2499-00	D-2499-00	E-2200-00
18	Relief Valve Seat	L-4867-00	L-4867-00	L-4638-05
19	Relief Valve Seat O-ring	D-2274-00	D-2274-00	D-2568-00
20	Relief Valve Body	Q-5783-05	Q-5783-05	Q-4535-05
21	1/2-13 x 1.25" HHC Screw	B-2550-00	B-2550-00	-----
22	5/8-11 x 1 3/4" HHC Screw	-----	-----	B-1800-00

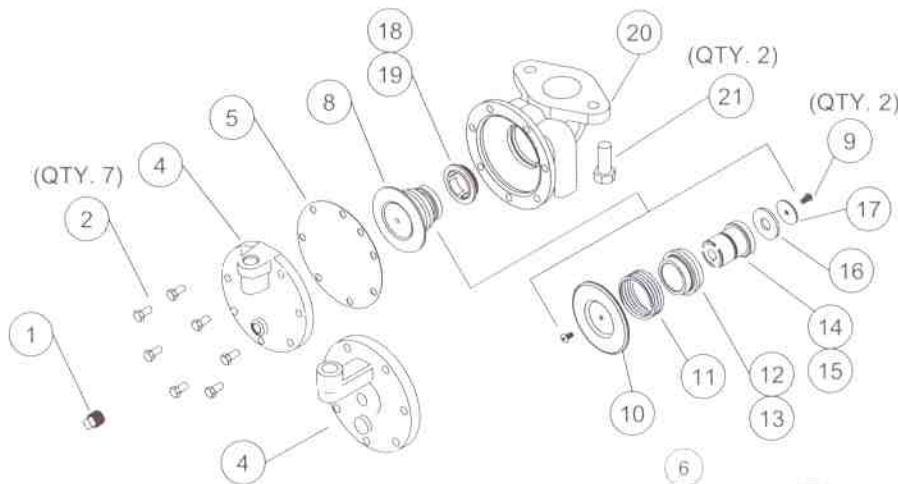


FIG. 13

**2-1/2" - 6"
RELIEF VALVE BODY ASSEMBLY**

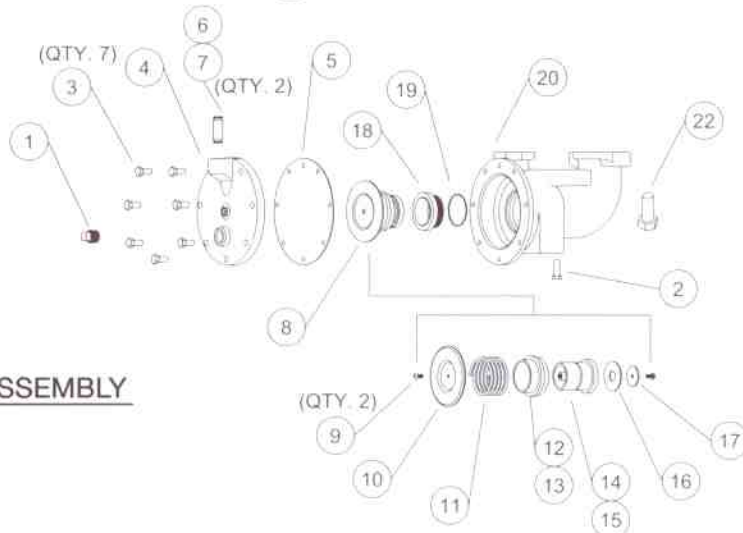


FIG. 14

**8" & 10"
RELIEF VALVE BODY ASSEMBLY**

VI. TESTING PROCEDURES

IT'S IMPORTANT THAT THE RP BE TESTED PERIODICALLY IN COMPLIANCE WITH LOCAL CODES, AT LEAST ONCE A YEAR OR MORE, AS SERVICE CONDITIONS WARRANT.

NOTE: Test set-up is illustrated in Figure 15.

EQUIPMENT REQUIRED

Conbraco reduced pressure backflow preventer test kit (40-200-TKU or 40-200-TK5U).

TEST NO. 1:

PROCEDURE 1 for use with 40-200-TKU, Test Kit only. See procedure 2 for 40-200-TK5U.

Purpose:

To test operation of the pressure differential relief valve.

Requirement:

The pressure differential relief valve must operate to maintain the "zone" between the two check valves at a minimum of 2 PSI less than the supply pressure.

PROCEDURE:

1. Bleed water through all four test cocks to flush any foreign material.
- NOTE: Open test cock #2 very slowly to avoid accidental dumping of the relief valve.
2. Connect the "high" side hose to test cock #2. Connect the "low" side to test cock #3.
3. Open valves #1, #2, and #3.
4. Slowly open test cock #3 and bleed all air from gauge and hoses through "vent" hose. With test cock #3 maintained in the open position, slowly open test cock #2 and bleed all air again through the "vent" hose. Close valve #3. Then close valve #2.

5. Close #2 shut-off valve.

6. Slowly open valve #3 until the differential gauge needle starts to drop.

NOTE: It is important that the differential gauge needle drops slowly. Maintain #3 at this position and observe the differential pressure reading at the moment the first discharge is noted from the relief valve.

7. Record this reading as the opening differential pressure of the relief valve and close valve #3.

TEST NO. 2:

Purpose:

To test check valve #2 for tightness against reverse flow.

Requirement:

The check valve shall permit no through leakage in a direction reverse to normal flow under all conditions of a pressure differential

PROCEDURE:

1. Maintain the #2 shut-off valve in the closed position (from Test No. 1).
2. Loosely attach the "vent" hose to test cock #4.
3. Bleed all air from the "vent" hose by opening valve #2.
4. Close valve #2 and tighten hose connection to test cock #4. Then open test cock #4.
5. Loosen "low" side hose at test cock #3 slightly and re-establish the normal reduced pressure within the zone. Then retighten hose.
6. Open valve #2. If the differential pressure remains steady then check valve #2 is reported as "OK". If the differential pressure fails until the relief valve opens then check valve #2 is recorded as "leaking" and Test No. 3 cannot be completed.

TEST NO. 3:

Purpose:

To test the static differential pressure across check valve #1.

Requirement:

The static differential pressure across check valve #1 must be a minimum of 3 PSI more than the opening differential pressure of the relief valve as recorded in Test No. 1.

PROCEDURE:

1. With the testing equipment installed as stated in Test No. 2, the static differential pressure across check valve #1 will be indicated on the gauge and should be recorded as such.

NOTE: Gauge needle should be steady and not falling.

RESTORE OPERATION:

Close all test cocks, open all needle-valves, open #2 shut-off valve and carefully remove all test equipment.

NOTE: Refer to Troubleshooting Guide in Section III to resolve any problems incurred during field testing.

CONBRACO REDUCED PRESSURE
 BACKFLOW PREVENTER
 4S-200 SERIES
 MODEL RP

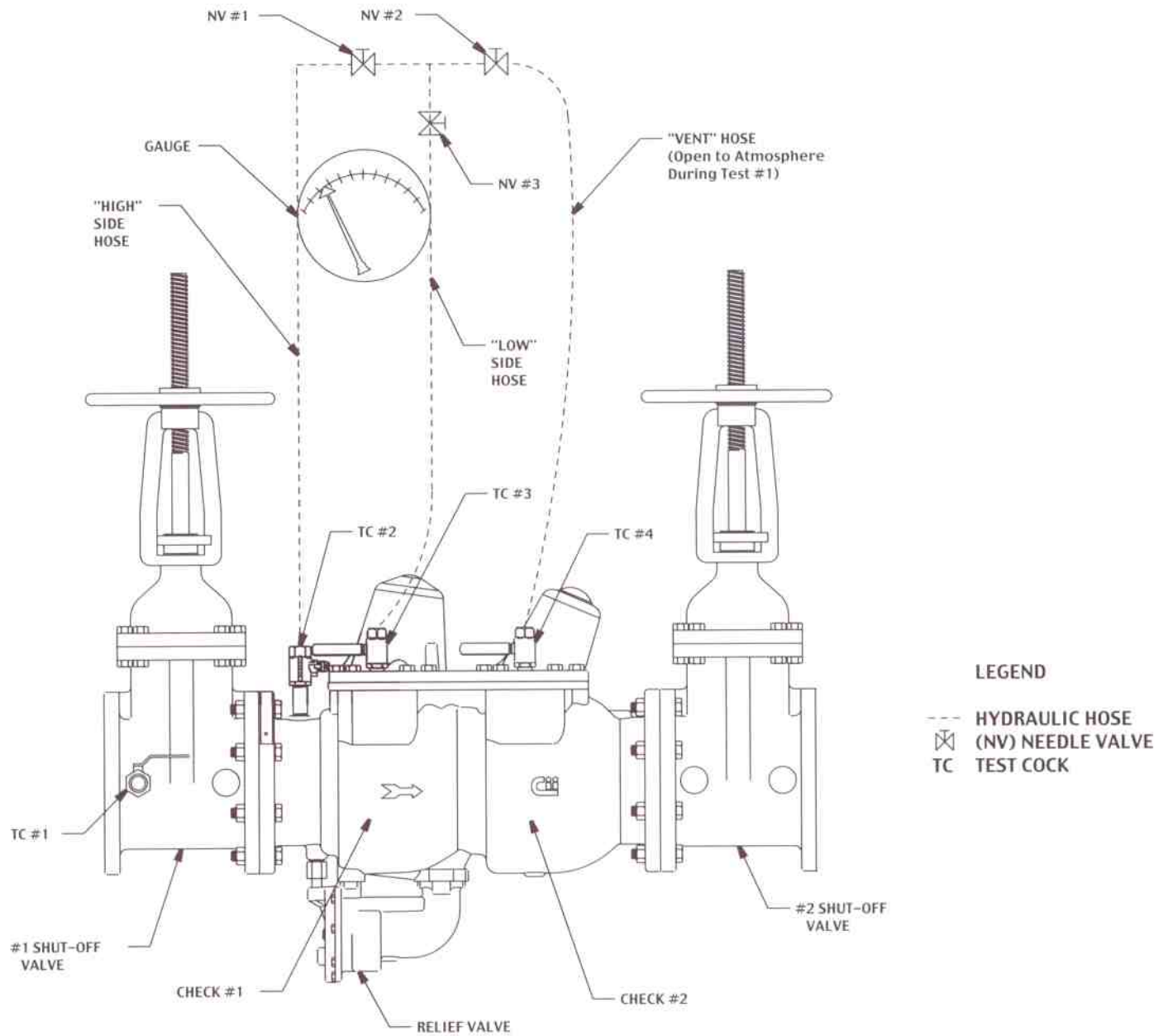


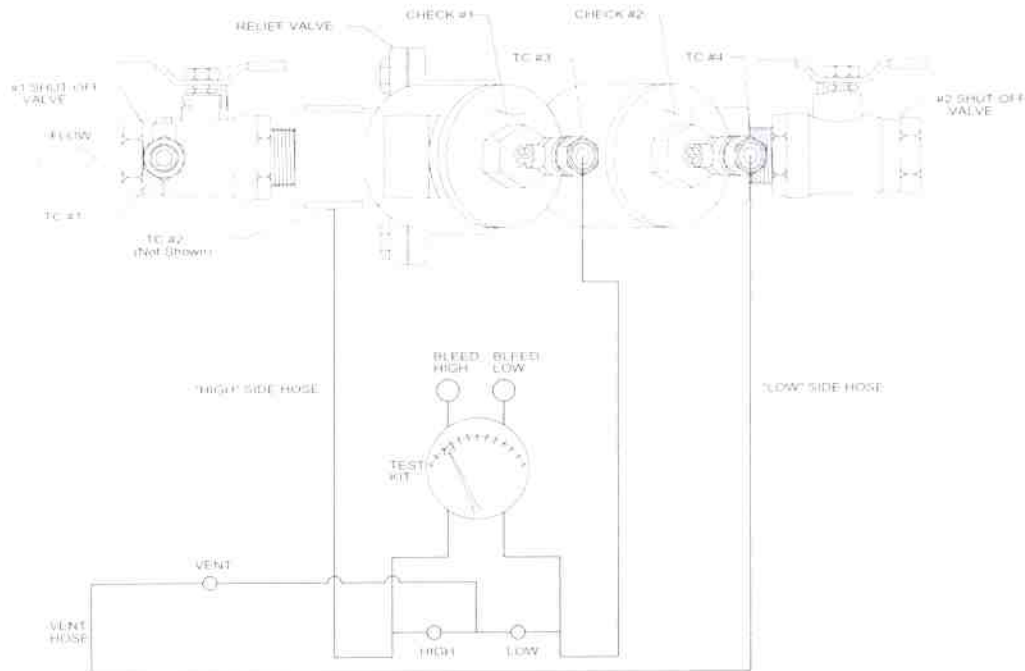
FIG. 15

PROCEDURE 2

TEST PROCEDURE USING 40-200-TK5U.

NOTE: IT IS THE TESTER'S RESPONSIBILITY TO DETERMINE IF THIS PROCEDURE IS ACCEPTED BY LOCAL AUTHORITIES.

CONBRACO REDUCED PRESSURE BACKFLOW PREVENTER



TEST SET UP

1. Obtain permission to shut off the water supply.
2. Determine the direction of flow.
3. Identify and install appropriate adapters in all 4 test cocks.
4. All test kit valves are closed.

TEST NO. 1

DOES THE DIFFERENTIAL PRESSURE RELIEF VALVE OPERATE TO MAINTAIN THE "ZONE" BETWEEN THE TWO CHECK VALVES AT LEAST 2 PSI LESS THAN THE SUPPLY PRESSURE.

1. Open test cock #4 to establish flow through the RP. "Blow out" test cocks 1, 2 & 3.

Note: Open test cock #2 slowly to avoid accidental dumping of the relief valve. Close test cock #4.

2. Connect the red hose between test cock #2 and the high side (back, middle) connection on the test kit.

3. Connect the green hose between test cock #3 and the low side (back, right) connection on the test kit.
4. Slowly open test cock #3. Bleed the low side by opening the bleed low (top, right) valve.
5. Slowly open test cock #2. Bleed the high side by opening the bleed high (top, left) valve. Close the bleed high (top, left) valve.
6. After the gauge reaches full scale, close the bleed low (top, right) valve.
7. Close the No. 2 shutoff valve and observe the pressure drop across Check Valve #1. Should the pressure drop until the relief valve discharges continuously, check valve #1 is leaking and must be repaired before continuing.
8. Open the high (bottom, middle, red) valve.
9. Open the low (bottom, right, green) valve no more than one quarter (1/4) turn.

10. Watch the gauge drop slowly to the relief valve opening point - record the reading. (If the differential pressure does not drop to the relief valve opening point, close the high and low valves and go to step 12).
11. Close the high and low valves and go to test No. 2.
12. No. 2 shutoff valve may be leaking. Reopen and close No. 2 shutoff valve to attempt a better shut-off. Repeat steps 7 through 10. If the relief valve does not open, a by-pass hose is required. (Large leaks may require a garden hose).
13. Attach a hose (not supplied with Test Kit) to test cock #1. Bleed hose by opening test cock #1. Close test cock #1.
14. Connect the hose from test cock #1 to test cock #4.
15. Open test cock #1 to pressurize the hose.
16. Slowly open test cock #4. Repeat steps 8 through 10. If the relief valve does not open, the leaky No. 2 shutoff valve must be repaired.

TEST NO. 2

IS CHECK VALVE #2 PRESSURE TIGHT AGAINST BACK PRESSURE.

NO BYPASS HOSE USED IN TEST 1.

1. Connect the black hose to vent (back, left) connection on the test kit.
2. Bleed vent hose by opening the high (bottom, middle, red) and vent (bottom, left, black) valves. Close the vent valve.
3. Attach the vent hose to test cock# 4.
4. Open test cock #4.
5. Open the bleed low (top, right) valve allowing the gauge to reach full scale. Close the bleed low valve.
6. Open the vent (bottom, left, black) valve.
7. If the differential pressure stabilizes above the relief valve opening point check valve #2 is recorded as "tight". (Proceed to test No. 3). If the reading falls to the relief valve opening point, check valve #2 is recorded as "leaking" and Test No. 3 cannot be completed.

BYPASS HOSE USED IN TEST 1.

1. Leave the bypass hose connected between test cocks #1 and #4.
2. Leave test cocks #1 and #4 open.
3. Open the bleed low (top, right) valve allowing the gauge to reach full scale. Close the bleed low valve.
4. If the differential pressure stabilizes above the relief

valve opening point, check valve #2 is recorded as "tight". (Proceed to Test No. 3). If the reading falls to the relief valve opening point, check valve #2 is recorded as "leaking" and Test No. 3 cannot be completed.

TEST NO. 3

IS THE STATIC PRESSURE DROP ACROSS CHECK VALVE 1 MAINTAINED AT LEAST 3 PSI ABOVE THE RELIEF VALVE OPENING POINT.

1. Open the bleed low (top, right) valve allowing the gauge to reach full scale. Close the bleed low valve.
2. Allow the gauge reading to stabilize. Record this reading as the static pressure drops across check valve #1.
3. Close all test cocks. Open the No. 2 shutoff valve. Remove all test equipment. Drain test kit.

BACKFLOW PREVENTER TEST KITS

DESCRIPTION

The Conbraco Backflow Preventer Test Kits are compact, lightweight, and portable testing devices. They come equipped with a gauge, hoses, and all required adapter fittings. Also included is a flexible or adjustable strap for hanging the gauge, laminated test procedures and a molded plastic carrying case with foam inserts.

DIFFERENTIAL PRESSURE GAUGE TEST KITS 40-200-TKU

These are three valve test kits used for testing all DCV, RPZ, PVB & SVB backflow preventers.

The gauge is a differential pressure type with a dual scale of 0-15 psid/0-100 kPa differential pressure range with a +2% accuracy (full scale).

40-200-TK5U

This is a five valve test kit used for testing all DCV, RPZ, PVB & SVB backflow preventers.

The five valve test kit is similar to the three valve test kit except it has and additional two valves that make it possible to bleed lines without disconnecting hoses. It also features a line pressure gauge in addition to the differential pressure gauge, a thermoplastic gauge body and adjustable nylon strap.

MODEL	APPLICATION	WT. (lbs.)
40-200-TKU	ALL DCV, RPZ, PVB & SVB	7.8
40-200-TK5U	ALL DCV, RPZ, PVB & SVB	6.5

