"Apollo®

INSTALLATION, OPERATION & MAINTENANCE MANUAL

Double Check Valve (DC) Backflow Preventers 2-1/2" - 10"

Double Check Valve Detector Assembly (DCDA) Backflow Preventers 2-1/2" - 10"

ES1595 IOM BFMM4S00 rev.a

INSTALLATION, OPERATION & MAINTENANCE MANUAL

I. DESCRIPTION AND OPERATION

The Double Check Valve (DC) device consists of two independently acting, spring loaded check valves. Two resilient seated shut-off valves and four test cocks complete the assembly.

Each check is designed to maintain a minimum of 1 psi across the valve during normal operation. If at any time the pressure downstream of the device increases above the supply pressure, both check valves will close to prevent any backflow from occurring.

The various styles and sizes of Double Check Valves are illustrated in figures 1 and 2.

II. INSTALLATION

1. The DCV must be installed in an accessible location to facilitate periodic field testing and maintenance.
2. Flush all upstream piping thoroughly to remove foreign matter prior to installing the device.
3. After installing the assembly and with downstream or #2 shut-off valve closed, pressurize the device and bleed air through test cock #4. Then open #2 shut-off valve.

FIGURE 1
2-1/2" - 6"
NO FLOW CONDITION

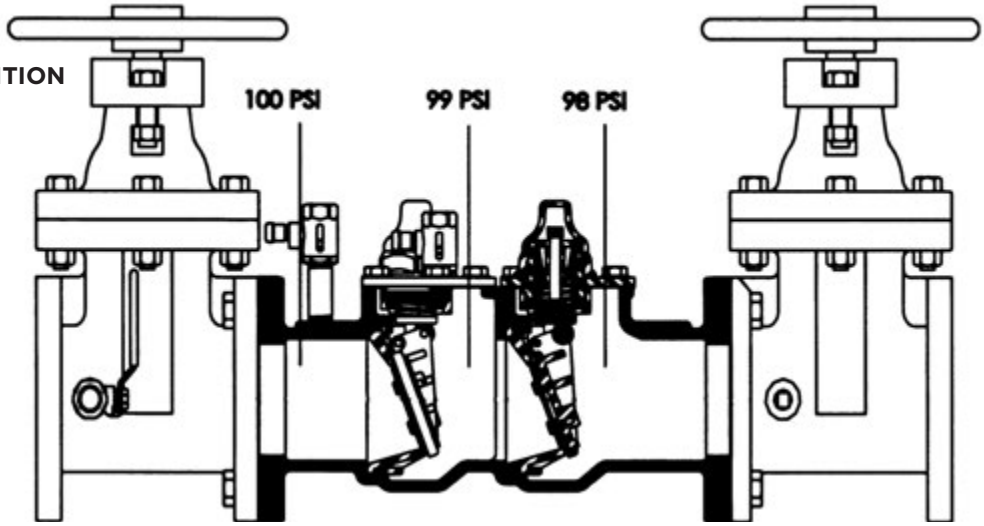
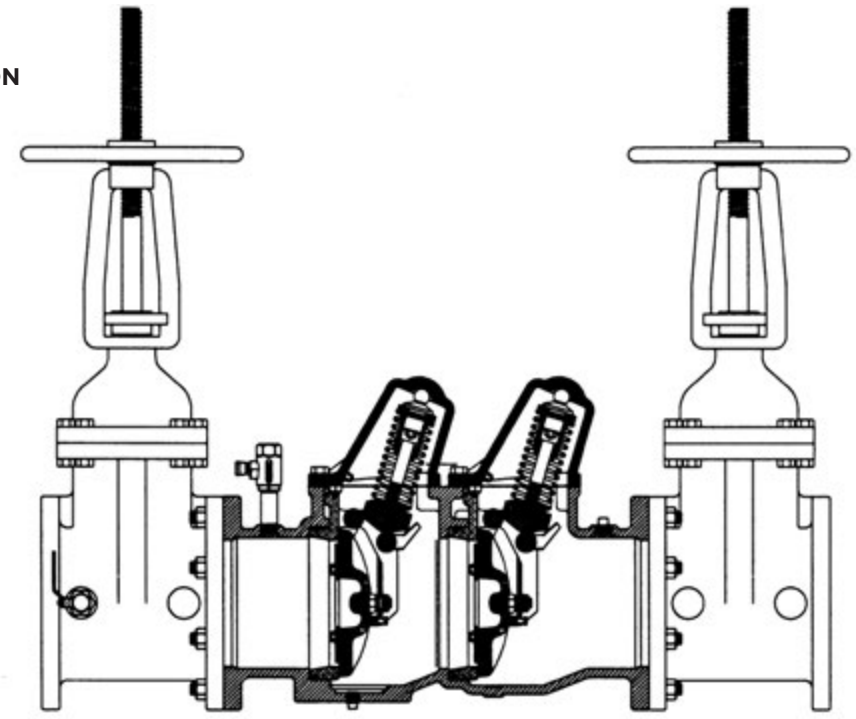


FIGURE 1
8" & 10"
NO FLOW CONDITION



III. TROUBLESHOOTING

SYMPTOM	CAUSE	CORRECTIVE ACTION
Check valve fails to hold 1 psid.	Shut-off valve not closed completely. Check valve fouled with debris.	Close #2 shut-off valve or inspect for possible through leakage. Inspect and clean seat disc and seat.

IV. MAINTENANCE INSTRUCTIONS - 2-1/2" - 6" DC

A. DISASSEMBLY – CHECK VALVES

1. Close #2 shut-off valve, then close #1 shut-off valve.
2. Bleed pressure from the assembly by opening #2, #3, and #4 test cocks.
3. Unscrew black plastic cap. Remove cover bolts, cover and gasket. Pry check assembly toward outlet to loosen check from its o-ring bore.
4. Remove complete check assembly from body.
5. Unscrew and remove spring assembly from seat housing by placing a wrench on the flats provided. DO NOT REMOVE THE SOCKET HEAD BOLT. Tension will be released from the check at this point.

WARNING: The check valve spring is held in compression by the retainer bolt. This assembly should not be disassembled as serious injury could occur. The spring assembly is sold as a pre-loaded unit.

6. To remove the seat disc, remove the seat disc retaining screws and the disc retaining plate. Remove seat disc.

B. INSPECTION

1. All parts should be carefully inspected for any damage or excessive wear and thoroughly rinsed in clean water prior to reassembly. Replace worn parts as necessary.

C. ASSEMBLY – CHECK VALVES

1. Install seat disc in seat disc retainer and secure with disc retaining plate and disc retaining screws.

NOTE: Due to the symmetry of the seat disc, the old disc may be turned over to obtain an effective seal.

2. Install the spring assembly into the seat housing, making sure spring assembly is tight.
3. Install check assembly into body and push tight into place (toward inlet). To aid installation, liberally apply a non-toxic grease to o-ring surface. A pry-bar may be needed to aid in seating check assembly into o-ring bore. The test cock immediately upstream must be open to release the air in the chamber.
4. Replace gasket, cover plate and cover bolts. Tighten bolts evenly. Replace spring cap. Do not overtighten! Cap needs only to be snug.

V. MAINTENANCE INSTRUCTIONS - 8" & 10" DC

A. DISASSEMBLY – CHECK VALVES

1. Close #2 shut-off valve, then close #1 shut-off valve.
2. Bleed pressure from the assembly by opening #2, #3, and #4 test cocks.
3. Remove cover bolts, cover, spring assembly, and gasket. Pry check assembly toward outlet to loosen check from its o-ring bore.
4. Remove check assembly from body.
5. To remove the seat disc, remove the seat disc retaining screws and disc retaining plate. Remove seat disc.

WARNING: Do not disassemble the spring assembly as serious injury may occur. The spring assembly is sold as a pre-loaded unit.

6. All parts should be carefully inspected for damage or excessive wear and thoroughly rinsed in clean water prior to reassembly.
7. Replace worn parts as necessary.

B. ASSEMBLY – CHECK VALVES

1. Install seat disc in seat disc retainer and secure with disc retaining plate and disc retaining screws. Due to the symmetry of the disc, the old disc may be turned over to obtain an effective seal.
2. Install check assembly into body and push tight into place (toward inlet). To aid installation, liberally apply a non-toxic grease to o-ring surface. A pry-bar will be needed to aid in seating check assembly into the o-ring bore. The testcock immediately upstream must be open to release the air in the chamber.
3. Ensure that cam positioner is flipped down on swingarm of check assembly. Replace spring assembly, gasket, and cover, making sure to place cam end of spring assembly on both cam rollers of the check assembly. The cover places approximately 1/4" of preload on the spring assembly. Replace cover bolts and tighten.

VI. TESTING PROCEDURES

NOTE: It is important that the DCV device be tested periodically in compliance with local codes, but at least once a year or more, as service conditions warrant.

METHOD 1

NOTE: Test set-up is illustrated in Figure 3.

Equipment Required: Differential Pressure Test Kit 40-200-TKU

NOTE: All connections must be free from leaks in order to achieve accurate readings during testing.

TEST NO. 1:
PURPOSE: TO TEST CHECK VALVE #1 FOR TIGHTNESS AGAINST REVERSE FLOW.

REQUIREMENT:
The valve shall permit no through leakage in a direction reverse normal flow under all conditions of a pressure differential.

PROCEDURE:
1. Bleed water through all four test cocks to flush any foreign material.
2. Connect the "high" side hose to test cock #2. Connect the "low" side hose to test cock #3.
3. Open test cocks #2 and #3. Bleed both hoses, making sure to bleed the "low" side last.
4. Close #2 shut-off valve, then close #1 shut-off valve.
5. Slowly open by-pass valve #1 and lower the pressure at test cock #2 approximately 2 psi below the pressure at test cock #3.

Note: Due to check valve disc compression, both "high" and "low" side gauges may drop at the same rate approximately 10-15 psi or more. After the check valve disc compresses fully the required "high" side pressure of 2 psi below the "low" side should be obtainable. If this pressure differential can be maintained then check valve #1 is reported as "tight" or "okay". Proceed to test no. 2. However if this pressure cannot be maintained proceed to step no. 6.

6. Open #1 shut-off valve to repressurize the device.
7. Loosely attach the vent hose to test cock #1. Bleed all air from the gauge and vent hose by opening bypass valve #2. Close bypass valve #2, tighten vent hose. Open test cock #1.
8. Close #1 shut-off valve.
9. Loosen the "low" side hose at test cock #3 and lower the pressure in the assembly approximately 10 psi. Retighten hose.
10. Simultaneously open by-pass valves #1 and #2 very slowly. If the check valve is holding tight the "high" side gauge will begin to drop while the "low" side gauge will rise. Close both by-pass valves. If a small (no more than 5 psi) pressure differential is created and held, then the check valve is reported as "tight" or "okay". If a pressure differential cannot be maintained the check valve is reported as leaking.

TEST NO. 2:

PURPOSE: TO TEST CHECK VALVE #2 FOR TIGHTNESS AGAINST REVERSE FLOW.

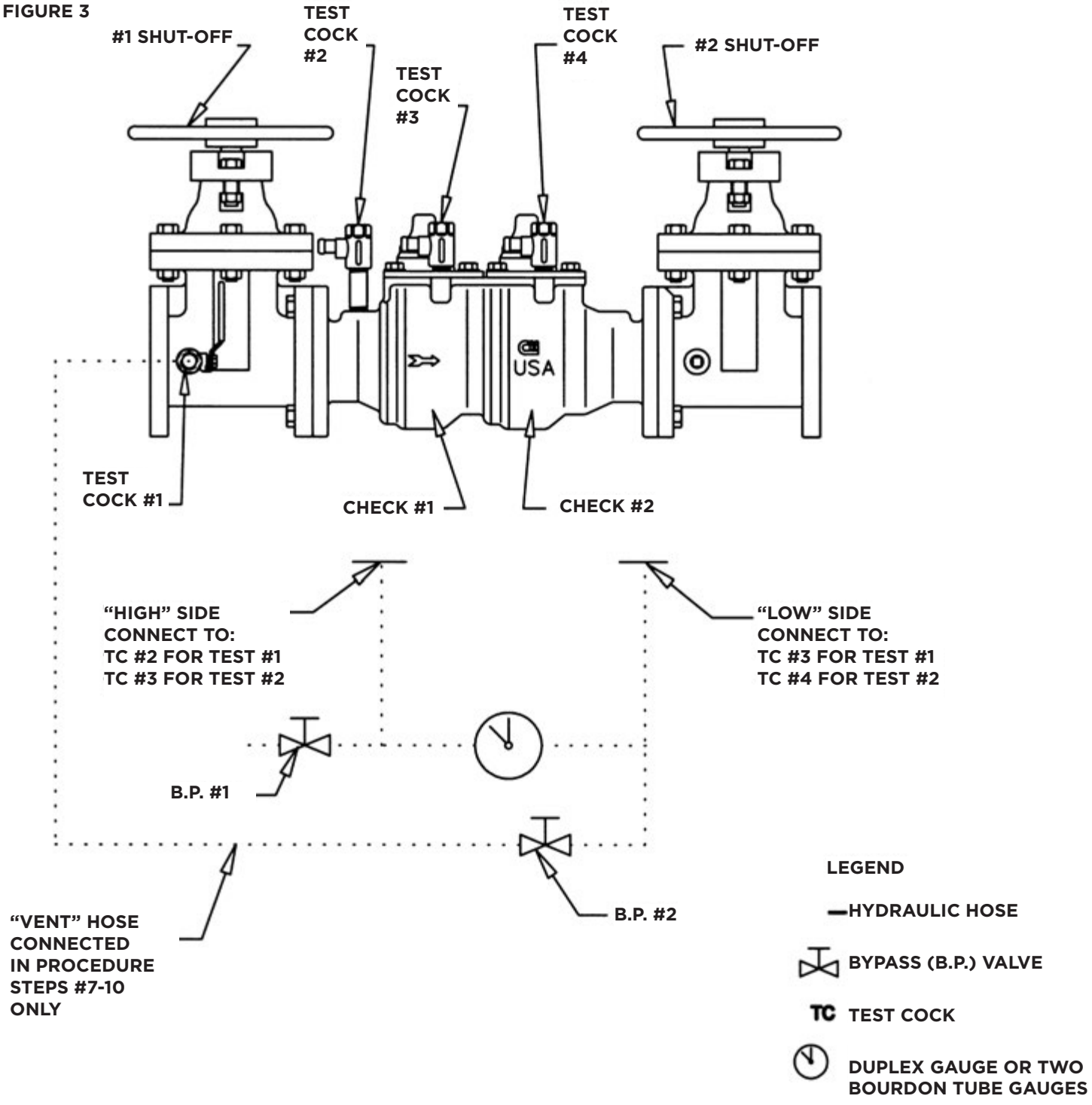
REQUIREMENT:
The valve shall permit no through leakage in a direction reverse to normal flow under all conditions of a pressure differential.

PROCEDURE:
1. Same as test #1 except the "high" side hose is connected to test cock #3 and the "low" side connected to test cock #4.

RESTORE OPERATION:
1. Close all test cocks. Remove testing equipment. Open shut-off valves #1 and #2.

VI. TESTING PROCEDURES

FIGURE 3



VI. TESTING PROCEDURES

METHOD 2

NOTE: Test set-up is illustrated in Figure 4.

Equipment Required: Differential Pressure Test Kits 40-200-TKU or 40-200 TK5U.

NOTE: For all testing, the gauge and open ends of hoses not being used must be held at the same level as the assembly being tested.

TEST NO. 1:
PURPOSE: TO DETERMINE THE STATIC PRESSURE DROP ACROSS CHECK VALVE NO. 1.

REQUIREMENT:
The static pressure drop across check valve No.1 shall be at least 1 psid.

PROCEDURE:
1. To eliminate foreign material, flush all four test cocks, one at a time.
2. Open test valves No.1 and No.2 on the gauge and close test valve No.3. Attach "high" side hose to test cock No.2.
3. Bleed all air from hose and gauge by slowly opening test cock No.2. Then slowly close test valve No.2.
4. Close the outlet shut-off valve. Then close the inlet shut-off valve.
5. Slowly open test cock No.3. After the gauge reading stabilizes and water stops running out of test cock No.3, the static pressure drop across the check valve is indicated by the gauge and is recorded as such.

NOTE: If water continues to discharge from test cock No.3 then a leaky shut-off valve is evident and should be repaired or by-passed before testing continues. If the water recedes from the test cock opening then move the gauge to a point level with the centerline of the check seat area and record the gauge reading as the static pressure differential across check No.1.

TEST NO. 2
PURPOSE: TO DETERMINE THE STATIC PRESSURE DROP ACROSS CHECK VALVE NO.2.

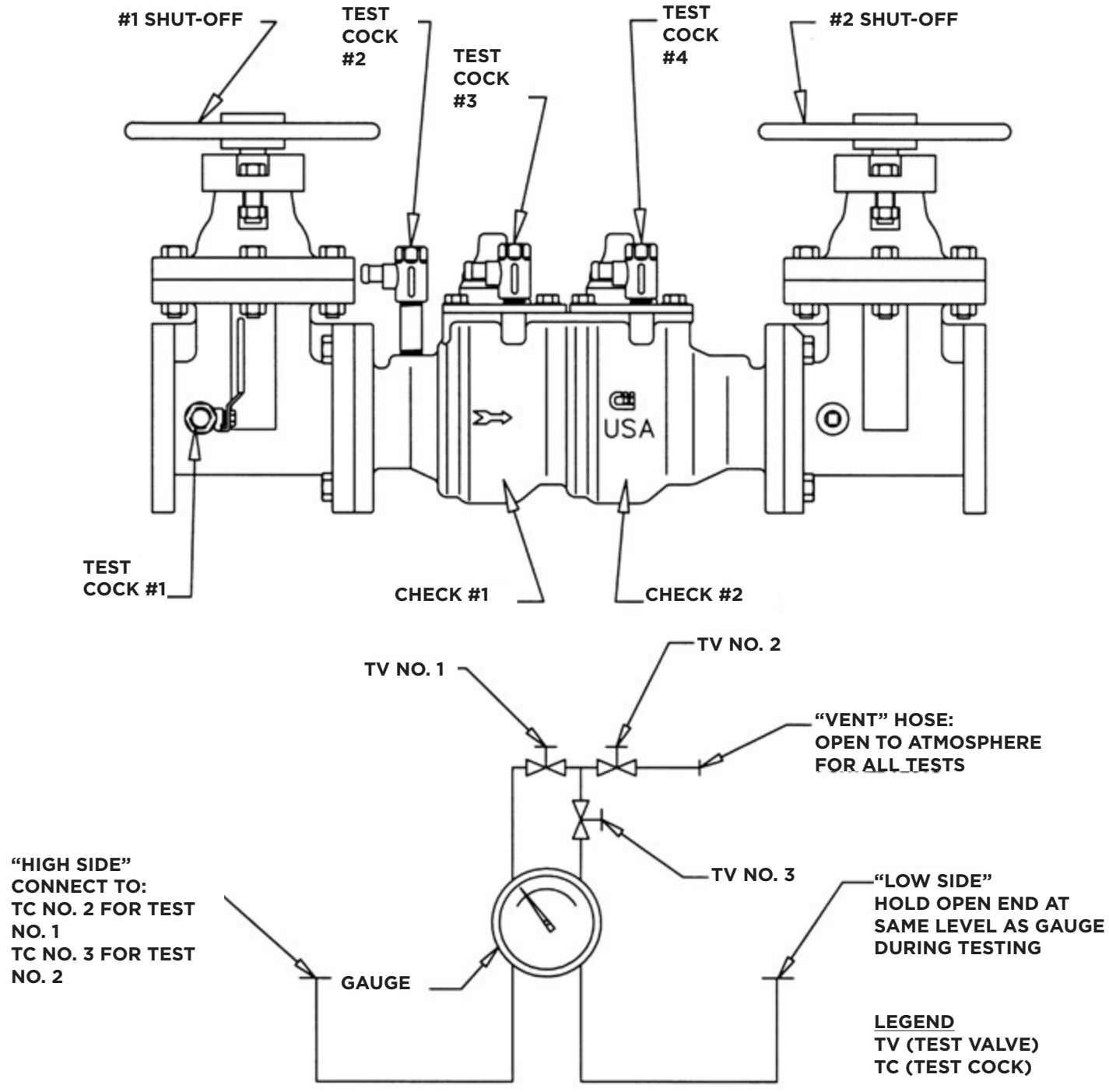
REQUIREMENT:
The static pressure drop across check valve No.2 shall be at least 1 psid.

PROCEDURE:
1. Open test valves No.1 and No.2 on the gauge and close test valve No.3. Attach "high" side hose to test cock No.3.
2. Bleed all air from hose and gauge by slowly opening test cock No.3. Then slowly close test valve No.2.
3. Close the outlet shut-off valve. Then close the inlet shut-off valve.
4. Slowly open test cock No.4. After the gauge reading stabilizes and water stops running out of test cock No.4, the static pressure drop across the check valve is indicated by the gauge and is recorded as such.

NOTE: If water continues to discharge from test cock No.4 then a leaky shut-off valve is evident and should be repaired or by-passed before testing continues. If the water recedes from the test cock opening then move the gauge to a point level with the centerline of the check seat area and record the gauge reading as the static pressure differential across check No.2.

VI. TESTING PROCEDURES

FIGURE 4



I. DESCRIPTION AND OPERATION

The Double Check Detector Assembly (DCDA) consists of a mainline DC incorporating two spring loaded check valves and a by-pass assembly consisting of an approved DCV assembly and a water meter. Each device is equipped with test cocks for periodic field testing and is normally supplied with inlet and outlet shut-off valves. NOTE: UL and FM installations must include indicating type shut-off valves.

During no flow conditions, the mainline and by-pass check valves will remain closed. If there is a low flow demand (up to a minimum of 3 gpm) of water downstream, the flow is routed through the water meter to monitor such consumption. If the downstream pressure increases above the supply pressure or there is a reduction in the inlet pressure, the mainline and by-pass check valves will close to prevent backflow.

II. INSTALLATION

1. The DCDA must be installed in an accessible location to facilitate periodic field testing and maintenance.
2. Flush all upstream piping thoroughly to remove foreign matter prior to installing the device.
3. After installing the assembly and with downstream or #2 shut-off valve closed, pressurize the device and bleed air through test cock #4. Then open #2 shut-off valve.

OTHER INSTALLATION TIPS:

- Installing this device in a pit requires consideration for future maintenance and repair. Along with necessary clearances, there must be adequate drainage within the pit to deter potential accumulation of standing water. Also, check with local codes and/or inspectors prior to making such installations.
- Do not install in areas subject to freezing.
- Install a line strainer upstream of the device to prevent check valve fouling.
- As in any piping system, provisions should be made to minimize water hammer and pressure rise due to thermal expansion, as these conditions can create damaging and dangerously high internal pressures.

III. MAINTENANCE INSTRUCTIONS

MAINLINE: REFER TO PAGE 3 OF THIS MANUAL

BYPASS DC

DISASSEMBLY:

1. Close by-pass inlet and outlet shut-off valves (Figure 5).
2. Bleed pressure from the by-pass assembly by opening test cock No. 2,3, and 4.
3. Unscrew and remove bronze cap.
4. Remove stainless steel spacer using lifting tab.
5. Remove first check module by pulling outward with fingers (A small screwdriver may aid removal). Be sure test cock No.2 is open so as to prevent hydraulic lock. Generally, the first check o-ring will remain in the bore.
6. Remove second check assembly by sliding the assembly out of its bore (A small flat screwdriver placed in the groove provided will aid removal). Be sure test cock No.4 is open so as to prevent hydraulic lock.

INSPECTION:

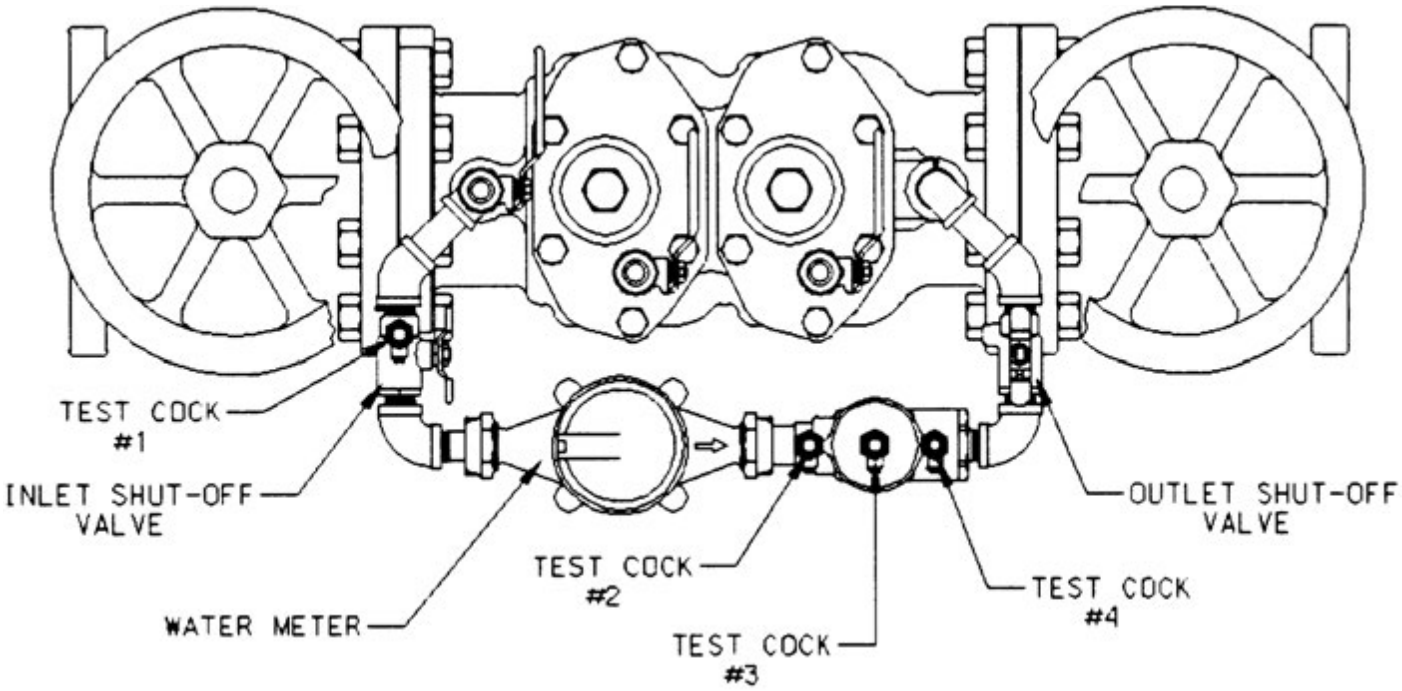
1. All parts should be carefully inspected for any damage or excessive wear and thoroughly rinsed in clean water prior to reassembly.
2. Replace all worn parts as necessary.

NOTE: Check valve modules are not user serviceable. In the event of check failure, replacement modules are sold individually.

ASSEMBLY:

3. Replace check modules, second check first then first check. Make sure first check o-ring is installed. (Tip: Push o-ring to the bottom of the bore before installing check module.) Press check module into bore. A thin coat of synthetic based lubricant on o-ring will aid insertion.
4. Replace stainless steel spacer.
5. Apply a thin coat of synthetic based lubricant on cap o-ring. Replace cap.

FIGURE 5



IV. TESTING PROCEDURES

It is important that this DCDA device be tested periodically in compliance with local codes, but at least once a year or more as service conditions warrant.

Equipment Required: Differential Pressure Test Kit 40-200 TK5U.

NOTE: During testing, the differential pressure gauge and all hoses not being used must be held at the same level as the assembly being tested.

MAINLINE TEST

Refer to pages 4 - 7 of this manual for Mainline test instructions.
Shut-off valves on bypass must be closed for this test.

BYPASS TEST (SEE FIGURE 6)

Testing procedures for by-pass DCV are similar to the mainline DCV except as follows:

1. For all testing the inlet by-pass shut-off valve remains open.
2. Flush water through test cocks No. 5,6,7, and 8 to eliminate foreign material.
3. To test check valve No. 1 connect the “high” side hose to test cock No. 6. To test check valve No. 2 connect the “high” side hose to test cock No. 7.
4. To pressurize by-pass line, close the inlet shut-off valve on the mainline and bypass line.

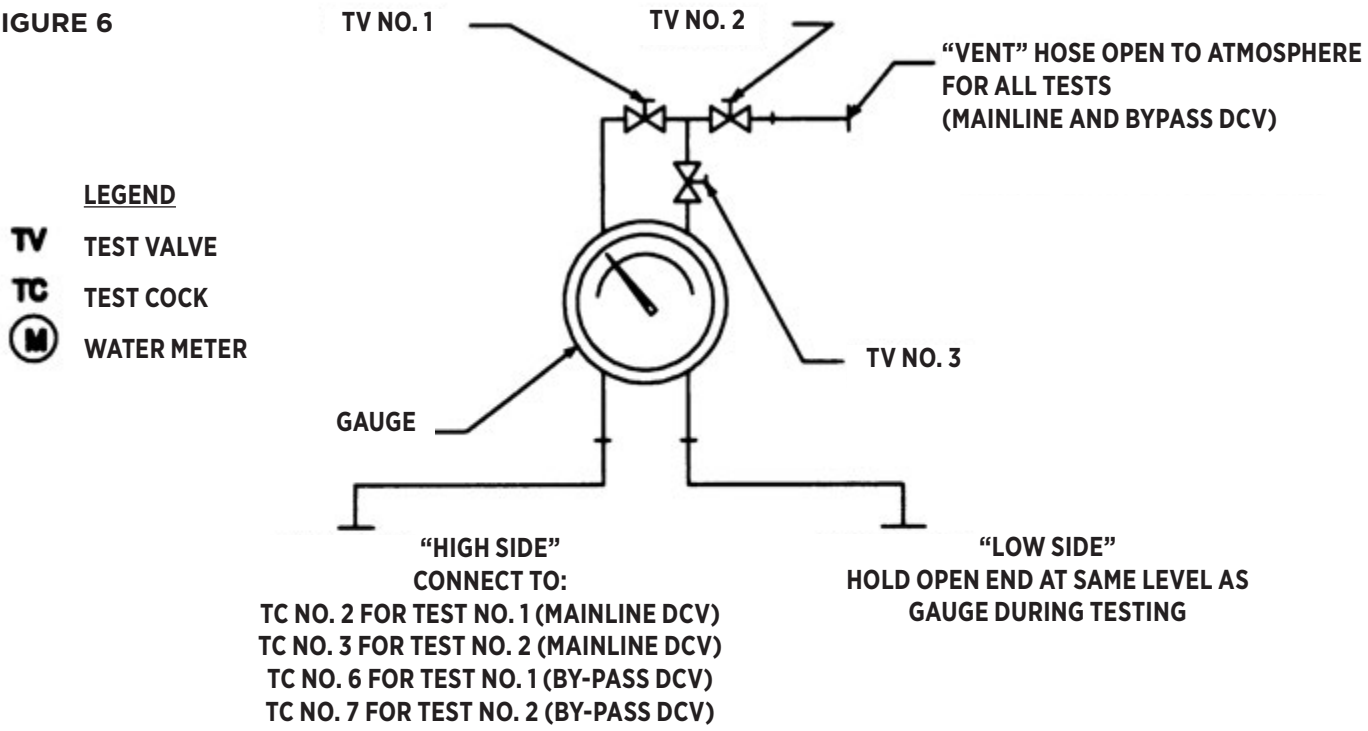
RESTORE OPERATION:

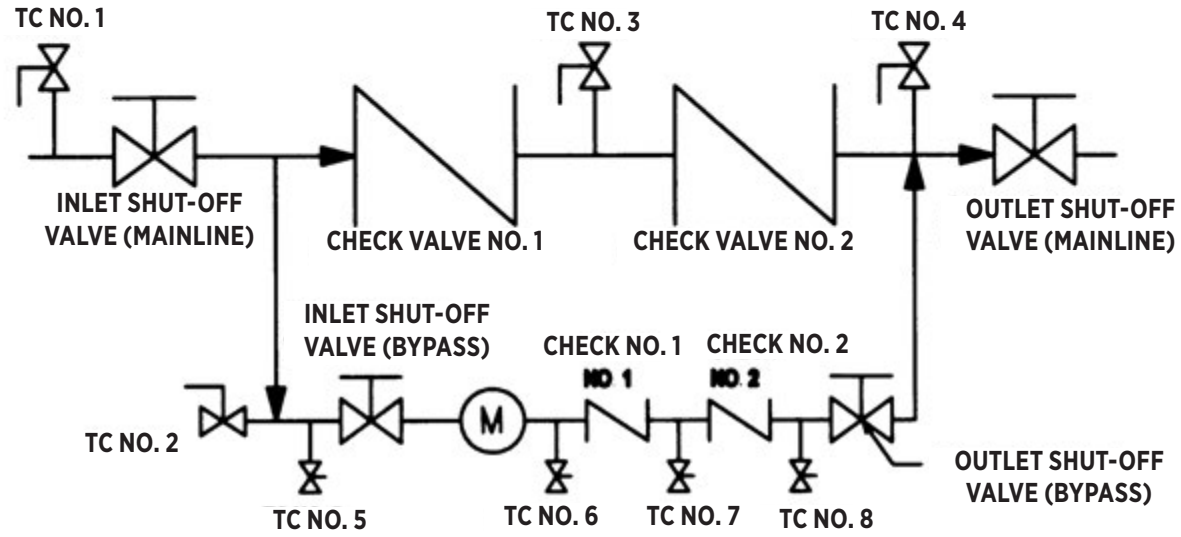
Close all test cocks, open all test valves and remove all test equipment. Slowly open the inlet shut-off valve on the mainline. Then slowly open the outlet shut-off valve on the mainline. Open the shut-off valves on the bypass.

NOTE: Refer to troubleshooting guide to resolve any problems encountered during field testing.

IV. TESTING PROCEDURES

FIGURE 6

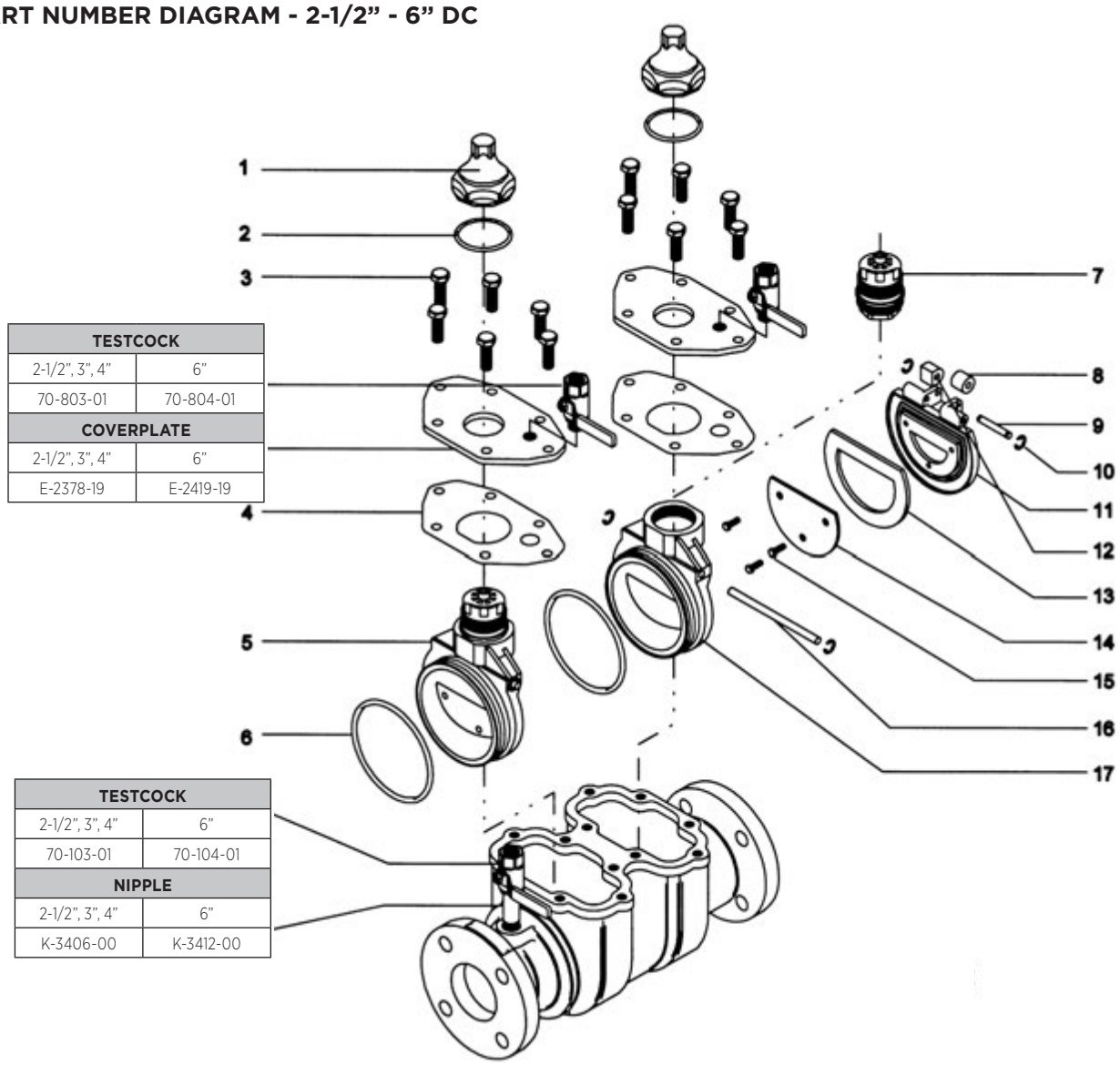




V. TROUBLESHOOTING

SYMPTOM	CAUSE	CORRECTIVE ACTION
Check valve fails to hold 1 psid.	Shut-off valve not closed completely. Check valve fouled with debris.	Close outlet shut-off valve or inspect for possible through leakage. Inspect and clean seat disc and seat.

PART NUMBER DIAGRAM - 2-1/2" - 6" DC



TESTCOCK	
2-1/2", 3", 4"	6"
70-803-01	70-804-01
COVERPLATE	
2-1/2", 3", 4"	6"
E-2378-19	E-2419-19

TESTCOCK	
2-1/2", 3", 4"	6"
70-103-01	70-104-01
NIPPLE	
2-1/2", 3", 4"	6"
K-3406-00	K-3412-00

ITEM NO.	DESCRIPTION	QTY	PART NO.
1	Spring Cap	2	S-4877-00
2	O-Ring	2	D-3506-00
3	Cover Bolt	12	B-2083-00
4	Gasket	2	D-3505-00
5	Check Assembly	2	W-7590-05
6	O-Ring	2	D-3507-00
7	Spring Assembly	2	W-8393-00
8	Roller	2	I-5866-00
9	Roller Pin	2	I-5867-06

ITEM NO.	DESCRIPTION	QTY	PART NO.
10	"E" Clip	4	I-3144-00
11	Seat Disc Retainer	2	G-3769-00
12	Hinge Bushing	2	D-3685-00
13	Seat Disc	2	D-3504-00
14	Disc Retaining Plate	2	E-2379-00
15	Disc Retaining Screw	6	B-1793-00
16	Hinge Pin	2	I-5868-06
17	Seat Housing	2	F-3090-00

REPAIRS KIT 2-1/2" – 6"

SEAT REPAIR KIT

4S-009-01: Kit includes items 2,4, and 5

RUBBER REPAIR KIT

4S-009-02: Kit includes items 2, 4, 6, 12, and 13

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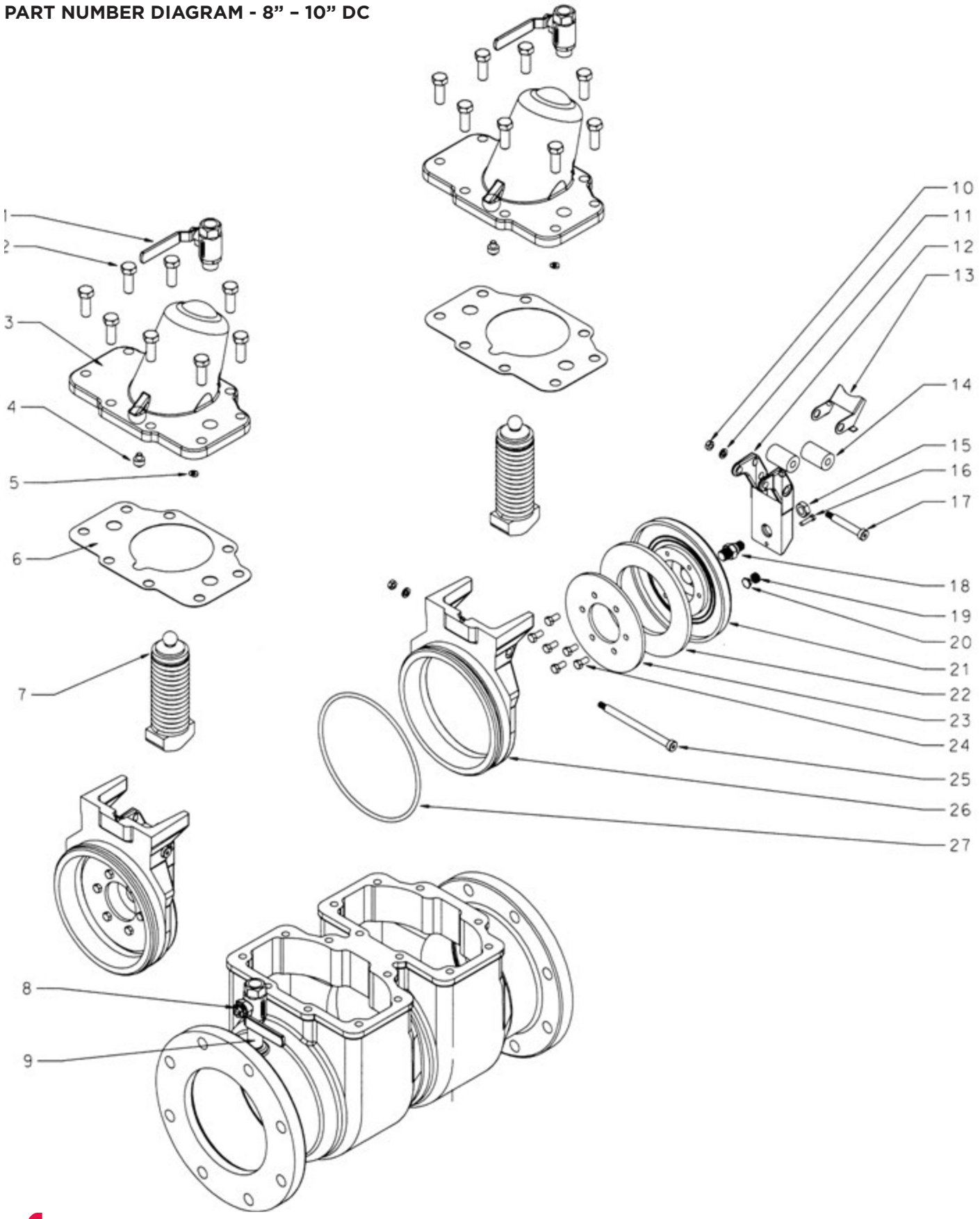
PART NUMBER DIAGRAM - 8" – 10" DC



PARTS LIST - 8" & 10"

DOUBLE CHECK BACKFLOW PREVENTER – 8" & 10" DC PARTS LIST

ITEM NO.	DESCRIPTION	QUANTITY	PART NO.
1	Testcock	2	70-804-01
2	Cover Bolt	16	B-1800-00
3	Cover	2	W-9459-05
4	Pilot Pin	2	I-6411-06
5	Cam Bumper	2	I-6412-06
6	Gasket	2	D-3964-00
7	Spring Assembly	2	W-4373-05
8	Testcock	1	70-104-01
9	3/4" Nipple	1	K-3412-00
10	Nut	2	C-2039-00
11	Lock Washer	2	E-2276-00
12	Swing Arm	2	F-3235-05
13	Cam Positioner	2	I-6441-00
14	Cam Roller	4	I-6410-00
15	Stem Nut	2	C-2040-00
16	Compensator Bolt	2	B-2183-00
17	Roller Pin	2	B-2518-00
18	Check Stem	2	G-3980-06
19	Compensator Spring	2	A-1459-00
20	Spring Button	2	E-2497-06
21	Seat Retaining Disc	2	F-3225-05
22	Seat Disc	2	D-3961-00
23	Disc Retaining Plate	2	E-2494-00
24	Disc Retaining Screw	12	B-1754-00
25	Hinge Pin	2	B-2517-00
26	Seat	2	L-6137-05
27	Seat O-ring	2	D-3963-00
	Body	1	Consult Factory

REPAIR KITS FOR 8" & 10" DC

SEAT REPAIR KIT
4S-00E-06: Kit includes items 6 (gasket) and 10 – 27 (seat assembly w/ o-ring)

RUBBER REPAIR KIT
4S-00E-04: Kit includes (1) each: gasket (6), seat disc (22), and seat o-ring (27)

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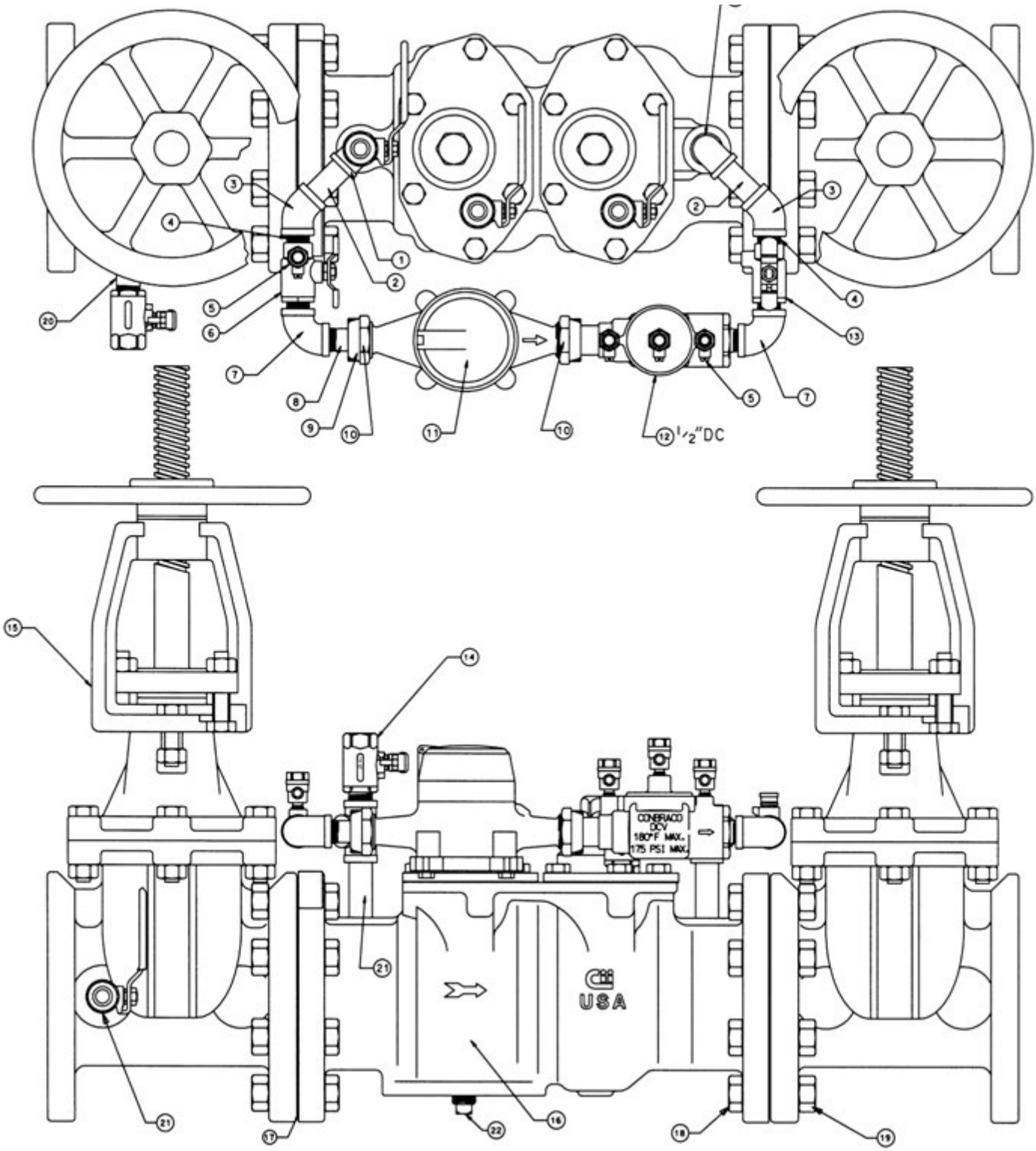
PART NUMBER DIAGRAM - 2-1/2" – 6" DCDA



PARTS LIST - 2-1/2" – 6" DCDA

DOUBLE CHECK BACKFLOW PREVENTER – 8" & 10" DC PARTS LIST

ITEM NO.	DESCRIPTION	QUANTITY	PART NO.
1	1/2" x 1/2" x 1/2" Tee	1	K-3571-00
2	1/2" NPT x 2" Nipple	2	K-3771-00
3	1/2" NPT x 45° Elbow	2	K-3963-00
4	1/2" NPT Close Nipple	2	K-3460-00
5	Testcock	1	78-257-01
6	1/2" Hydro Ball Valve	1	7B-803-01
7	1/2" NPT x 90° Elbow	3	K-3959-00
8	Meter Connector	1	K-3960-06
9	Swivel Nut	1	C-1844-05
10	Meter Union Washer	2	D-2610-00
11	Water Meter (Gallons)	1	W-7094-00
	Water Meter (Cubic Feet)		W-7062-00
12	1/2" DCV	1	W-4321-00
13	1/2" Hydro Ball Valve (No Tap)	1	7B-803-31
14	1/2" MxF Ball Valve	1	70-803-01
15	OS&Y Gate Valve	2	See Below
16	Mainline DCV	1	Consult Factory
17	Ring Gasket	2	See Below
18	Flange Bolt	*	See Below
19	Flange Nut	*	See Below
20	1/2" NPT x 3" Nipple	1	K-3406-00
21	1/2" FxF Ball Valve	1	70-103-01
22	1/2" NPT Brass Plug	1	K-3008-00

PARTS COMMON TO DC & DCDA

SIZE	OS&Y GATE VALVES	*BOLT PACKS
2 1/2"	W-6789-00	40-009-BP
3"	W-6790-00	40-000-BP
4"	W-6824-00	40-00A-BP
6"	W-6825-00	40-00C-BP

**Bolt Packs include flange gasket, bolts and nuts (for one flange).*

DCDA BYPASS ASSEMBLY KITS

4S60ABPC: 2-1/2" DCDA w/meter in cubic feet
4S60ABPE: 2-1/2" DCDA w/meter in gallons
4S60ABPG: 2-1/2" DCDA w/o meter
4S60ABPC: 3" DCDA w/meter in cubic feet
4S60ABPE: 3" DCDA w/meter in gallons
4S60ABPG: 3" DCDA w/o meter
4S60ABPC: 4" DCDA w/meter in cubic feet
4S60ABPE: 4" DCDA w/meter in gallons
4S60ABPG: 4" DCDA w/o meter
4S60CBPC: 6" DCDA w/meter in cubic feet
4S60CBPE: 6" DCDA w/meter in gallons
4S60CBPG: 6" DCDA w/o meter

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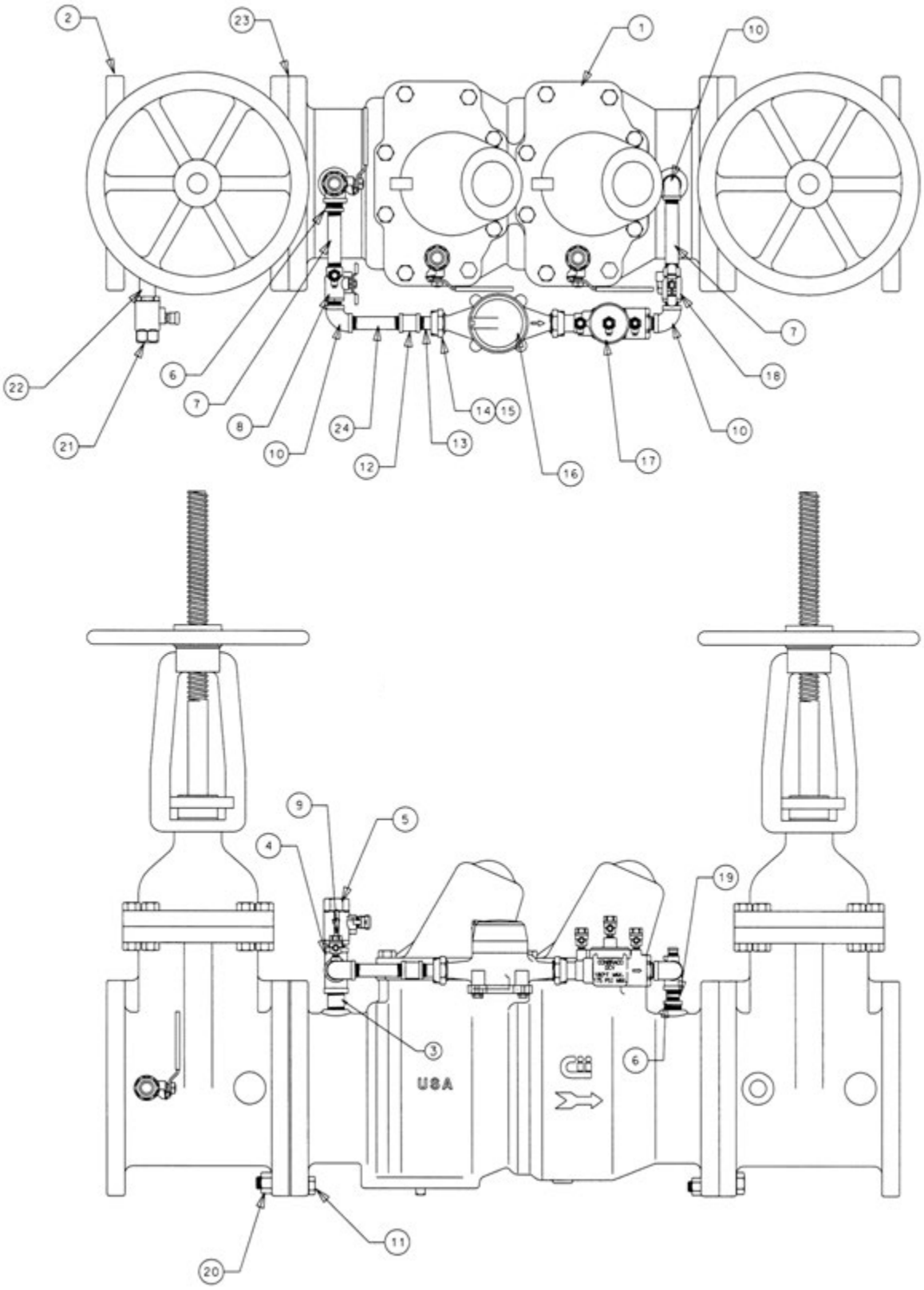
PARTS NUMBER DIAGRAM - 8" & 10" DCDA



PARTS LIST - 8" & 10" DC

DOUBLE CHECK DETECTOR ASSEMBLY – 8" & 10" DCDA PARTS LIST

ITEM NO.	DESCRIPTION	QUANTITY	PART NO.
1	DCV Assembly	1	Consult Factory
2	OS&Y Gate Valve	2	See Below
3	3/4" NPT x 2" Nipple	1	K-3772-00
4	3/4" NPT Tee	1	K-3511-00
5	3/4" NPT M x F Ball Valve	1	70-804-01
6	3/4" NPT x 1/2" NPT Reducer Bushing	2	K-3503-00
7	1/2" NPT x 5" Nipple	2	K-3980-00
8	1/2" Full Port Ball Valve	1	7B-803-01
9	Testcock	1	78-257-01
10	1/2" NPT x 90° Elbow	3	K-3959-00
11	Flange Bolt	*	See Below
12	1/2" NPT Coupling	1	K-3979-00
13	Meter Connector	1	K-3960-06
14	Meter Nut	1	C-1844-05
15	Meter Nut Washer	2	D-2610-00
16	Water Meter (GPM)	1	W-7094-00
	Water Meter (CU. FT)		W-7062-00
17	1/2" DCV	1	W-4321-00
18	1/2" M x F Full Port Ball Valve (No Tap)	1	7B-803-31
19	1/2" NPT Close Nipple	1	K-3460-00
20	Flange Nut	*	See Below
21	3/4" NPT Ball Valve	1	70-104-01
22	3/4" NPT x 3" Nipple	1	K-3412-00
23	Flange Gasket	2	See Below
24	1/2" NPT x 4" Nipple	1	K-3982-00

PARTS COMMON TO DC & DCDA

SIZE	OS&Y GATE VALVES	*BOLT PACKS
8"	W-6826-00	40-00E-BP
10"	W-6859-00	40-00G-BP

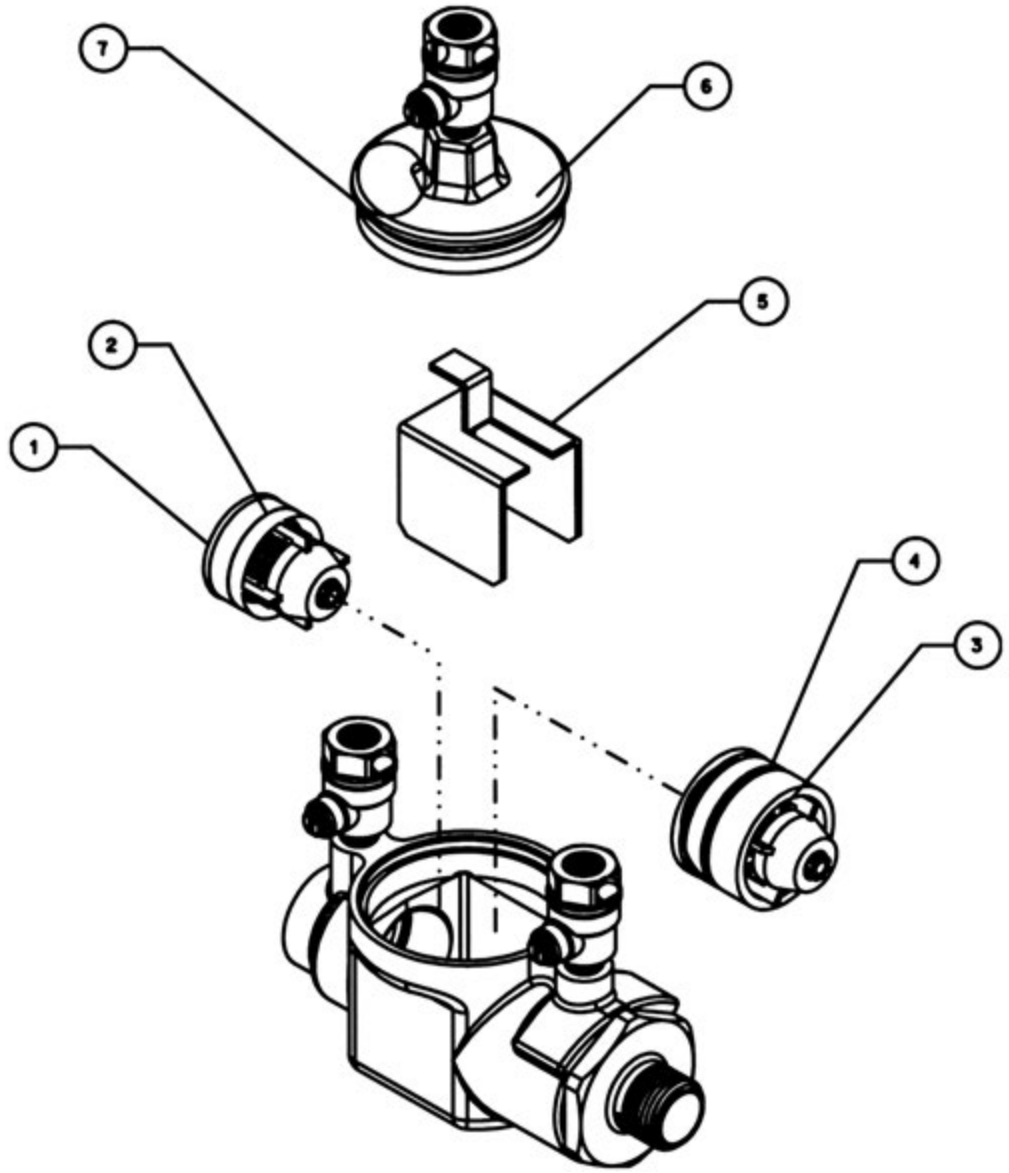
**Bolt Packs include flange gasket, bolts and nuts (for one flange).*

DCDA BYPASS ASSEMBLY KITS

4S60EBPC: 8" DCDA w/meter in cubic feet
4S60EBPE: 8" DCDA w/meter in gallons
4S60EBPG: 8" DCDA w/o meter
4S60GBPC: 10" DCDA w/meter in cubic feet (not available in 4SG Series)
4S60GBPE: 10" DCDA w/meter in gallons (not available in 4SG Series)
4S60GBPG: 10" DCDA w/o meter (not available in 4SG Series)

BFMMDC4S00
ES1595 REV A

PARTS LIST BYPASS DC UNIT



ITEM NO.	DESCRIPTION	QUANTITY	PART NO.
1	Check Module O-ring	1	D-3885-00
2	1st Check Module	1	F-3228-00
3	2nd Check Assembly	1	W-4302-00
4	2nd Check O-ring	1	D-2422-00
5	Check Spacer	1	L-6104-00
6	Cap	1	F-3206-05
7	Cap O-ring	1	D-2568-00

**Included in 1/2" Bypass DC unit but not shown: Meter connector and meter nut.*

REPAIR KIT

4S-003-01: Kit includes items 1, 2, 3, 4, and 7

"Apollo"®

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Regional Management List
now available online at:
http://conbra.co/rmlist

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