



Installation, Maintenance, & Repair

Series 994/994RPDA

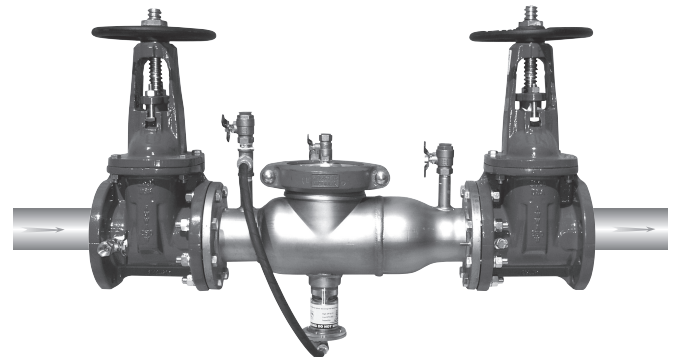
Reduced Pressure Zone Assemblies
Reduced Pressure Detector Assemblies

Sizes: 2½" – 10" (65 – 250mm)

▲ WARNING	
	<p>Read this Manual BEFORE using this equipment.</p> <p>Failure to read and follow all safety and use information can result in death, serious personal injury, property damage, or damage to the equipment.</p>
	<p>Keep this Manual for future reference.</p>
	

Local building or plumbing codes may require modifications to the information provided. You are required to consult the local building and plumbing codes prior to installation. If this information is not consistent with local building or plumbing codes, the local codes should be followed.

Need for Periodic Inspection/Maintenance: This product must be tested periodically in compliance with local codes, but at least once per year or more as service conditions warrant. Corrosive water conditions, and/or unauthorized adjustments or repair could render the product ineffective for the service intended. Regular checking and cleaning of the product's internal components helps assure maximum life and proper product function.



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NOTICE

Inquire with governing authorities for local installation requirements

NOTICE

For Australia and New Zealand: Pipeline strainers should be installed between the upstream shutoff valve and the inlet of the backflow preventer.

Testing

For field testing procedure, refer to Watts installation sheets IS-TK-DP/DL, IS-TK-9A, IS-TK-99E and IS-TK-99D found on www.watts.com.

For troubleshooting guide, refer to literature S-TSG.

For other repair kits and service parts, refer to our Backflow Prevention Products Repair Kits & Service Parts price list PL-RP-BPD found on www.watts.com.

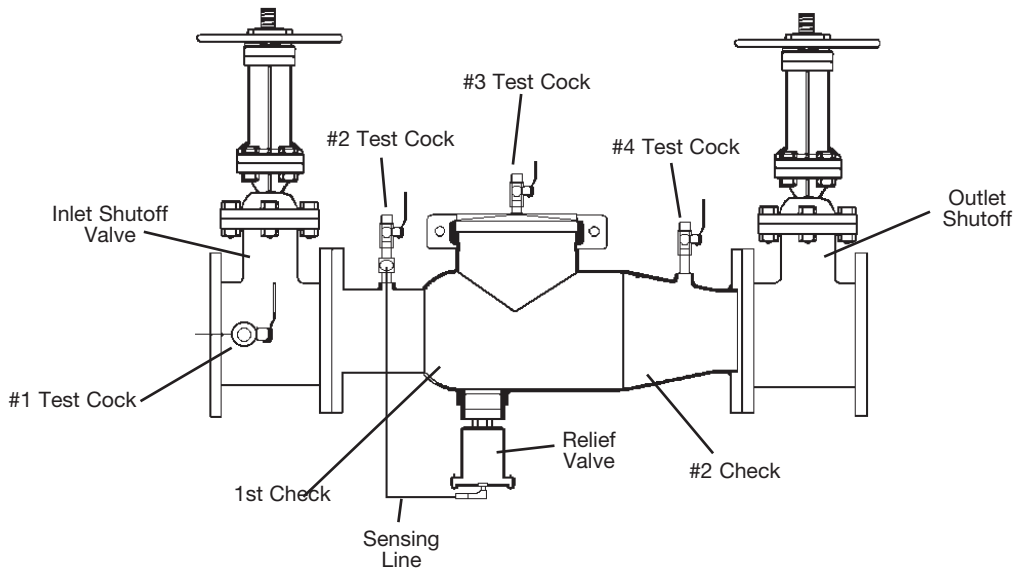
For technical assistance, contact your local Watts representative.

Basic Installation Instructions

Series 994 Reduced Pressure Zone Assemblies

NOTICE

The flange gasket bolts for the gate valves should be retightened during installation as the bolts may have loosened due to storage and shipping.



Location and Installation Considerations

- Backflow preventers must be installed in high-visibility locations in order to allow for immediate notice of telltale discharge or other malfunction. This location should also facilitate testing and servicing and protect against freezing and vandalism.
- Installation procedures must comply with all state and local codes.**
- Installing a backflow preventer in a pit or vault is not recommended. An air gap below the relief port must be maintained so as to avoid flooding and submersion of the assembly, which may lead to a cross-connection. Watts recommends installations indoors or above ground in an insulated enclosure. (Refer to literature ES-WB)
- A strainer should be installed ahead of the backflow preventer to protect the discs from unnecessary fouling.
- ASSEMBLY:** If the backflow preventer is disassembled during installation, it **MUST** be reassembled in its **proper order**. The gate valve with the test cock is to be mounted on the inlet side of the backflow preventer. The test cock must be on the inlet side of the wedge. Failure to reassemble correctly will result in possible water damage due to excessive discharge from the relief port/vent and possible malfunction of the backflow preventer.
- Prior to installation, thoroughly flush pipe line to remove any foreign matter.
- START UP at Initial Installations and After Servicing:** The downstream shutoff should be closed. Slowly open upstream shutoff and allow the backflow preventer to fill slowly. Bleed air at each test cock. When backflow preventer is filled, slowly open the downstream shutoff and fill the water supply system. This is necessary to avoid water hammer or shock damage.

CAUTION

Do not install a strainer ahead of the backflow preventer on seldom-used, emergency water lines (i.e. fire sprinkler lines). The strainer mesh could potentially become clogged with debris present in the water and cause water blockage during an emergency.

- Normal discharge and nuisance spitting are accommodated by the use of a Watts air gap fitting and a fabricated indirect waste line. Floor drains of the same size **MUST** be provided in case of excessive discharge.
- When a Series 994 backflow preventer is installed for dead-end service applications, discharge from the relief vent may occur due to water supply pressure fluctuation during static no-flow conditions. A check valve may be required ahead of the backflow preventer.

NOTICE

Assembly body should not be painted.

Figure 1

VALVE SIZE		TYPICAL FLOW RATES AS SIZED BY FLOOR DRAIN MANUFACTURERS	DRAIN SIZE
<i>in.</i>	<i>mm</i>		
2½	65	55 gpm	2
3	80	112 gpm	3
4	100	170 gpm	4
6, 8, 10	150, 200, 250	350 gpm	5

Series 994 Installation Instructions

Installation

- A. Series 994 shall be installed in a horizontal position. The shutoff valve with the test cock is to be mounted on the inlet side of the backflow preventer. The test cock is on the inlet side of the shutoff valve.
- B. The 994 should always be installed in an accessible location to facilitate testing and servicing. Check the state and local codes to ensure that the backflow preventer is installed in compliance, such as the proper height above the ground. The backflow preventer must be supported and is not designed to carry full weight of the stand pipe.
- C. Water discharge from the relief valve should be vented in accordance with code requirements. The relief valve should never be solidly piped into a drainage ditch, sewer or sump. The discharge should be funneled through a Watts air gap fitting piped to a floor drain.
- D. Watts recommends a strainer be installed ahead of Watts Series 994 assemblies to protect the discs from unnecessary fouling.

⚠ CAUTION

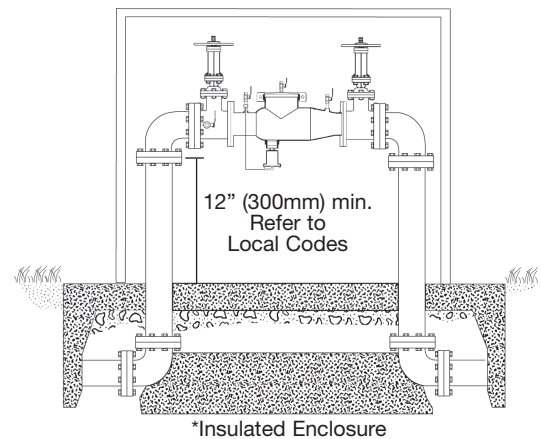
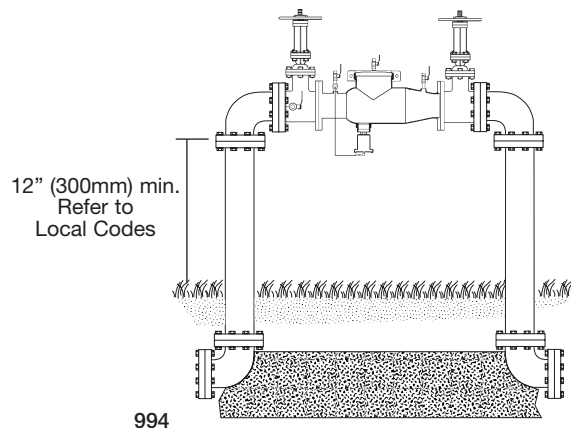
Do not install a strainer ahead of the backflow preventer on seldom-used, emergency water lines (i.e. fire sprinkler lines). The strainer mesh could potentially become clogged with debris present in the water and cause water blockage during an emergency.

Start Up

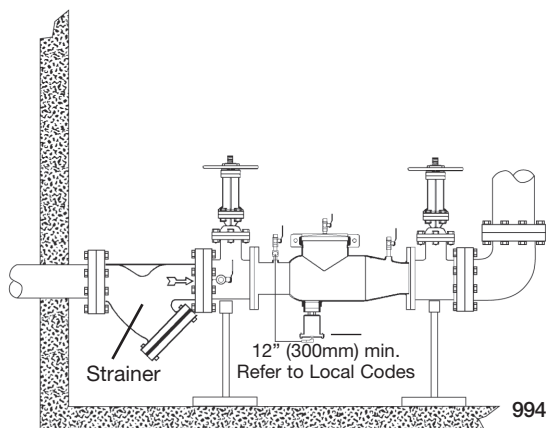
- E. The downstream shutoff should be closed. Open upstream slowly, fill the valve and bleed the air through Test cock 2, 3 and 4. When valve is filled, open the downstream shutoff slowly and fill the water supply system. This is necessary to avoid water hammer or shock damage.
- F. The installation of a Watts air gap with the drain line terminating above a floor drain will handle any normal discharge or nuisance spitting through the relief valve. However, floor drain size may need to be designed to prevent water damage caused by a catastrophic failure condition. Do not reduce the size of the drain line from the air gap fitting.
- G. Two or more smaller size valves can be piped in parallel (when approved) to serve a large supply pipe main. This type of installation is employed where increase capacity is needed beyond that provided by a single valve and permits testing or servicing of an individual valve without shutting down the complete line.

The number of assemblies used in parallel should be determined by the engineer's judgement based on the operating conditions of a specific installation.

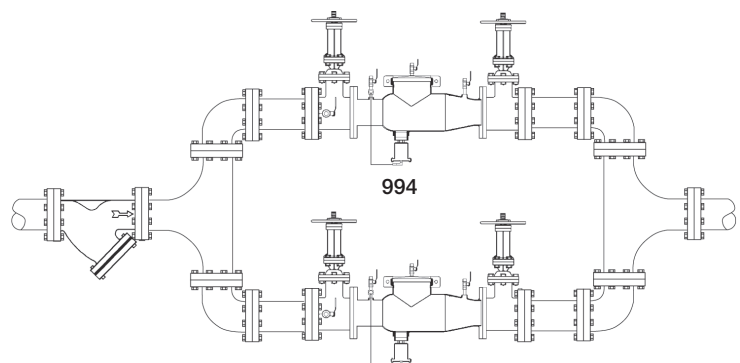
Above Ground



Indoors



Parallel



*For additional information on Watts insulated enclosures refer to literature ES-WB.

Servicing First and Second Checks

Series 994/994RPDA 4" and 6" (100 – 150mm)

Removing Check Assemblies (Before servicing be sure shutoff valves are closed)

1. Slowly open all ball valves to relieve air and water pressure. Loosen bolts on groove coupler and remove groove couple and cover plate from valve body.
2. Remove #1 Check Assembly by using your hands to unscrew (turn counterclockwise) Check and remove through top access port. Do not use Check Arm as a handle to unscrew. If Check cannot be loosened by hand, insert a long screwdriver between valve body and Check (**see figure 2**). Gently apply pressure against the Check until loosened. Finish unscrewing by hand. Unscrew #2 Check (turn counter-clockwise) by placing long screwdriver across lugs and applying pressure to loosen #2 Check. Finish unscrewing by hand.
3. To clean #1 Check 6" (150mm) only, locate the Check Arm opening stud on the outlet flange of the valve assembly. Slide the Check Arm over the stud with the check threads facing downward (**figure 5A**). Tighten $\frac{1}{4}$ " (8mm) nut on stud to secure cam bar. Slowly pull the assembly outward to open check allowing exposure of the seat clapper area for cleaning. To clean #2 Check, lift Cam Arm and hold in open position. Raise clapper so that the end of the Check Arm rests between roller and clapper (**figure 5B**). Thoroughly clean the seat area and clapper sealing surfaces of both Checks. Inspect seats, clapper sealing surfaces, Check Arms, and O-rings for damage, nicks, and debris. If not damaged, gently close the clapper. If damaged, install a new Check assembly and/or O-ring.
4. Before reinstallation of Checks, thoroughly clean O-ring groove and lubricate O-ring with FDA approved lubricant. Insert and thread #2 Check first and then #1 Check. #2 Check should be tightened by inserting a long screwdriver between lugs to tighten firmly (**see figure 2**). Do not over tighten. Tighten #1 Check firmly by hand only. Replace cover plate, clean groove coupler gasket and groove. Replace groove coupler. Repressurize and bleed air from all test cocks.

Figure 1

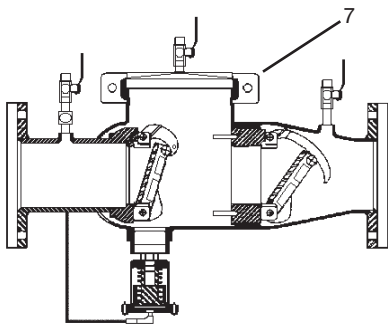


Figure 2

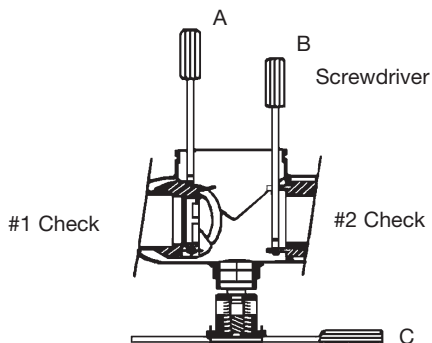
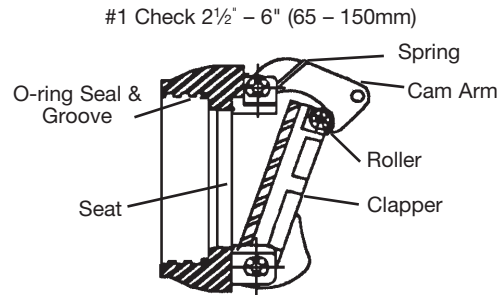


Figure 3



Note: See page 6 for additional 1st check servicing

Figure 4

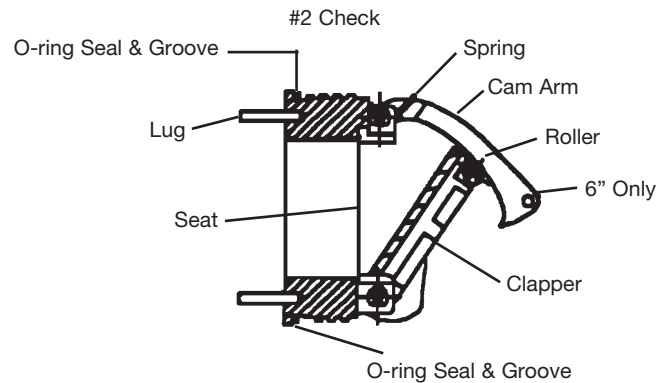


Figure 5A

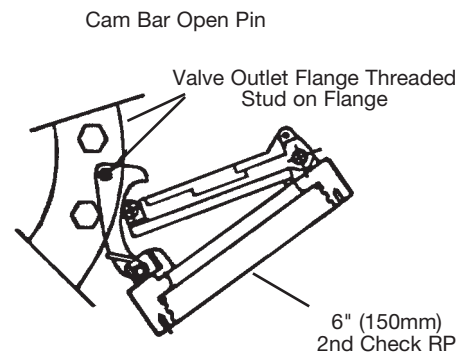


Figure 5B



Servicing First and Second Checks

Series 994/994RPDA
8" and 10" (200 – 250mm)

Removing Check Assemblies (Before servicing be certain shutoff valves are closed)

1. Slowly open all ball valves to relieve air and water pressure. Loosen bolts on groove coupler and remove groove couple and cover plate from valve body.
2. **#1 CHECK**
Using a $\frac{9}{16}$ " socket wrench or nut driver, remove the four nuts from the #1 check studs (see fig. 1). Using two hands, place them at 12 o'clock and 6 o'clock, wiggle the check assembly free. Remove through access port with back of clapper first with spring end down. Pull check assembly out of main body. Inspect seats and clapper sealing surfaces. (See page 6.)
#2 CHECK
After loosening bolts with a $\frac{9}{16}$ " socket, remove bolts completely. Using the centerline access bar, spin the check assembly from the 9 o'clock position to the 12 o'clock position, then (without letting go of the access bar) push the cam assembly slightly downstream so that the clapper is now parallel to the valve body. Now bring the check assembly through the check retaining wall. Leave the check assembly parallel to the valve body. Pull the check assembly through the access port.
3. Using a $\frac{3}{8}$ " nut driver or a piece of small diameter pipe, place on the check arm torsion spring and move away from and move away from and around the torsion spring retaining bracket so as to relieve the torsion spring tension. This will allow the check arm to move freely, enabling you to inspect the clapper face and check seat. Thoroughly clean the seat area and clapper sealing surfaces, check arms, and O-rings for damage, nicks, and debris. If damaged, install a new check assembly and or O-ring.
4. Before reinstallation of check assembly, thoroughly clean O-ring groove and lubricate O-ring with F.D.A. approved lubricant.

Figure 1

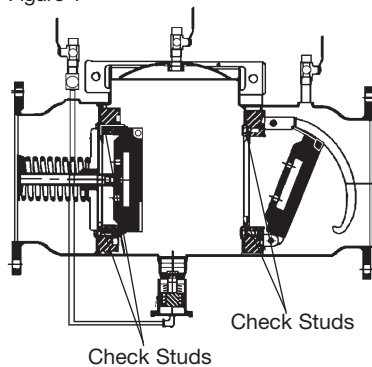


Figure 2

#1 Cam-Check RP

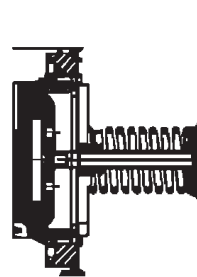


Figure 3

#2 Cam-Check DC & RP

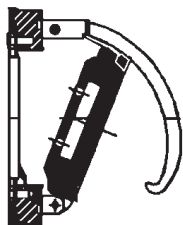
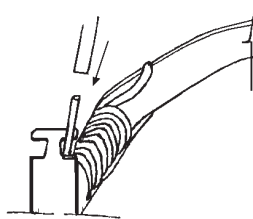


Figure 4



⚠ DANGER

Use extreme caution when servicing the first check!

Servicing the First Check

To inspect the seat and clean the seat and clapper washer:

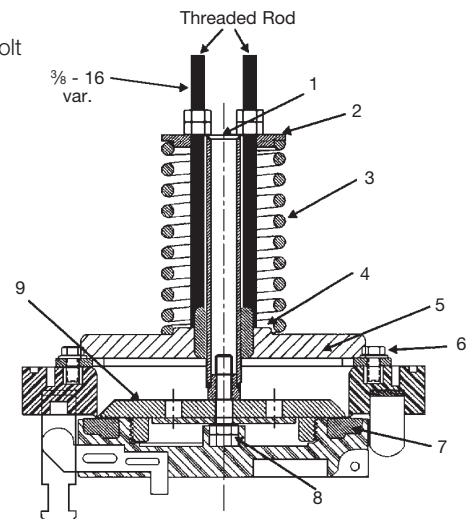
1. After removing the first check from the backflow valve body, place on a flat surface with the coil spring facing up.
2. In order to gain access to the seat and clapper rubber ring, you must compress the spring (#3) that surrounds the clapper shaft (#1). To do so, you must place the $\frac{3}{8}$ " threaded rod through two holes of the spring retaining plate #2.
3. After placing the $\frac{3}{8}$ " all-thread rod through the spring retaining plate, screw the threaded rod into the holes (#4) at the base of spider (#5 next to shaft). Be sure to use two nuts on the threaded rod to tighten them into the holes. The depth of the threaded holes should be approximately $\frac{1}{2}$ ". This operation will require you to use two pieces of threaded rod (see drawing below).
4. Compressing the spring. To do so you need to loosen the top $\frac{3}{8}$ " nut and back it off without unthreading the threaded rod from the spider. Place a box end wrench or crescent wrench on the $\frac{3}{8}$ " nut closest to the spring retaining plate and tighten. Tighten both threaded and nut evenly; put a few turns on one threaded rod nut and a few turns on the other.
5. During compression, the clapper will slowly move up, away from the seat. To examine the seat, continue spring compression until the clapper has moved approximately 1" from the seat. This will allow debris to be removed and or the seat to be examined.
6. To unload the spring compression, loosen the all-thread and then double nut the all-thread and unscrew the rod from the spider and shaft base.

To disassemble the first check, you will need the following:

- Two pieces of $\frac{3}{8}$ " threaded rod (approximately 14" long)
- Adjustable crescent wrench
- Pipe wrench or channel lock pliers

1. Shaft
2. Spring retaining plate
3. Spring
4. $\frac{3}{8}$ " threaded hole (maintenance)
5. Spider
6. Spider retaining bolt
7. Seat ring
8. Clapper to shaft bolt
9. Seat ring retainer

#1 Check Valve 8" & 10" (200 & 250mm)



Servicing the Relief Valve

1. The relief valve may be serviced while on or off the backflow preventer valve.

2. **NOTICE**

DO NOT USE A PIPE WRENCH TO REMOVE THE RELIEF VALVE ASSEMBLY FROM THE BACKFLOW PREVENTER.

3. Shut down water system.

8. Position the bottom flange cover on the bottom of the relief valve body and secure by hand tightening the four bottom bolts.

9. Now tighten the four bottom bolts to approximately 15 ft.-lbs. with a $\frac{5}{16}$ " socket or open-end wrench.

10. Reattach the relief valve hose to the elbow in the bottom flange cover.

Relief Valve Disassembly

1. Disconnect the relief valve hose from the elbow in the bottom flange cover at the swivel hose connection. Do not remove the elbow.

2. If the valve is to be removed from the backflow preventer for service, place a screw driver blade or flat bar across the edges of two of the hex head screws in the bottom flange cover and turn counter-clockwise to loosen the relief valve assembly. (See Figure 2 page 4)

3. Remove the four bottom bolts from the bottom of the relief valve assembly with a $\frac{5}{16}$ " socket or open-end wrench. Remove the bottom flange cover.

4. Remove the piston assembly & sleeve from the relief valve body by placing your index fingers through the slots in the side of the body and pressing down on the top of the disc retainer in the top of the piston assembly. (See Figure 7.)

5. Pull the piston assembly free of the body by grasping the sleeve and pulling down.

6. Grip the sleeve and the piston assembly by the head of the hex head bolt. Pull up on the sleeve to extend the diaphragm. Slide the sleeve (item #26) completely off of the diaphragm and inspect the diaphragm for tears, holes or excessive wrinkles. If the diaphragm is damaged, order a new piston/diaphragm assembly.

Relief Valve Reassembly

1. Thoroughly clean all inside surfaces of the relief valve body.

2. Inspect the relief valve body seat surface located at the top edge of the three discharge slots near the top of the body by rubbing the end of the index finger around the entire seat surface; access the seat surface through the slots or the bottom of the body. The seat must be free of nicks. If nicks are discovered, remove the body & install a new relief valve assembly.

3. Position the diaphragm on the piston assembly so that it is facing up as shown in Figure 8.

4. Now fold the top (ribbed) edge of the diaphragm inward, grasp the sleeve with the **ribbed edge up** and slide the sleeve down over the piston assembly as shown in Figure 8.

5. While still holding the sleeve, slide it up over the diaphragm and, using your thumb & index finger, position the bead of the diaphragm so that it wraps over the outside of the rib on the top of the sleeve so that the sleeve is held by the diaphragm. Now place the piston assembly on a flat, firm surface with diaphragm facing up as shown in Figure 9.

6. Cup your hand slightly to form an air trap and force the sleeve down over the piston assembly with a rapid slap (hard) on the open end of the diaphragm with your cupped hand. The trapped air in the diaphragm will force the diaphragm between the inside of the sleeve and the outside of the piston. Ensure that the diaphragm is fully seated. **If diaphragm is wrinkled, repeat previous step.**

7. Slide the piston assembly and sleeve into the relief valve body with the hex head bolt entering the flanged end of the body first. Slide the piston assembly in until the diaphragm lip is smoothly seated in the machined groove in the flanged end of the body. By running your index finger around the outside of the diaphragm bead, you will ensure it is seated smoothly

Figure 6

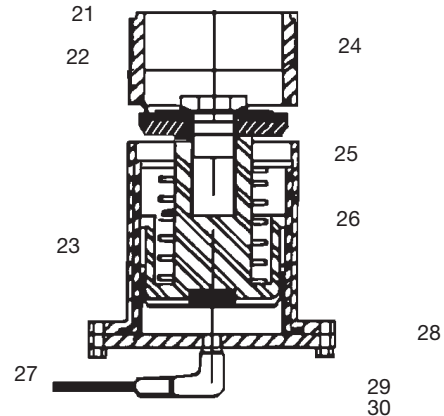


Figure 7

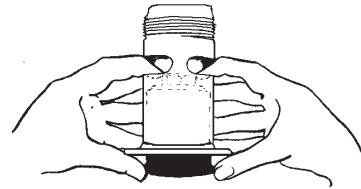


Figure 8

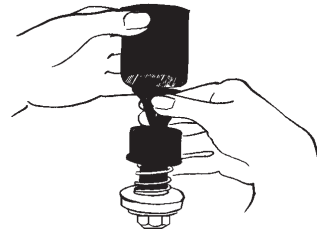
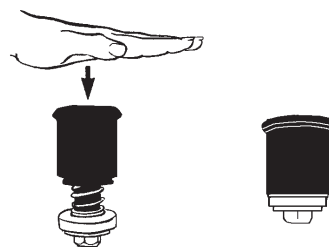


Figure 9



PARTS TABLE #2

Item #	Part Description	Qty.
21	Relief Valve Body	1
22	Rubber Shutoff Disc	1
23	Piston Diaphragm Assembly	1
24	Hex Head Bolt	4
25	Disc Retainer	1
26	Sleeve	1
27	Bottom Bolt	1
28	Bottom Flange (w st. elbow)	1
29	Bottom st. elbow	1
30	O-ring disc	1

Testing - Reduced Pressure Zone Assemblies

The following Test Procedure is one of several that is recognized throughout the United States for testing Backflow Preventers.

The following procedure is not a specific recommendation. The Watts series of test kits are capable of performing any of the recognized Backflow test procedures.

- A. Open TC #4 and flush test cocks No's. 1, 2 and 3 on BF assembly, then close TC #4.
- B. Turn tester on (before connecting hoses). Tester must read all zeros. Close VA and VB.

Test No. 1 - Relief Valve

1. Install high-side hose between TC #2 and tester connection A.
 2. Install low-side hose between TC #3 and tester connection B.
 3. Open TC #3 then VB. Now open TC #2 slowly, then VA. Close VA then VB.
 4. Close #2 shutoff valve.
 5. Observe the apparent first check valve differential pressure (A - B).
 6. Install bypass hose between VA and VB. Open VB and bleed air by loosening hose connection at VA. Tighten hose connection and close VB.
- Push - Print Head (wait) then Push - Start Test**
7. Open VA, then slowly open VB (no more than 1/4 turn). When relief valve drips, push the "hold button" for 2 seconds. Record reading (must be 2 PSID or more).
- Push - Stop Test**
8. Close VA and VB.

Test No. 2 - Test No. 2 Check Valve

9. Install bypass hose between VA and TC #4. Open VA, then bleed air by loosening hose connection at TC #4. Tighten hose connection. Close VA.
- Push - Start Test**
10. Open VB to reestablish pressure within the "zone". Close VB.
 11. Open TC #4, then open VA. If relief valve does not drip, record second check valve as "close tight".

Test No. 3 - Test No. 1 Check Valve

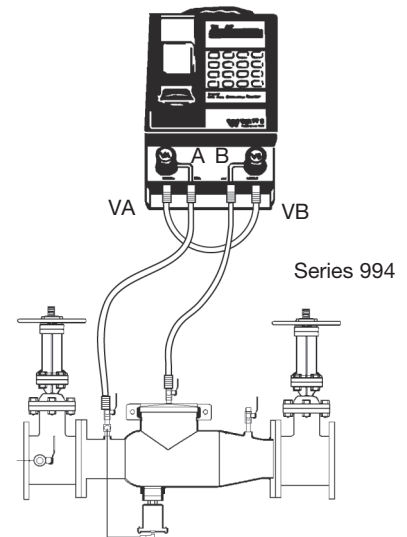
12. Open VB to reestablish first check valve differential pressure. Close VB. Record pressure differential.
- Stop Test (Push Stop Test twice)**
13. Close test cocks and remove tester, return assembly to normal operating condition.

⚠ WARNING

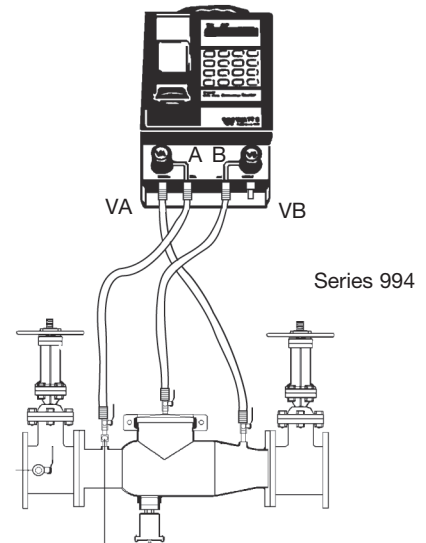
It is important that this device be tested periodically in compliance with local codes, but at least once per year or more as service conditions warrant. If installed on a fire sprinkler system all mechanical checks, such as alarm checks, single checks and backflow preventers should be inspected internally every one to five years in accordance with NFPA 13 A and NFPA 25

Watts TK-DL

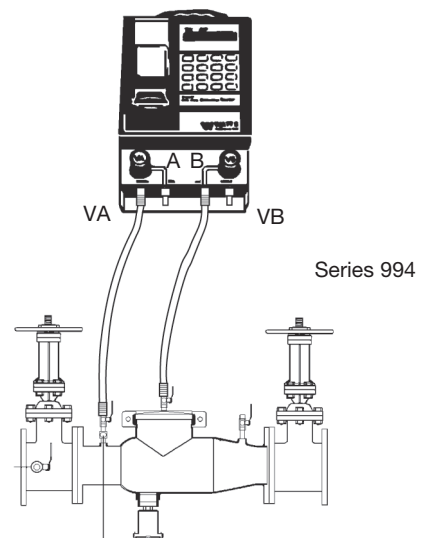
RPZ
Test 1



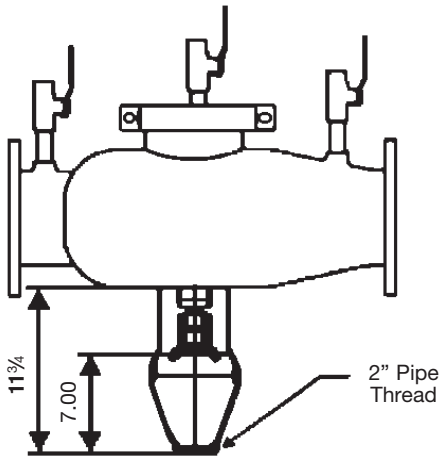
RPZ
Test 2



RPZ
Test 3



Troubleshooting Guide



Air Gap Drain

For repair kits and parts, refer to our Backflow Prevention Products Repair Kits & Service Parts price list PL-RP-BPD found on www.watts.com.

WARNING: This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.
For more information: www.watts.com/prop65

Problem	Cause	Solution
A. Assembly discharges from differential relief valve during no flow condition.	Fouled first check	Disassemble and clean No. 1 check valve
	Fluctuating inlet pressure	Control supply line water pressure. Install a soft seated, spring loaded, check valve upstream of the assembly.
	Outlet pressure higher than inlet pressure & leak in No. 2 check valve	Disassemble, clean #2 check valve & identify cause of backpressure
	Leak through diaphragm or around flange bolt holes of relief valve	Service relief valve
	Pressure relief valve does not close	See problem D
B. Assembly discharges from differential relief valve during a flow condition.	No. 1 check valve wedged open	Disassemble and clean No. 1 check valve
	O-ring displaced from groove in 1st check	Disassemble and replace
	Pressure relief valve does not close	See problem D
	Fluctuating line pressure	
C. Differential pressure relief valve does not open during test	Differential pressure across No. 1 check valve stays above 2.0psi due to leaking outlet gate valve	Repair shutoff valves
	Weak or broken relief valve spring	Disassemble and replace relief valve spring
	Shutoff seat tube bound in body	Disassemble and repair
	Plugged hydraulic hose	Disassemble and repair
D. Pressure relief valve does not close	Debris on sealing surface	Remove relief valve and clean
	Plugged hydraulic hose	Disassemble and clean
	Damaged seat or rubber shutoff disc	Remove relief valve assembly and replace
	Ruptured diaphragm	Disassemble and replace diaphragm
	Wrinkled or improperly installed diaphragm	Disassemble and properly position diaphragm

Limited Warranty: Watts Regulator Co. (the "Company") warrants each product to be free from defects in material and workmanship under normal usage for a period of one year from the date of original shipment. In the event of such defects within the warranty period, the Company will, at its option, replace or recondition the product without charge.

THE WARRANTY SET FORTH HEREIN IS GIVEN EXPRESSLY AND IS THE ONLY WARRANTY GIVEN BY THE COMPANY WITH RESPECT TO THE PRODUCT. THE COMPANY MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED. THE COMPANY HEREBY SPECIFICALLY DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

The remedy described in the first paragraph of this warranty shall constitute the sole and exclusive remedy for breach of warranty, and the Company shall not be responsible for any incidental, special or consequential damages, including without limitation, lost profits or the cost of repairing or replacing other property which is damaged if this product does not work properly, other costs resulting from labor charges, delays, vandalism, negligence, fouling caused by foreign material, damage from adverse water conditions, chemical, or any other circumstances over which the Company has no control. This warranty shall be invalidated by any abuse, misuse, misapplication, improper installation or improper maintenance or alteration of the product.

Some States do not allow limitations on how long an implied warranty lasts, and some States do not allow the exclusion or limitation of incidental or consequential damages. Therefore the above limitations may not apply to you. This Limited Warranty gives you specific legal rights, and you may have other rights that vary from State to State. You should consult applicable state laws to determine your rights. **SO FAR AS IS CONSISTENT WITH APPLICABLE STATE LAW, ANY IMPLIED WARRANTIES THAT MAY NOT BE DISCLAIMED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED IN DURATION TO ONE YEAR FROM THE DATE OF ORIGINAL SHIPMENT.**



A Watts Water Technologies Company



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