Hersey®
PRODUCTS

INSTALLATION MAINTENANCE, AND TEST INSTRUCTIONS

BEECO® *Aergap*™
MODELS FRP I AND FRP II
REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER
FRP I, ¾", 1"
FRP II, ¾", 1", 1¼", 1½", 2"

MODEL FDC
BACKFLOW PREVENTER

TABLE OF CONTENTS

¾"-2" BEECO MODEL FRP REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER

¾"-2" HERSEY MODEL FDC DOUBLE CHECK VALVE ASSEMBLY

BACKFLOW PREVENTER

Model FRP Section I — Description and Operation

DESCRIPTION (see Fig. 1)

The BEECO Reduced Pressure Principle Backflow Preventer operates on the principle that water will not flow from a zone of lower pressure to one of higher pressure. It provides protection against backflow caused by both backpressure and backsiphonage.

The device consists of two spring-loaded check valves (A and B) and a spring-loaded, diaphragm-actuated differential pressure relief valve (C) located in the zone between the check valves.

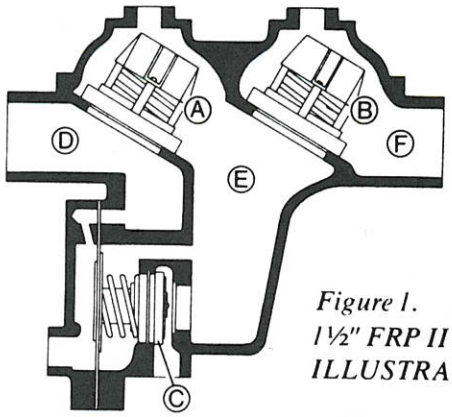

Figure 1.
1½" FRP II DEVICE ILLUSTRATED

NORMAL OPERATION

The first check valve (A) causes all water passing through it to be automatically reduced in pressure by approximately 5-8 psi.

The second check valve (B) is lightly springloaded and forms the "double check" feature of the device. It acts to prevent unnecessary drainage of the domestic system in case a backflow condition occurs.

The relief valve (C) is spring-loaded to remain open, and diaphragm actuated to close by means of differential pressure.

To illustrate the operation, assume water, having a supply pressure of 60 psi, is flowing in a normal direction through the device. If all valves beyond area F are closed, creating a static condition, the water pressure in area D will be 60 psi and water pressure between the check valves (E) will be 52 psi.

The inlet pressure of 60 psi is transmitted through a drilled passageway to the *underside* of the diaphragm of the relief valve (C). This valve is springloaded to remain in an open position until the differential pressure amounts to approximately 4 psi across the relief valve.

During normal operation, therefore, the 8 psi differential pressure produced by the first check valve (A) exceeds the spring-loading of the relief valve (C) and causes the relief valve (C) to remain closed.

BACKFLOW

There are two conditions that tend to produce backflow:

Backsiphonage — where the pressure in the drinking water system becomes less than atmospheric due to a vacuum or partial vacuum in that system.

Backpressure — where the pressure in the nonpotable system exceeds that in the drinking water system.

BACKSIPHONAGE

As the supply pressure drops in area D, it also drops in the area below the diaphragm of the relief valve (C). When the pressure differential across the diaphragm decreases to approximately 4 psi, the relief valve (C) will start to open. This happens because the spring above the diaphragm of the relief valve (C), which is trying to force the valve open, is designed to compress with a differential pressure of 8 psi. When that differential is decreased to 4 psi, the spring will extend and cause the relief valve (C) to start to open.

This spring-loaded relief valve is designed to eliminate intermittent discharges and "spitting" with normal minor fluctuations in the line pressure.

As the supply pressure continues to drop, the relief valve (C) automatically opens to drain and, regardless of the pressure on the supply side, approximately 4 psi less pressure will be maintained between the check valves (zone E) until zone pressure reaches atmospheric.

BACKPRESSURE

Assume that pressure at the discharge side (F) increases to 80 psi, while the supply pressure (D) remains at 60 psi:

1. *If the second check valve (B) does not leak,* water under higher pressure in area F will not enter the area between the check valves (zone E), and the pressure in this zone will remain at 52 psi. Under these conditions, the relief valve (C) will remain closed since the 8 psi differential pressure is still being maintained between the supply pressure (area D) and the area of reduced pressure between the check valves (zone E).

TABLE OF CONTENTS

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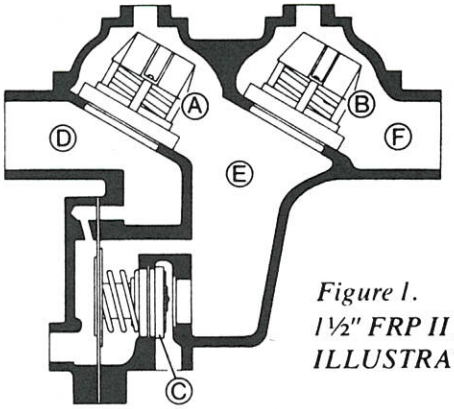

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2. *If the second check valve (B) does leak,* water under high pressure (area F) will flow into zone E. If the pressure in this zone increases to approximately 56 psi — still 4 psi *lower* than the supply pressure (area D) — the relief valve will start to open and discharge this reversely flowing water to atmosphere, maintaining the pressure in zone E approximately 4 psi lower than supply pressure. The relief valve will automatically continue to drain as long as this backflow condition exists and as long as the second check valve (B) is leaking.

If for any reason the first check valve (A) should leak during a shutoff beyond area F, the water under higher pressure in area D will leak into zone E. This will cause the relief valve to open as previously described and, again, provide visual indication at the drain outlet.

In the unlikely event that the relief valve diaphragm should rupture, an unbalanced condition between area D and zone E will occur, and the relief valve will immediately discharge to atmosphere.

FRP SECTION II — INSTALLATION

A. GENERAL INSTALLATION INSTRUCTIONS

1. Before installing the device, pipelines should be thoroughly flushed to remove foreign material.
2. If not already provided, shut off valves should be installed at each end of the device so that it can be tested and maintained. A ¼" test cock must be mounted on the inlet side of the inlet shutoff valve.
3. Devices must be installed in a *horizontal* position above the ground or floor level.
4. Devices should be installed in an accessible location with ample clearance to facilitate testing and repairs. (See Fig. 2)
5. In no case should the relief valve discharge be solidly piped into a sump, sewer, drainage ditch, etc.
6. This device should be tested upon installation to insure proper operation and then inspected periodically for continual discharge from the relief valve, which indicates a need for maintenance.

B. WARM CLIMATE OUTDOOR INSTALLATION (See Fig. 2)

1. Reduced pressure backflow preventers should be installed only where there is adequate drainage and no danger of freezing. At no time should they be placed where any part of the unit could be submerged in standing water. The recommended installation is above ground. A concrete slab under the unit is sometimes desirable.
2. Normally, any discharge from the relief valve is spilled onto the ground. Drainage may be piped away from the location, in which case, an air gap must be used between the relief valve port and the drain line. (See Fig. 4)

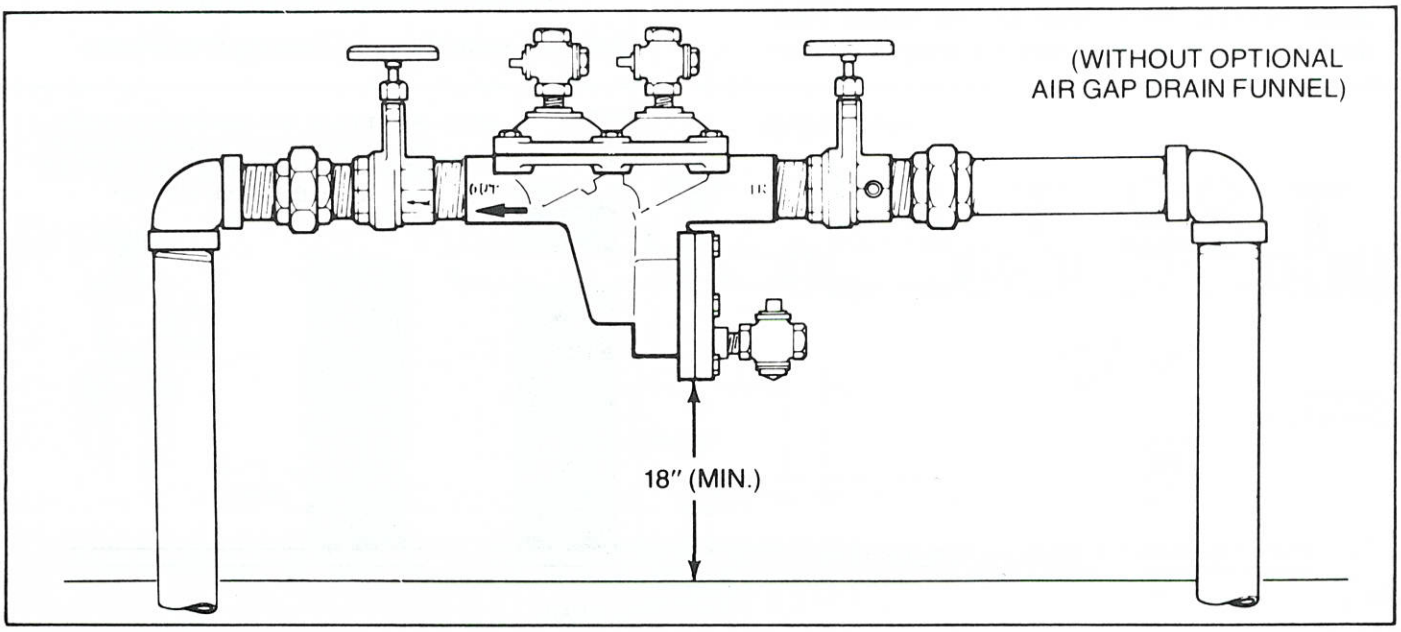


Figure 2. WARM CLIMATE OUTDOOR INSTALLATION

C. COLD CLIMATE OUTDOOR INSTALLATION

In remote locations or where installation cannot be made in a heated building, a separate insulated structure should be built around the backflow preventer and adjacent piping. In extremely cold areas, some form of heat should be provided within the structure. Strip heaters or light bulbs may be sufficient for this purpose.

D. COLD CLIMATE INDOOR INSTALLATION (See Fig. 3)

In climates where freezing conditions are likely, or where it is impractical to install the backflow preventer above ground, the installation should be made at an easily accessible location inside a heated building.

The unit should be placed above the floor at a distance great enough to allow clearance for repair work. If the backflow preventer is positioned against a wall, care should be taken to be sure that the four test cocks are easily accessible. Proper drainage should be provided for the relief valve. An air gap must be used between the relief valve outlet and the drain line if drainage is to be piped away.

E. MODIFIED PIT INSTALLATION (See Fig. 5)

In the event installation must be made in a pit, only the modified pit type installation may be used. The relief valve drain should be piped to the outside of the pit and discharged no less than 12" above the grade line.

F. BATTERY (PARALLEL) INSTALLATION (See Fig. 6)

Where it is essential to provide uninterrupted water service, installation of two model FRP devices in a battery (parallel) setting is recommended. This avoids interruptions to water service when maintenance or testing is required. One device can be shut off while the other is left in operation. This installation also provides higher flow capacity than provided by one backflow preventer.

G. CORRECTION OF DISCHARGE

1. After installation, *with flow through the device,* continual discharge from the relief valve opening usually indicates that there is foreign material holding the relief valve open. To remove foreign material, flush relief valve as follows:
   a. Close inlet shutoff valve.
   b. Open test cock No. 2. Relief valve should fully open and discharge.
   c. Close test cock No. 2.
   d. Open inlet shutoff valve.

   If relief valve continues to leak, repeat procedure. If flushing does not stop discharge, with flow through the device, close shutoff valves, remove and clean the relief valve.*
2. After installation, *with no flow through the device* (inlet shutoff valve open, outlet shutoff valve closed) continual discharge from the relief valve indicates a leaking first check valve, probably caused by foreign material under the seat. If flushing (substantial flow through the device) will not clear the device, close shutoff valves, remove and clean the first check valve.*
3. Occasional "spitting" or momentary discharge from the relief valve can be expected, if line pressure drops suddenly, due to operation of flushometers, quick opening valves, or similar devices and valves.

*See Disassembly and Cleaning Procedures.

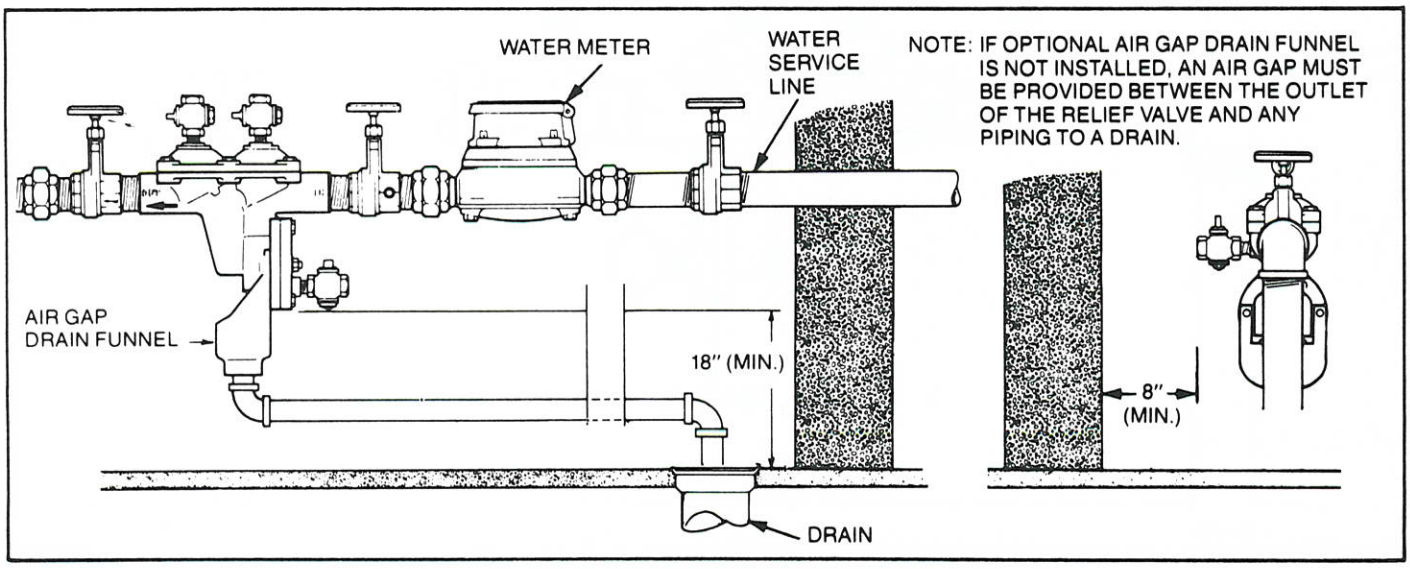


Figure 3. COLD WEATHER INDOOR INSTALLATION

MODEL FRP RELIEF VALVE AIR GAP DRAIN FITTING

GENERAL

This fitting has been designed to permit direct connection of the relief valve drain piping to the backflow preventer. It provides an air gap below the outlet of the relief valve; and includes an internally-threaded opening at its base.

Two sizes are provided: one for installation on ¾" and 1" devices; and the second for installation on 1¼", 1½" and 2" devices. The internal thread size is 1" - 11½ NPT on both fittings. Both fittings are available as kits which include the fitting and two connection bolts and nuts (see FRP Parts List, pages 10 and 12).

INSTALLATION (see Fig. 3)

Remove the two relief valve cover bolts that are in line with the notches on the fitting. Discard them.

Hold the fitting in position against the flange on the bottom case *opposite* the cover. Insert bolts into the holes on the flange and tighten firmly, using an open-end wrench. Install nuts.

Thread piping to fitting, using commercially-available pipe sealant.

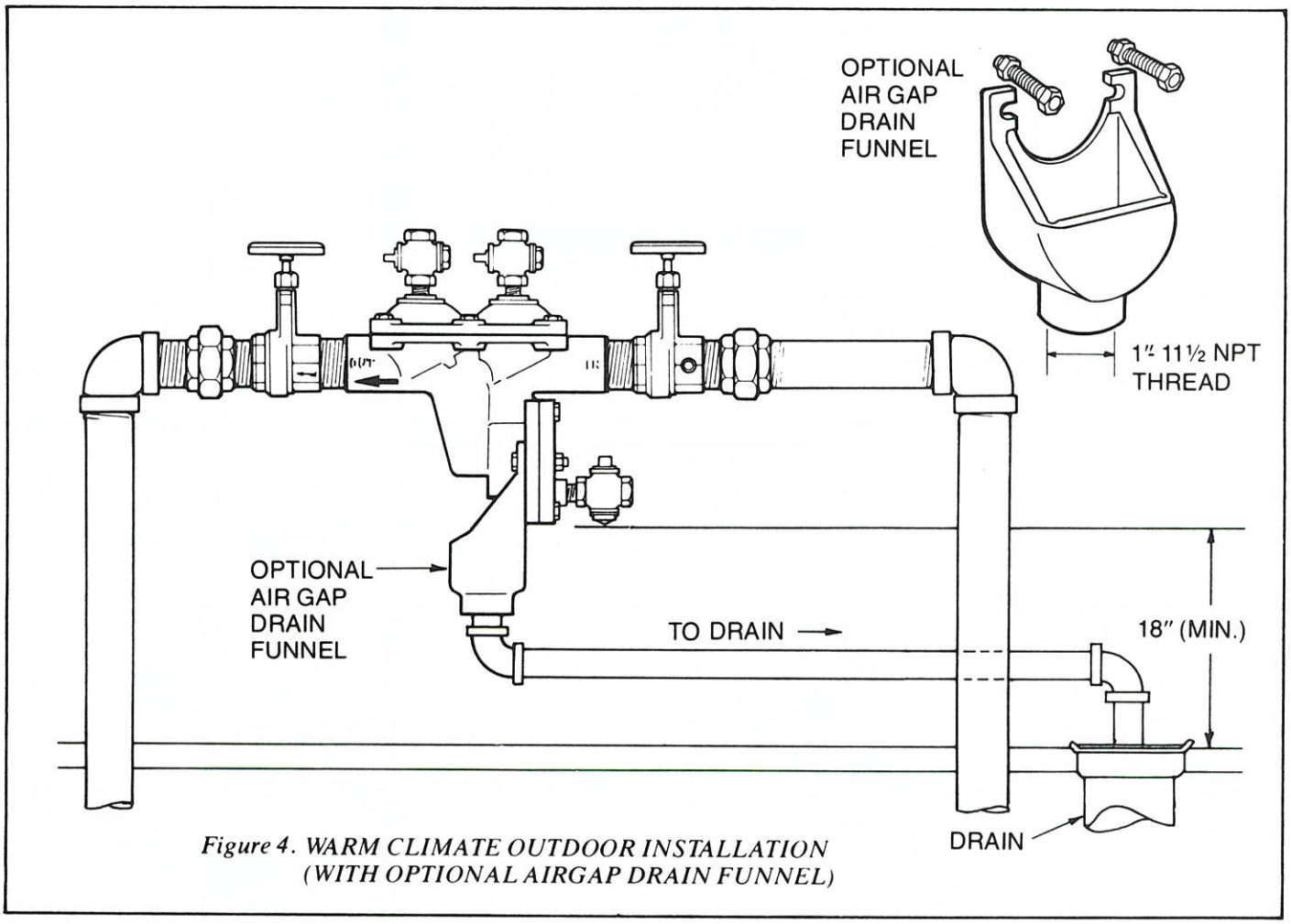


Figure 4. WARM CLIMATE OUTDOOR INSTALLATION (WITH OPTIONAL AIRGAP DRAIN FUNNEL)

FRP SECTION III — MAINTENANCE

A. DISASSEMBLY

1. Remove top case bolts and lift off top case(s).
2. Loosen check valve mounting screws and lift off check valve assemblies, with screws attached. (See Fig. 7, 14A, 14B, 15).
3. Remove relief valve housing bolts and relief valve housing, or relief valve cover (See Fig. 7, 14A, 14B, 15).
4. Remove relief valve assembly from housing by grasping diaphragm and lifting assembly up (FRPI) or pull out horizontally (FRPII).
5. Inspect relief valve seat for damage caused by foreign material. If it requires replacement, order repair kit (see page 10, 12).
6. To remove seat, insert wrench and turn counterclockwise. (See Fig. 9A, 9B).

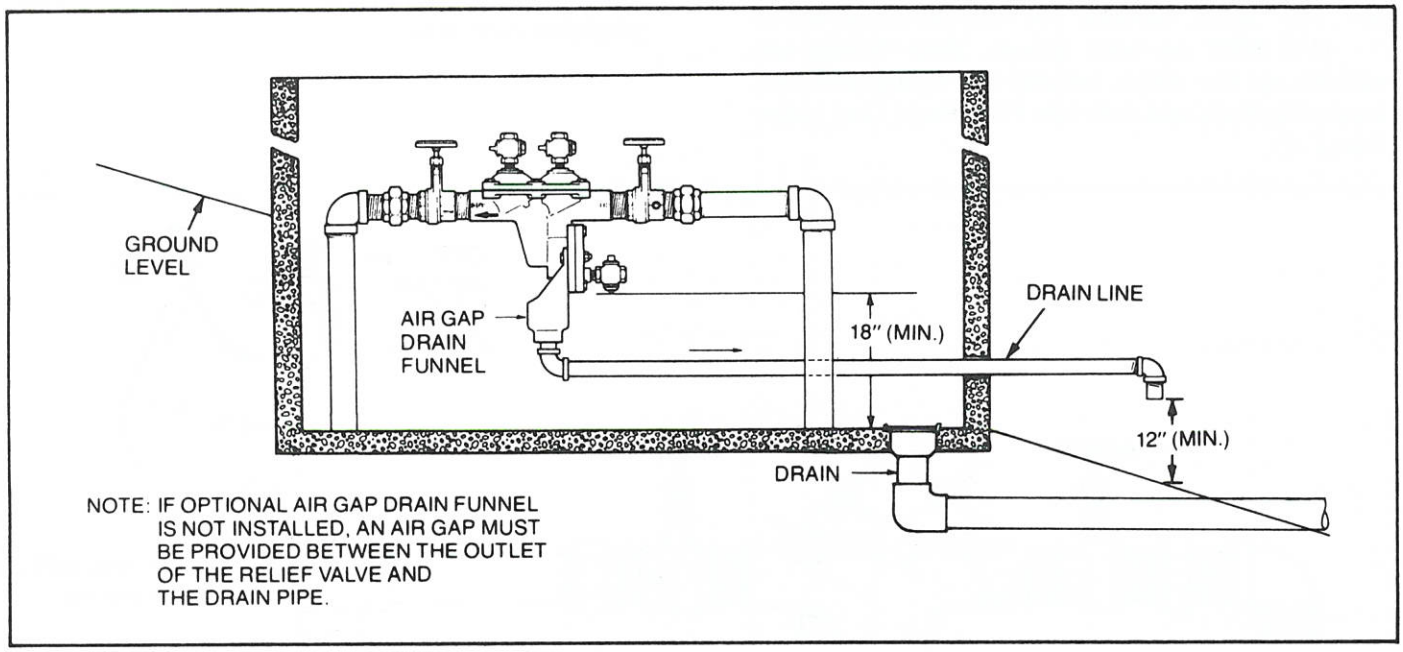


Figure 5. MODIFIED PIT INSTALLATION

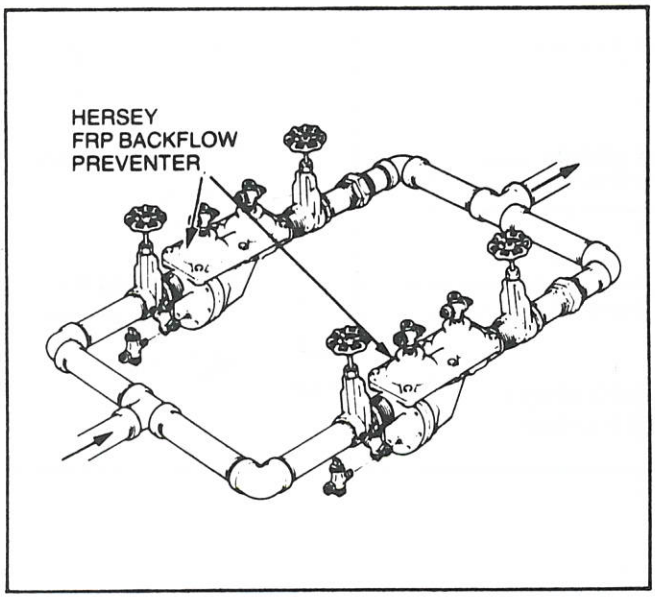


Figure 6. BATTERY (PARALLEL) INSTALLATION

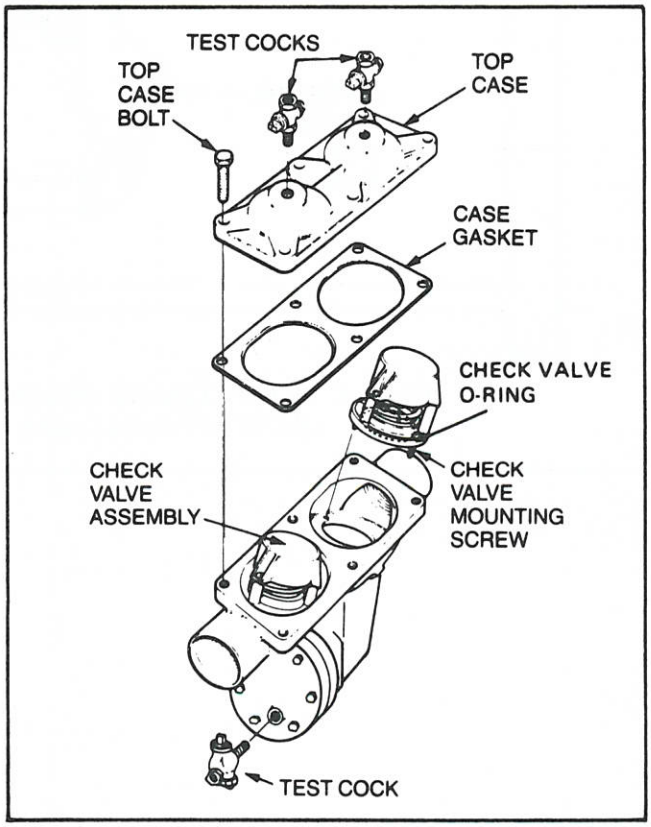


Figure 7. 3/4" AND 1" CHECK VALVE ASSEMBLIES

B. CLEANING

1. Check Valves
   a. If dirt in the lines has accumulated on first check valve seat, causing leakage when there is no flow through the device, remove check valve as outlined in Paragraph A.
   b. Open ¾" and 1" first check valves as follows:
      1. Press thumb against disc to compress spring.
      2. Insert flat-sided wooden pencil between seat and disc to hold valve open (see Fig. 10).
   c. Open 1¼", 1½" and 2" first check valves as follows:
      1. Remove the check valve disc screw, but leave washer in place.
      2. Attach the spring compression tool (see Fig. 11) with 4 machine screws and wing nuts provided, using the mounting screw holes in the check valve seat ring.
      3. Engage the pilot on the end of the jacking screw in the valve screw hole.
      4. Turn jacking screw clockwise to open valve.
   d. To open second check valves, all sizes, press thumb against disc to compress spring.
   e. Clean valve seats and discs with a clean non-abrasive cloth. DO NOT USE SOLVENTS ON THE PLASTIC SEAT!
   f. Re-assemble check valves to body of device. (On 1¼", 1½" and 2" sizes first remove spring compression tool and replace disc screw.)
   g. If cleaning does not stop leaking replace the check valve assembly.

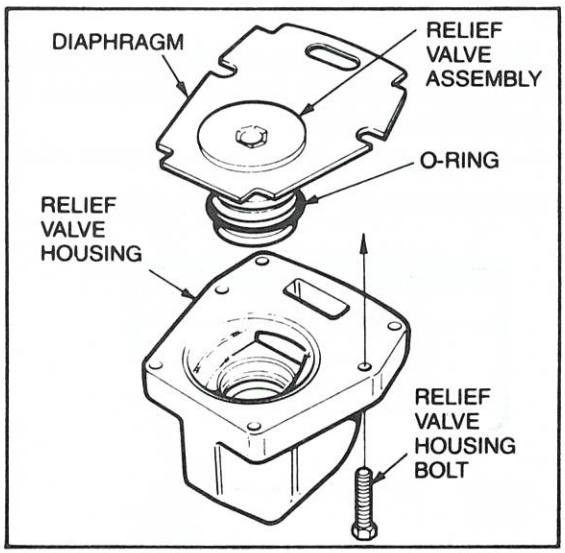


Figure 8A. RELIEF VALVE ASSEMBLY FRP-I

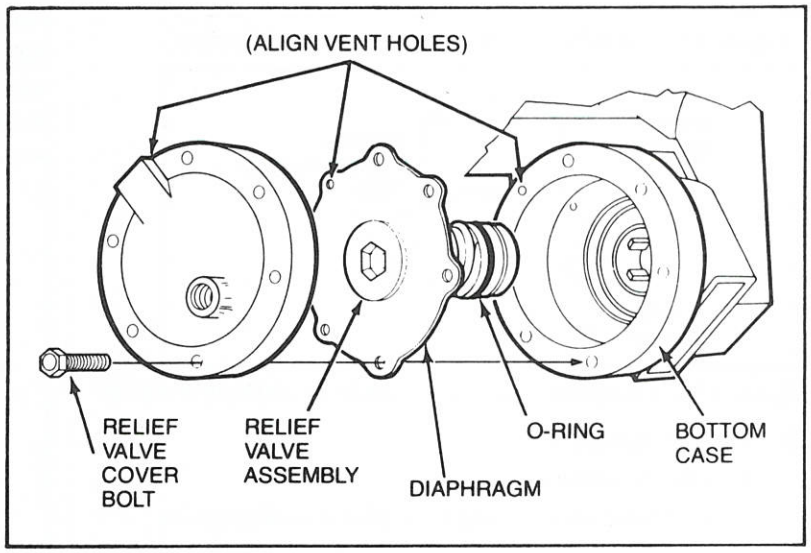


Figure 8B. RELIEF VALVE ASSEMBLY FRP-II (1-1/2" ILLUSTRATED)

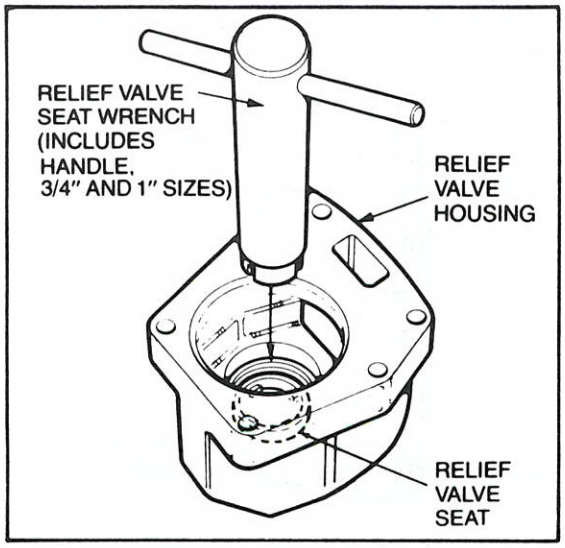


Figure 9A. RELIEF VALVE SEAT REPLACEMENT FRP-I

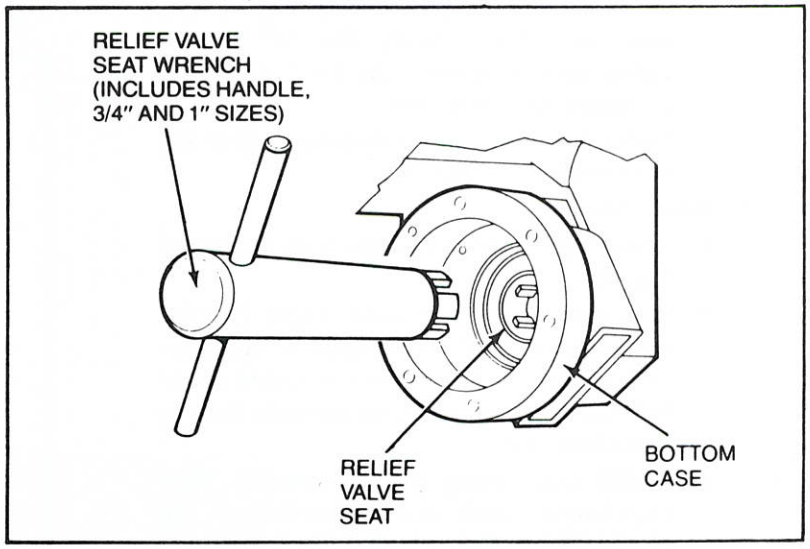


Figure 9B. RELIEF VALVE SEAT REPLACEMENT FRP-II

C. REPAIRS

Foreign matter in the supply line may cause wear or damage to components of the check and relief valve assemblies. To simplify repair procedures, complete valve assemblies, rather than individual parts, are provided at modest prices.

Kits are available for the first check, second check and relief valve assemblies, and also including all three valves. Case gaskets, o-ring seals and mounting screws (first and second valve kits) are included. See description on pages 10 and 12.

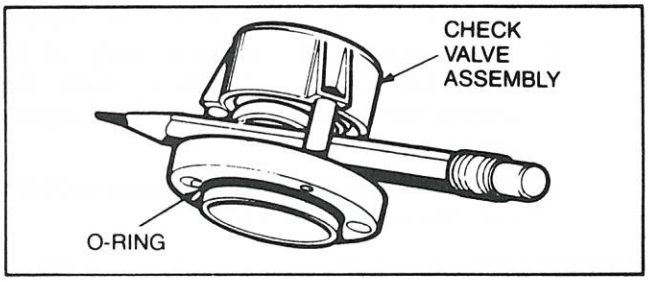


Figure 10. CLEANING 3/4" AND 1" CHECK VALVE

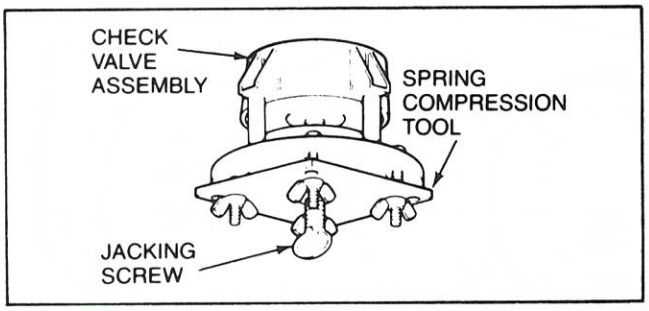


Figure 11. CLEANING 1¼", 1½" AND 2" CHECK VALVE

D. REASSEMBLY

1. Check valves
   a. Make sure o-ring is in place as shown in Figure 7.
   b. Place mounting screws in holes in check valve assembly as shown in Fig. 7, and position valve in body. The ¾" and 1" valves have 2" screws; the 1¼", 1½" and 2" valves have 4 screws.
   c. Tighten screws until resistance is felt. Do not overtighten screws.
2. Relief Valve
   a. Make sure o-ring is in place as shown in Fig. 8.
   b. If seat has been removed, apply Loctite adhesive sealant to threads of replacement seat (remove any residue from bottom case or housing threads before installing seat.)
   c. Install seat, using special wrench. Turn clockwise until resistance is felt. To avoid distortion of seat do not overtighten.

NOTE: Do not get any sealant on seating area of seat. Remove any present before installing relief valve assembly.

   d. Push relieve valve into position in housing or bottom case, seating o-ring in recess.
   e. Align diaphragm plate parallel to flange on housing or bottom case. Diaphragm holes must align with holes in flange. (See Figs. 8A and 8B.) On 1¼", 1½" and 2" sizes, the diaphragm plate extends inside the outer surface of the flange.
   f. Test relief valve operation by pushing assembly in with thumbs to compress spring. Assembly should spring back when pressure is released.
   g. Reassemble housing or cover to bottom case.

NOTE: On the FRPII, the vent holes in the cover, diaphragm and flange must be aligned. The vent hole in the cover is inside the boss opposite the test cock.

NOTE: Tighten all bolts finger-tight before using wrench. Tighten opposite bolts in sequence to avoid cocking the assembly.

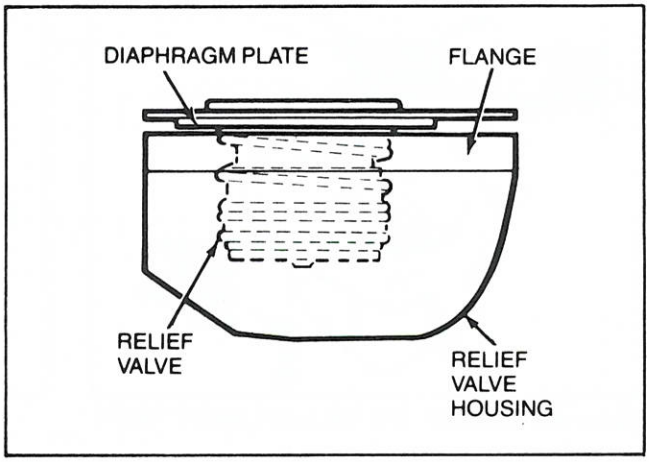


Figure 12A. REPLACING RELIEF VALVE FRP-I

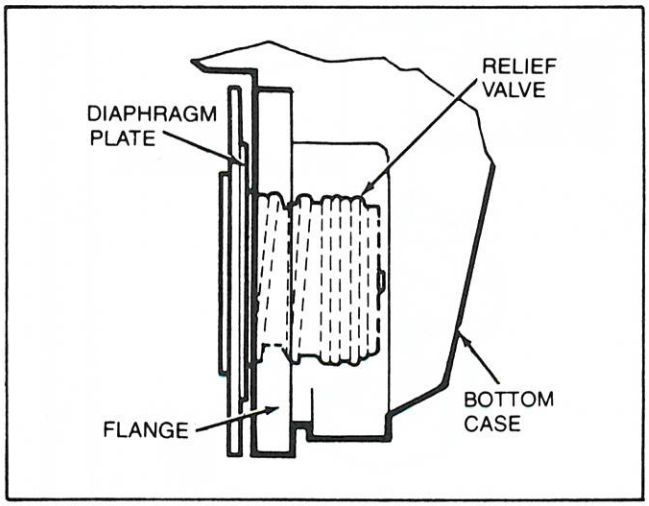


Figure 12B. REPLACING RELIEF VALVE FRP-II

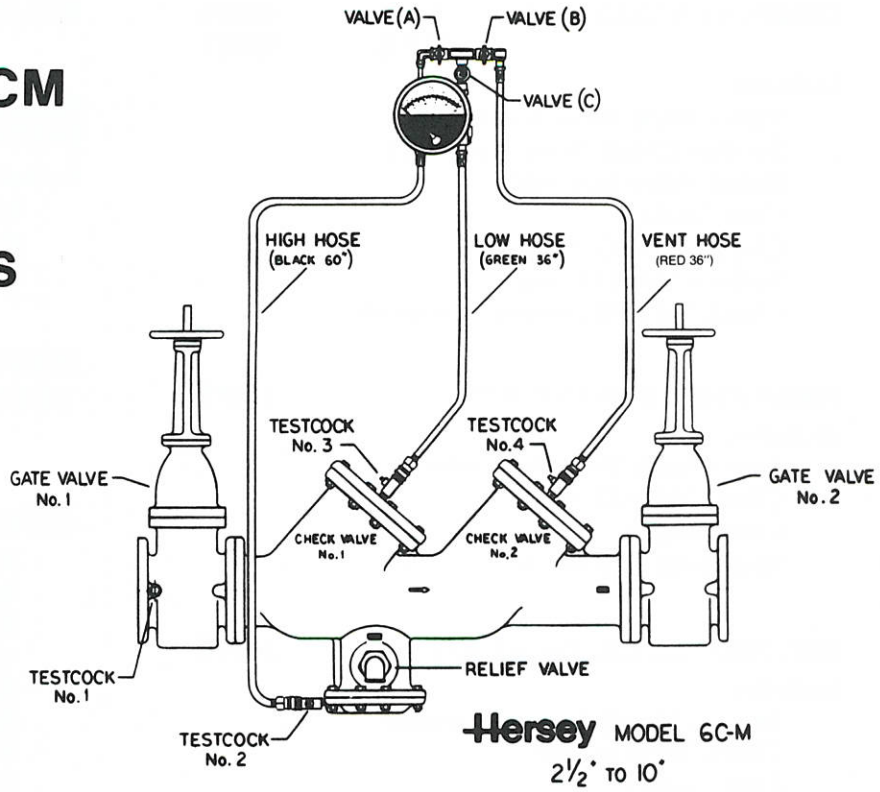
DIFFERENTIAL PRESSURE GAUGE TEST METHOD
BEECO TEST KIT PART NUMBER 98415

MODEL FRP II and 6CM

REDUCED PRESSURE BACKFLOW PREVENTERS

ASSEMBLY OF TEST KIT TO BACKFLOW PREVENTER

1. Close valves (A), (B) and (C) on test kit.
2. Connect HIGH pressure hose (black) to testcock No. 2 on the device.
3. Connect LOW pressure hose (green) to testcock No. 3.
4. Close gate valve No. 2.
5. Open testcocks No. 2 and No. 3.
6. Open vent valve (B).
7. Open high pressure (A) and low pressure (C) valves until all air is expelled.
8. Close (A), (B) and (C) valves.
9. Connect VENT hose (red) to testcock No. 4 on the device.



TEST PROCEDURES

A. To determine the static pressure drop across the first check valve. Requirement: the first check valve shall maintain a static pressure drop of at least 5 PSI.
   1. Testcocks No. 2 and No. 3 must be open.
   2. Crack open gate valve No. 2 to re-establish pressure conditions in the device.
   3. Close gate valve No. 2 and note the differential pressure on the gauge. A reading of 5-8 PSI is normal.

B. To test the second check valve for tightness against reverse flow. Requirement: the second check valve must be tight against reverse flows under all pressure differentials.
   1. Slowly open HIGH valve (A) and VENT valve (B). Keep LOW valve (C) closed.
   2. Open testcock No. 4
   3. The differential pressure reading on the gauge will drop slightly and then remain steady. If the gauge reading continues to drop (until the relief valve discharges), it indicates that the second check valve is leaking.

C. To test gate valve No. 2 for tightness. After passing Test B, continue the test by closing testcock No. 2. The indicated pressure will decrease slightly. If the pressure differential continues to decrease (approaching zero), the No. 2 gate valve is reported to be leaking.

   NOTE: If gate valve No. 2 is leaking, the Test A is invalid. An indication of leakage in Test B could be either check valve No. 1 or check valve No. 2. If no indication of leakage in Test B, then both check valves are tight.

D. To test operation of the differential pressure relief valve. Requirement: the differential press relief valve must operate to maintain the zone between the two check valves at least 2 PSI less than the supply pressure.
   1. Valves (A), (B) and (C), and testcock No. 4 must be closed. Testcocks No. 2 and No. 3 must be open.
   2. Open HIGH valve (A).
   3. Very slowly open LOW valve (C) until the differential gauge needle starts to drop. Note the pressure reading when the relief valve starts to discharge. This gauge reading must be at least 2 PSI.

   NOTE: If during test C, gate valve No. 2 is shown to be leaking, also open VENT valve (B) and testcock No. 4 during step #2 of Test D. This extra step uses supply pressure to seat check valve No. 2 and allows testing of the relief valve.

TEST CONCLUSION

1. Close all testcocks.
2. Disconnect VENT hose from testcock No. 4
3. Open valves (A), (B) and (C) to drain water pressure from the test gauge.
4. Remove hoses from testcocks No. 2 and No. 3 and drain remaining water in the gauge to prevent freezing.

FRP SECTION V — ¾" AND 1" REPLACEMENT PARTS (SEE FIGS. 14A AND 14B)

	Part No. ¾"-1"
COMPLETE VALVE KIT — FRP I	65554
FRP II	65627

Includes:
- First Check Valve Assembly
- Second Check Valve Assembly
- Relief Valve Assembly
- Case Gasket
- Check Valve O-rings (2)
- Relieve Valve O-ring
- Check Valve Mounting Screws (4)

FIRST CHECK VALVE KIT 65555

Includes:
- First Check Valve Assembly
- Check Valve O-ring
- Case Gasket
- Mounting Screws (2)

SECOND CHECK VALVE KIT 65556

Includes:
- Second Check Valve Assembly
- Check Valve o-ring
- Case Gasket
- Mounting Screws (2)

RELIEF VALVE KIT — FRP I	65557
FRP II	65628

Includes:
- Relief Valve
- O-ring Seal

RELIEF VALVE AIR GAP FITTING KIT 65639

RELIEF VALVE SEAT INSTALLATION KIT 65524

Includes:
- Relief Valve Seat
- Relief Valve Seat Wrench
- Relieve Valve Adhesive/Sealant

DIFFERENTIAL PRESSURE GAUGE TEST KIT 98415

OTHER PARTS:

Relief valve cover-FRP II	65624
Relief valve housing w/seat Ring-FRP I	N/A
Top case	65531
Bottom case-FRP II ¾"	65623
Bottom case-FRP II 1"	65622
Bottom case-FRP I	N/A
Case bolts -FRP I	90026 (12)
Case bolts-FRP II	90026 (12)
Test cocks	96339 (3)
Check valve mounting screws	98116 (4)
Case gasket	65534

(Figures in parentheses after part number indicate number of parts required, if more than one.)

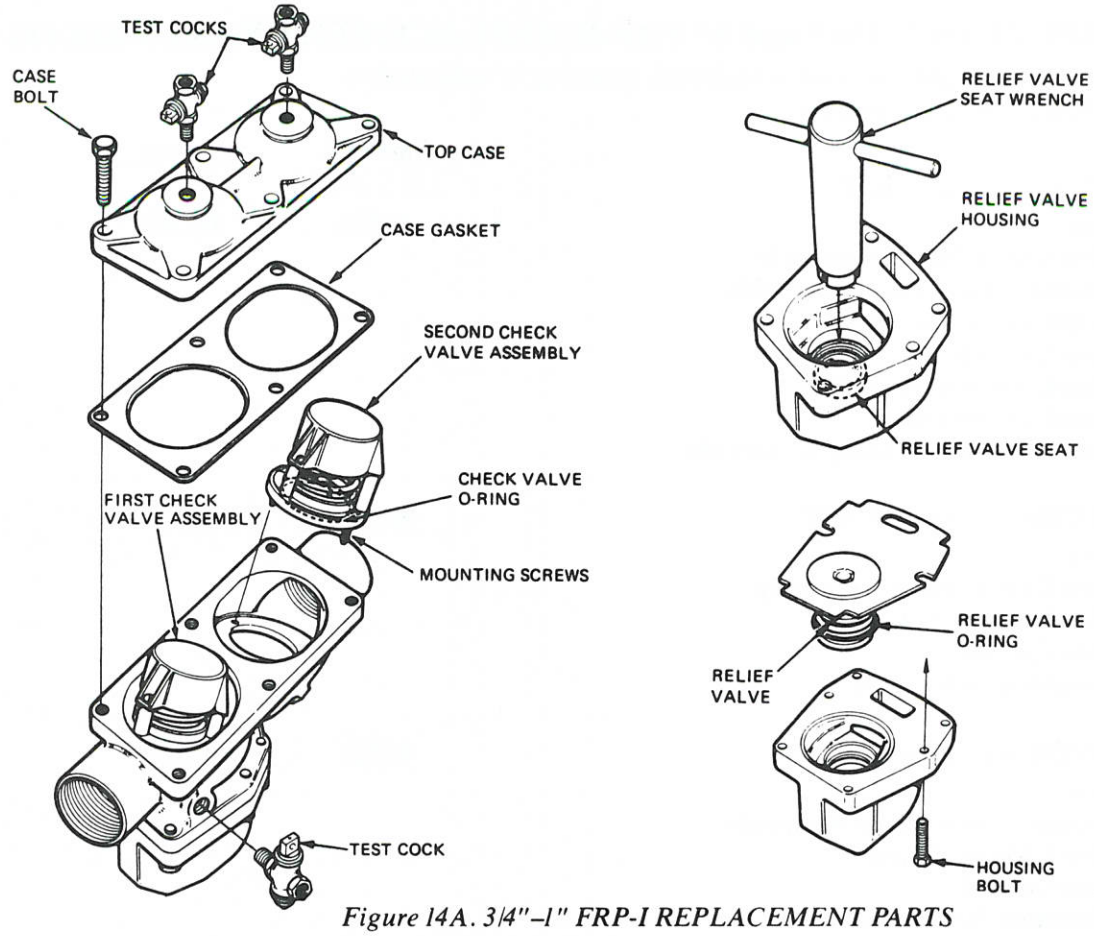


Figure 14A. 3/4"–1" FRP-I REPLACEMENT PARTS

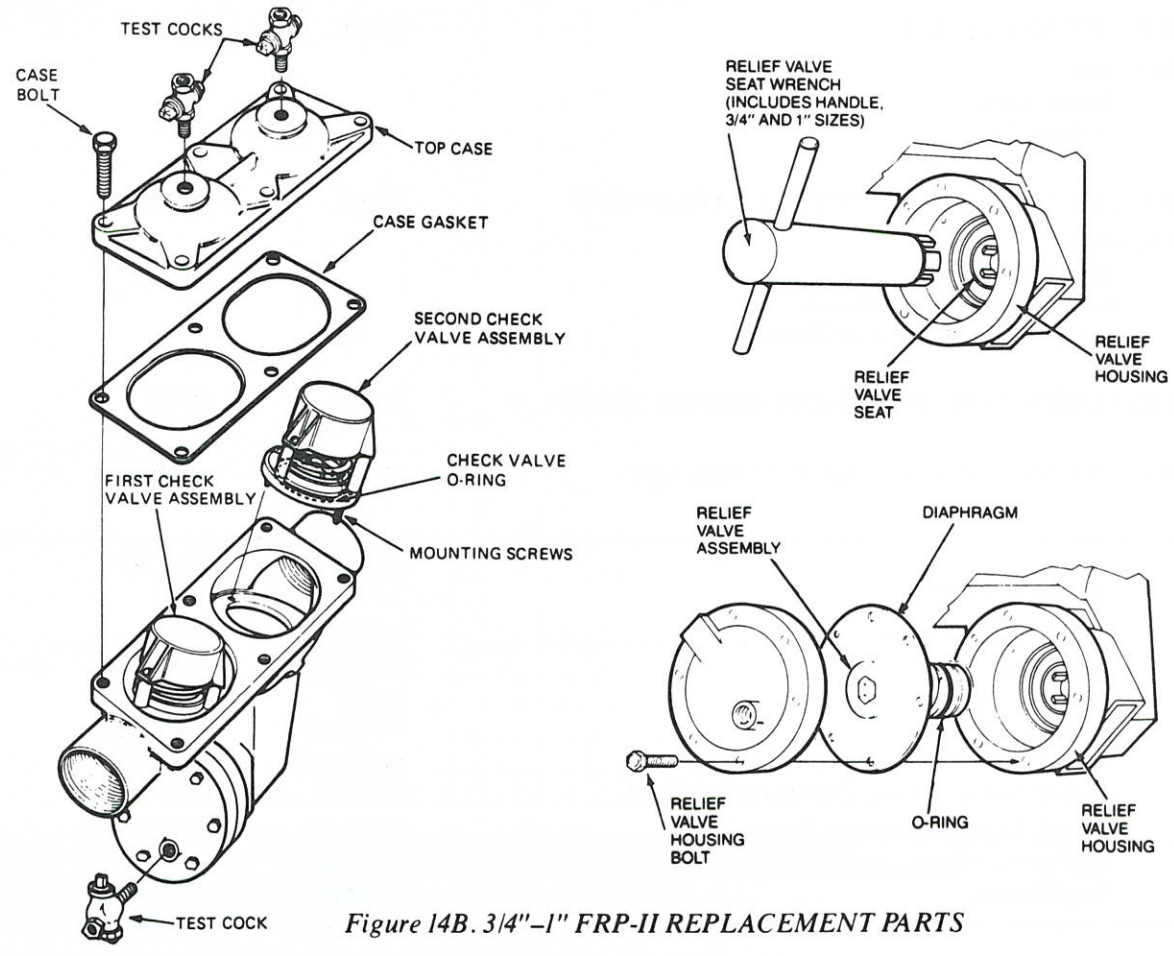


Figure 14B. 3/4"–1" FRP-II REPLACEMENT PARTS

FRP SECTION VI-1¼", 1½" and 2" FRP-II REPLACEMENT PARTS (SEE FIG. 15)

If more than one part per unit is required, quantity is indicated in parentheses after part number.

	Part No. 1¼", 1½"	Part No. 2"
COMPLETE VALVE KIT	65525	65543
Includes:		
First Check Valve Assembly		
Second Check Valve Assembly		
Relief Valve Assembly		
Case Gaskets (2)		
Check Valve O-rings (2)		
Relief Valve O-ring		
Check Valve Mounting Screws (8)		
FIRST CHECK VALVE KIT	65526	65544
Includes:		
First Check Valve Assembly		
Check Valve O-ring		
Case Gasket		
Mounting Screws (4)		
SECOND CHECK VALVE KIT	65527	65545
Includes:		
Second Check Valve Assembly		
Check Valve O-ring		
Case Gasket		
Mounting Screws (4)		
RELIEF VALVE KIT	65546	65546
Includes:		
Relief Valve		
O-Ring Seal		
RELIEF VALVE SEAT INSTALLATION KIT	65548	65548
Includes:		
Relief Valve Seat		
Relief Valve Seat Wrench		
Relief Valve Adhesive/Sealant		
DIFFERENTIAL PRESSURE GAUGE TEST KIT	**98415**	**98415**
RELIEF VALVE AIR GAP FITTING KIT	65640	65640

OTHER PARTS	Part No. 1¼", 1½"	Part No. 2"
Relief Valve Cover	65632	65632
Top Case	65560(2)	65578(2)
Bottom Case	65631	65636
Case Bolts	90028(18)	90028(22)
Test Cocks	**96339(3)**	**96339(3)**
Check Valve Spring Compression Tool	65572	65572
Check Valve Mounting Screws	98174(8)	98174(8)
1½" x 1¼" Reducing Bushing (1¼" only)	67016(2)	————
Case Gasket	65568(2)	65595(2)

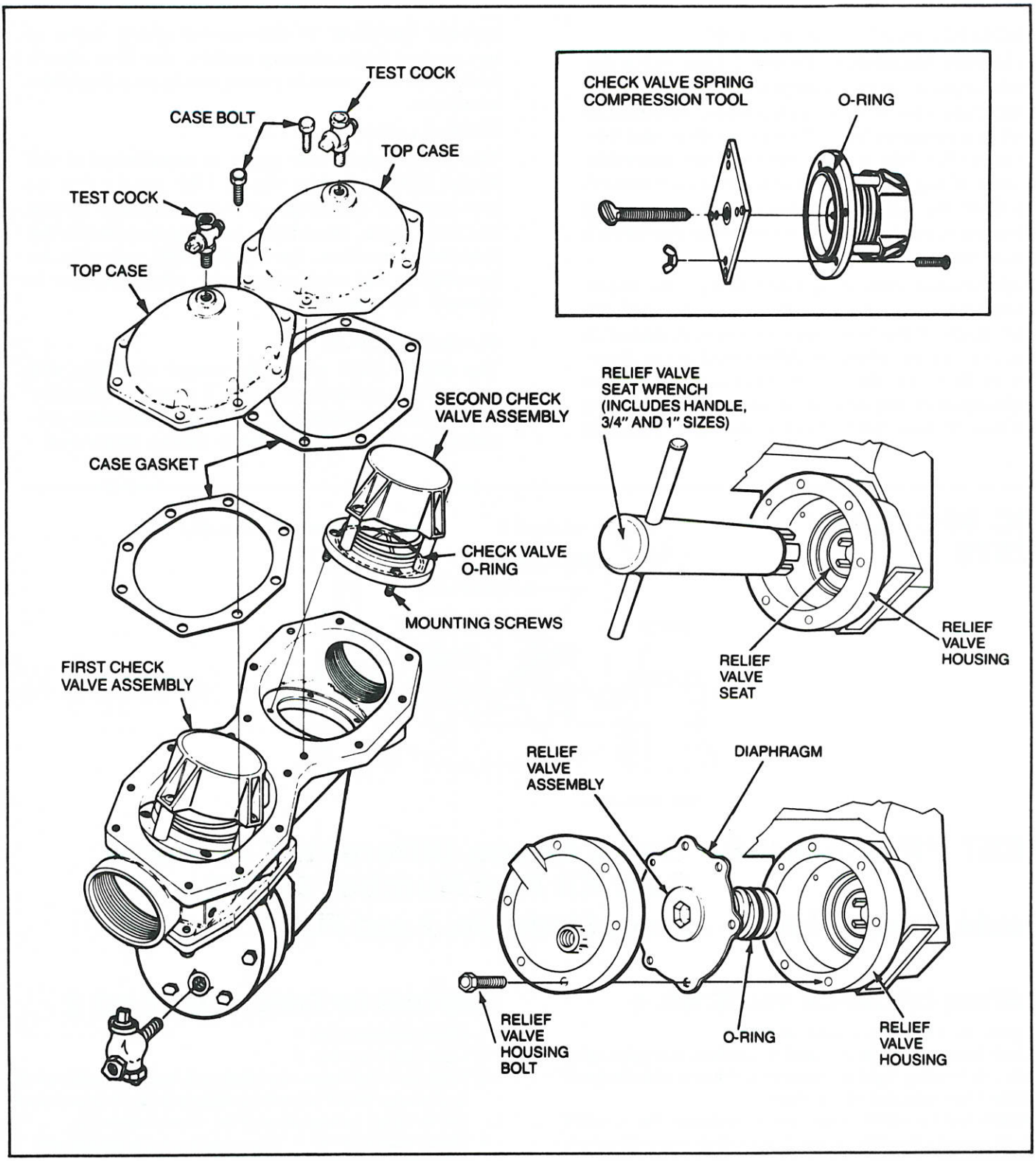


Figure 15. 1¼", 1½" AND 2" FRP II REPLACEMENT PARTS

FDC-SECTION I — Description, Operation and Installation-Model FDC Double Check Valve Assemblies

DESCRIPTION AND OPERATION

The Hersey Model FDC Double Check Valve Assembly consists of two independent spring-loaded poppet-type check valve assemblies, mounted in series in a common body. Two gate valves and four test cocks for field testing complete the assembly. For ease of repair, the valve assemblies are removable from the top of the device, making possible in-line maintenance without removing the device from its setting.

Under normal operating conditions, the check valves remain closed until there is a demand for water. Each of the two check valves is designed to open at a one psi pressure differential in the direction of flow. In the event pressure increases downstream of the device, tending to reverse the direction of flow, both check valves are closed to prevent backflow. If the second check valve is prevented from closing tightly, the first check valve will still provide protection from a backflow condition.

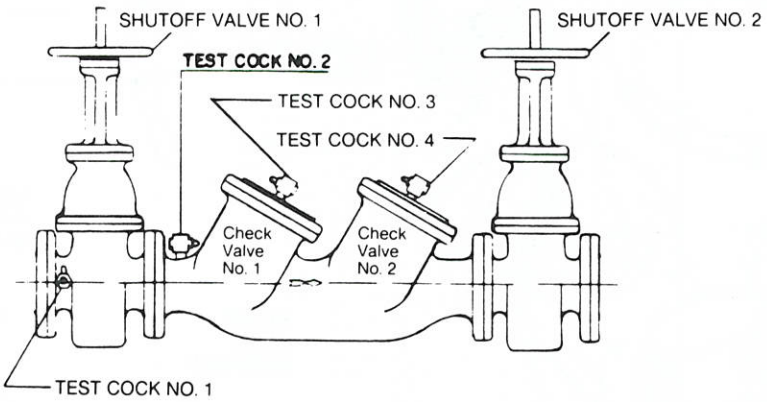
INSTALLATION

The same instructions apply to installation of the Model FDC as for the Model FRP, except that no provision for discharge of water from the device has to be made. In addition to being installed in the horizontal position, the Model FDC may also be installed in the vertical position when the flow is upward. See pages 3–5.

MAINTENANCE

The Model FDC should be tested annually, and valves replaced at least every 5 years. For further details, refer to cleaning, repair and assembly procedures for Model FRP check valves, pages 6–8.

FDC SECTION II TESTS



TEST PROCEDURE - Using Beeco Differential Pressure Test Kit Part Number 98415

Double Check Valves - Hersey Model No. 2 and FDC*

TESTING OF CHECK VALVE NO. 1

1. Close No. 1 and No. 2 gate valves.
2. Open testcocks Nos. 2, 3 and 4. Confirm that gate valve No. 1 is holding tight by observing that the discharge of water from testcock No. 2 stops.
3. Attach test kit VENT hose (red) to testcock No. 1, LOW hose (green) to testcock No. 2, and HIGH hose (black) to testcock No. 3. Open valves (A) and (B). Close valve (C).
4. Close testcock No. 4
5. Open testcock No. 1. The needle on the gauge will indicate a pressure in excess of 15 PSI.
6. Slowly open valve (C) until the gauge reads approximately 10 PSI. Close valve (C). The gauge reading will not change if check valve No 1 is holding tight. If No. 1 check valve is leaking the gauge reading, will drop to 0.

TESTING OF CHECK VALVE NO. 2

1. Close testcock No. 1.
2. Open testcock No. 4.
3. Change LOW hose from testcock No. 2 to testcock No. 3. Change HIGH hose from testcock No. 3 to testcock No. 4. Open valves (A) and (B). Close valve (C).
4. Open testcock No. 1. The needle on the gauge will indicate a pressure in excess of 15 PSI.
5. Slowly open valve (C) until the gauge reads approximately 10 PSI. Close valve (C). The gauge reading will not change if check valve No. 2 is holding tight. If check valve No. 2 is leaking, the gauge will drop to 0.

   NOTE: Minor leakage in gate valve No. 2 will not affect the test results of check valve No. 2. However, a leaking gate valve No. 1 will cause a good check valve No. 1 to fail the test.

*The same test method is used for testing the Hersey/BEECO Model HDC.

TEST PROCEDURES — HERSEY NO. 2 DOUBLE CHECK VALVE ASSEMBLY ALTERNATIVE TWO-GAUGE METHOD

(SEE FIGURE 16)

QTY. DESCRIPTION

2 - Pressure gauges, of good quality - 2" dial or larger, 0-150 psi range.
3 - 6-ft. lengths rubber hose with ¼" watertight screw couplings. (¼" i.d. welding hose is suggested).
2 - ¼" level handle brass gauge cocks, double female.
2 - ¼" standard brass tees
2 - ¼" brass close nipples
6 - ¼" I.P. thread to welding hose thread brass couplings (sometimes called regulator outfit fittings).
⅜" plywood board for mounting gauges.

TEST NO. 1

Purpose:
To test No. 1 check valve for tightness against reverse flow.

Requirement:
Valve must be tight against reverse flow under all pressure differentials.

Steps.

1. Close shutoff valve No. 2.
2. Install pressure gauges and control cocks (closed) at test cocks No. 2 and No. 3.
3. Open test cocks No. 2 and 3. Close No. 1 shutoff valve.
4. Drain *slowly* from control cock at test cock No. 2 until gauge at test cock No. 2 reads 1 psi less than gauge at test cock No. 3. Close control cock. If both gauges hold the established differential pressure for at least one minute, the check shall be noted in the report as "Closed Tight".

   If the check valve leaks, both gauges will drop simultaneously while water is being drained from control cock at test cock No. 2 in the attempt to establish the one-pound differential. Confirm by the following procedure:

   a. Open shutoff valve No. 1 and re-establish pressure in the device.
   b. Install bypass hose between No. 1 and No. 3 test cocks, thus feeding line pressure downstream of check valve.
   c. Close shutoff valve No. 1 Drain slowly from control cock at test cock No. 2 until gauge at test cock No. 2 reads 1 psi less than gauge at test cock No. 3. If water runs continuously from control cock, the check shall be noted as "Leaked".

TEST NO. 2

Purpose:
To test No. 2 check valve for tightness against reverse flow.

Requirement:
Valve must be tight against reverse flow under all pressure differentials.

Steps:

1. Open No. 1 shutoff valve and re-establish pressure in the device.
2. Install pressure gauges and control cocks at test cocks No. 3 and No. 4.
3. Open test cocks No. 3 and No. 4.
   Close No. 1 shutoff valve.
4. Drain *slowly* from control cock at test cock No. 3 until gauge at test cock No. 3 reads 1 psi less than gauge at test cock No. 4. Close control cock. If both gauges hold the established differential for at least one minute, the check shall be noted as "Closed Tight." If the check valve leaks, both gauges will drop simultaneously while water is being drained from control cock at test cock No. 3 in the attempt to establish the one-pound differential. Confirm by the following procedure:

   a. Open No. 1 shutoff valve and re-establish pressure in the device.
   b. Install bypass hose between No. 1 and No. 4 test cocks, thus feeding line pressure downstream of check valve.
   c. Close No. 1 shutoff valve. Drain slowly from control cock at test cock No. 3 until gauge at test cock No. 3 reads 1 psi less than gauge at test cock No. 4. If water runs continuously from control cock, the check shall be noted as "Leaked".
   d. Remove all equipment and return shut-off valves to original setting.

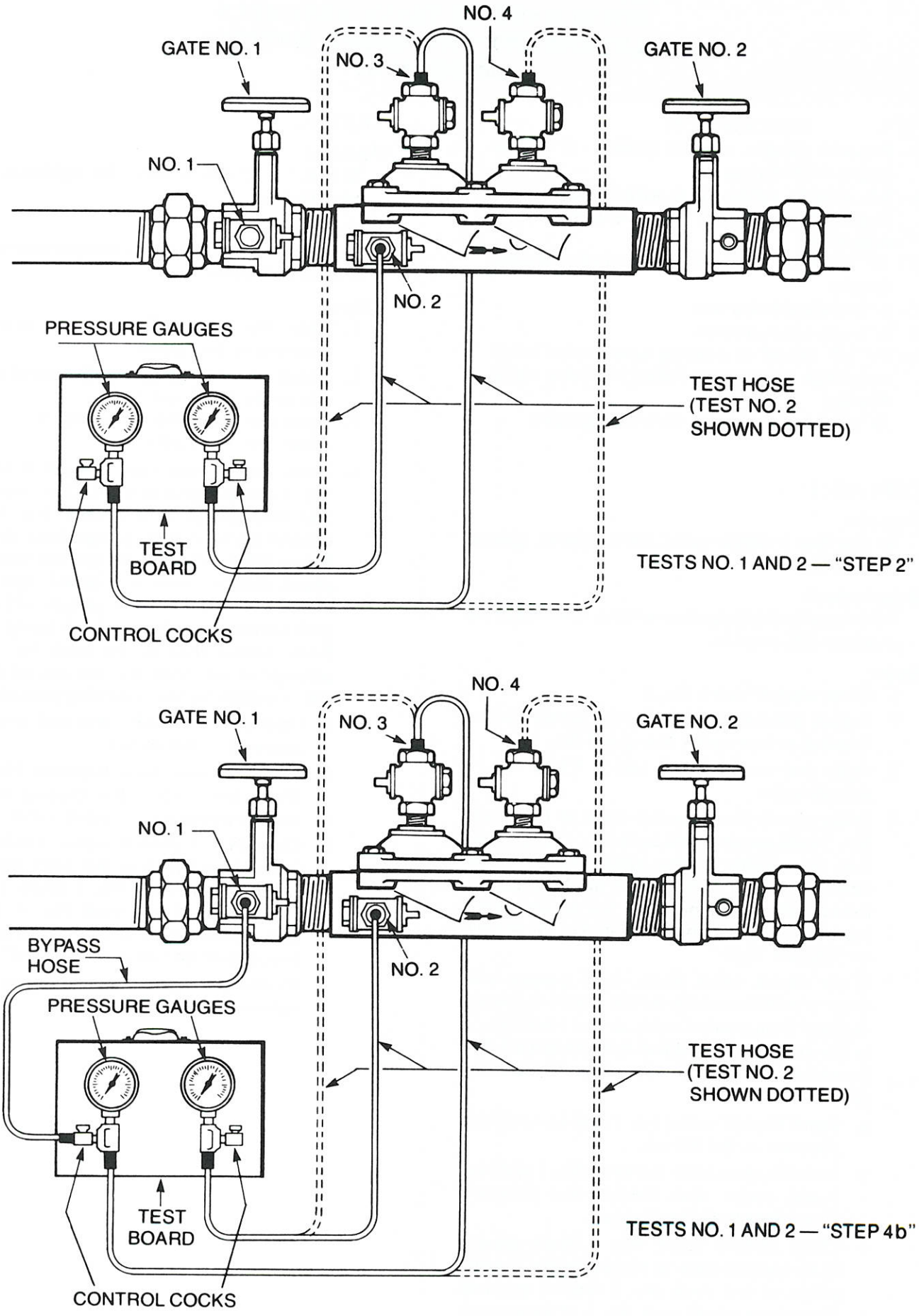


Figure 16. PRESSURE GAUGES INSTALLED ON FDC DOUBLE CHECK VALVE ASSEMBLY