



Installation, Service and Operation Manual



ARAD-GSP and ARAD-FAB Iron, Sulphur, Manganese Removal Systems

Thank you for purchasing your new AquaRinse Chemical Free Iron, Manganese and Sulphur removing System. Reading of the following pages should ensure trouble free setup and installation, not to mention years of trouble free service and clean, filtered water for your home.

Benefits of an AquaCera ARAD Iron Manganese and Sulphur System:

- ✓ **No Salt**
- ✓ **No Chemicals**
- ✓ **No Regular Maintenance**
- ✓ **Retains Essential Minerals**
- ✓ **Protects Water Using Appliances**
- ✓ **Simple Installation**
- ✓ **Takes very limited space**
- ✓ **Compatible with all on-site/community waste water treatment systems**
- ✓ **Recommended for use in areas with water softener restrictions and areas where water softeners have become “banned”**
- ✓ **High levels of clear water iron removal**
- ✓ **Hydrogen Sulfide removal with FCE based unit**
- ✓ **Manganese Removal**

Conditions for Proper Operation:

pH range 6.8 – 8.8

Iron 12 ppm

Manganese 5 ppm

Sulphur 5 ppm

Chemical Oxidants 0.2 ppm

Well Pump Rate: Sufficient to provide at least 5 gallons per minute continuous

Important Notice- Read before attempting Installation

THIS UNIT IS PRE-PROGRAMMED AT THE FACTORY- DO NOT ADJUST.

The control valve, fittings and/or bypass are designed to accommodate minor plumbing misalignments but are not designed to support the weight of a system or the plumbing.

Do not use Vaseline, oils, other hydrocarbon lubricants or spray silicone anywhere. A silicone lubricant may be used on black o-rings but is not necessary. **Avoid any type of lubricants, including silicone, on the clear lip seals.**

The nuts and caps are designed to be removed or **tightened by hand** or with the special plastic wrench. Pliers can be used to unscrew the nut or cap if necessary. Do not use a pipe wrench to tighten or loosen nuts or caps. Do not place a screwdriver in the slots on caps and/or tap with a hammer.

Do not use pipe dope or other sealants on threads. Use Teflon tape on threaded inlet, outlet and drain fittings. Teflon tape is not necessary on the nut connection or caps because of o-ring seals.

After completing any valve maintenance involving the drive assembly or the drive cap assembly and pistons, press and hold NEXT and REGEN buttons for 3 seconds or unplug power source jack from the printed circuit board (black wire) and plug back in. This resets the electronics and established the service piston position. The display should flash all wording, and then flash the software version (e.g. 191) and then reset the valve to the service position.

All plumbing should be done in accordance with local plumbing codes. The pipe size for the drain line should be a minimum of ½". Backwash flow rates in excess of 7 gpm or length in excess of 20' require ¾" drain line. Ideally, the control will be above the drain and not more than 20 feet. The maximum run should not exceed 40 feet. Maximum elevation above the control is 6 feet if line pressure is at least 40 psi, however, the run should not exceed 15 feet if the drain is elevated. The drain may be elevated an additional 2 feet for each additional 10 psi of line pressure above 40 psi.

Solder joints near the drain must be done prior to connecting the drain line flow control fitting. Leave at least 6" between the drain line control fitting and solder joints when soldering pipes that are connected on the drain line control fitting. Failure to do this could cause interior damage to the drain line flow control fitting.

When assembling the installation fitting package (inlet and outlet), connect the fitting to the plumbing system first and then attach the nut, split ring and o-ring. Heat from soldering or solvent cements may damage the nut, split ring or o-ring. Solder joints should be cool and solvent cements should be set before installing the nut, split ring and o-ring. Avoid getting primer and solvent cement on any part of the o-rings, split rings, bypass valve or control valve.

Plug into an electrical outlet. Note: all electrical connections must be connected according to local codes. (Be certain the outlet is uninterrupted.) Install grounding strap on metal pipes.

WARNING!

Do not allow the water filter to freeze. Maximum ambient temperature is 120° F. Exposure to pressure and/or temperature outside the operating parameters stated in the table below voids the warranty.

Minimum/Maximum Operating Pressures	20 psi (138kPa) – 125 psi (862 kPa)
Minimum/Maximum Operating Temperatures	40° F (4°C) - 110° F (43° C)
AC Adapter:	<u>U.S.</u>
Supply Voltage	120 V AC
Supply Frequency	60 Hz
Output Voltage	12 V AC
Output Current	500 mA

No user serviceable parts are on the PC board, the motor or the AC adapter. The means of Disconnection from the main power supply is by unplugging the AC adapter from the wall.

Inlet / Outlet Plumbing Options

- (a) 1+NPT elbow which has unique drill out feature to allow a ¼+NPT connection to the inlet and/or outlet
- (b) ¾, 1+ and 1 ¼#1 ½+ Solvent weld fitting
- (c) 1+plastic male NPT fitting
- (d) 1+Quick Connect elbow

Fasteners and Tools

The control valve uses no traditional fasteners (e.g. screws); instead, clips, threaded caps and nuts and snap type latches are used. Caps and nuts only need to be firmly hand tightened because radial seals are used. Tools required to service the valve include one small blade screw driver, one large blade screw driver, pliers and a pair of hands. A plastic wrench is available which eliminates the need for screwdrivers and pliers. Disassembly for servicing takes much less time than comparable products currently available on the market.

Nonvolatile Memory

The control valve remembers all settings for up to 8 hours if the power goes out and the battery is not depleted. After 8 hours, the only item that needs to be reset is the time of day; other values are permanently stored in the nonvolatile memory. If a power loss lasts less than 8 hours and the time flashes on and off, the time of day should be reset and the non-rechargeable battery should be replaced. **Battery replacement is a 3 volt lithium coin cell type 2032.** When replacing the battery, align positives and push down to fully seat.

AC Adapter

The AC adapter power pack comes with a 15 foot power cord and is designed for use with the control valve. The AC adapter power pack is for dry location use only.

Properly installing and programming the ARAD Chem-Free System

This system will normally be installed:

After:	Supply lines to outside faucets Sediment Filters Acid Neutralizers	Before:	NoScale Salt Free Unit Carbon Filters UltraViolet Systems Drinking Water Systems
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NOTE: The installer must check for proper operation of all cycles before installation is complete. DO NOT INSTALL IN A FINISHED ROOM WITHOUT PROPER DRAINAGE!

An inlet check valve (provided) must be installed to prevent back flow.

The cycle times for the ARAD System are as follows:

1. Backwash 1st = 10 to 14 minutes
2. Draw = 50-75 minutes
3. Backwash 2nd = OFF
4. Fast Rinse = 6 to 10 minutes
5. Regenerant Refill = OFF
6. Service Interval = Every 2-3 days of filtered water

THIS UNIT IS PRE-PROGRAMMED AT THE FACTORY- DO NOT ADJUST.

Set day override to 2-3 days BUT do NOT exceed 3 days!

The timing and frequency of regeneration can be modified as required. Be sure that no other equipment will be regenerating at the same time as the filter. Untreated water is available during the regeneration cycle.

Maintenance

It is recommended that the valve be serviced annually because of the harsh conditions in which it may be used. At a minimum, service the valve part numbers V3005 Spacer Stack Assembly and the V3011 Down-flow Piston Assembly. These should be replaced annually to maintain optimal performance. The injector and screen must be cleaned or replaced annually to ensure that the system is working properly. Your dealer should be contacted for this annual maintenance.

System Install and Start UP

1. Install a water line from the water service to the unit inlet connection. This is where the check valve is screwed on to the adapter. Do not sweat pipe that is connected to the check valve as this may destroy the seal on the check valve. If the filter does not include the factory bypass then plumb in a three-valve bypass with unions.
2. Install a water line from the outlet connection to the service line feeding the residence or building.
3. Run piping from the drain connection to an approved drain, following all local codes.
4. Plug the power cord into any standard 120 volt outlet. Make sure the outlet has continuous electrical power.
5. The display will light and display %Days To Regen+. Press the “**Next**” button until the time appears.
6. Use the **UP and DOWN** arrows on the display to set the correct time of day. Then press the “**Next**” button to return to %Days To Regen+.
7. Cycle the control valve into the backwash mode by pressing and holding the **REGEN** button on the right of the valve until the regeneration is started.
8. Turn the Bypass valve to the %Service+position.
9. Fill the unit **SLOWLY** by turning on the water service valve.
10. Manually cycle through all the valve cycles and check to see that all functions work properly and the unit finds home. Press the **REGEN** button again to advance the control to the next cycle. Check the drain to ensure no sediment is lodged in the valve and water is not running to drain when in service.

Control Valve Function and Cycles of Operation

This glass filled Noryl¹ (or equivalent) fully automatic control valve is designed as the primary control center to direct and regulate all cycles of a water softener or filter. When the WS1CS control valve is manufactured as a softener, the control valve can be ordered to perform downflow or upflow regeneration. The WS1.25CS control valve is only available in downflow regeneration. When the WS1CS or WS1.25CS control valve is set up as a filter, the control valve can be set to perform downflow regeneration or simply backwash. The control valve can be set to regenerate on demand (consumption of a predetermined amount of water) and/or as a time clock (passage of a particular number of days). The control valve can be set so that a softener can meet the Water Quality Association (WQA) Standard S100 or NSF/ANSI Standard 44 efficiency rating.

It is not recommended to change control valves from downflow to upflow brining or vice versa in the field. The valve bodies for downflow and upflow are unique to the regeneration type and should not be interchanged. A mismatch of valve body and regeneration piston will result in hard water bypass during service.

The control valve is compatible with a variety of regenerants and resin cleaners. The control valve is capable of routing the flow of water in the necessary paths to regenerate or backwash water treatment systems. The injector regulates the flow of brine or other regenerants. The control valve regulates the flow rates for backwashing, rinsing, and the replenishing of treated water into a regenerant tank, when applicable.

The control valve uses no traditional fasteners (e.g. screws); instead clips, threaded caps and nuts and snap type latches are used. Caps and nuts only need to be firmly hand tightened because radial seals are used. Tools required to service the valve include one small blade screw driver, one large blade screw driver, pliers and a pair of hands. A plastic wrench is available which eliminates the need for screwdrivers and pliers. Disassembly for servicing takes much less time than comparable products currently on the market. Control valve installation is made easy because the distributor tube can be cut ½" above to ½" below the top of tank thread. The distributor tube is held in place by an o-ring seal and the control valve also has a bayonet lock feature for upper distributor baskets.

The AC adapter power pack comes with a 15 foot power cord and is designed for use with the control valve. The AC adapter power pack is for dry location use only. The control valve remembers all settings for two hours if the power goes out. After two hours, the only item that needs to be reset is the time of day; all other values are permanently stored in the nonvolatile memory. The control valve does not need batteries.

Table 3 shows the order of the cycles when the valve is set up as a softener. The OEM has the option of having the regenerant refill after the rinse cycle or have the regenerant prefill before regeneration. If the OEM chooses to have the regenerant prefill before regeneration, the prefill starts two hours before the regeneration time set. During the 2-hour period in which the brine is being made, treated (softened) water is still available. For example: regeneration time = 2:00 am, prefill option selected, downflow softener. Fill occurs at 12:00 a.m., start of backwash cycle occurs at 2:00 a.m. Tables 4 and 5 show the length of the cycles when different program codes are selected.

**Table 3
Regeneration Cycles Softening**

WS1CS & WS1.25CS Downflow Regenerant Refill After Rinse	WS1CS & WS1.25CS Downflow Regenerant Prefill	WS1CS Only Upflow Regenerant Refill After Rinse	WS1CS Only Upflow Regenerant Prefill
1 st Cycle: Backwash	1 st Cycle: Fill	1 st Cycle: Regenerate	1 st Cycle: Fill
2 nd Cycle: Regenerate	2 nd Cycle: Service	2 nd Cycle: Backwash	2 nd Cycle: Service
3 rd Cycle: Second Backwash*	3 rd Cycle: Backwash	3 rd Cycle: Rinse	3 rd Cycle: Regenerate
4 th Cycle: Rinse	4 th Cycle: Regenerate	4 th Cycle: Fill/Dissolve	4 th Cycle: Backwash
5 th Cycle: Fill/Dissolve	5 th Cycle: Second Backwash*	5 th Cycle: Service	5 th Cycle: Rinse
6 th Cycle: Service	6 th Cycle: Rinse		6 th Cycle: Service
	7 th Cycle: Service		

*Second Backwash is optional

¹ Noryl is a trademark of General Electric.

Table 4
Downflow Softener Program Codes for WS1CS or WS1.25CS

Program Code	Main Piston	1 st Backwash	Brine/Slow Rinse	2 nd Backwash	Fast Rinse
P1	Downflow	3	40	3	3
P2	Downflow	3	45	3	3
P3	Downflow	4	45	4	3
P4	Downflow	4	60	4	3
P5	Downflow	5	60	4	4
P6	Downflow	5	60	5	4
P7	Downflow	6	45	4	3
P8	Downflow	6	60	5	4
P9	Downflow	6	60	6	5
P10	Downflow	7	50	5	4
P11	Downflow	7	60	6	6
P12	Downflow	7	65	7	7
P13	Downflow	8	45	5	4
P14	Downflow	8	60	6	6
P15	Downflow	8	60	8	8
P16	Downflow	8	65	8	6
P17	Downflow	8	65	8	7
P18	Downflow	8	75	8	5
P19	Downflow	9	50	5	5
P20	Downflow	9	60	5	4
P21	Downflow	9	65	8	5
P22	Downflow	10	45	4	4
P23	Downflow	10	60	5	4
P24	Downflow	10	65	8	8
P25	Downflow	10	65	6	5
P26	Downflow	10	75	7	5
P27	Downflow	12	45	4	4
P28	Downflow	12	60	6	4
P29	Downflow	12	60	8	8
P30	Downflow	12	65	6	6
P31	Downflow	12	65	8	8
P32	Downflow	12	65	12	8
P33	Downflow	12	75	6	6
P34	Downflow	14	45	5	4
P35	Downflow	14	60	6	5
P36	Downflow	14	60	8	8
P37	Downflow	14	65	7	6
P38	Downflow	14	65	8	8
P39	Downflow	14	65	12	8
P40	Downflow	14	75	8	7
P41	Downflow	16	60	7	5
P42	Downflow	16	65	8	6
P43	Downflow	16	65	8	8
P44	Downflow	16	65	12	8
P45	Downflow	16	75	9	7

Table 6 shows the order of the cycles when the valve is set up as a filter. If the control valve is set to regenerate for a filter, the OEM has the option of having the regenerant refill after the rinse cycle or have the regenerant prefill before regeneration. If the OEM chooses to have the regenerant prefill before regeneration, the prefill starts two hours before the regeneration time set. During the 2-hour period in which the regenerant is being made, treated water is still available. For example: regeneration time = 2:00 am, prefill option selected, downflow filter. Fill occurs at 12:00 a.m., start of backwash cycle occurs at 2:00 a.m. Tables 7 and 8 show the length of the cycles when the valve is set up as a filter.

When the control valve is used as a non-regenerating filter, the OEM has the option to specify one backwash or two backwashes. If two backwashes are specified, two rinses occur. Tables 7 and 8 show the length of the cycles when the valve is set up as a filter. When used as a non-regenerating filter, the downflow piston must be installed, the regenerant piston removed, injector plugs must be installed in both the DN and UP injector locations and the refill elbow must be replaced with a refill port plug.

NOTE: The program codes listed on this page and the following page should be used only as a guideline. Any program code listed can be applied to a softener or filter application for WS1CS valves.

Table 5
Upflow Softener Program Codes for WS1CS only

Program Code	Main Piston	1st Backwash	Brine/Slow Rinse	2nd Backwash	Fast Rinse
P60	Upflow	N/A	45	6	4
P61	Upflow	N/A	45	8	6
P62	Upflow	N/A	60	10	6
P63	Upflow	N/A	60	12	8
P64	Upflow	N/A	75	10	6
P65	Upflow	N/A	75	12	8

Table 6
Regeneration Cycles Filtering for WS1CS or WS1.25CS

Downflow Regenerant Refill After Rinse	Downflow Regenerant Prefill	No Regenerant
1 st Cycle: Backwash 2 nd Cycle: Regenerate 3 rd Cycle: <i>Second Backwash*</i> 4 th Cycle: Rinse 5 th Cycle: Fill 6 th Cycle: Service	1 st Cycle: Fill 2 nd Cycle: Service 3 rd Cycle: Backwash 4 th Cycle: Regenerate 5 th Cycle: <i>Second Backwash*</i> 6 th Cycle: Rinse 7 th Cycle: Service	1 st Cycle: Backwash 2 nd Cycle: Rinse 3 rd Cycle: <i>Second Backwash*</i> 4 th Cycle: Second Rinse 5 th Cycle: Service

*Second Backwash is optional in some Program Codes

Table 7
Regenerating Filter Program Codes for WS1CS or WS1.25CS

Program Code	Main Piston	1st Backwash	Brine/Slow Rinse	2nd Backwash	Fast Rinse
P70	Downflow	6	20	6	6
P71	Downflow	12	10	N/A	12
P72	Downflow	4	50	N/A	4
P73	Downflow	10	50	N/A	6
P74	Downflow	12	60	N/A	10
P75	Downflow	12	75	N/A	10

Table 8
Non-Regenerant Filter Program Codes for WS1CS or WS1.25CS

Program Code	Main Piston	1st Backwash	1st Fast Rinse	2nd Backwash	2nd Fast Rinse
P80	Downflow	8	8	N/A	N/A
P81	Downflow	12	6	N/A	N/A
P82	Downflow	14	8	N/A	N/A
P83	Downflow	14	10	N/A	N/A
P84	Downflow	16	10	N/A	N/A
P85	Downflow	18	10	N/A	N/A
P86	Downflow	20	10	N/A	N/A
P90	Downflow	8	6	10	8
P91	Downflow	12	6	12	10

Note: For non-regenerant filters: 1) The regenerant piston is removed; 2) injector plugs are installed in both the UP and DN holes under the injector cap.

**Table 9
DIR/Time Clock Options**

DIR	Time Clock	Reserve Capacity	Softener	Filter		Settings ³	
				Regenerant	Backwash Only	Day Override	Gallon Capacity
Yes		Automatically calculated	Yes			Off	Auto
Yes		If desired enter a value less than estimated capacity	Yes	Yes	Yes	Off	Any Number
Yes	Yes	Automatically calculated	Yes			Any Number	Auto
Yes	Yes	If desired enter a value less than estimated capacity	Yes	Yes	Yes	Any Number	Any number
	Yes	None	Yes	Yes	Yes	Any Number	Off

The control valve with a water meter can be set for Demand Initiated Regeneration (DIR) only, Time Clock operation only or DIR and Time Clock which ever comes first, depending upon what settings are selected for Day Override and Gallon Capacity.² See Table 9.

If a control valve does not contain a meter, the valve can only act as a time clock, and day override should be set to any number and gallon capacity should be set to off.

For DIR Softeners, there are two options for setting the Gallons Capacity. The Gallons Capacity is automatically calculated if set to AUTO. Reserve Capacity is automatically estimated based on water usage if AUTO is used. The other option is to set the Gallons Capacity to a specific number. If a specific number is set, reserve capacity is zero, unless the value is manually set (i.e. the manufacturer intentionally sets the gallon capacity number below the calculated capacity of the system).

The control valve can also be set to regenerate immediately or at the next regeneration time by changing the Regeneration Time Option. There are three choices for settings:

1. "NORMAL" means regeneration will occur at the preset regeneration time.
2. "on 0" means regeneration will occur when the gallons capacity reaches zero.
3. "NORMAL" and "on 0" means the regeneration will occur at the preset regeneration time unless the gallons capacity reaches zero. If the gallons capacity reaches zero the regeneration will begin 10 minutes after no water usage.

The user can initiate manual regeneration. The user has the option to request the manual regeneration at the delayed regeneration time or to have the regeneration occur immediately:

1. Pressing and releasing the REGEN button. "Regen Today" will flash on the display and the regeneration will occur at the delayed regeneration time. The user can cancel the request by pressing and releasing the REGEN button. This method of manually initiating regeneration is not allowed when the system is set to "on 0," i.e. immediately regenerate when the gallon capacity reaches zero.
2. Pressing and holding the REGEN button for approximately 3 seconds will immediately start the regeneration. The user cannot cancel this request, except by resetting the control by pressing NEXT and REGEN buttons simultaneously for 3 seconds.

The control valve consists of the following components:

1. Drive Assembly
2. Drive Cap Assembly, Main Piston and Regenerant Piston
3. Spacer Stack Assembly
4. Injector Cap, Screen, Injector Plug and Injector
5. Refill Flow Control Assembly or Refill Port Plug
6. Drain Line Flow Control and Fitting Assembly
7. Water Meter or Meter Plug
8. Mixing Valve (optional)
9. Installation Fitting Assemblies
10. Bypass Valve (optional)

Note: The WS1CS and WS1.25CS share many of the same components. Refer to Figure 6 for control valve identification.

² See Installer Display Settings Step 3I, OEM Softener Setup Step 7S and OEM Filter Setup Step 6F for explanations of Day Override and Gallon Capacity.

³ Day Override and Gallon Capacity can not both be set to "oFF" at the same time.

Water Meter or Meter Plug

The water meter is installed on the outlet side of the control valve. The water meter uses a turbine to measure gallons of treated water. The turbine rotates with the flow of water and reports its rate of rotation through Hall effect⁵ circuitry to the printed circuit (PC) board. This rotation permits the PC board to record the total volume of treated water and the flow rate. The small centrally located magnet is shielded from water, which substantially reduces iron-fouling problems with the turbine.

THIS WATER METER SHOULD NOT BE USED AS THE PRIMARY MONITORING DEVICE FOR CRITICAL HEALTH EFFECT APPLICATIONS.

The turbine is accurate to within $\pm 5\%$ over a wide operating flow rate range (0.25 gpm up to control valve maximums) and has a very low pressure drop. Water used for regeneration is not metered. If the control valve is set to prefill the regenerant, water used between the prefill cycle up to the start of the regeneration cycle is metered. If the control valve is in regeneration mode (e.g. a backwash cycle) and there is a water demand, that water usage is not metered.

When facing the front of the control valve, the water meter is positioned on the left-hand side of the control valve. Allow sufficient clearance to clean and repair the water meter without disconnecting the plumbing or disassembling any other parts of the control valve.

Control valves can be ordered with a meter plug (i.e. no electronics or turbine) rather than a water meter if desired. Control valves without meters should only be set up for time clock operation (i.e. no water meter, no demand-initiated regeneration). Control valves with water meters provide a wider variety of useful information (see OEM General Instructions for list of information).

A unique feature of this control valve is the ability to display actual water usage for the last 63 days. The values are initially stored as “----”. This means the value is unknown. As days pass values are stored as “0” for no flow or the actual number of gallons. The counting of the gallons starts at the regeneration time. If no regeneration time can be set (i.e. when the valve is set for immediate regeneration) the counting of gallons starts at 12 a.m. Day 1 is yesterday, day 2 the day before yesterday, etc. As new values are added the oldest history disappears.

Another unique feature is that the valve automatically calculates a reserve capacity when set up as a softener with “Gallons Capacity” set to “AUTO” and the “Regeneration Time Option” set to “Normal” or “Normal + on 0”. The actual reserve capacity is compared to the gallons capacity remaining immediately prior to the preset regeneration time. A regeneration will occur if the actual reserve capacity is less than the gallons capacity remaining. The actual reserve capacity is calculated by using the estimated reserve capacity and adjusting it up or down for actual usage.

The estimated reserve capacity for a given day of the week is the maximum value stored for the last three non-trivial water usages (i.e. more than 20 gallons/day) in seven day intervals.

Mixing Valve

The mixing valve is installed on the outlet side of the control valve. The mixing valve is used to blend raw water with treated water.

To adjust the blended water, close the mixing valve. Open a water faucet to the desired flow rate. Open the mixing valve until the desired hardness is reached. Close the faucet.

Installation Fitting Assemblies

The installation fittings are used to connect the optional bypass or the control valve to the plumbing system. These are the installation fitting assemblies available:

1. 1” NPT elbow assembly
2. ¾” & 1” PVC solvent weld elbow fitting assembly
3. 1” straight brass sweat fitting assembly⁶
4. ¾” straight brass sweat fitting assembly⁶
5. 1” plastic male NPT fitting assembly
6. 1¼” plastic male NPT fitting assembly
7. 1” plastic male BSPT fitting assembly
8. 1¼” plastic male BSPT fitting assembly
9. 1¼” & 1½” brass sweat fitting assembly⁶
10. 1¼” & 1½” PVC solvent fitting assembly

The installation fitting assemblies are sold in pairs and consist of two fittings, two nuts, two split rings and two o-rings. The installation fitting assemblies and the bypass valve are sold separately from the control valve.

Both elbow fittings have a unique drill out feature to allow a ¼” NPT connection to the inlet and/or outlet which can be used for a RO feed, test ports, pressure tap ports, etc.

⁵ Some semiconductor materials exhibit a phenomenon in the presence of a magnetic field that is adaptable to sensing devices. When a current is passed through one pair of wires attached to a semiconductor, another pair of wires properly attached and oriented with respect to the semiconductor will develop a voltage proportional to the magnetic field present and the current in the other pair of wires. Holding the exciting current constant and moving a permanent magnet near the semiconductor produces a voltage output proportional to the movement of the magnet. Hall effect devices provide a high speed response, excellent temperature stability, and no physical contact.

⁶ Has not been tested for compliance with California Proposition 65, so this fitting should not be installed in California.

Bypass Valve

The bypass valve is typically used to isolate the control valve from the plumbing system's water pressure in order to perform control valve repairs or maintenance. The WS1 bypass valve is particularly unique in the water treatment industry due to its versatility and state of the art design features. The 1" full flow bypass valve incorporates four positions, including a diagnostic position that allows service personal to work on a pressurized system while still providing untreated bypass water to the facility or residence. Its completely non-metallic, all-plastic design allows for easy access and serviceability without the need for tools.

The bypass body and rotors are glass filled Noryl⁷ (or equivalent) and the nuts and caps are glass filled polypropylene. All seals are self-lubricating EPDM to help prevent valve seizing after long periods of non-use. Internal o-rings can easily be replaced if service is required.

The bypass consists of two interchangeable plug valves that are operated independently by red arrow-shaped handles. The handles identify the flow direction of the water. The plug valves enable the bypass valve to operate in four positions.

- 1. Normal Operation Position:** The inlet and outlet handles point in the direction of flow indicated by the engraved arrows on the control valve. Water flows through the control valve during normal operation and this position also allows the control valve to isolate the media bed during the regeneration cycle. (See Figure 1)
- 2. Bypass Position:** The inlet and outlet handles point to the center of the bypass, the control valve is isolated from the water pressure contained in the plumbing system. Untreated water is supplied to the plumbing system. (See Figure 2)
- 3. Diagnostic Position:** The inlet handle points in the direction of flow and the outlet handle points to the center of bypass valve, system water pressure is allowed to the control valve and the plumbing system while not allowing water to exit from the control valve to the plumbing. (See Figure 3)
- 4. Shut Off Position:** The inlet handle points to the center of the bypass valve and the outlet handle points in the direction of flow, the water is shut off to the plumbing system. If water is available on the outlet side of the softener it is an indication of water bypass around the system (i.e. a plumbing connection somewhere in the building bypasses the system). (See Figure 4)

⁷ Noryl is a trademark of General Electric.

BYPASS VALVE OPERATION

Figure 1

NORMAL OPERATION

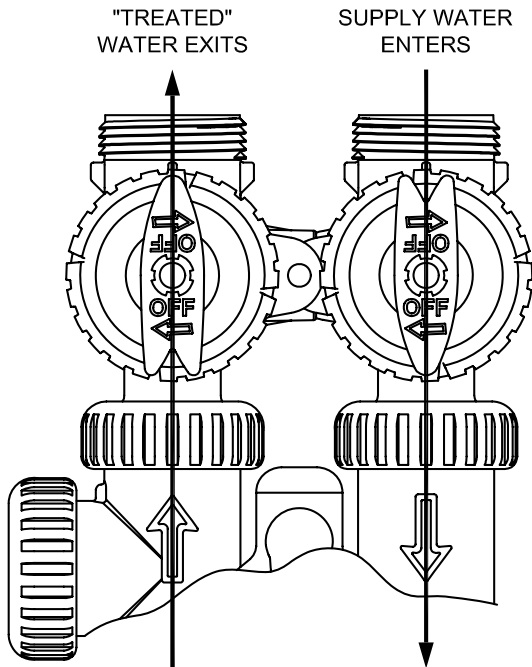


Figure 2

BYPASS OPERATION

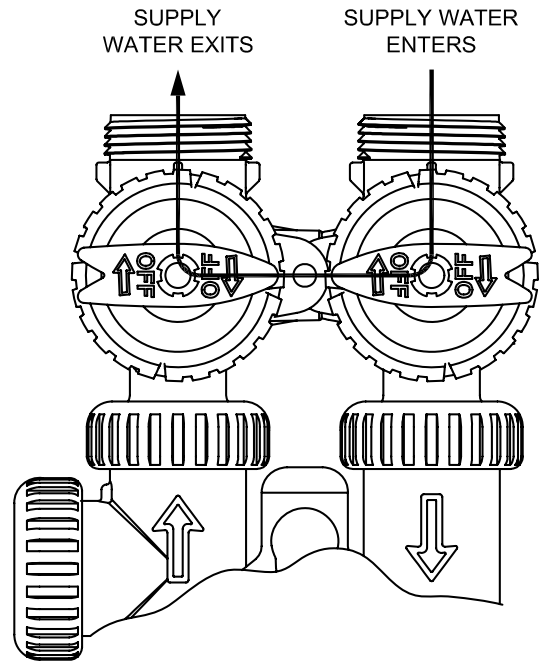


Figure 3

DIAGNOSTIC MODE

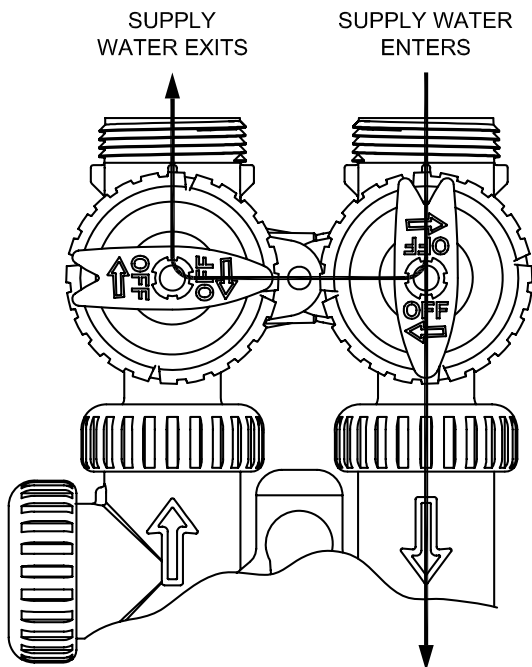
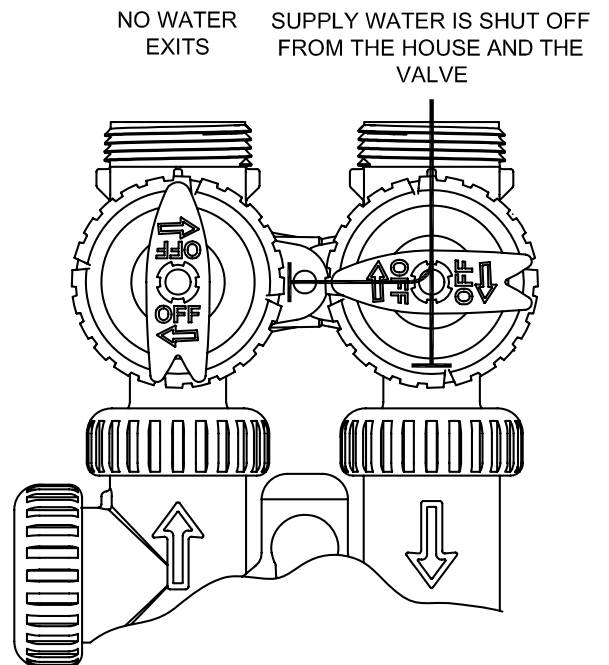


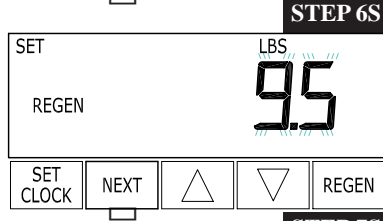
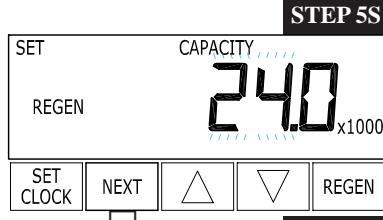
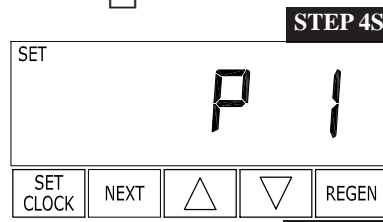
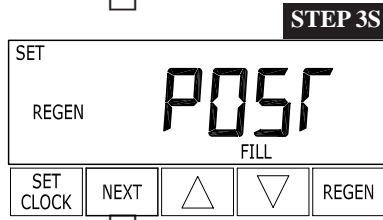
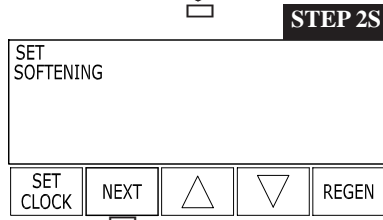
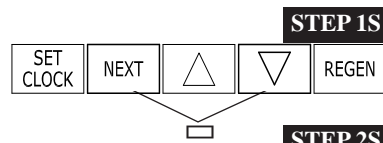
Figure 4

SHUT OFF MODE



OEM Softener System Setup Quick Reference

This is a quick reference setup procedure. See OEM Softener System Setup Detail for more information on available settings.



RETURN TO
NORMAL MODE

STEP 1S – Press NEXT and ▼ buttons simultaneously for 3 seconds. If screen in step 2S does not appear in 5 seconds the lock on the valve is activated. To unlock press ▼, NEXT, ▲, and SET CLOCK in sequence, then press NEXT and ▼ simultaneously for 3 seconds.

STEP 2S – Choose Softening using ▼ or ▲ buttons. Press NEXT to go to Step 3S. Press REGEN to exit OEM Softener System Setup.

STEP 3S – Set Refill option using ▼ or ▲ buttons:

- “PoST” to refill the brine tank after the final rinse; or
- “PrE” to refill the brine tank two hours before the regeneration time set.

Press NEXT to go to Step 4S. Press REGEN to return to previous step.

STEP 4S – Program Code: Enter the desired program code from Table 4 or Table 5. Prior to selecting a Program Code, verify the correct valve body, main piston, regenerant piston, and stack are being used, and that the injector or injector plug(s) are in the correct locations. See Compliance Table in Service Instructions under the Injector Cap, screen, Injector Plug and Injector section and Figure 6. Note: Do not select P60 through P65 if using a WS1.25CS valve. Press NEXT to go to Step 5S. Press REGEN to return to previous step.

STEP 5S – Enter the ion exchange capacity in grains of hardness as calcium carbonate for the system based on test data using ▼ or ▲ buttons. Press NEXT to go to Step 6S. Press REGEN to return to previous step.

STEP 6S – Enter the pounds of salt per regeneration using ▼ or ▲ buttons. Press NEXT to go to Step 7S. Press REGEN to return to previous step.

STEP 7S – Set Gallons Capacity using ▼ or ▲ buttons:

- “AUTO” (reserve capacity automatically estimated and gallons capacity automatically calculated from grains capacity and water hardness);
- “oFF” (regeneration based on day override); or
- number of gallons (20 to 50,000).

See Table 12 for more detail. Press NEXT to go to Step 8S. Press REGEN to return to previous step.

STEP 8S – Set Regeneration Time Option using ▼ or ▲ buttons:

- “NORMAL” means regeneration will occur at the preset time;
- “on 0” means regeneration will occur immediately when the gallons capacity reaches 0 (zero); or
- “NORMAL + on 0” means regeneration will occur at one of the following:
 - ▶ the preset time when the gallons capacity falls below the reserve or the specified number of days between regenerations is reached whichever comes first; or
 - ▶ after 10 minutes of no water usage when the gallon capacity reaches 0 (zero).

See Table 12 for more detail. Press NEXT to exit OEM Softener System Setup. Press REGEN to return to previous step.

Table 12
Softener Setting Options

Gallons Capacity	Regeneration Time Option	Day Override	Result ⁸
AUTO	NORMAL	oFF	Reserve capacity automatically estimated. Regeneration occurs when gallons capacity falls below the reserve capacity at the next Regen Set Time.
AUTO	NORMAL	Any number	Reserve capacity automatically estimated. Regeneration occurs at the next Regen Set Time when gallons capacity falls below the reserve capacity or the specified number of days between regenerations is reached.
Any number	NORMAL	oFF	Reserve capacity <u>not</u> automatically estimated. Regeneration occurs at the next Regen Set Time when gallons capacity reaches 0.
oFF	NORMAL	Any number	Reserve capacity <u>not</u> automatically estimated. Regeneration occurs at the next Regen Set Time when the specified number of days between regenerations is reached.
Any number	NORMAL	Any number	Reserve capacity <u>not</u> automatically estimated. Regeneration occurs at the next Regen Set Time when gallons capacity reaches 0 or the specified number of days between regenerations is reached.
AUTO	On O	oFF	Reserve capacity not automatically estimated. Regeneration occurs immediately when gallons capacity reaches 0. Time of regeneration will not be allowed to be set because regeneration will always occur when gallons capacity reaches 0.
Any number	On O	oFF	Reserve capacity <u>not</u> automatically estimated. Regeneration occurs immediately when gallons capacity reaches 0. Time of regeneration will not be allowed to be set because regeneration will always occur on 0.
AUTO	NORMAL on 0	oFF	Reserve capacity automatically estimated. Regeneration occurs when gallons capacity falls below the reserve capacity at the next Regen Set Time or regeneration occurs after 10 minutes of no water usage when gallon capacity reaches 0.
AUTO	NORMAL on 0	Any number	Reserve capacity automatically estimated. Regeneration occurs at the next Regen Set Time when gallons capacity falls below the reserve capacity or the specified number of days between regenerations is reached or regeneration occurs after 10 minutes of no water usage when gallon capacity reaches 0.
Any number	NORMAL on 0	Any number	Reserve capacity <u>not</u> automatically estimated. Regeneration occurs at the next Regen Set Time when the specified number of days between regenerations is reached or regeneration occurs after 10 minutes of no water usage when gallon capacity reaches 0.

⁸Reserve capacity estimate is based on history of water usage.

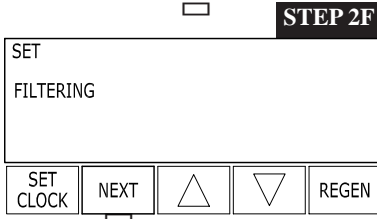
OEM Filter System Setup Quick Reference

This is a quick reference setup procedure. See OEM Filter System Setup Detail for more information on available settings.



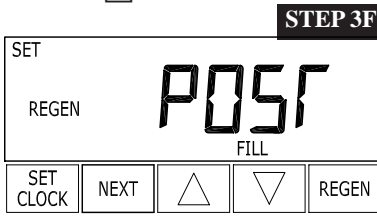
STEP 1F

STEP 1F – Press NEXT and ▼ simultaneously for 3 seconds. If screen in step 2F does not appear in 5 seconds the lock on the valve is activated. To unlock press ▼, NEXT, ▲, and SET CLOCK in sequence, then press NEXT and ▼ simultaneously for 3 seconds.



STEP 2F

STEP 2F – Choose Filtering using ▼ or ▲ buttons. Press NEXT to go to step 3F. Press REGEN to exit OEM Filter System Setup.

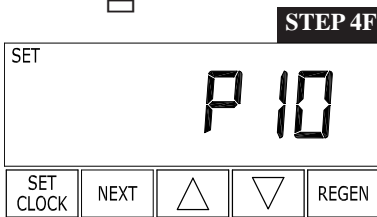


STEP 3F

STEP 3F – Set Refill option using ▼ or ▲ buttons:

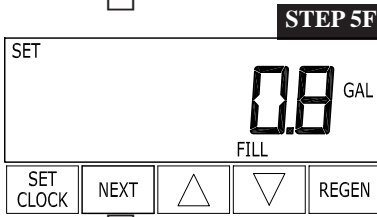
- “PoST” to refill the brine tank after the final rinse; or
- “PrE” to refill the brine tank two hours before the regeneration time set.

Press NEXT to go to step 4F. Press REGEN to return to previous step.



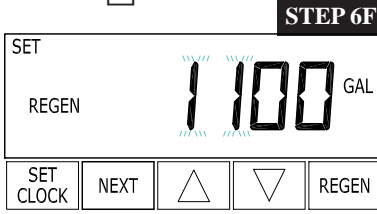
STEP 4F

STEP 4F – Program code: Enter the desired program code from Table 4, Table 7 or Table 8. Prior to selecting a Program Code, verify the correct valve body, main piston, regenerant piston, and stack are being used, and that the injector or injector plug(s) are in the correct locations. See Compliance Table in Service Instructions under the Injector Cap, screen, Injector Plug and Injector section and Figure 6. Press NEXT to go to Step 5F. Press REGEN to return to previous step.



STEP 5F

STEP 5F – Enter “oFF” if regenerant is not used (i.e. backwash only) or enter the refill volume (in gallons) using ▼ or ▲ buttons. Press NEXT to go to step 6F. Press REGEN to return to previous step.



STEP 6F

STEP 6F – Set Gallons Capacity using ▼ or ▲ buttons:

- “oFF” (regeneration based on day override); or
- number of gallons (20 to 50,000).

See Table 13 for more detail. Press NEXT to go to step 7F. Press REGEN to return to previous step.



STEP 7F

STEP 7F – Set Regeneration Time Option using ▼ or ▲ buttons:

- “NORMAL” means regeneration will occur at the preset time;
- “on 0” means regeneration will occur immediately when the gallons capacity reaches 0 (zero); or
- “NORMAL + on 0” means regeneration will occur at one of the following:
 - ▶ the preset time when the specified number of days between regenerations is reached; or
 - ▶ after 10 minutes of no water usage when the gallon capacity reaches 0 (zero).

See Table 13 for more detail. Press NEXT to exit OEM Filter System Setup. Press REGEN to return to previous step.

RETURN TO
NORMAL MODE

**Table 13
Filter Setting Options**

Gallons Capacity	Regeneration Time Option	Day Override	Result
oFF	NORMAL	Any number	Reserve capacity <u>not</u> automatically estimated. Regeneration occurs at the next Regen Set Time when the specified number of days between regenerations is reached.
Any number	NORMAL	oFF	Reserve capacity <u>not</u> automatically estimated. Regeneration occurs at the next Regen Set Time when gallons capacity reaches 0.
Any number	NORMAL	Any number	Reserve capacity <u>not</u> automatically estimated. Regeneration occurs at the next Regen Set Time when gallons capacity reaches 0 or the specified number of days between regenerations is reached.
Any number	On 0	oFF	Reserve capacity <u>not</u> automatically estimated. Regeneration occurs immediately when gallons capacity reaches 0. Time of regeneration will not be allowed to be set because regeneration will always occur on 0.
Any number	NORMAL on 0	Any number	Reserve capacity <u>not</u> automatically estimated. Regeneration occurs at the next Regen Set Time when the specified number of days between regenerations is reached or regeneration occurs after 10 minutes of no water usage when gallon capacity reaches 0.

OEM Filter System Setup Detail

STEP 1F – Press NEXT and ▼ simultaneously for 3 seconds. If screen in step 2F does not appear in 5 seconds the lock on the valve is activated. To unlock press ▼, NEXT, ▲, and SET CLOCK in sequence, then press NEXT and ▼ simultaneously for 3 seconds.

STEP 2F - Softening or Filtering: First the OEM must set the valve for use as a filter. Press ▼ or ▲ to choose filtering. Press NEXT to go to step 3F. Press REGEN to exit OEM Filter System Setup.

STEP 3F – Refill: Select “PoST” to refill the brine tank after the final rinse or select “PrE” to refill the brine tank two hours before the regeneration time set. If “oFF” is selected in Step 6F the display can be left on “PoST” or “PrE” because no refill occurs. Press NEXT to go to step 4F. Press REGEN to return to previous step.

STEP 4F – Program code: Enter the desired program code from Table 4, Table 7 or Table 8. Prior to selecting a Program Code, verify the correct valve body, main piston, regenerant piston, and stack are being used, and that the injector or injector plug(s) are in the correct locations. See Compliance Table in Service Instructions under the Injector Cap, screen, Injector Plug and Injector section and Figure 6. Press NEXT to go to Step 5F. Press REGEN to return to previous step.

STEP 5F – Fill Volume: If the filter design does not require a regenerant the value is set to “oFF”. If a regenerant is required, the volume of refill (in gallons) can be set to the desired value. The default value is 0.8 and the value ranges from 0.1 to 100.0. The increment increase is 0.1 for the range of 0.1 to 10.0; 0.5 for the range of 10.0 to 50.0 and 1.0 for the range of 50.0 to 100.0. Press NEXT to go to step 6F. Press REGEN to return to previous step.

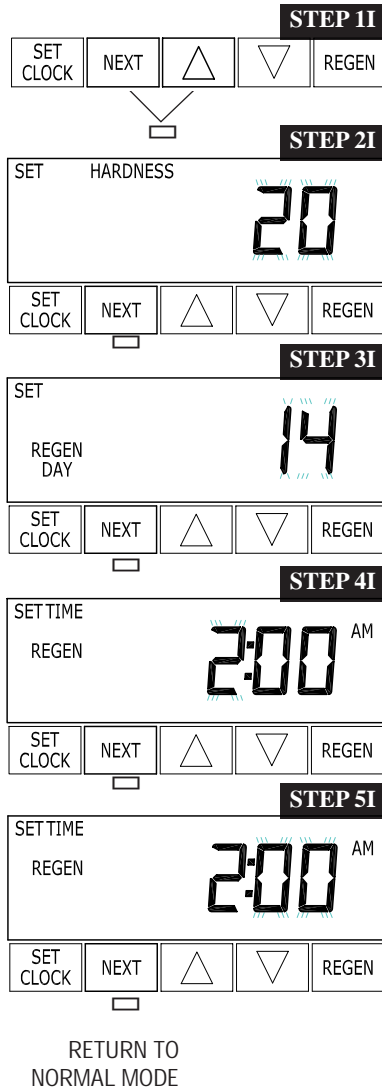
STEP 6F – Gallons Capacity: If value is set to:

- “oFF” regeneration will be based solely on the day override set (see Installer Display Settings step 3I); or
- as a number (allowable range 20 to 50,000) regeneration initiation will be based off the value specified.

Increment increase is 20 for the range of 20 to 1000; 50 for the range of 1000 to 10,000 and 100 for the range of 10,000 to 50,000. Hardness display will not be allowed to be set in the Install Display Settings. See Table 13 for more detail. Press NEXT to go to step 7F. Press REGEN to return to previous step.

STEP 7F – Regeneration Time Option: Three choices for settings are available “NORMAL”, “on 0” and “NORMAL + on 0”. See Table 13 for more detail. Press NEXT to exit OEM Filter System Setup. Press REGEN to return to previous step.

Installer Display Settings



STEP 1I - Press NEXT and ▲ simultaneously for 3 seconds.

STEP 2I – Hardness: Set the amount of hardness in grains of hardness as calcium carbonate per gallon using the ▼ or ▲ buttons. The default is 20 with value ranges from 1 to 150 in 1 grain increments. Note: The grains per gallon can be increased if soluble iron needs to be reduced. This display will show “-nA-” if “FILTER” is selected in Step 2F or if ‘AUTO’ is not selected in Step 7S. Press NEXT to go to step 3I. Press REGEN to exit Installer Display Settings.

STEP 3I – Day Override: When gallon capacity is set to off, sets the number of days between regenerations. When gallon capacity is set to AUTO or to a number, sets the maximum number of days between regenerations. If value set to “oFF” regeneration initiation is based solely on gallons used. If value is set as a number (allowable range from 1 to 28) a regeneration initiation will be called for on that day even if sufficient number of gallons were not used to call for a regeneration. Set Day Override using ▼ or ▲ buttons:

- number of days between regeneration (1 to 28); or
- “oFF”.

See Table 12 for more detail on softener setup and Table 13 for more detail on filter setup. Press NEXT to go to step 4I. Press REGEN to return to previous step.

STEP 4I – Next Regeneration Time (hour): Set the hour of day for regeneration using ▼ or ▲ buttons. AM/PM toggles after 12. The default time is 2:00 a.m. This display will show “REGEN on 0 GAL” if “on 0” is selected in Step 8S or Step 7F. Press NEXT to go to step 5I. Press REGEN to return to previous step.

STEP 5I – Next Regeneration Time (minutes): Set the minutes of day for regeneration using ▼ or ▲ buttons. This display will not be shown if “on 0” is selected in Step 8S or Step 7F. Press NEXT to exit Installer Display Settings. Press REGEN to return to previous step.

To initiate a manual regeneration immediately, press and hold the “REGEN” button for three seconds. The system will begin to regenerate immediately. The control valve may be stepped through the various regeneration cycles by pressing the “REGEN” button.

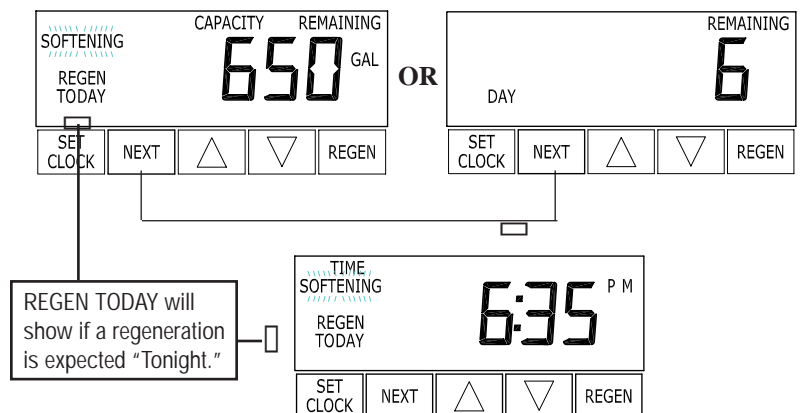
User Display Settings

General Operation

When the system is operating one of two displays will be shown. Pressing NEXT will alternate between the displays. One of the displays is always the current time of day. The second display is one of the following: days remaining or gallons remaining. Days remaining is the number of days left before the system goes through a regeneration cycle. Capacity remaining is the number of gallons that will be treated before the system goes through a regeneration cycle. The user can scroll between the displays as desired.

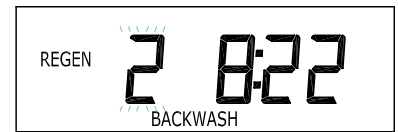
If the system has called for a regeneration that will occur at the preset time of regeneration, the words REGEN TODAY will appear on the display.

When water is being treated (i.e. water is flowing through the system) the word “Softening” or “Filtering” flashes on the display if a water meter is installed.



Regeneration Mode

Typically a system is set to regenerate at a time of low water usage. An example of a time with low water usage is when a household is asleep. If there is a demand for water when the system is regenerating, untreated water will be used.

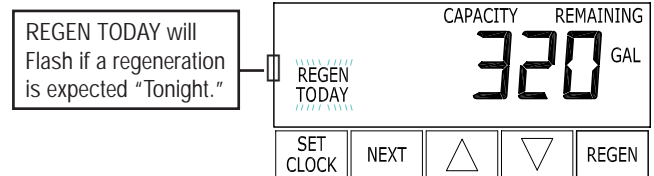


When the system begins to regenerate, the display will change to include information about the step of the regeneration process and the time remaining for that step to be completed. The system runs through the steps automatically and will reset itself to provide treated water when the regeneration has been completed.

Manual Regeneration

Sometimes there is a need to regenerate the system sooner than when the system calls for it, usually referred to as manual regeneration. There may be a period of heavy water usage because of guests or a heavy laundry day.

To initiate a manual regeneration at the preset delayed regeneration time, when the regeneration time option is set to "NORMAL" or "NORMAL + on 0", press and release "REGEN". The words "REGEN TODAY" will flash on the display to indicate that the system will regenerate at the preset delayed regeneration time. If you pressed the "REGEN" button in error, pressing the button again will cancel the request. Note: If the regeneration time option is set to "on 0" there is no set delayed regeneration time so "REGEN TODAY" will not activate if "REGEN" button is pressed.

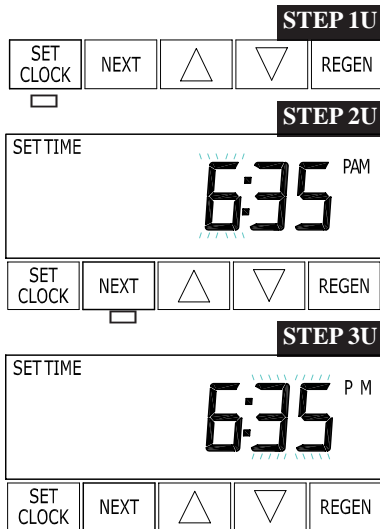


To initiate a manual regeneration immediately, press and hold the "REGEN" button for three seconds. The system will begin to regenerate immediately. The request cannot be cancelled.

Note: For softeners, if brine tank does not contain salt, fill with salt and wait at least two hours before regenerating.

Set Time of Day

The user can also set the time of day. Time of day should only need to be set after extended power outages or when daylight saving time begins or ends. If an extended power outage occurs, the time of day will flash on and off which indicates the time of day should be reset.



STEP 1U – Press SET CLOCK.

STEP 2U - Current Time (hour): Set the hour of the day using ▼ or ▲ buttons. AM/PM toggles after 12. Press NEXT to go to step 3U.

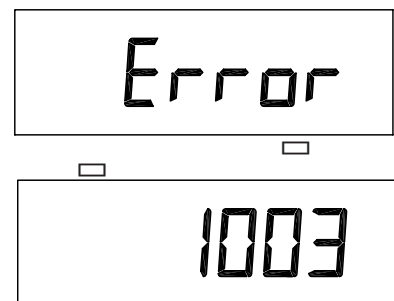
STEP 3U - Current Time (minutes): Set the minutes of the day using ▼ or ▲ buttons. Press NEXT to exit Set Clock. Press REGEN to return to previous step.

Power Loss

If the power goes out for less than two hours, the system will automatically reset itself. If an extended power outage occurs, the time of day will flash on and off which indicates the time of day should be reset. The system will remember the rest.

Error Message

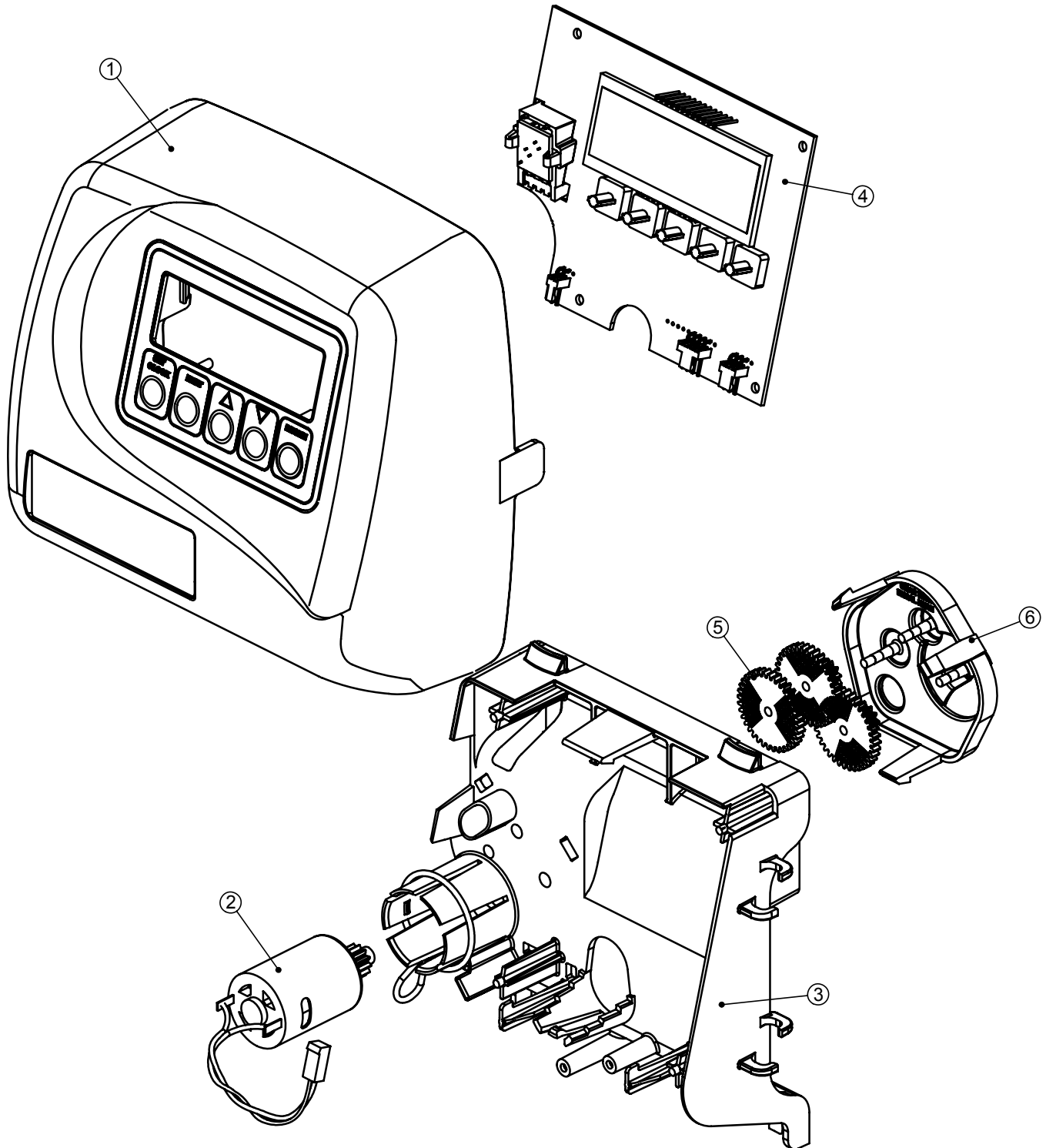
If the word "ERROR" and a number are alternately flashing on the display contact the OEM for help. This indicates that the valve was not able to function properly.



Drawings and Part Numbers

Front Cover and Drive Assembly

Drawing No.	Order No.	Description	Quantity
1	V3175-01	WS1 Front Cover ASY	1
2	V3107-01	WS1 Motor	1
3	V3106-01	WS1 Drive Bracket & Spring Clip	1
4	V3108CS	WS1CS PC Board	1
5	V3110	WS1 Drive Gear 12x36	3
6	V3109	WS1 Drive Gear Cover	1
	V3002	WS1 Drive ASY	*
Not Shown	V3186	WS1 AC Adapter 110V - 12V	1

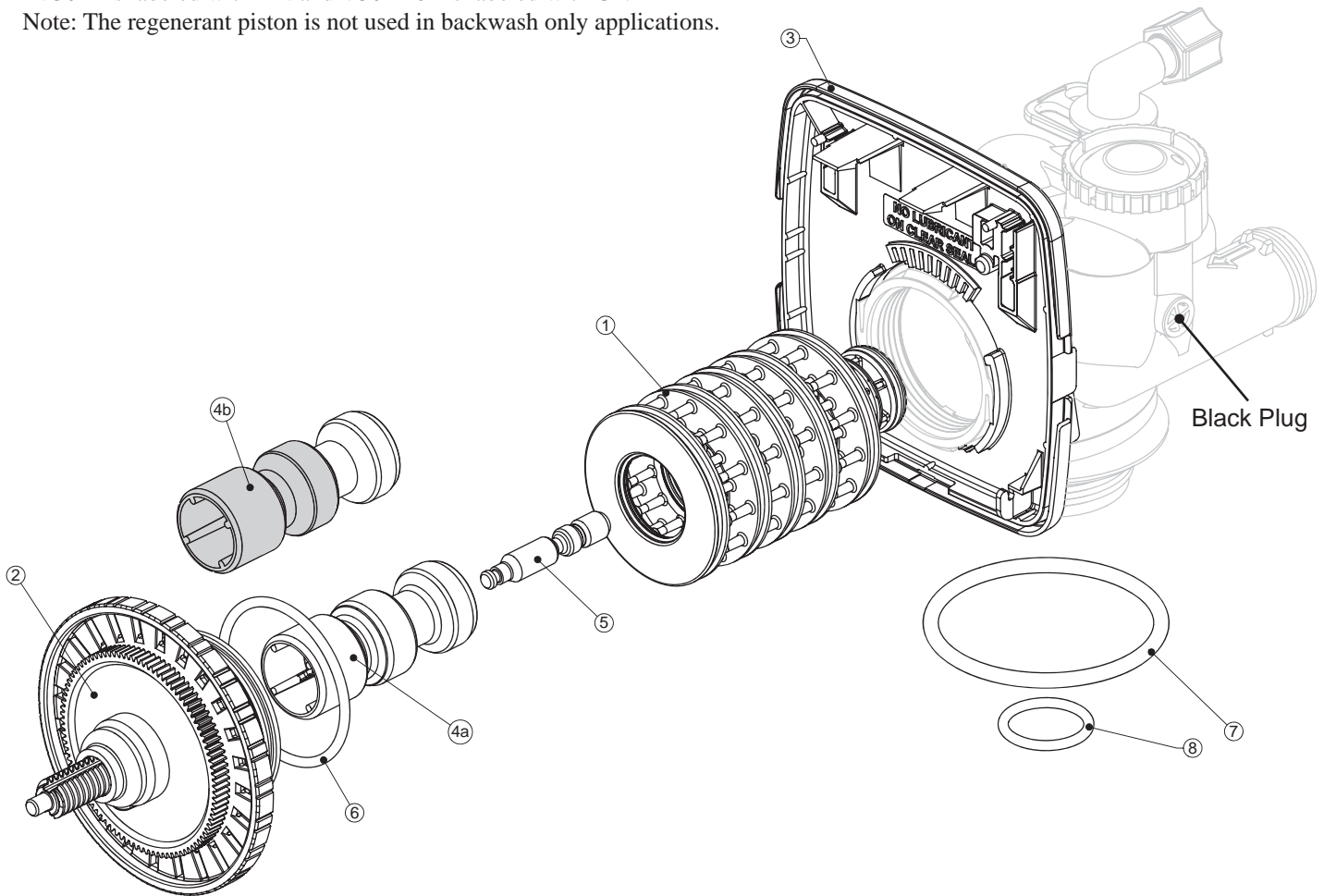


WS1CS Drive Cap Assembly, Downflow Piston, Upflow Piston, Regenerant Piston and Spacer Stack Assembly

Drawing No.	Order No.	Description	Quantity
1	V3005	WS1 Spacer Stack Assembly	1
2	V3004	Drive Cap ASY	1
3	V3178	WS1 Drive Back Plate	1
4a	V3011*	WS1 Piston Downflow ASY	1
4b	V3011-01*	WS1 Piston Upflow ASY	
5	V3174	WS1 Regenerant Piston	1
6	V3135	O-ring 228	1
7	V3180	O-ring 337	1
8	V3105	O-ring 215 (Distributor Tube)	1
Not Shown	V3001	WS1 Body ASY Downflow	1
	V3001-02	WS1 Mixing Valve Body ASY	
	V3001UP	WS1 Body ASY Upflow	
	V3001-02UP	WS1 Mixing Valve Body Upflow ASY	
Not Shown	V3013	WS1 Mixing Valve ASY	1

*V3011 is labeled with DN and V3011-01 is labeled with UP.

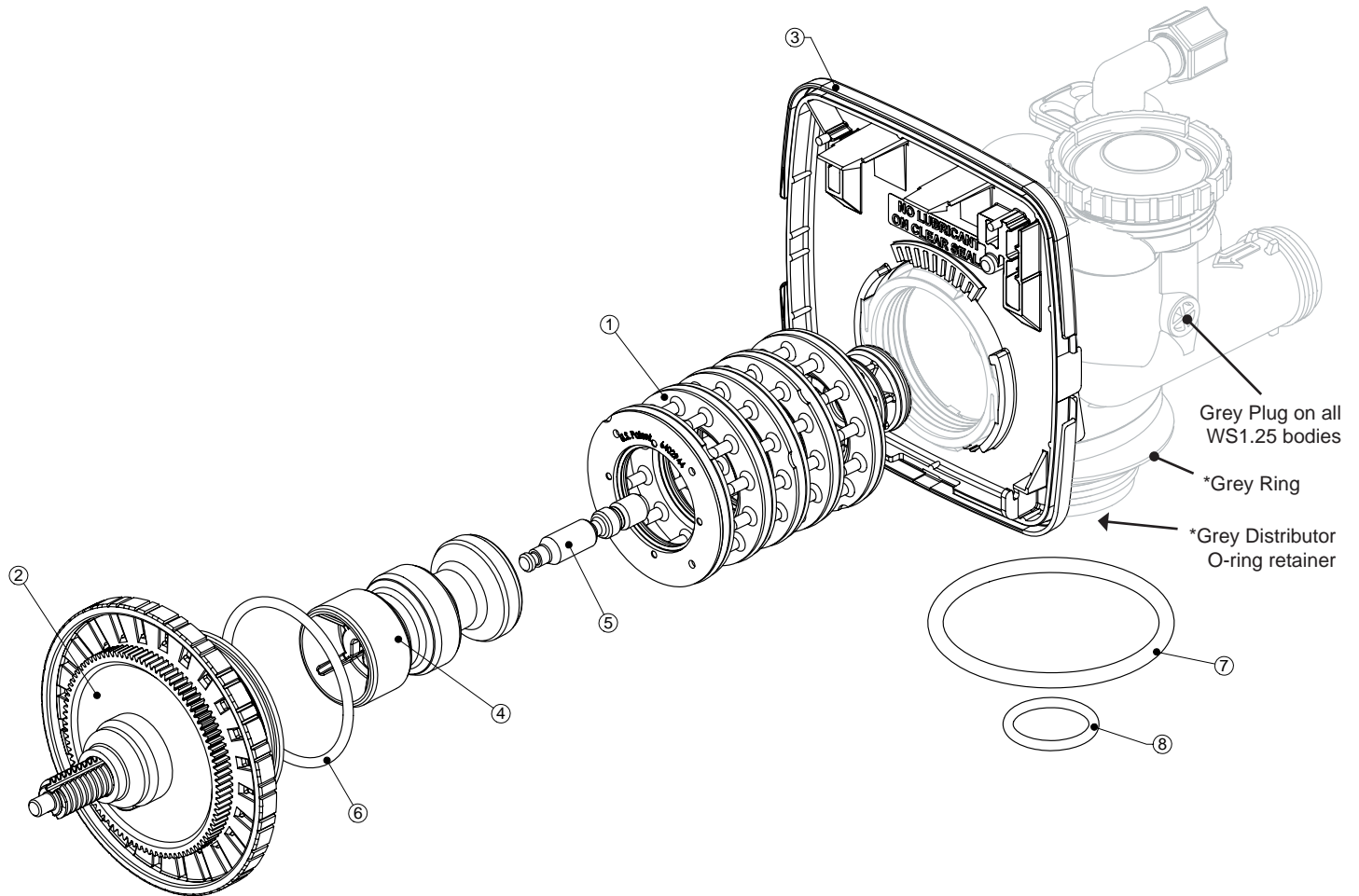
Note: The regenerant piston is not used in backwash only applications.



WS1.25CS Drive Cap Assembly, Downflow Piston, Regenerant Piston and Spacer Stack Assembly

Drawing No.	Order No.	Description	Quantity
1	V3430	WS1.5 Spacer Stack Assembly	1
2	V3004	Drive Cap ASY	1
3	V3178	WS1 Drive Back Plate	1
4	V3407	WS1.5 Piston Downflow ASY	1
5	V3174	WS1 Regenerant Piston	1
6	V3135	O-ring 228	1
7	V3180	O-ring 337	1
8	V3358	O-ring 219 (Distributor Tube Opening 1.32")	1
	V3357	O-ring 218 (Distributor Tube Opening 32mm)	
Not Shown	V3020	WS1.25 Body ASY Downflow (Distributor Tube Opening 1.32")	1
	V3020-01	WS1.25 Mixing Valve Body Downflow ASY (Distributor Tube Opening 1.32")	
	V3020-02	WS1.25 Body ASY Downflow (Distributor Tube Opening 32mm)	
	V3020-03	WS1.25 Mixing Valve Body Downflow ASY (Distributor Tube Opening 32mm)	

Note: The regenerant piston is not used in backwash only applications.



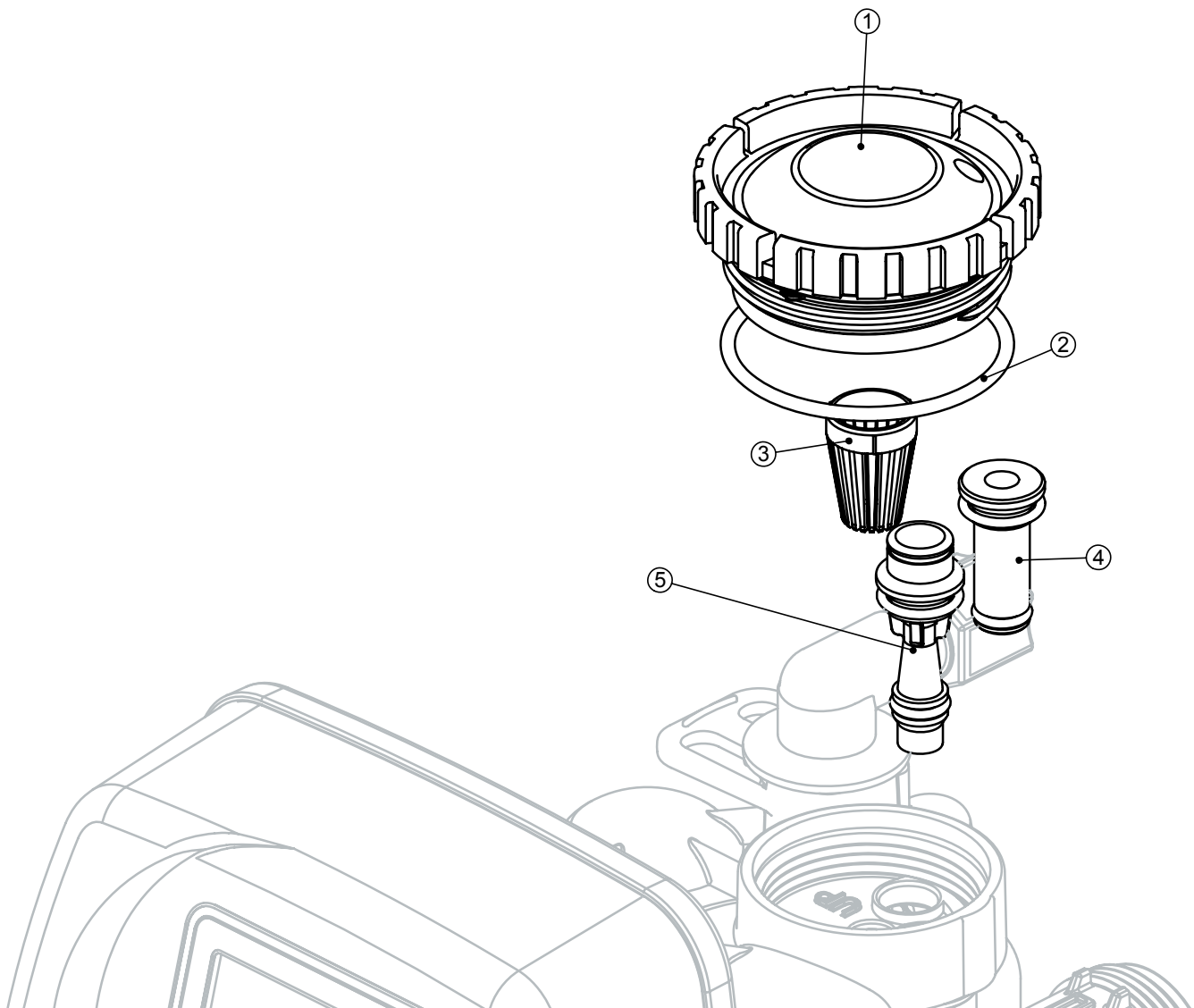
*Only for valves that have a 32mm Distributor Tube Opening

Injector Cap, Injector Screen, Injector, Plug and O-Ring

Drawing No.	Order No.	Description	Quantity
1	V3176	Injector Cap	1
2	V3152	O-ring 135	1
3	V3177	Injector Screen	1
4	V3010-1Z	WS1 Injector ASY Z Plug	1
5	V3010-1A	WS1 INJECTOR ASY A BLACK	1
	V3010-1B	WS1 INJECTOR ASY B BROWN	
	V3010-1C	WS1 INJECTOR ASY C VIOLET	
	V3010-1D	WS1 INJECTOR ASY D RED	
	V3010-1E	WS1 INJECTOR ASY E WHITE	
	V3010-1F	WS1 INJECTOR ASY F BLUE	
	V3010-1G	WS1 INJECTOR ASY G YELLOW	
	V3010-1H	WS1 INJECTOR ASY H GREEN	
	V3010-1I	WS1 INJECTOR ASY I ORANGE	
	V3010-1J	WS1 INJECTOR ASY J LIGHT BLUE	
	V3010-1K	WS1 INJECTOR ASY K LIGHT GREEN	
Not Shown	V3170	O-ring 011	*
Not Shown	V3171	O-ring 013	*

*The injector plug and the injector each contain one 011 (lower) and 013 (upper) o-ring.

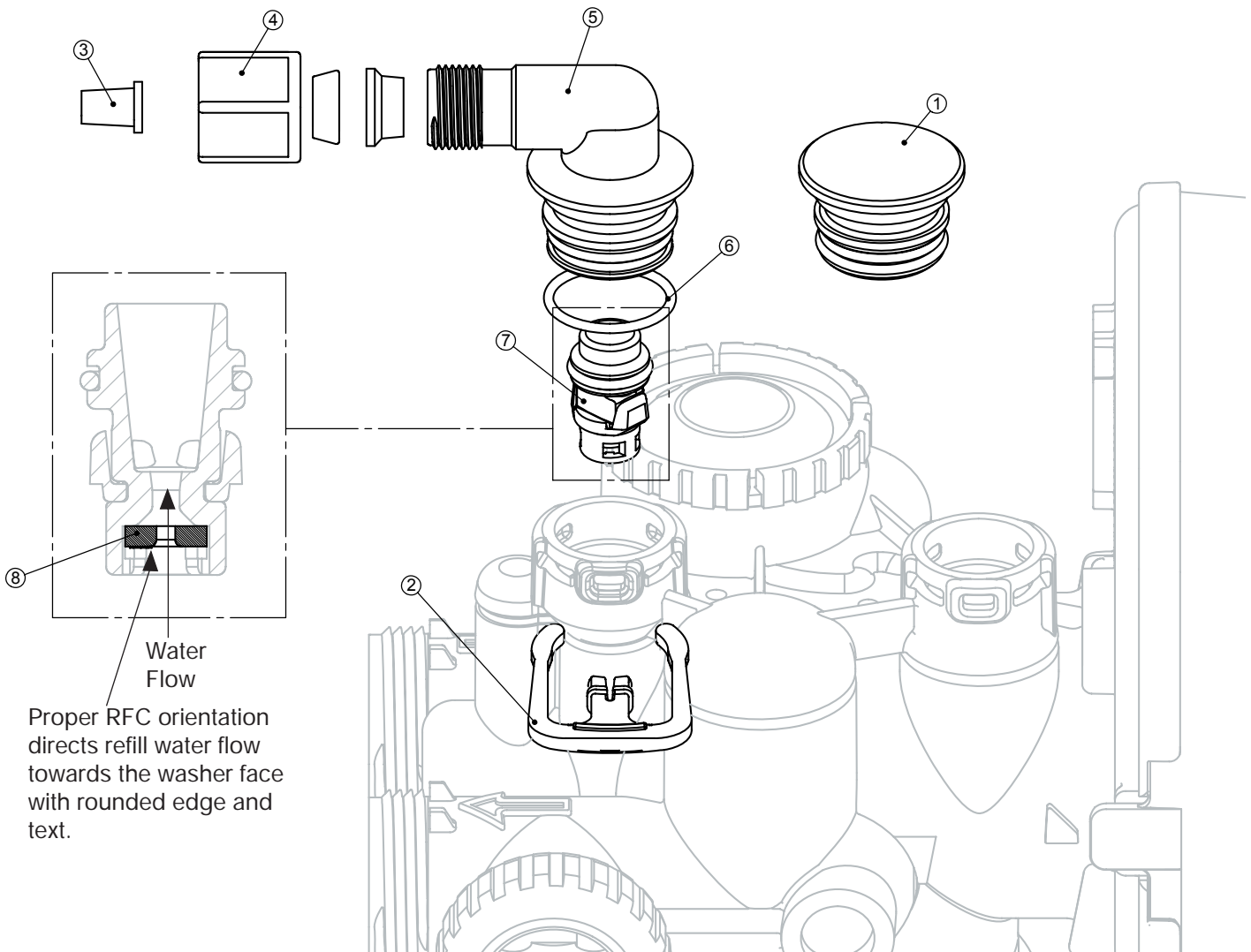
Note: For upflow position, injector is located in the up hole and injector plug is in the other hole. WS1CS upflow bodies are identified by having the DN marking removed. For a filter that only backwashes, injector plugs are located on both holes.



Refill Flow Control Assembly and Refill Port Plug

Drawing No.	Order No.	Description	Quantity
1	V3195-01	WS1 Refill Port Plug ASY	This part is required for backwash only systems
2	H4615	Elbow Locking Clip	1
3	JCP-P-6	Polytube insert 3/8"	1
4	JCPG-6PBLK	Nut 3/8"	1
5	H4613	Elbow Cap 3/8"	1
6	V3163	O-ring 019	1
7	V3165-01*	WS1 RFC Retainer ASY	1
8	V3182	WS1 RFC	1
Not Shown	H4650	Elbow 1/2" with nut and insert	Option

*Assembly includes WS1 RFC.

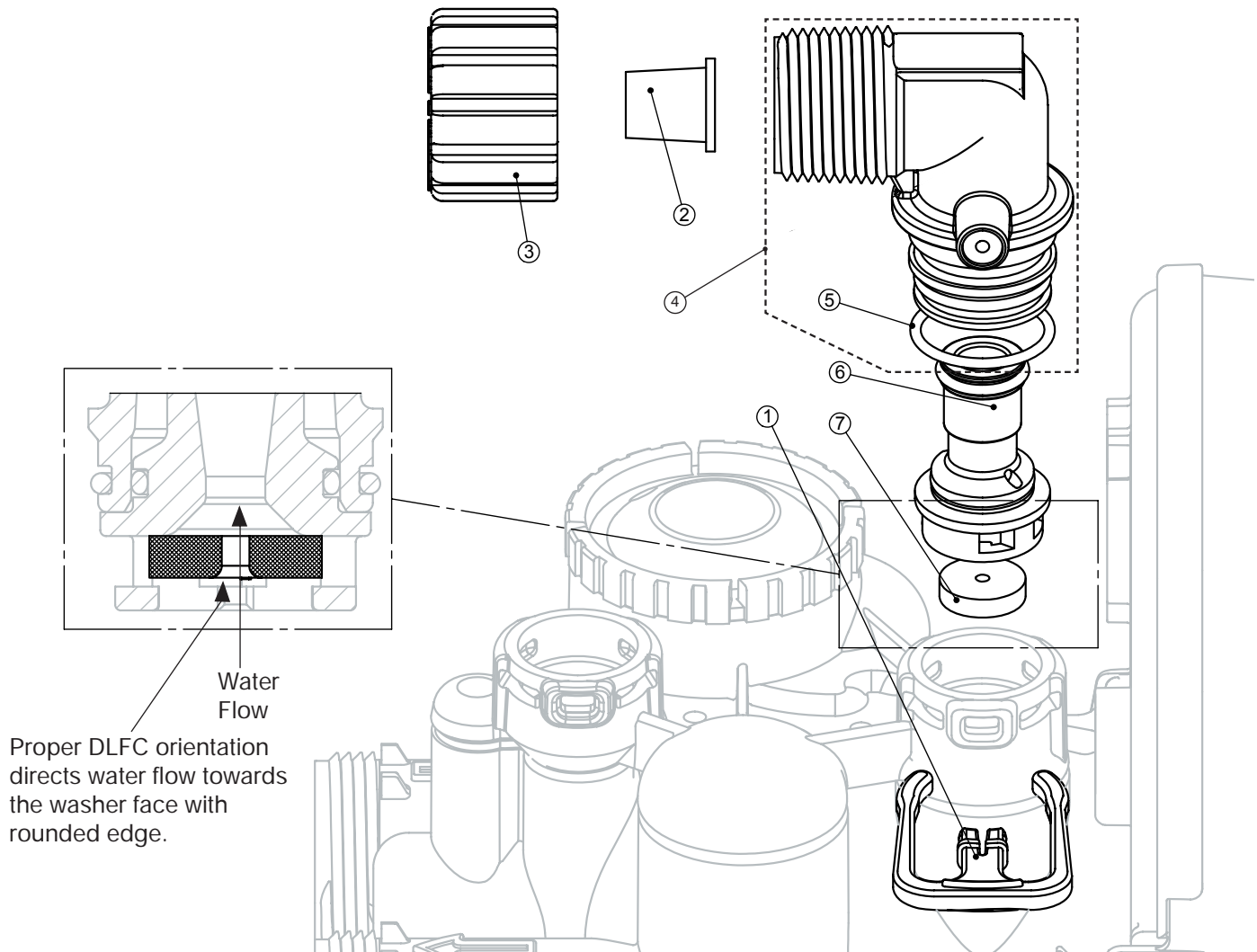


Drain Line – 3/4"

Drawing No.	Order No.	Description	Quantity
1	H4615	Elbow Locking Clip	1
2	PKP10TS8-BULK	Polytube insert 5/8	Option
3	V3192	WS1 Nut 3/4 Drain Elbow	Option
4*	V3158-01	WS1 Drain Elbow 3/4 Male	1
5	V3163	O-ring 019	1
6*	V3159-01	WS1 DLFC Retainer ASY	1
7	V3162-007	WS1 DLFC 0.7 gpm for 3/4	One DLFC must be used if 3/4 fitting is used
	V3162-010	WS1 DLFC 1.0 gpm for 3/4	
	V3162-013	WS1 DLFC 1.3 gpm for 3/4	
	V3162-017	WS1 DLFC 1.7 gpm for 3/4	
	V3162-022	WS1 DLFC 2.2 gpm for 3/4	
	V3162-027	WS1 DLFC 2.7 gpm for 3/4	
	V3162-032	WS1 DLFC 3.2 gpm for 3/4	
	V3162-042	WS1 DLFC 4.2 gpm for 3/4	
	V3162-053	WS1 DLFC 5.3 gpm for 3/4	
	V3162-065	WS1 DLFC 6.5 gpm for 3/4	
	V3162-075	WS1 DLFC 7.5 gpm for 3/4	
	V3162-090	WS1 DLFC 9.0 gpm for 3/4	
	V3162-100	WS1 DLFC 10.0 gpm for 3/4	

*4 and 6 can be ordered as a complete assembly - V3331 WS1 Drain Elbow and Retainer Asy

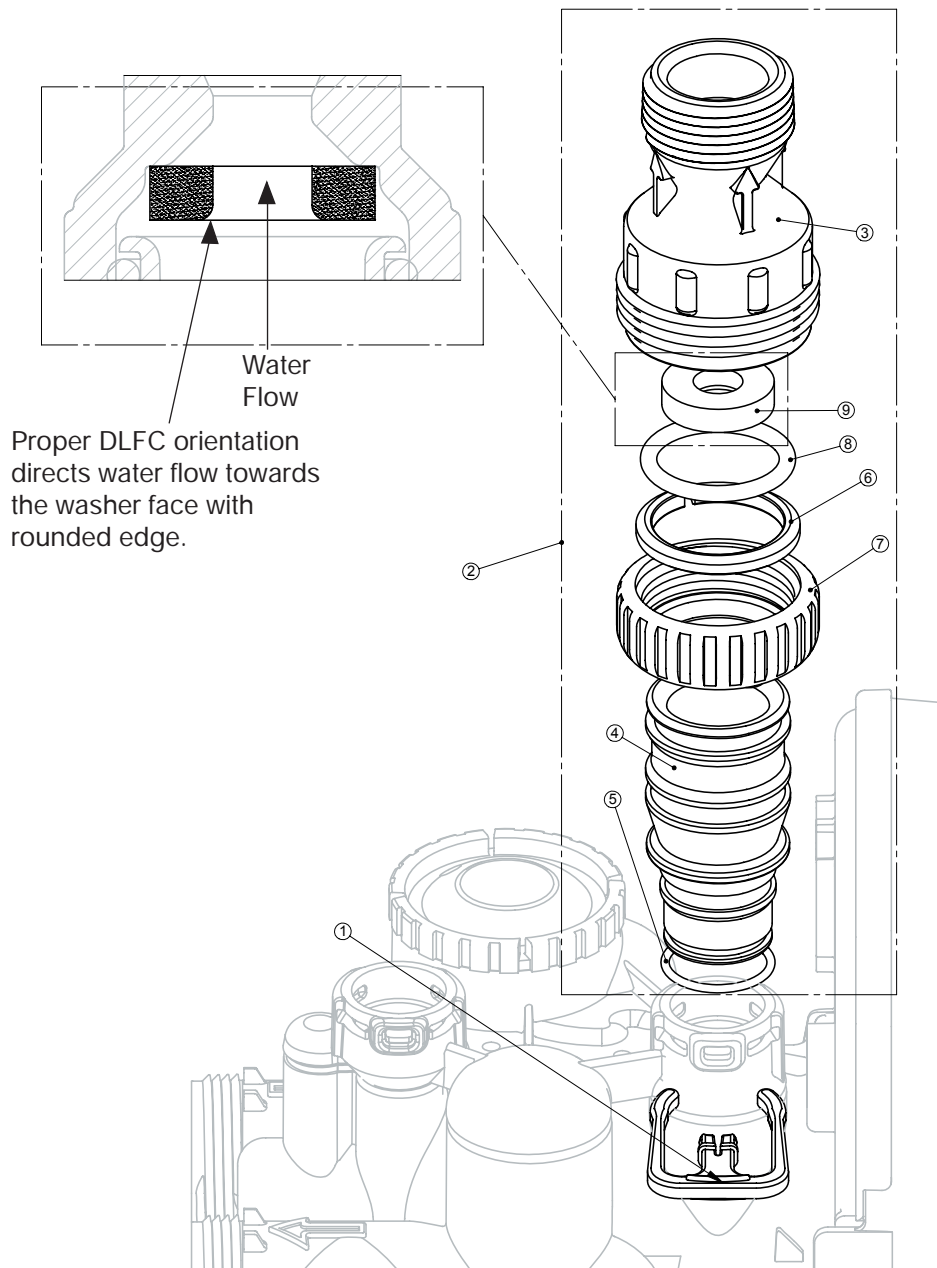
Valves are shipped without drain line flow control (DLFC) - install DLFC before using. Valves are shipped without 3/4 nut for drain elbow (polytube installation only) and 5/8" polytube insert (polytube installation only).



Drain Line – 1”

Drawing No.	Order No.	Description	Quantity
1	H4615	Elbow Locking Clip	1
2	V3008-02	WS1 Drain FTG 1 Straight	1
3*	V3166	WS1 Drain FTG Body 1	1
4*	V3167	WS1 Drain FTG Adapter 1	1
5*	V3163	O-ring 019	1
6*	V3150	WS1 Split Ring	1
7*	V3151	WS1 Nut 1” QC	1
8*	V3105	O-ring 215	1
9	V3190-090	WS1 DLFC 9.0 gpm for 1	One DLFC must be used if 1” fitting is used
	V3190-100	WS1 DLFC 10.0 gpm for 1	
	V3190-110	WS1 DLFC 11.0 gpm for 1	
	V3190-130	WS1 DLFC 13.0 gpm for 1	
	V3190-150	WS1 DLFC 15.0 gpm for 1	
	V3190-170	WS1 DLFC 17.0 gpm for 1	
	V3190-200	WS1 DLFC 20.0 gpm for 1	
	V3190-250	WS1 DLFC 25.0 gpm for 1	

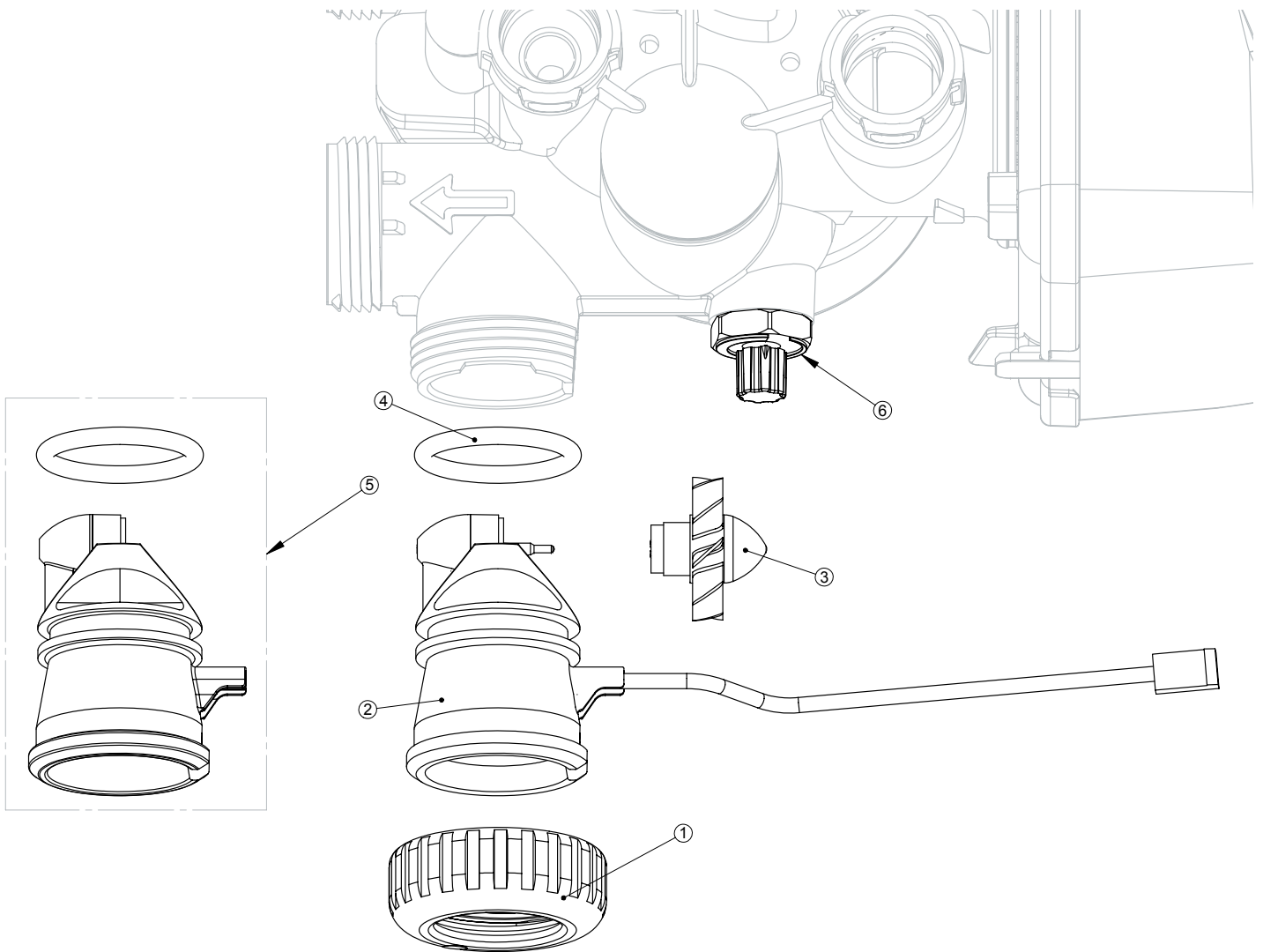
* Can be ordered as a set. Order number V3008-02, description: WS1 Drain FTG 1 Straight.



Water Meter, Meter Plug and Mixing Valve

Drawing No.	Order No.	Description	Quantity
1	V3151	WS1 Nut 1" QC	1
2	V3003*	WS1 Meter ASY	1
3	V3118-01	WS1 Turbine ASY	1
4	V3105	O-ring 215	1
5	V3003-01	WS1 Meter Plug ASY	1
6	V3013	Mixing Valve	Optional

* Order number V3003 includes V3118-01 WS1 Turbine Asy and V3105 O-ring 215.



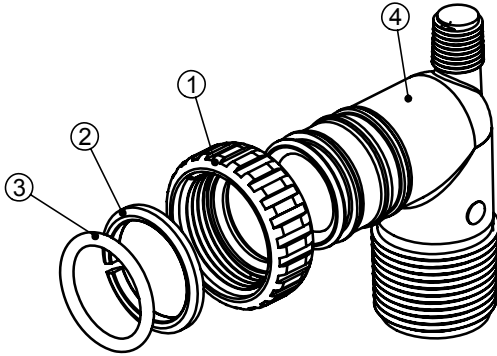
THIS WATER METER SHOULD NOT BE USED AS THE PRIMARY MONITORING DEVICE FOR CRITICAL HEALTH EFFECT APPLICATIONS.

Installation Fitting Assemblies

Order No: **V3007**

Description: **WS1 Fitting 1" PVC Male NPT Elbow Assembly**

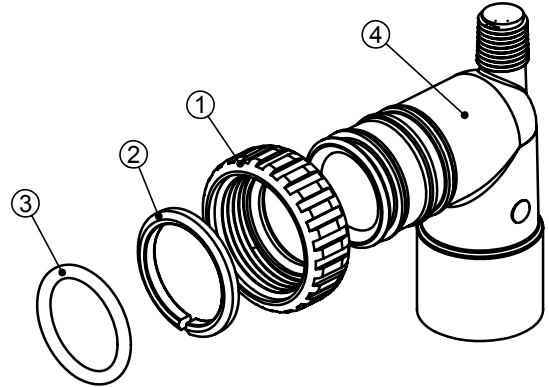
Drawing No.	Order No.	Description	Quantity
1	V3151	WS1 Nut 1" Quick Connect	2
2	V3150	WS1 Split Ring	2
3	V3105	O-Ring 215	2
4	V3149	WS1 Fitting 1 PVC Male NPT Elbow	2



Order No: **V3007-01**

Description: **WS1 Fitting 3/4" & 1" PVC Solvent 90° ASY**

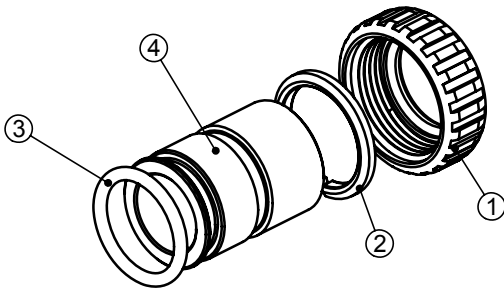
Drawing No.	Order No.	Description	Quantity
1	V3151	WS1 Nut 1" Quick Connect	2
2	V3150	WS1 Split Ring	2
3	V3105	O-Ring 215	2
4	V3189	WS1 Fitting 3/4 & 1 PVC Solvent 90	2



Order No: **V3007-02**

Description: **WS1 Fitting 1" Brass Sweat Assembly**

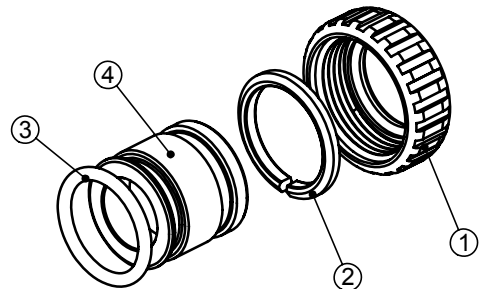
Drawing No.	Order No.	Description	Quantity
1	V3151	WS1 Nut 1" Quick Connect	2
2	V3150	WS1 Split Ring	2
3	V3105	O-Ring 215	2
4	V3188	WS1 Fitting 1 Brass Sweat Assembly	2



Order No: **V3007-03**

Description: **WS1 Fitting 3/4" Brass Sweat Assembly**

Drawing No.	Order No.	Description	Quantity
1	V3151	WS1 Nut 1" Quick Connect	2
2	V3150	WS1 Split Ring	2
3	V3105	O-Ring 215	2
4	V3188-01	WS1 Fitting 3/4 Brass Sweat	2

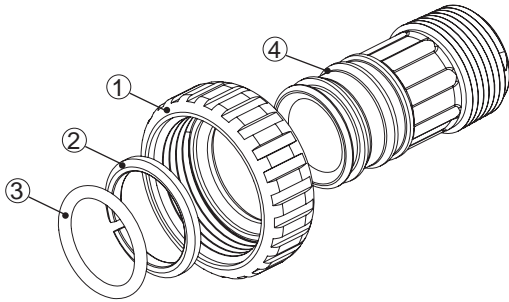


Installation Fitting Assemblies

Order No: **V3007-04**

Description: **WS1 Fitting 1" Plastic Male NPT Assembly**

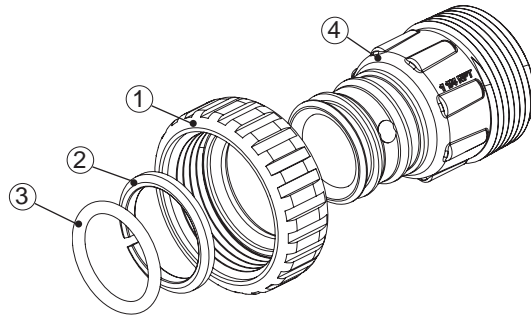
Drawing No.	Order No.	Description	Quantity
1	V3151	WS1 Nut 1" Quick Connect	2
2	V3150	WS1 Split Ring	2
3	V3105	O-Ring 215	2
4	V3164	WS1 Fitting 1" Plastic Male NPT	2



Order No: **V3007-05**

Description: **WS1 Fitting 1-1/4" Plastic Male Assembly**

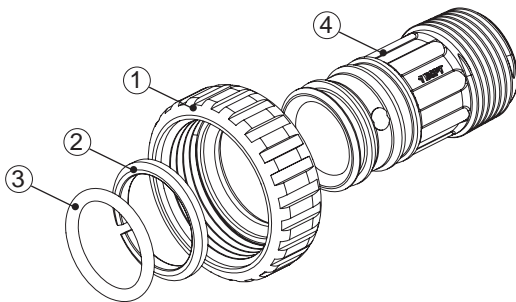
Drawing No.	Order No.	Description	Quantity
1	V3151	WS1 Nut 1" Quick Connect	2
2	V3150	WS1 Split Ring	2
3	V3105	O-Ring 215	2
4	V3317	WS1 Fitting 1-1/4" Plastic Male NPT	2



Order No: **V3007-06**

Description: **WS1 Fitting 1" Plastic Male BSPT Assembly**

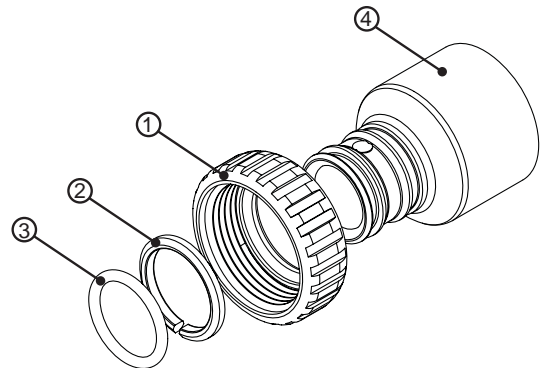
Drawing No.	Order No.	Description	Quantity
1	V3151	WS1 Nut 1" Quick Connect	2
2	V3150	WS1 Split Ring	2
3	V3105	O-Ring 215	2
4	V3316	WS1 Fitting 1" Plastic Male BSPT	2



Order No. **V3007-07**

Description: **WS1 Fitting 1/4" & 1/2" PVC Solvent Assembly**

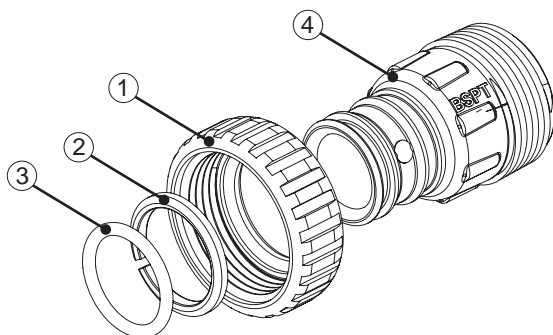
Drawing No.	Order No.	Description	Quantity
1	V3151	WS1 Nut 1" Quick Connect	2
2	V3150	WS1 Split Ring	2
3	V3105	O-Ring 215	2
4	V3352	WS1 Fitting 1/4" & 1/2" PVC Solvent	2



Order No. **V3007-08**

Description: **WS1 Fitting 1-1/4" Plastic Male BSPT Assembly**

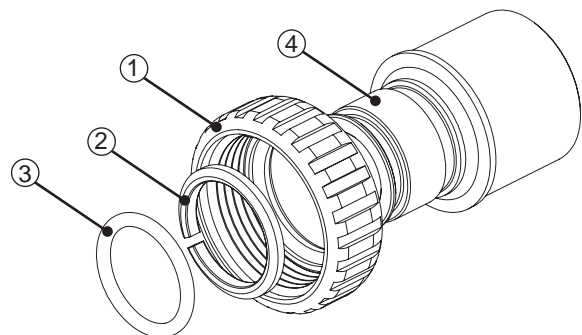
Drawing No.	Order No.	Description	Quantity
1	V3151	WS1 Nut 1" Quick Connect	2
2	V3150	WS1 Split Ring	2
3	V3105	O-Ring 215	2
4	V3361	WS1 Fitting 1-1/4" Plastic Male BSPT	2



Order No: **V3007-09**

Description: **WS1 Fitting 1/4" & 1/2" Brass Sweat Assembly**

Drawing No.	Order No.	Description	Quantity
1	V3151	WS1 Nut 1" Quick Connect	2
2	V3150	WS1 Split Ring	2
3	V3105	O-Ring 215	2
4	V3375	WS1 Fitting 1/4" & 1/2" Brass Sweat	2

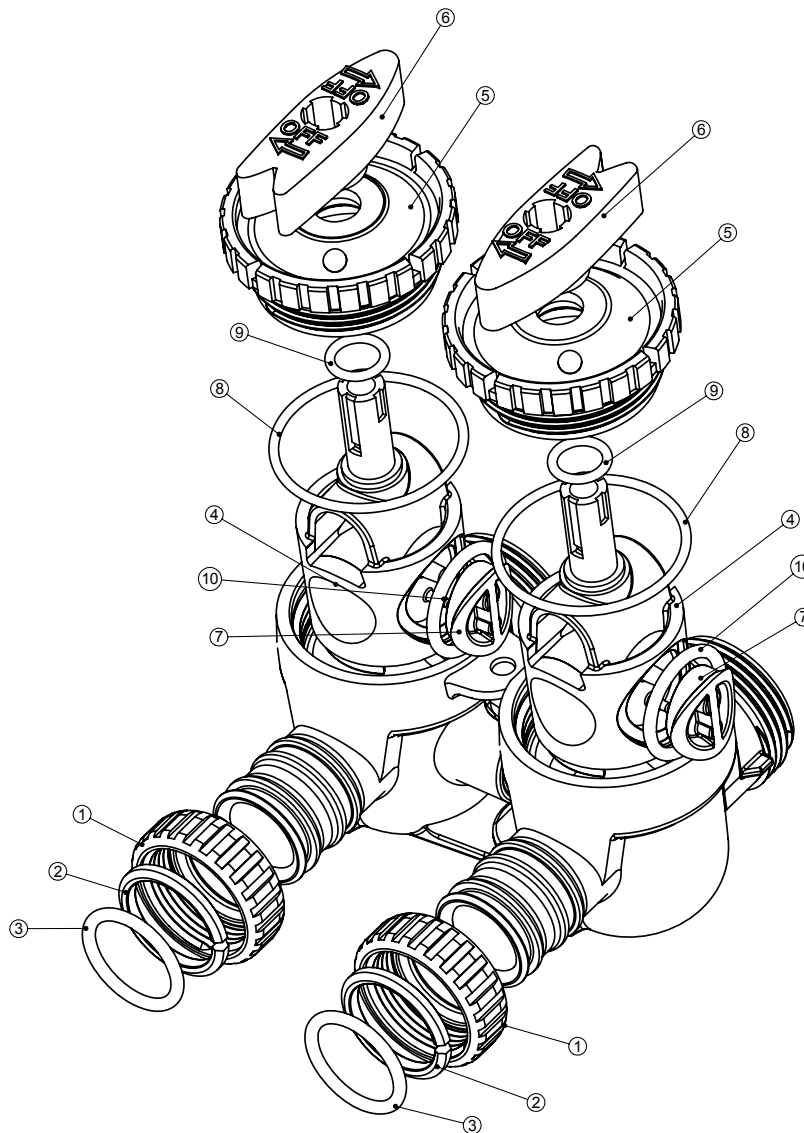


Bypass Valve

Drawing No.	Order No.	Description	Quantity
1	V3151	WS1 Nut 1" Quick Connect	2
2	V3150	WS1 Split Ring	2
3	V3105	O-Ring 215	2
4	V3145	WS1 Bypass 1" Rotor	2
5	V3146	WS1 Bypass Cap	2
6	V3147	WS1 Bypass Handle	2
7	V3148	WS1 Bypass Rotor Seal Retainer	2
8	V3152	O-ring 135	2
9	V3155	O-ring 112	2
10	V3156	O-ring 214	2

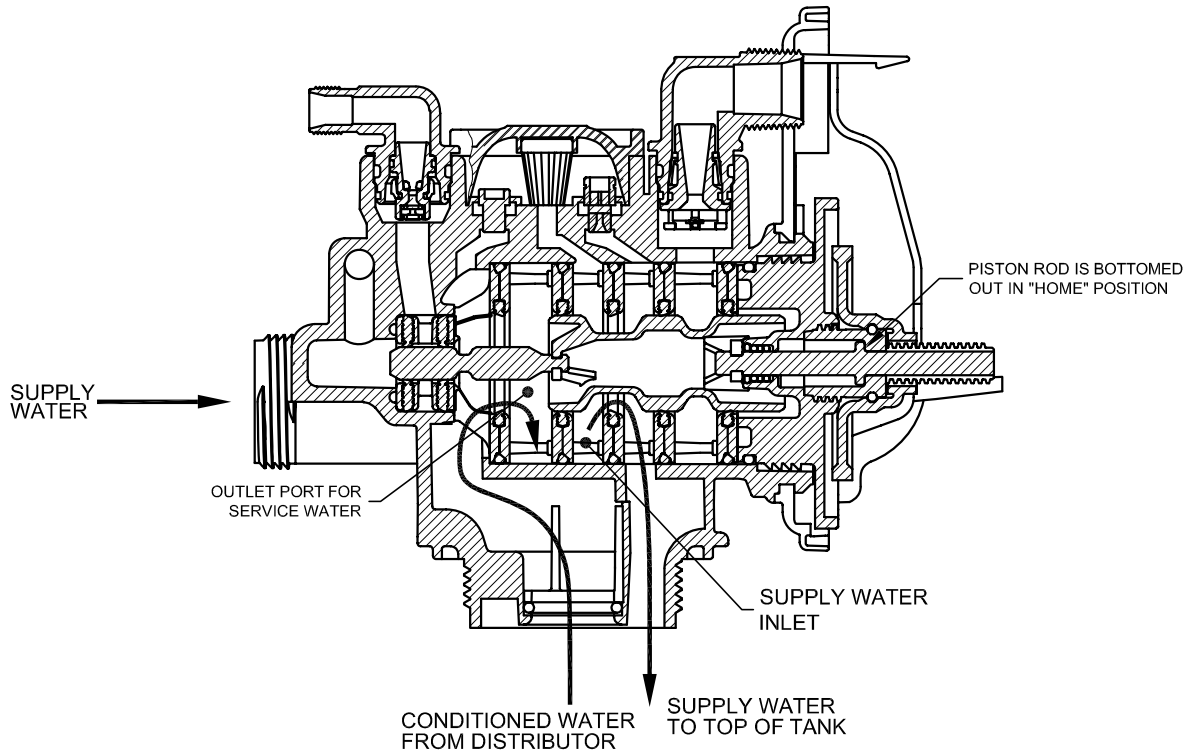
(Not Shown) Order No. V3191-01, Description: WS1 Bypass Vertical Adapter Assembly

Order No.	Description	Quantity
V3151	WS1 Nut 1" Quick Connect	2
V3150	WS1 Split Ring	2
V3105	O-Ring 215	2
V3191	WS1 Bypass Vertical Adapter	2

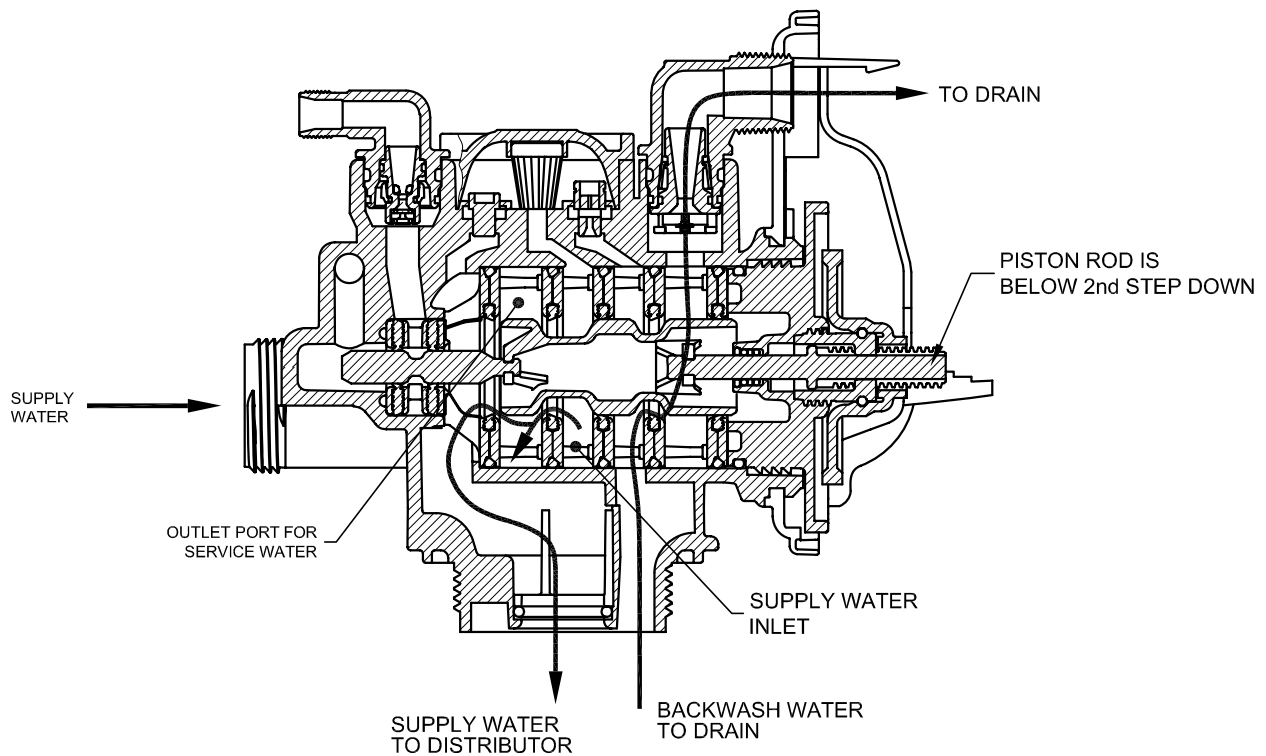


Flow Diagrams – Service and Backwash

flow diagram...service

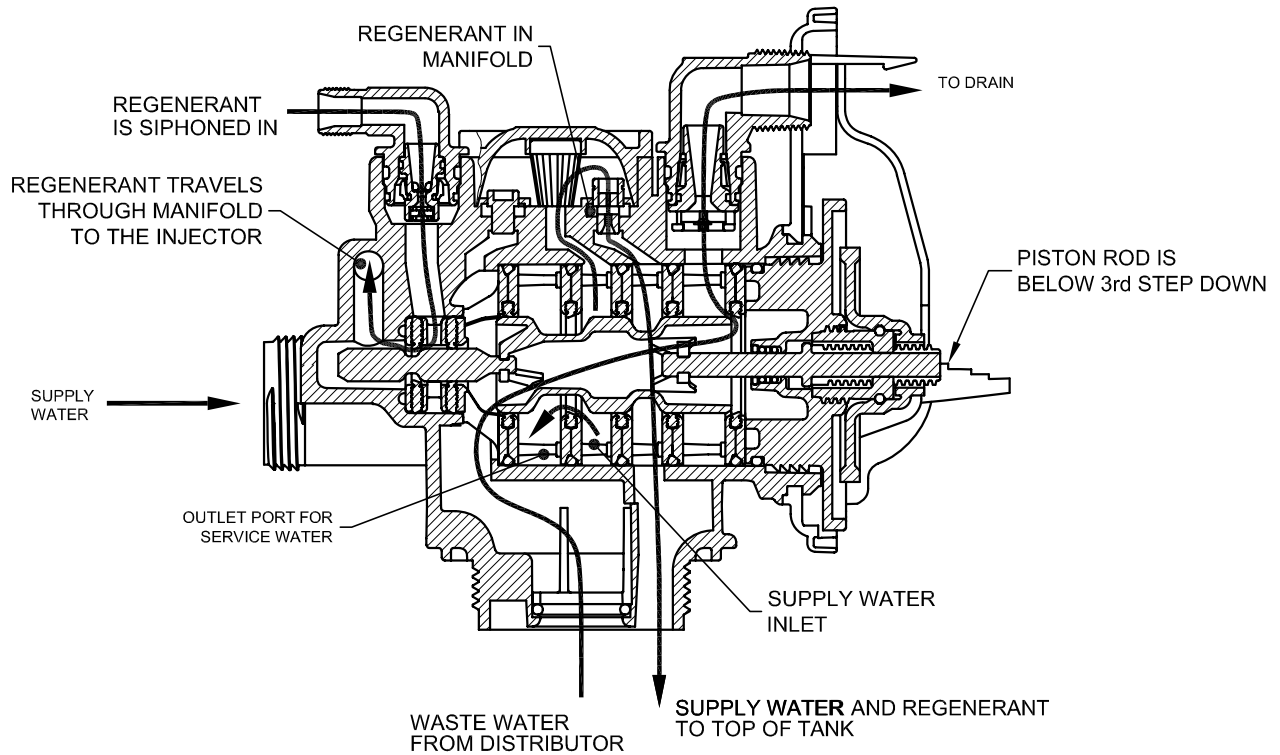


flow diagram...backwash



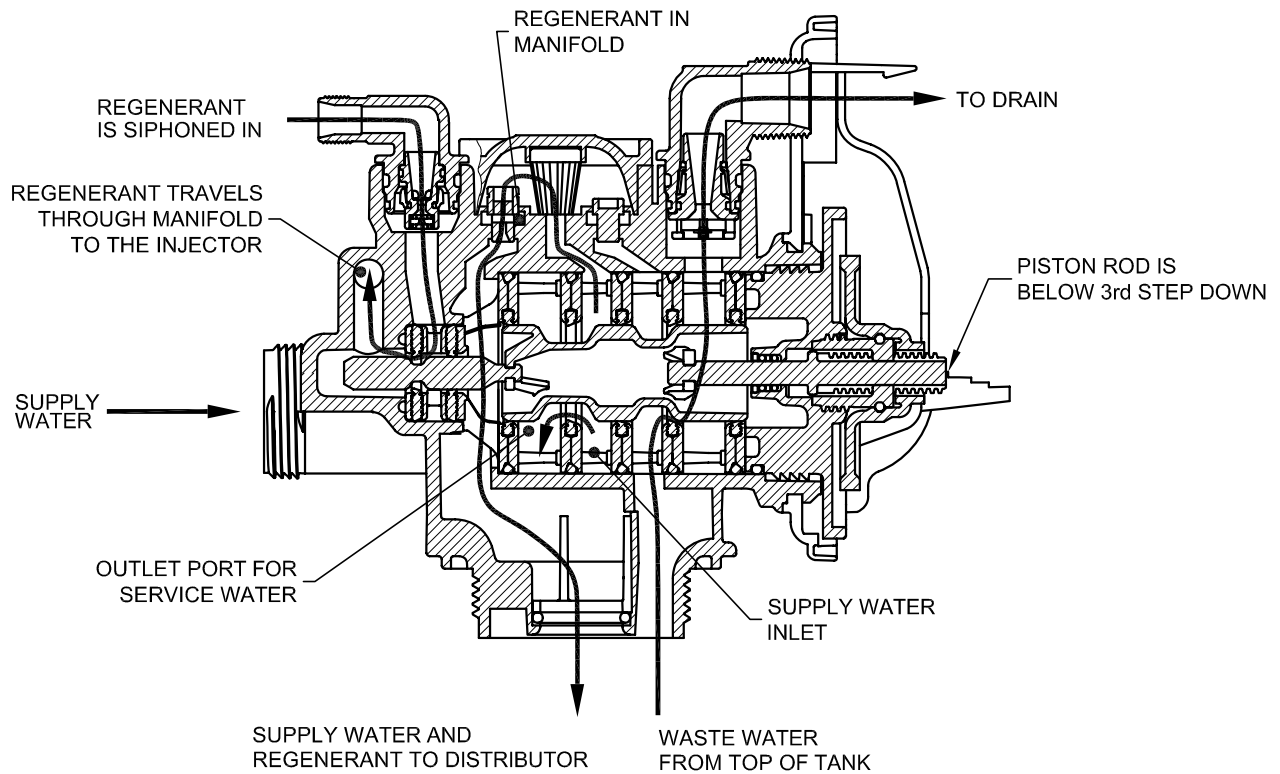
Flow Diagrams – Downflow and Upflow

flow diagram...downflow brine



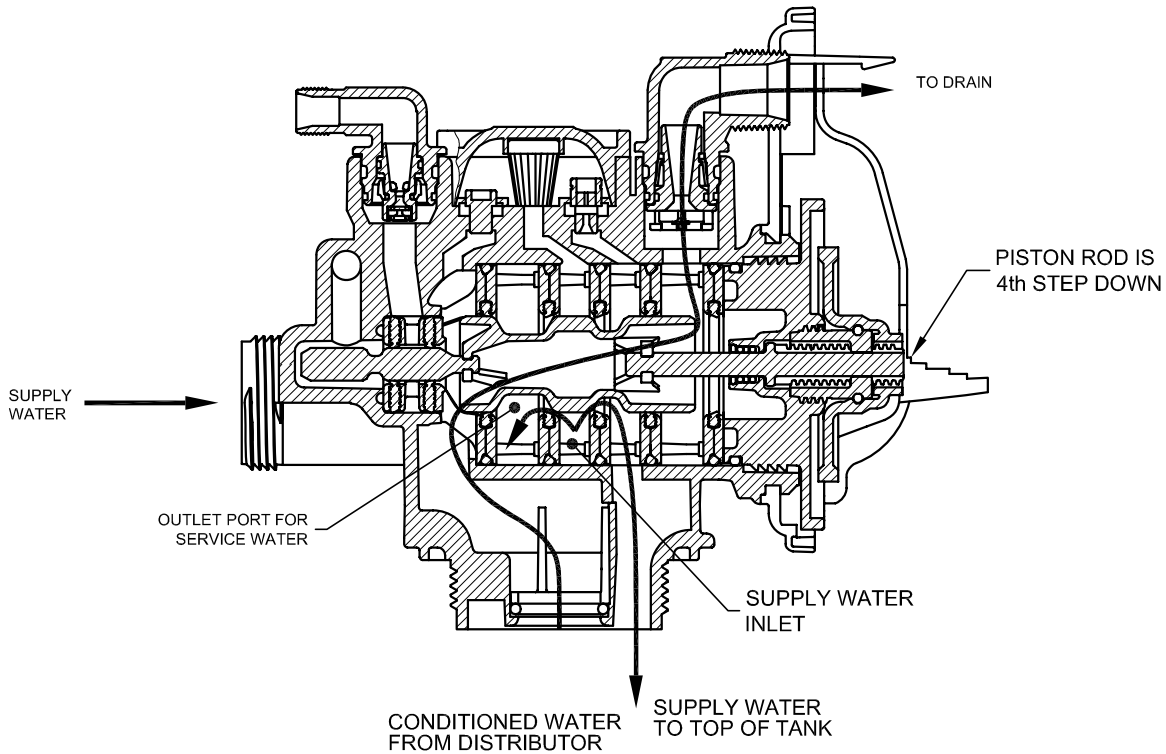
(WS1CS Only)

flow diagram...upflow brine



Flow Diagrams – Rinse and Fill

flow diagram...rinse



flow diagram...fill

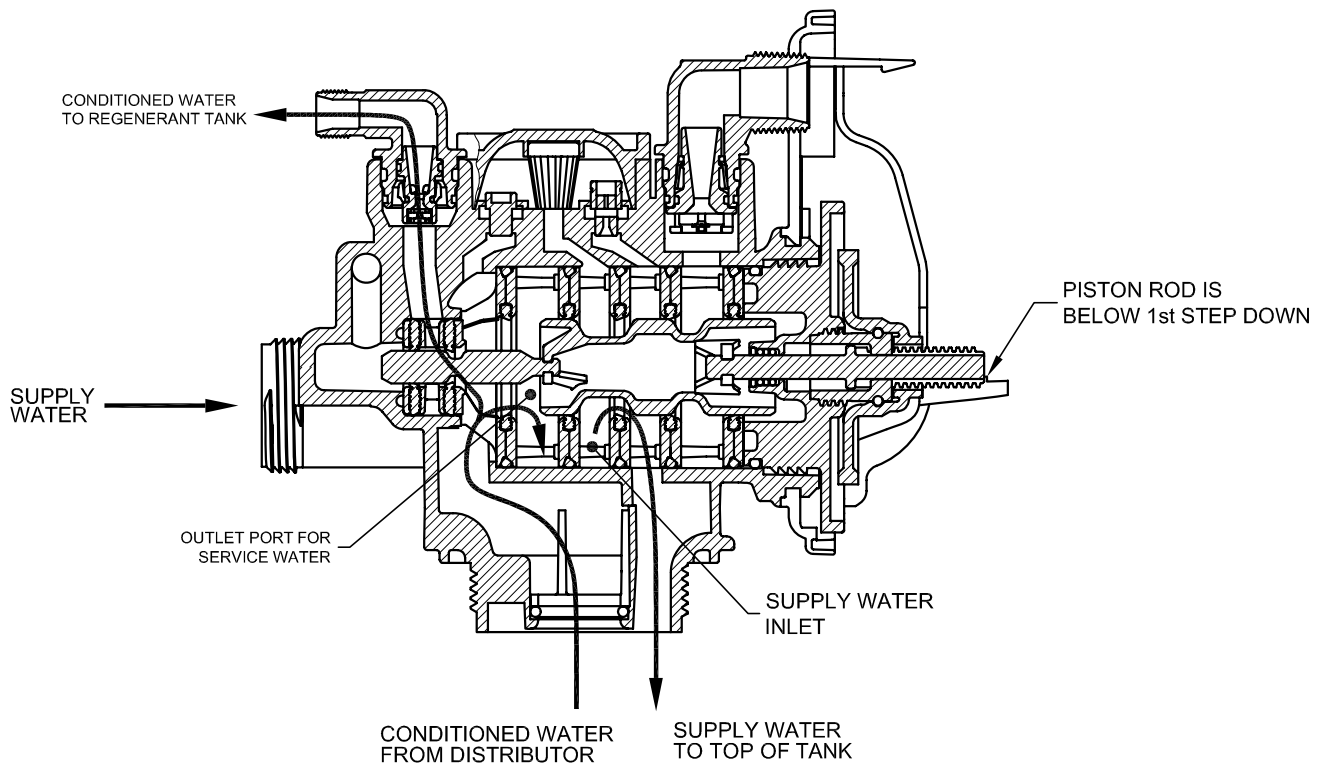


Table 15
Troubleshooting Procedures

Problem	Possible Cause	Solution
1. Timer does not display time of day	a. AC Adapter unplugged	a. Connect power
	b. No electric power at outlet	b. Repair outlet or use working outlet
	c. Defective AC Adapter	c. Replace AC Adapter
	d. Defective PC board	d. Replace PC board
2. Timer does not display correct time of day	a. Switched outlet	a. Use uninterrupted outlet
	b. Power outage	b. Reset time of day
	c. Defective PC board	c. Replace PC board
3. No softening/filtering display when water is flowing	a. Bypass valve in bypass position	a. Put bypass valve in service position
	b. Meter connection disconnected	b. Connect meter to PC board
	c. Restricted/stalled meter turbine	c. Remove meter and check for rotation or foreign material
	d. Defective meter	d. Replace meter
	e. Defective PC board	e. Replace PC board
4. Control valve regenerates at wrong time of day	a. Power outages	a. Reset control valve to correct time of day
	b. Time of day not set correctly	b. Reset to correct time of day
	c. Time of regeneration incorrect	c. Reset regeneration time
	d. Control valve set at “on 0” (immediate regeneration)	d. Check control valve set-up procedure regeneration time option
	e. Control valve set at NORMAL + on 0	e. Check control valve set-up procedure regeneration time option
5. ERROR followed by code number Error Code 1001 -Unable to recognize start of regeneration Error Code 1002 – Unexpected stall Error Code 1003 – Motor ran to long, timed out trying to reach next cycle position Error Code 1004 - Motor ran to long, timed out trying to reach home position If other Error Codes display contact the factory.	a. Control valve has just been serviced	a. Press NEXT and REGEN for 3 seconds or unplug power source jack (black wire) and plug back in to reset control valve
	b. Foreign matter is lodged in control valve	b. Check piston and spacer stack assembly for foreign matter
	c. High drive forces on piston	c. Replace piston(s) and spacer stack assembly
	d. Control valve piston not in home position	d. Press NEXT and REGEN for 3 seconds or unplug power source jack (black wire) and plug back in to reset control valve
	e. Motor not inserted fully to engage pinion, motor wires broken or disconnected, motor failure	e. Check motor and wiring. Replace motor if necessary
	f. Drive gear label dirty or damaged, missing or broken gear	f. Replace or clean drive gear
	g. Drive bracket incorrectly aligned to back plate	g. Reseat drive bracket properly
	h. PC board is damaged or defective	h. Replace PC board
	i. PC board incorrectly aligned to drive bracket	i. Ensure PC board is correctly snapped on to drive bracket

Problem	Possible Cause	Solution
6. Control valve stalled in regeneration	a. Motor not operating	a. Replace motor
	b. No electric power at outlet	b. Repair outlet or use working outlet
	c. Defective AC Adapter	c. Replace AC Adapter
	d. Defective PC board	d. Replace PC board
	e. Broken drive gear or drive cap assembly	e. Replace drive gear or drive cap assembly
	f. Broken piston retainer	f. Replace drive cap assembly
	g. Broken main or regenerant piston	g. Replace main or regenerant piston
7. Control valve does not regenerate automatically when REGEN button is depressed and held	a. AC Adapter unplugged	a. Connect AC Adapter
	b. No electric power at outlet	b. Repair outlet or use working outlet
	c. Broken drive gear or drive cap assembly	c. Replace drive gear or drive cap assembly
	d. Defective PC board	d. Replace PC board
8. Control valve does not regenerate automatically but does when REGEN button is depressed	a. By-pass valve in bypass position	a. Put bypass valve in normal operation position
	b. Meter connection disconnected	b. Connect meter to PC board
	c. Restricted/stalled meter turbine	c. Remove meter and check for rotation or foreign matter
	d. Defective meter	d. Replace meter
	e. Defective PC board	e. Replace PC board
	f. Set-up error	f. Check control valve set-up procedure
9. Time of day flashes on and off	a. Power has been out more than two hours, the AC Adapter was unplugged and then plugged back into the wall outlet, the AC Adapter plug was unplugged and then plugged back into the board or the NEXT and REGEN buttons were pressed to reset the valve.	a. Reset the time of day

Service Instructions



ARAD- Iron, Manganese

and Sulfur Systems

Manufacturer Tech Support:

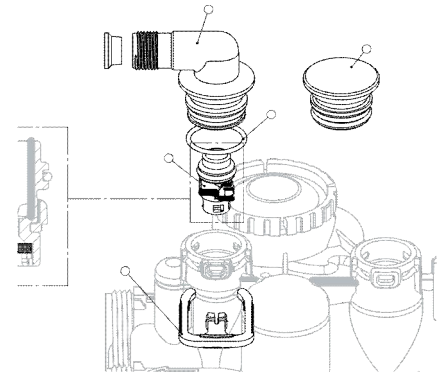
AquaRinse– ARAD system

Toll-Free: 888-236-8586

Mon-Friday 9 am – 3 pm

If you notice iron staining developing in your ARAD system; the first step to take to determine if your system is operating properly is to initiate an immediate regeneration. If during the second step of the backwash process the air check device connected to the elbow shown on the right does not sound like it is “drawing” air your venturi which creates the “air-draw” function may be clogged.

The following will explain how to service the venturi and other possible sources of failure which would lead to your system not functioning properly.

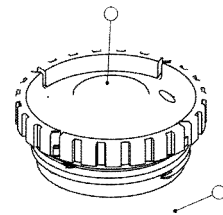


To service the ARAD controller, first place the unit in bypass mode by turning the red handles located at the back of the unit so that the arrows are facing away from the controller and the plumbing connections.

Remove the cap as shown on the right by unscrewing.

Once removed, you will find there are two devices inside; the Black device is a plug and can be left alone. The other device is the venturi. This device will need to be pulled out of the

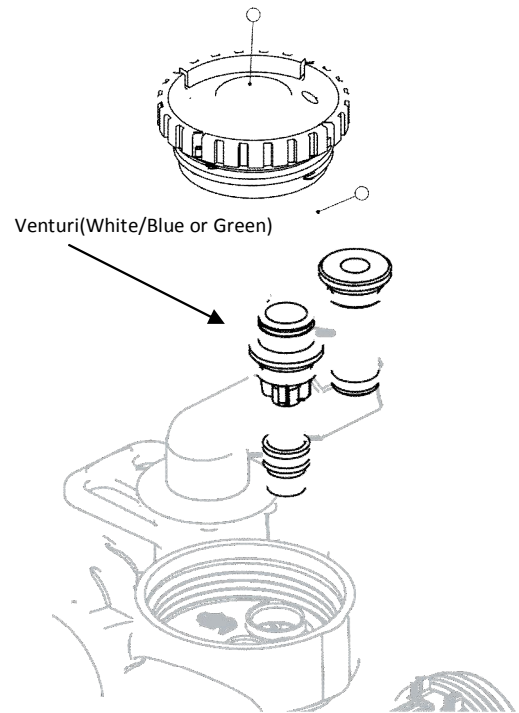
Controller (a flat-head screwdriver works best) by pulling upwards until it pops out. The venturi is about 2” long. The venturi will most likely be white in color depending on your system size.



The diagram on the right depicts the top portion of the Control Valve where the venturi is located. The venturi is the device inside the valve which draws in air during the regeneration of the backwash procedure.

When the venturi becomes clogged with debris that becomes trapped inside the valve, the system's ability to draw air is inhibited.

Cleaning of the inside of the venturi so that you can see through the part is necessary to restore the venturi to working condition.



An inline check-valve is supplied with your system purchase. This device is designed to prevent water from back-flowing into the tank after it has semi-filled with air.

The air is important as it creates an oxidizing effect inside the tank to help separate the contaminants from water so that they can be fully filtered out of water.

If during a regeneration the unit fills back up with water, the check valve needs to be inspected visually on both the inlet and outlet side to ensure no debris has become lodged inside and that the valve is functioning. If there is any doubt that the valve is not working—Replace.

