

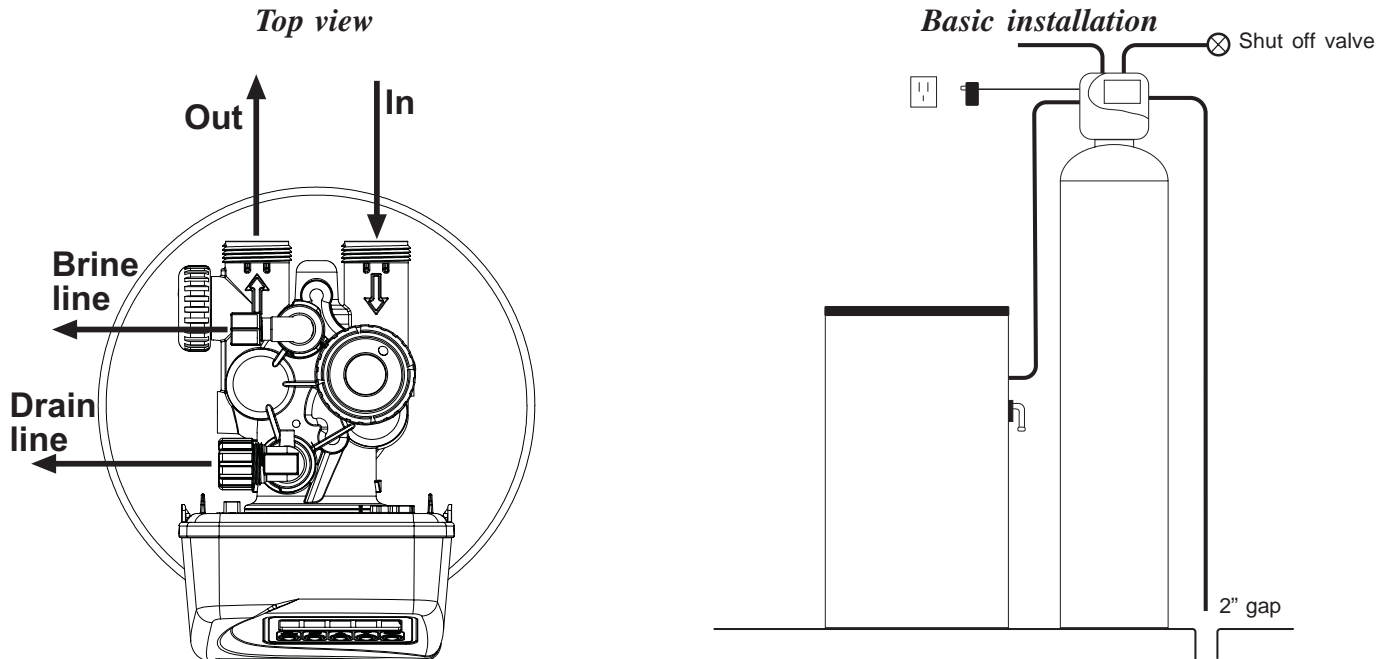
# Installation and Operation Manual



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## Installation



### GENERAL INSTALLATION & SERVICE WARNINGS

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 silicon lubricant may be used on black o-rings but is not necessary. **Avoid any type of lubricants, including silicone, on red or clear lip seals.**

**Do not use pipe dope or other sealants on threads.** Teflon tape must be used on the threads of the 1" NPT elbow or the ¼" NPT connection and on the threads for the drain line connection. Teflon tape is not necessary on the nut connections or caps because o-ring seals are used. The nuts and caps are designed to be unscrewed or tightened by hand or with the special plastic Service Wrench, #V3193. If necessary a pliers can be used to unscrew the nut or cap. **Do not use a pipe wrench** to tighten or loosen nuts or caps. **Do not place screwdriver in slots on caps and/or tap with a hammer.**

### SITE REQUIREMENTS:

- Water pressure, 20-125 psi
- Water temperature
- The tanks should be on a firm, level surface
- Electrical: Use a 115/120v, 60Hz uninterrupted outlet
- Current draw is 0.25 amperes
- A 15-foot power cord is furnished
- The plug-in transformer is for dry locations only
- Batteries are not used

1. The distance between the drain and the water conditioner should be as short as possible. All plumbing should be done in accordance with local plumbing codes.
2. Since salt must be periodically added to the brine tank, it should be located where it is easily accessible.
3. Do not install any water conditioner with less than 10 feet of piping between its outlet and the inlet of a water heater.
4. Do not locate unit where it or its connections (including the drain and overflow lines) will ever be subjected to room temperatures under 34° F.
5. The use of resin cleaners in an unvented enclosure is not recommended.

**6. INLET/OUTLET PLUMBING:** Connect to a supply line downstream of outdoor spigots. Install an inlet shutoff valve and plumb to the unit's bypass valve inlet located at the right rear as you face the unit. There are a variety of installation fittings available. They are listed under **Installation Fitting Assemblies**. 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 solder flux, primer, and solvent cement on any part of the o-rings, split rings, bypass valve or control

valve. If the building's electrical system is grounded to the plumbing, install a copper grounding strap from the inlet to the outlet pipe. **Plumbing must be done in accordance with all applicable local codes.**

**7. DRAIN LINE:** First, be sure that the drain can handle the backwash rate of the system. 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 flow control fitting and solder joints. Failure to do this could cause interior damage to the flow control. Install a ½" I.D. flexible plastic tube to the Drain Line Assembly or discard the tubing nut and use the ¾" NPT fitting for rigid pipe. If the backwash rate is greater than 7 gpm, use a ¾" drain line. Where the drain line is elevated but empties into a drain below the level of the control valve, form a 7" loop at the discharge end of the line so that the bottom of the loop is level with the drain connection on the control valve. This will provide an adequate anti-siphon trap. Where the drain empties into an overhead sewer line, a sink-type trap must be used. Run drain tube to its discharge point in accordance with plumbing codes. Pay special attention to codes for air gaps and anti-siphon devices.

**8. BRINE TANK CONNECTION:** Install a 3/8" O.D. polyethylene tube from the Refill Elbow to the Brine Valve in the brine tank.

#### **9. OVERFLOW LINE CONNECTION:**

AN OVERFLOW DRAIN LINE IS RECOMMENDED WHERE A BRINE OVERFLOW COULD DAMAGE FURNISHINGS OR THE BUILDING STRUCTURE.

Your softener may be equipped with a brine tank safety float which greatly reduces the chance of an accidental brine overflow. In the event of a malfunction, however, an OVERFLOW LINE CONNECTION will direct the "overflow" to the drain instead of spilling on the floor where it could cause considerable damage. This fitting should be on the side of the cabinet or the brine tank.

To connect overflow fitting, locate hole in side of brine tank. Insert overflow fitting into tank and tighten with plastic thumb nut and gasket from the inside. Attach a length of ½" I.D. tubing (not supplied) to fitting and run to drain. Do not elevate overflow line higher than 3" below bottom of overflow fitting. Do not "tie" this tube into the drain line of the control valve. Overflow line must be a direct, separate line from overflow fitting to drain, sewer, or tub. Allow an air gap as per the drain line instructions.

**IMPORTANT: Never insert a drain line directly into a drain, sewer line, or trap. Always allow an air gap between the drain line and the wastewater to prevent the possibility of sewage being back-siphoned into the conditioner.**

**10. SERIAL NUMBER:** Record the serial number on the installer's and customer's records.

### **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 Noryl 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)

# BYPASS VALVE OPERATION

Figure 1

## NORMAL OPERATION

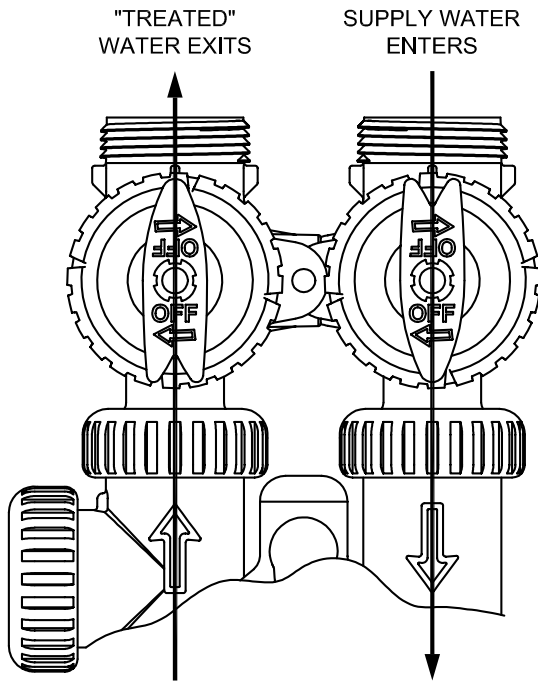


Figure 2

## BYPASS OPERATION

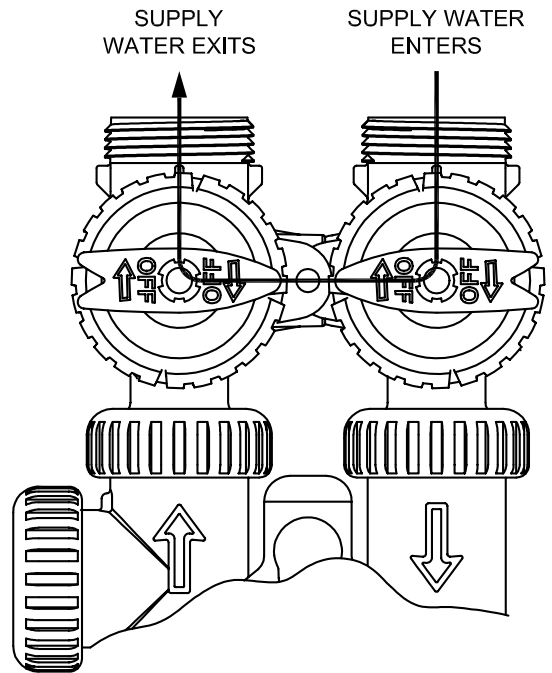


Figure 3

## DIAGNOSTIC MODE

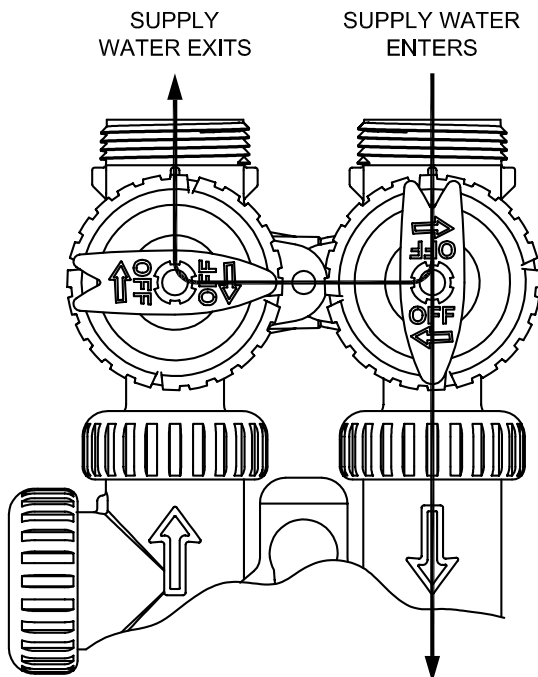
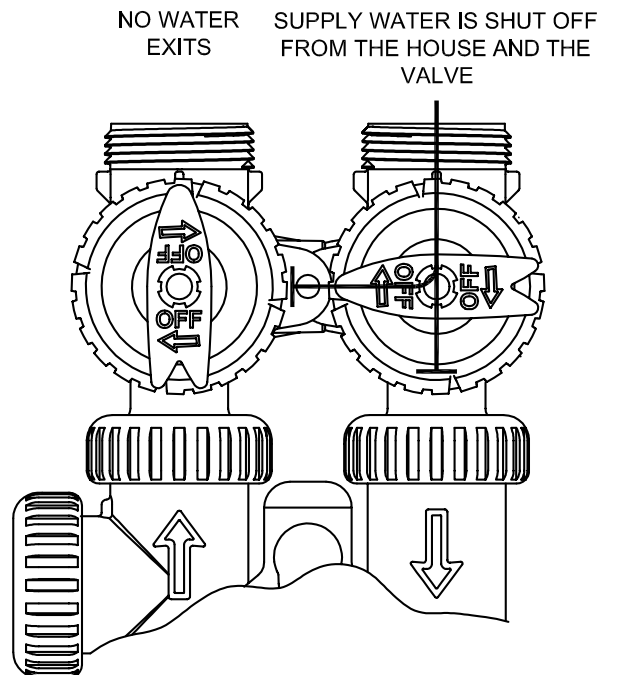


Figure 4

## SHUT OFF MODE



### Start-up Instructions

- After installation is completed and checked for leaks, rotate the bypass handles to the bypass position (see bypass valve diagram page).
  
- Fully open a cold water faucet.
  
- Allow water to run until clear to rid pipes of debris, which may have occurred during installation.
  
- The system is now ready for testing:
  1. With the bypass valve in the bypass position, manually pour enough water into the brine tank to reach the top of the air check valve.
  
  2. Press and hold the REGEN button for three seconds until the drive motor starts. Wait until the motor stops and the display reads “Backwash.” The backwash time will begin to count down.
  
  3. Open the inlet handle of the bypass valve very slightly allowing water to fill the tank slowly in order to expel air. CAUTION: If water flows too rapidly, there will be a loss of media out of the drain.
  
  4. When the water is flowing steadily to the drain without the presence of air, press the REGEN button to advance the control to the brine position. The brine time will begin to count down.
  
  5. Fully open the inlet bypass valve handle (bypass is now in the diagnostic position)
    - Check to verify that water is being drawn from the brine tank
    - There should be a slow flow to the drain
    - Allow three minutes for the media bed to settle
  
  6. Press the REGEN button again to advance the control to the next position and allow water to run to drain for 2-3 minutes. Control will transfer and the display will read backwash or rinse depending on the program used. If backwash is displayed press the REGEN button to advance the control to the rinse position. Allow water to run to drain until clear.
  
  7. Press the REGEN button to advance the control to where the display reads fill. This will allow water to run into the brine tank and prepare it for the next regeneration. Allow the brine tank to fill automatically.
  
  8. While the brine tank is filling, load it with water softener salt.
  
  9. SANITIZE! For each cubic foot of resin, add two ounces of 5 1/4% household chlorine bleach to the water in the brine tank brine well. Press and hold the REGEN button for three seconds to begin regeneration. Allow the system to complete the regeneration automatically. The system will now be sanitized and producing soft water. Be sure to check for local codes, which may also specify sanitization methods.

## General Information

**PLEASE NOTE:** For complete instructions refer to manual. Hand tighten nuts only.

**GENERAL OPERATION**

When the system is operating one of two displays will be shown. Time of day will be one choice, gallons of treated water available or days until the next regeneration will be the other choice. Pressing "NEXT" will toggle between the two choices.

REGEN TODAY will show if a regeneration is expected "Tonight."

**TO SET TIME OF DAY**

In the event of a prolonged power outage, time of day flashes, indicating that this needs to be reset. All other information will be stored in memory no matter how long the power outage. Please complete the steps as shown to the right. To access this mode, press "SET CLOCK."

1. Accessed by pressing "SET CLOCK."
2. Adjust hours with up and down arrows, AM/PM toggles at 12.
3. Press "NEXT."
4. Adjust minutes with up and down arrows.
5. Press "NEXT" to complete and return to normal operation.

**ADJUST HARDNESS, DAYS BETWEEN REGENERATIONS, OR TIME OF REGENERATION**

For initial set-up or to make adjustments, please complete the steps as shown to the right. Access this mode by pressing "NEXT" and "Δ" simultaneously. **NOTE:** Hardness display shows "-nA-" if used as a filter. If other displays do not appear, refer to manual.

1. Accessed by pressing "NEXT" and up arrow simultaneously.
2. Adjust hardness using up and down arrows.
3. Press "NEXT."
4. Adjust days between regenerations using up and down arrows.
5. Press "NEXT."
6. Adjust time of regeneration hours with up and down arrows, AM/PM toggles at 12.
7. Press "NEXT."
8. Adjust time of regeneration minutes with up and down arrows.
9. Press "NEXT" to complete and return to normal operation.

## General Information

### MANUAL REGENERATION

**NOTE:** For softeners, if brine tank does not contain salt, fill with salt and wait at least 2 hours before regeneration.

If you need to initiate a manual regeneration, either immediately, or tonight at the preprogrammed time for regeneration (typically 2:00 AM), complete the following steps.

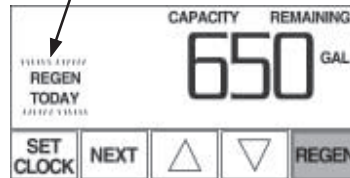
**For Immediate Regeneration:**

Press and hold "REGEN" until valve motor starts (typically 3 seconds).

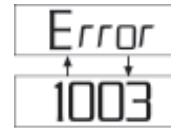
**For Regeneration Tonight:**

Press and release "REGEN" (notice that flashing "REGEN TODAY" appears).

REGEN TODAY will flash if a regeneration is expected "Tonight."



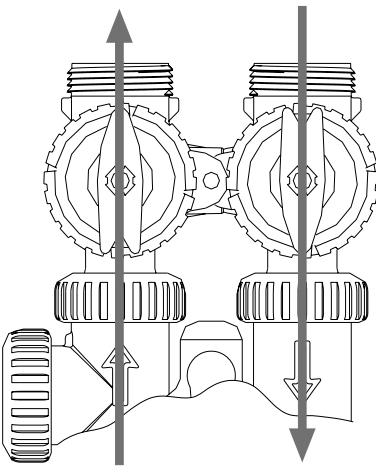
If the display toggles between "Error" and an error code (i.e. a number), call a service technician and report the error code.



To **shut-off water** to the system, please position arrow handles as shown in the **bypass operation** diagram below. If your valve doesn't look like the diagram below, contact your service technician for instructions on how to shut-off water.

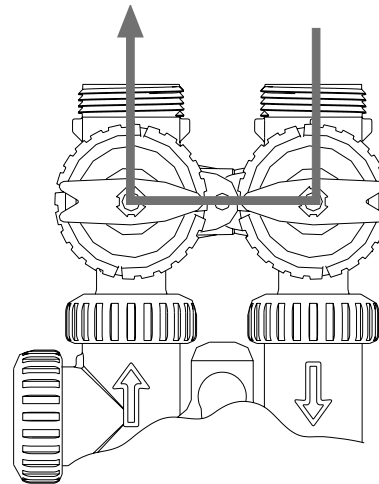
#### NORMAL OPERATION

Treated Water Exits      Supply Water Enters



#### BYPASS OPERATION

Supply Water Exits      Supply Water Enters



**NOTES:**

Installation date: _____	Hardness (gpg): _____
Injector color installed: _____	Water pressure: _____
Drain Control size installed: _____	Salt setting: _____
	Iron (ppm): _____
	Manganese (ppm): _____
	TDS (ppm): _____
	pH: _____

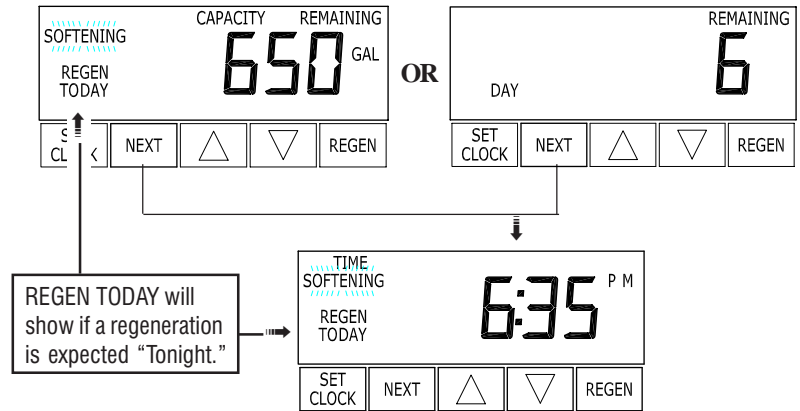
### User Displays/Settings

#### 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.

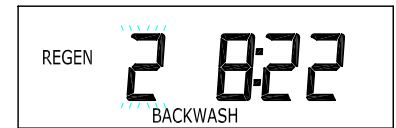
If the system has called for a regeneration that will occur at the preset time of regeneration, the words REGEN TODAY will appear on the display.

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

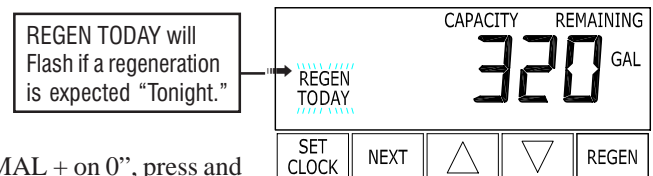
Typically a system is set to regenerate at a time of low water usage. An example of a time with low water usage is when a household is asleep. If there is a demand for water when the system is regenerating, untreated water will be used.



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

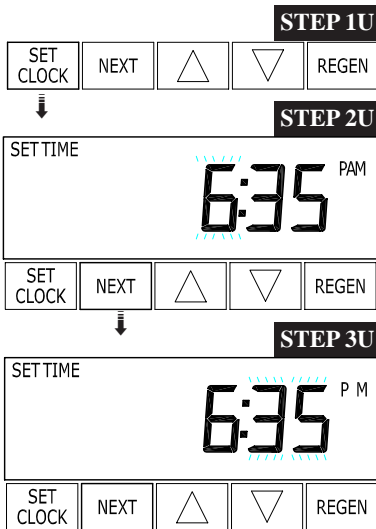
Sometimes there is a need to regenerate the system, sooner than when the system calls for it, usually referred to as manual regeneration. There may be a period of heavy water usage because of guests or a heavy laundry day.



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 Δ buttons. AM/PM toggles after 12. Press NEXT to go to step 3U.

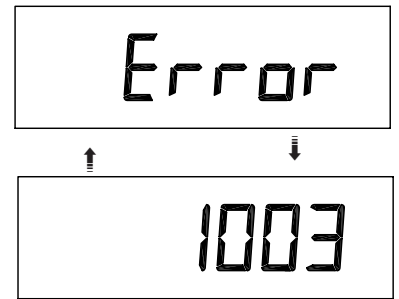
**STEP 3U** - Current Time (minutes): Set the minutes of the day using ∇ or Δ buttons. Press NEXT to exit Set Clock. Press REGEN to return to previous step.

**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.



**Installer Displays/Settings**



**STEP 1I** - Press NEXT and  $\Delta$  simultaneously for 3 seconds.

**STEP 2I** – Hardness: Set the amount of hardness in grains of hardness as calcium carbonate per gallon using the  $\nabla$  or  $\Delta$  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 6S. Press NEXT to go to step 3I. Press REGEN to exit Installer Displays/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  $\nabla$  or  $\Delta$  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  $\nabla$  or  $\Delta$  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 9S 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  $\nabla$  or  $\Delta$  buttons. This display will not be shown if “on 0” is selected in Step 9S or Step 7F. Press NEXT to exit Installer Displays/Settings. Press REGEN to return to previous step.

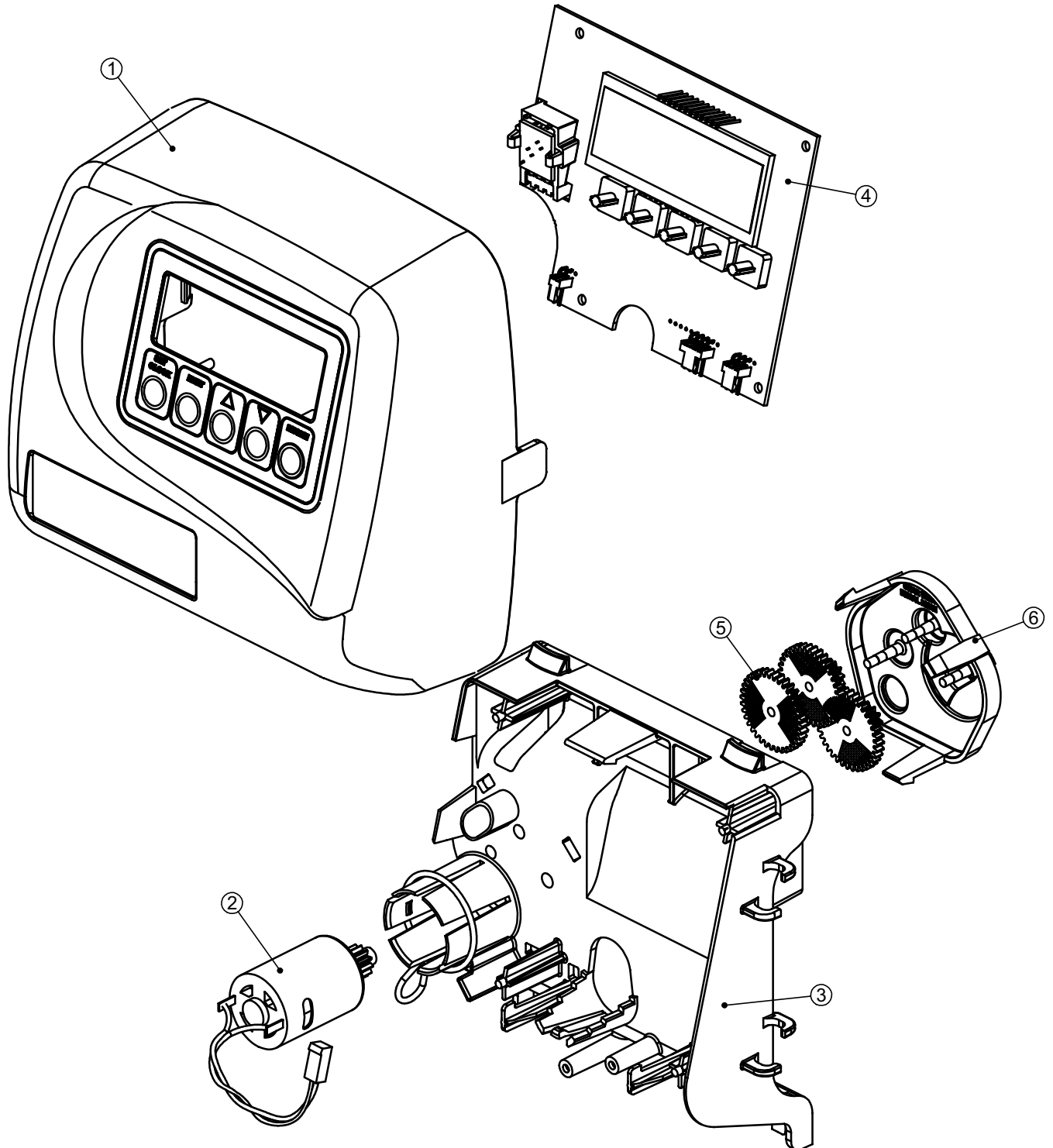
To initiate a manual regeneration immediately, press and hold the “REGEN” button for three seconds. The system will begin to regenerate immediately. The control valve may be stepped through the various regeneration cycles by pressing the “REGEN” button.

# **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	V3108	WS1 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 Transformer 110V-12V	1

\* Drawing number parts 2 through 6 may be purchased as a complete assembly, part V3002.

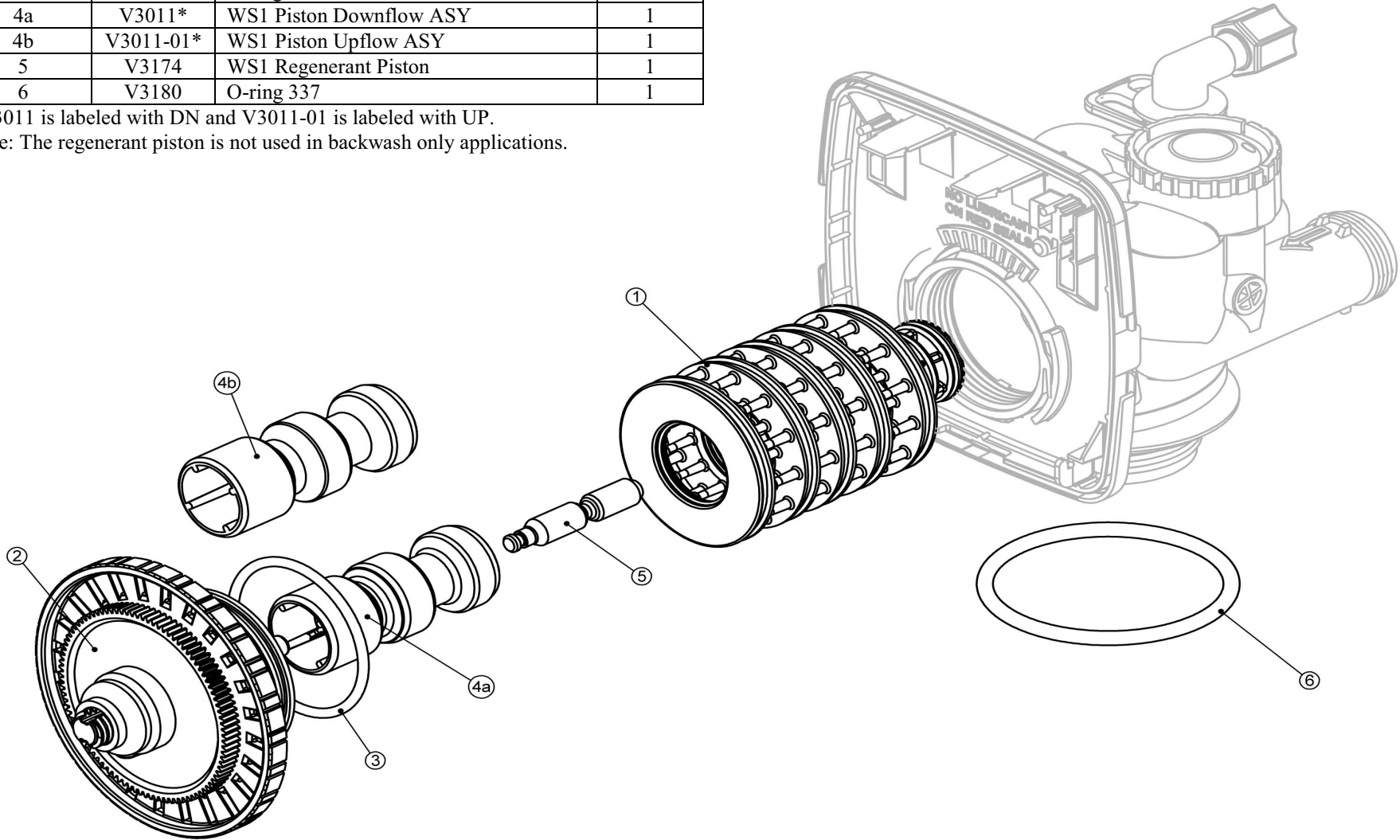


Drive Cap Assembly, Downflow Piston, Upflow Piston, Regenerant Piston and Spacer Stack Assembly

Drawing No.	Order No.	Description	Quantity
1	V3005	WS1 Spacer Stack Assembly	1
2	V3004	Drive Cap ASY	1
3	V3135	O-ring 228	1
4a	V3011*	WS1 Piston Downflow ASY	1
4b	V3011-01*	WS1 Piston Upflow ASY	1
5	V3174	WS1 Regenerant Piston	1
6	V3180	O-ring 337	1

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

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

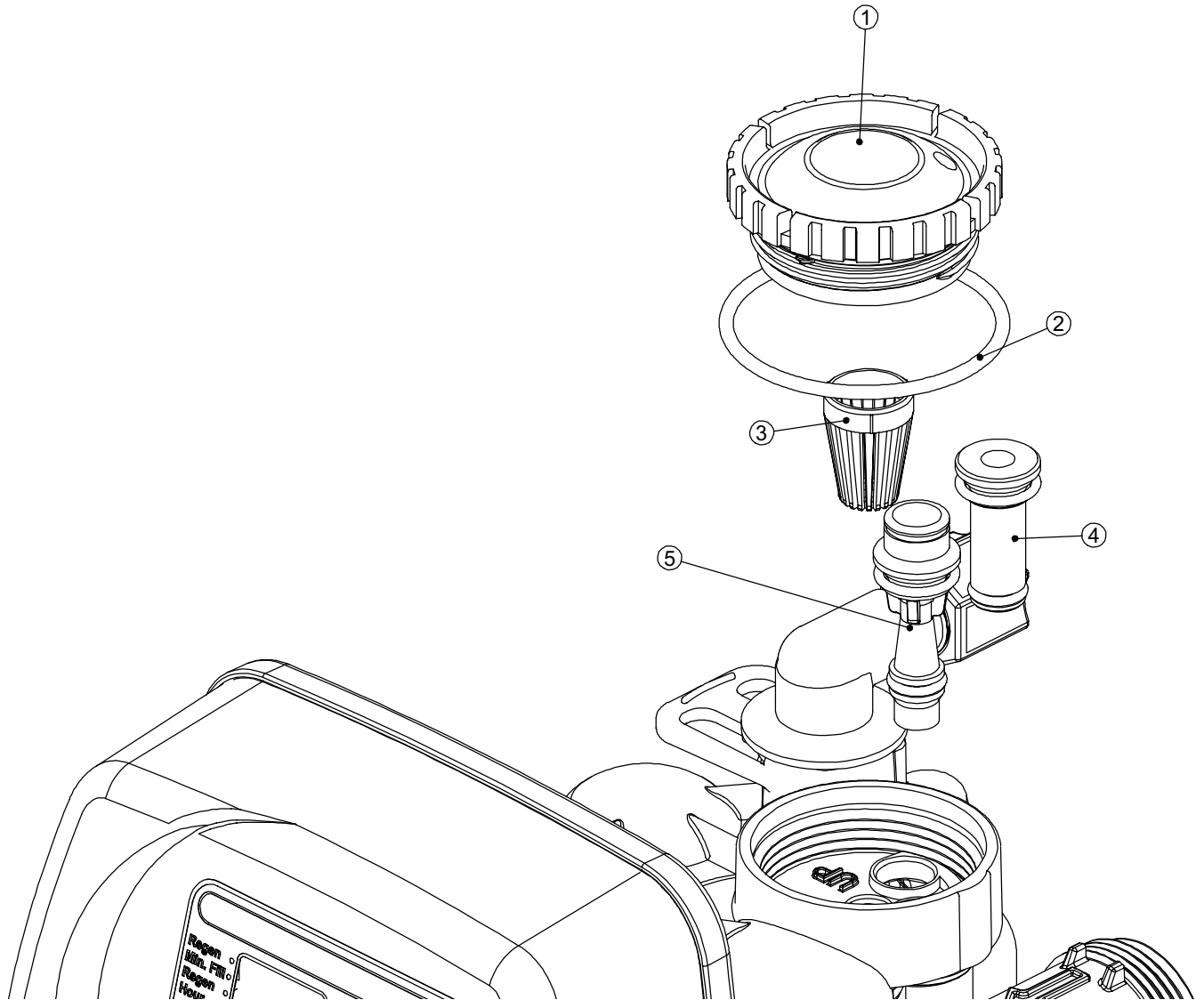


**Injector Cap, Injector Screen, Injector, Plug and O-Ring**

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.

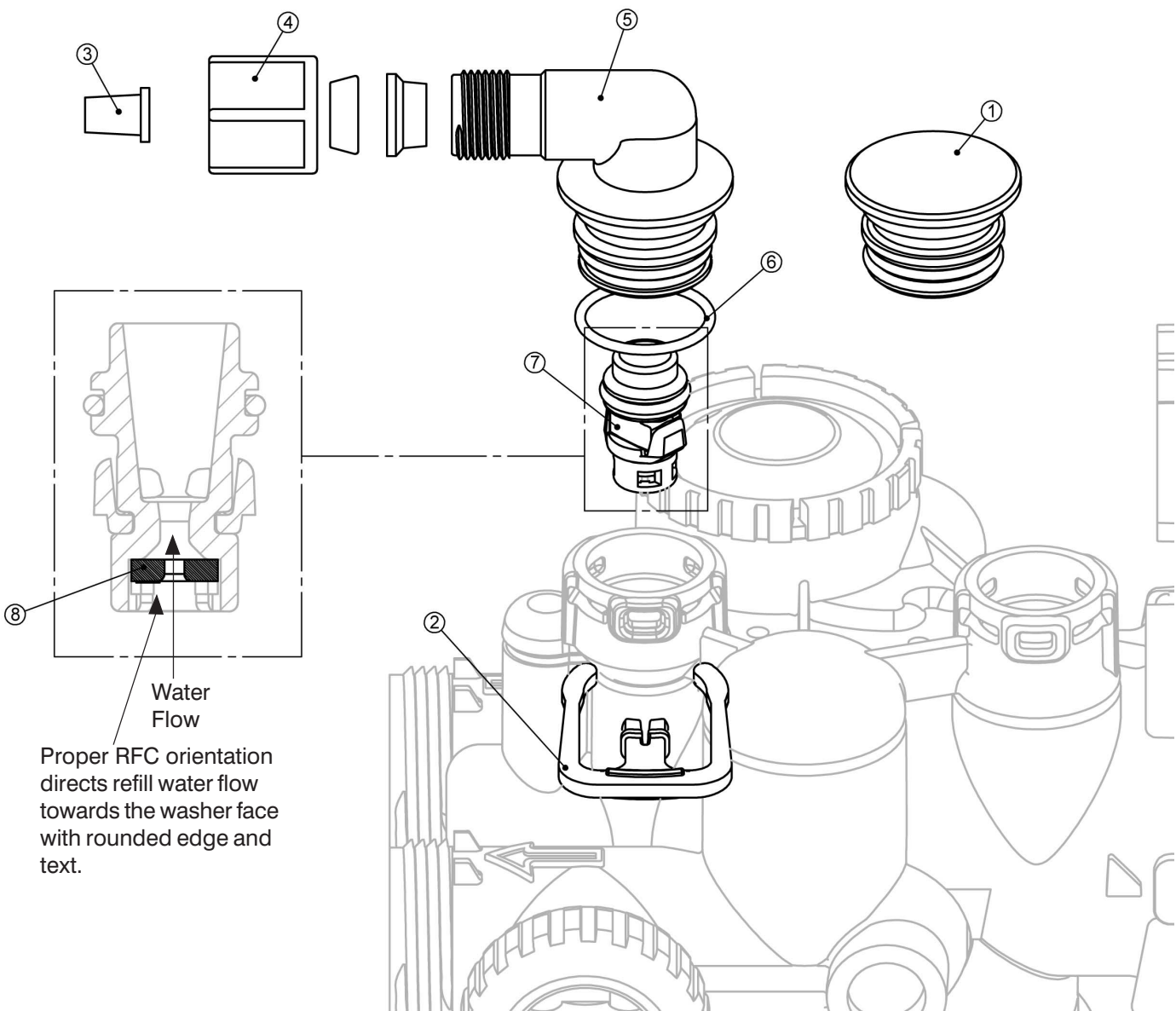
Note: For downflow, injector is located in the down hole and injector plug in the up hole. For a filter that only backwashes, injector plugs are located in both holes, and regenerant piston must be removed.



### Refill 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

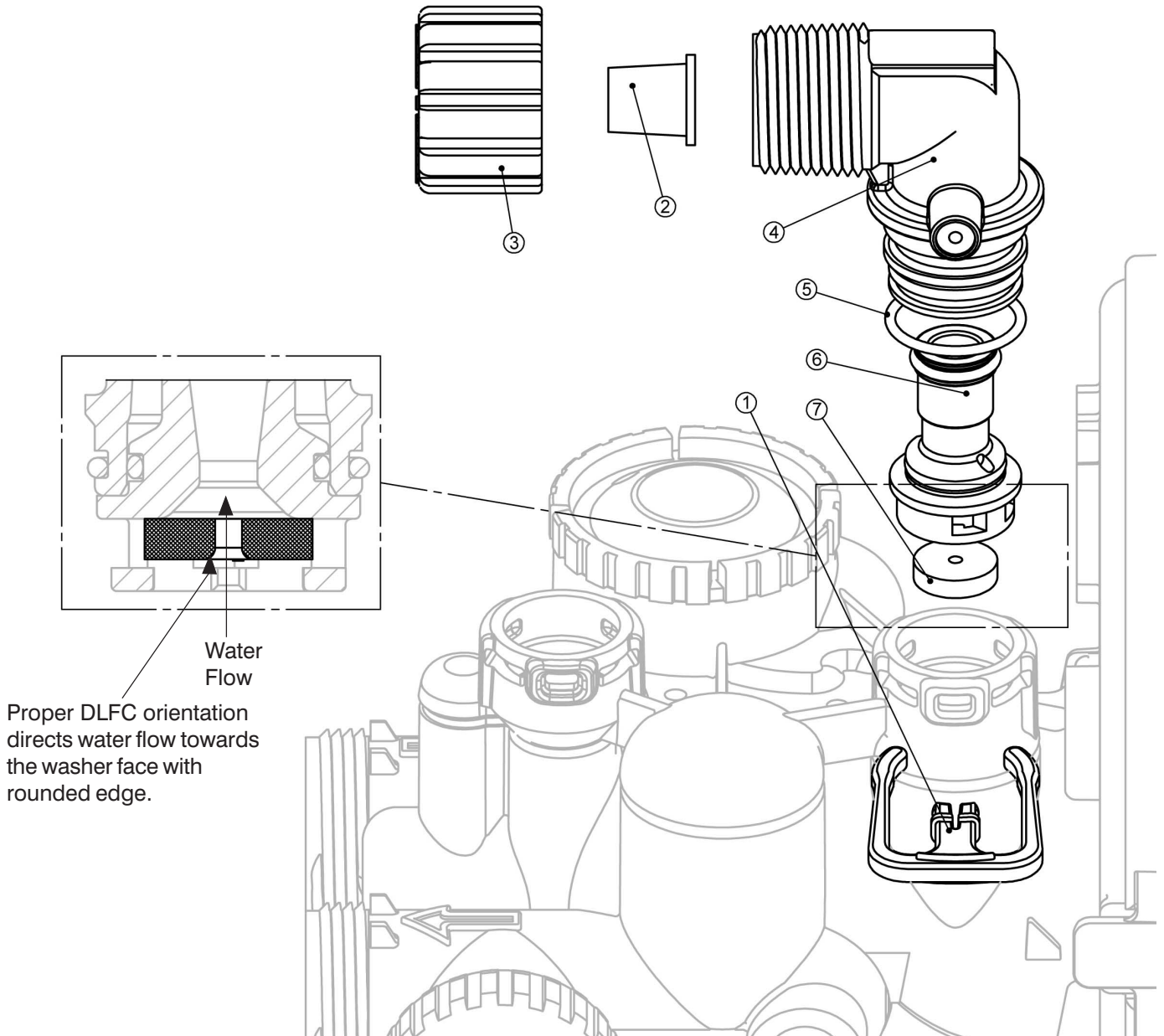
\*Assembly includes WS1 RFC.



**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 ASY	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 f gpm or 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		

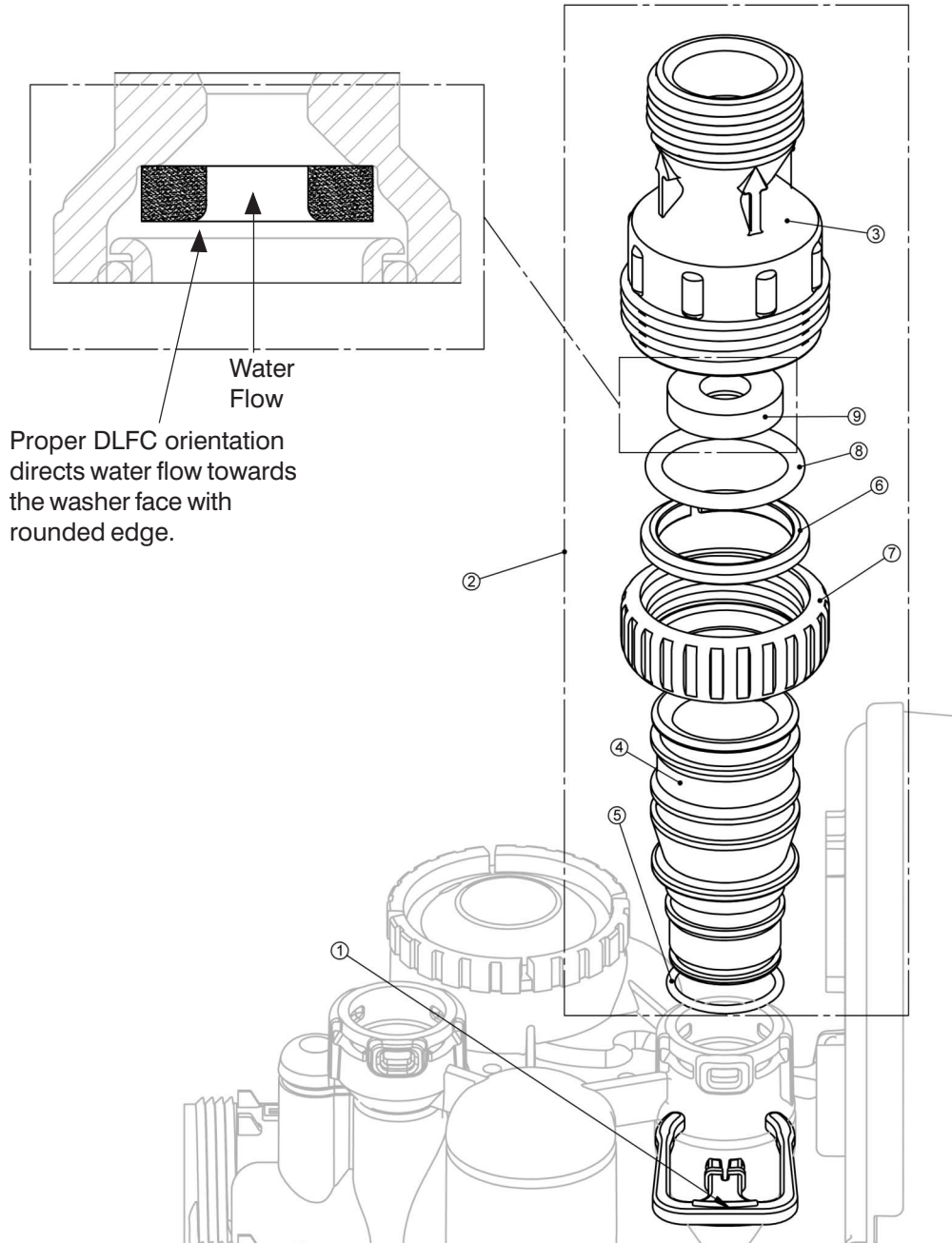
Valves are shipped without drain line flow control (DLFC) – install DLFC before using. Valves are shipped without 3/4” nut for drain elbow (polytube installation only) and 5/8” polytube insert (polytube installation only).



**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	

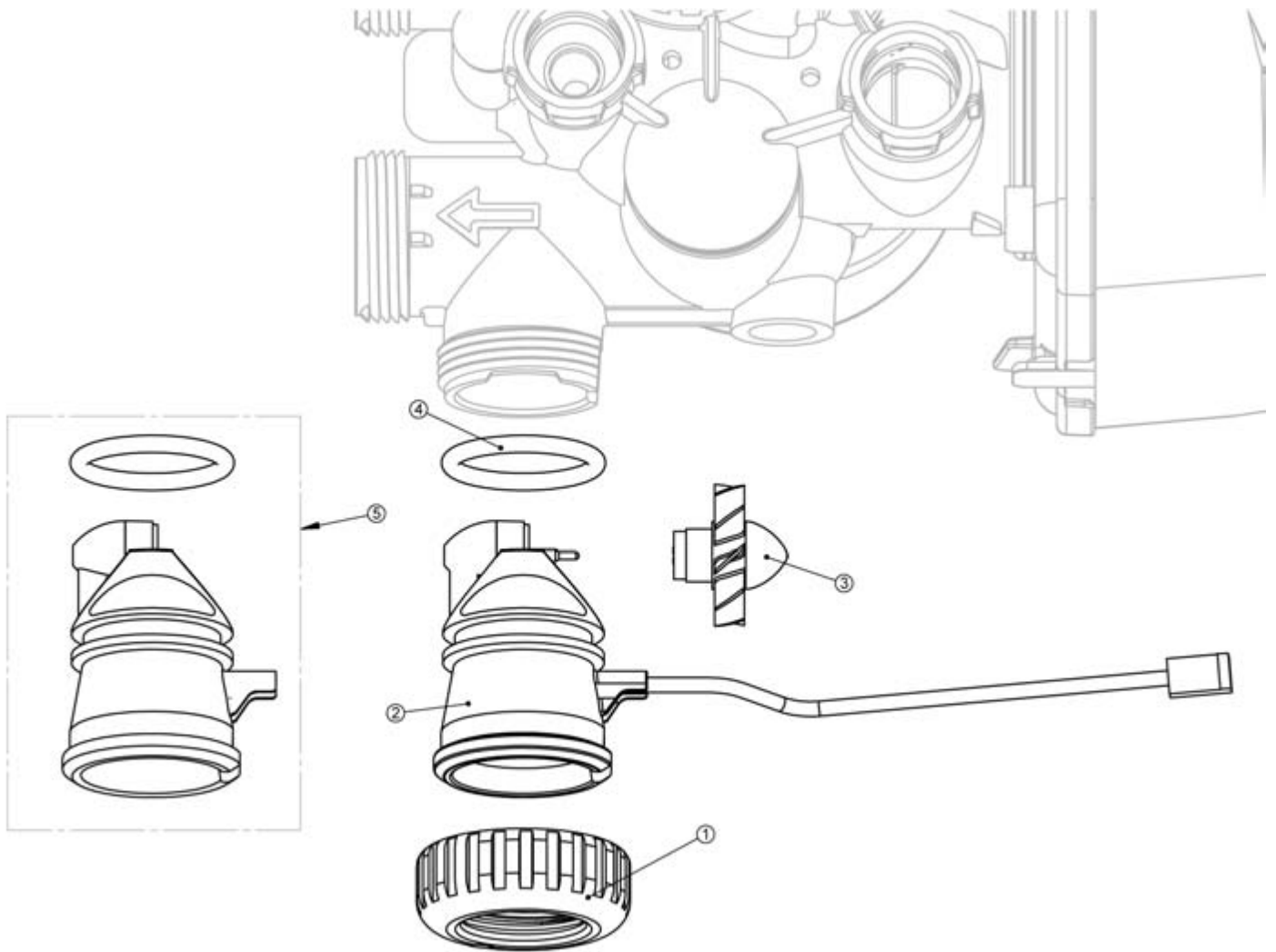
\* Can be ordered as a set order number V3008-02, description: WS1 Drain FTG 1 Straight.



**Water Meter and Meter Plug**

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

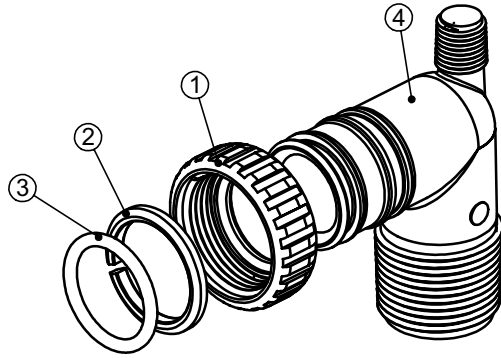
\*Order number V3003 includes V3118-01 and V3105.



### Installation Fitting Assemblies

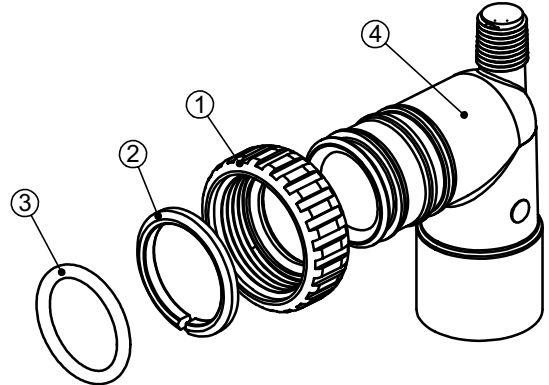
Order No: **V3007**  
Description: **WS1 Fitting 1" PVC Male NPT Elbow Assembly**

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



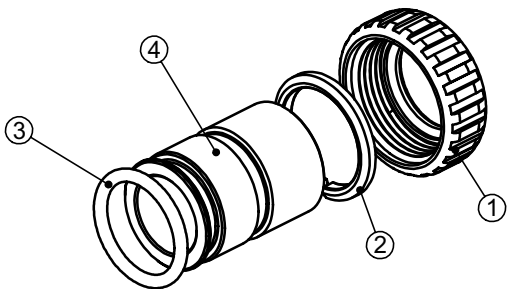
Order No: **V3007**  
Description: **WS1 Fitting 1" PVC Male NPT Elbow Assembly**

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



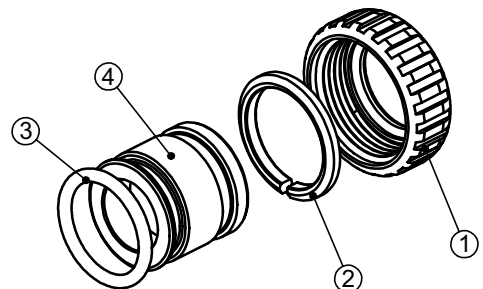
Order No: **V3007-02**  
Description: **WS1 Fitting 1" Brass Sweat Assembly**

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	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

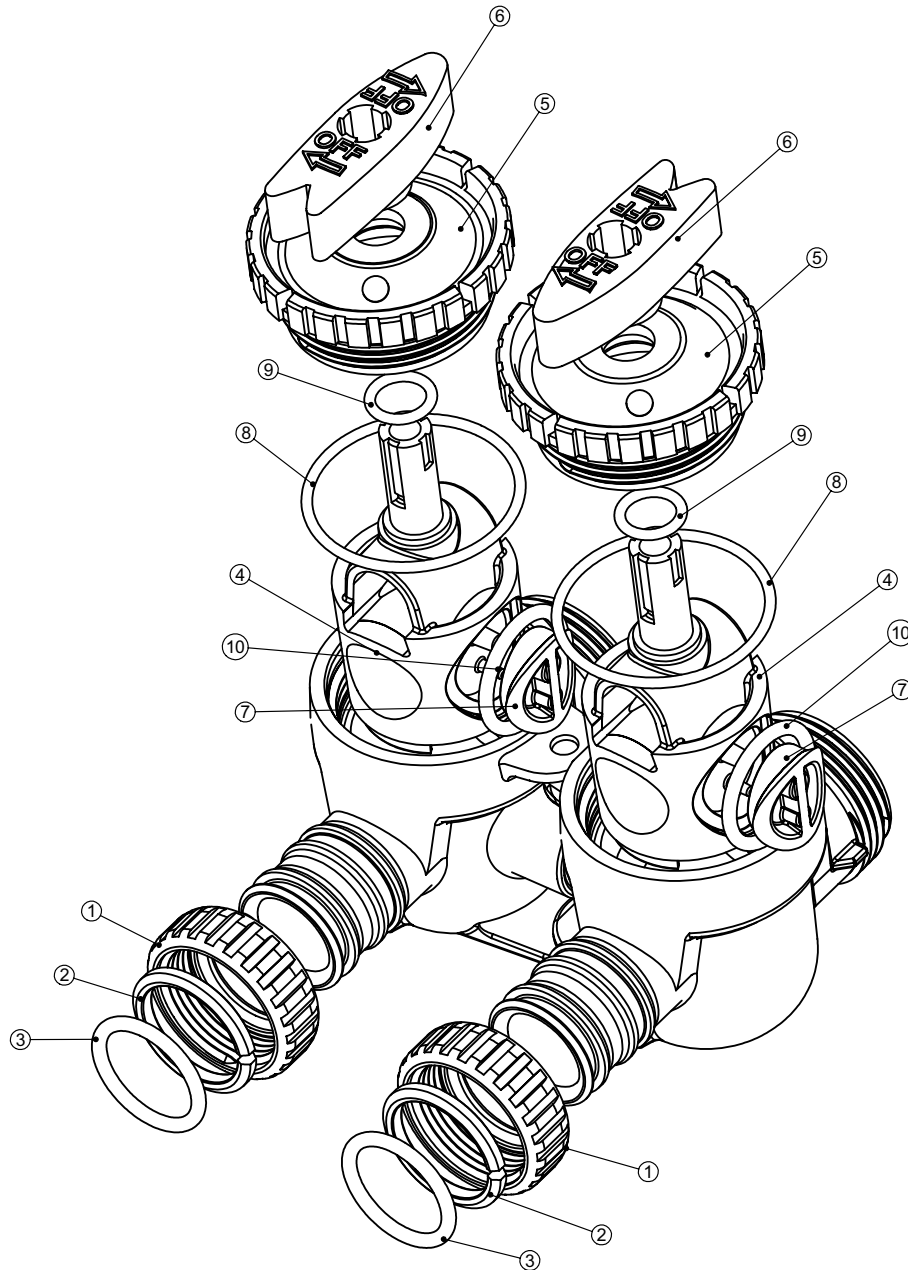


**Bypass Valve**

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

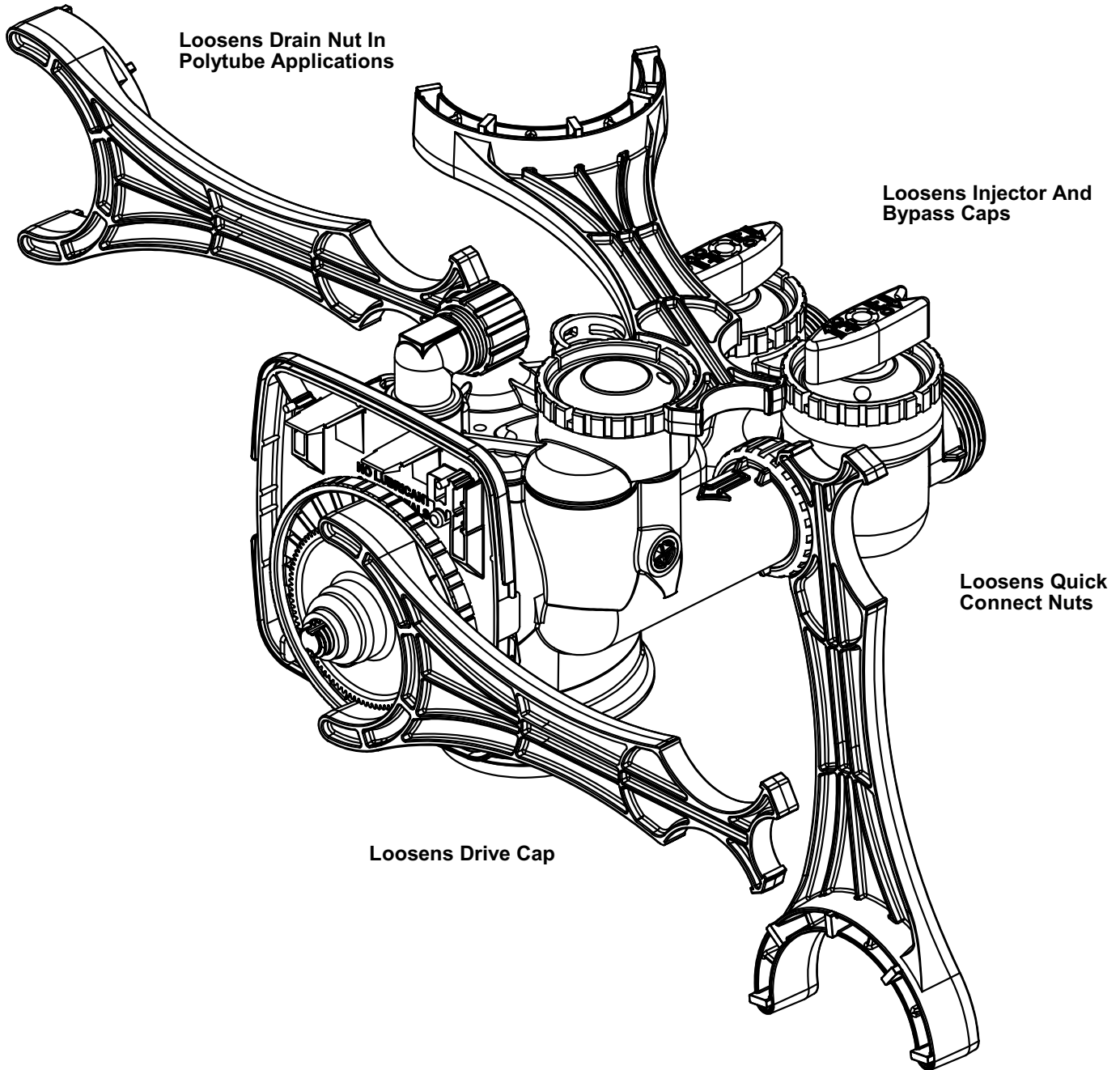
(Not Shown) Order No. V3191-01, Description: WS1 Bypass Vertical Adapter Assembly

Order No.	Description	Quantity
V3151	WS1 Nut 1" Quick Connect	2
V3150	WS1 Split Ring	2
V3105	O-Ring 215	2
V3191-01	WS1 Bypass Vertical Adapter Assembly	2



## Service Wrench

Although no tools are necessary to assemble or disassemble the valve, the WS1 wrench (shown in various positions on the valve) may be purchased to aid in assembly or disassembly.



## Service Instructions

### Drive Assembly

Remove the valve cover to access the drive assembly.

Disconnect the power source plug (black wire) from the PC board prior to disconnecting the motor or water meter plugs from the PC board. The motor plug connects to the two-pin jack on the left-hand side of the PC board. The power source plug connects to the four-pin jack. The four-pin jack is between the two-pin and three-pin jacks. The water meter plug (gray wire) connects to the three-pin jack on the far right-hand side of the PC board.

The PC board can be removed separately from the drive bracket but it is not recommended. Do not attempt to remove the display panel from the PC board. Handle the board by the edges. To remove the PC board from the drive bracket, unplug the power, water meter and motor plugs from the PC board. Lift the middle latch along the top of the drive bracket while pulling outward on the top of the PC board. The drive bracket has two plastic pins that fit into the holes on the lower edge of the PC board. Once the PC board is tilted about 45° from the drive bracket it can be lifted off of these pins. To reinstall the PC board, position the lower edge of the PC board so that the holes in the PC board line up with the plastic pins. Push the top of the PC board towards the valve until it snaps under the middle latch, weave the power and water meter wires into the holders and reconnect the motor, water meter and power plugs.

The drive bracket must be removed to access the drive cap assembly and pistons or the drive gear cover. It is not necessary to remove the PC board from the drive bracket to remove the drive bracket. To remove the drive bracket start by removing the plugs for the power source and the water meter. Unweave the wires from the side holders. Two tabs on the top of the drive back plate hold the drive bracket in place. Simultaneously lift the two tabs and gently ease the top of the drive bracket towards your body. The lower edge of the drive bracket has two notches that rest on the drive back plate. Lift up and outward on the drive bracket to disengage the notches.

To reassemble seat the bottom of the drive bracket so the notches are engaged at the bottom of the drive back plate. Push the top of the drive bracket towards the two latches. The drive bracket may have to be lifted slightly to let the threaded piston rod pass through the hole in the drive bracket. Maintain a slight engaging force on top of the drive bracket while deflecting the bracket slightly to the left by pressing on the side of the upper right corner. This helps the drive gears mesh with the drive cap assembly. The drive bracket is properly seated when it snaps under the latches on the drive back plate. If resistance is felt before latching, then notches are not fully engaged, the piston rod is not in hole, the wires are jammed between the drive bracket and drive back plate, or the gear is not engaging the drive cap assembly.

To inspect drive gears, the drive gear cover needs to be removed. The drive gear cover is held in place on the drive bracket by three clips. The largest of the three clips is always orientated to the bottom of the drive bracket. Before trying to remove the drive gear cover, the drive bracket must be removed from the drive back plate. The drive gear cover can be removed from the drive bracket without removing the motor or the PC board. Simultaneously, push in and down on the large clip at the bottom and the clip on the left-hand side of the drive bracket behind the PC board. Keep your other fingers behind the drive gear cover so the drive gears do not drop on the ground.

Replace broken or damaged drive gears. Do not lubricate any of the gears. Avoid getting any foreign matter on the reflective coating because dirt or oils may interfere with pulse counting.

The drive gear cover only fits on one way, with the large clip orientated towards the bottom. If all three clips are outside of the gear shroud on the drive bracket the drive gear cover slips easily into place.

The drive bracket does not need to be removed from the drive plate if the motor needs to be removed. To remove the motor, disconnect the power and motor plugs from the jacks on the PC board. Move the spring clip loop to the right and hold. Rotate the motor at least a ¼ turn in either direction before gently pulling on the wire connectors to remove the motor. Pulling directly on the wires without rotating the motor may break the wires off the motor.

Replace the motor if necessary. Do not lubricate the motor or the gears. When reinstalling the motor gently turn the motor while inserting so that the gear on the motor meshes with the gears under the drive gear cover and the small plastic bulge engages one of the slots on the motor housing. Reconnect the motor plug to the two pronged jack on the lower left hand side of the PC board. If motor will not easily engage with drive gear when reinstalling, lift and slightly rotate motor before reinserting.

Replace the valve cover. After completing any valve maintenance, press and hold NEXT and REGEN buttons for 3 seconds or unplug power source jack (black wire) and plug back in. This resets the electronics and establishes the service piston position. The display should flash all wording, then flash the soft ware version (e.g. 154) and then reset the valve to the service position.

#### Drive Cap Assembly, Main Piston and Regenerant Piston

The drive assembly must be removed to access the drive cap assembly. The drive cap assembly must be removed to access the piston(s). The drive cap assembly is threaded into the control valve body and seals with an o-ring. To remove the drive cap assembly use the special plastic wrench or insert a ¼" to ½" flat bladed screwdriver into one of the slots around the top 2" of the drive cap assembly so it engages the notches molded into the drive back plate around the top 2" of the piston cavity. See Figure 5. The notches are visible through the holes. Lever the screwdriver so the drive cap assembly turns counter clockwise. Once loosened unscrew the drive cap assembly by hand and pull straight out.

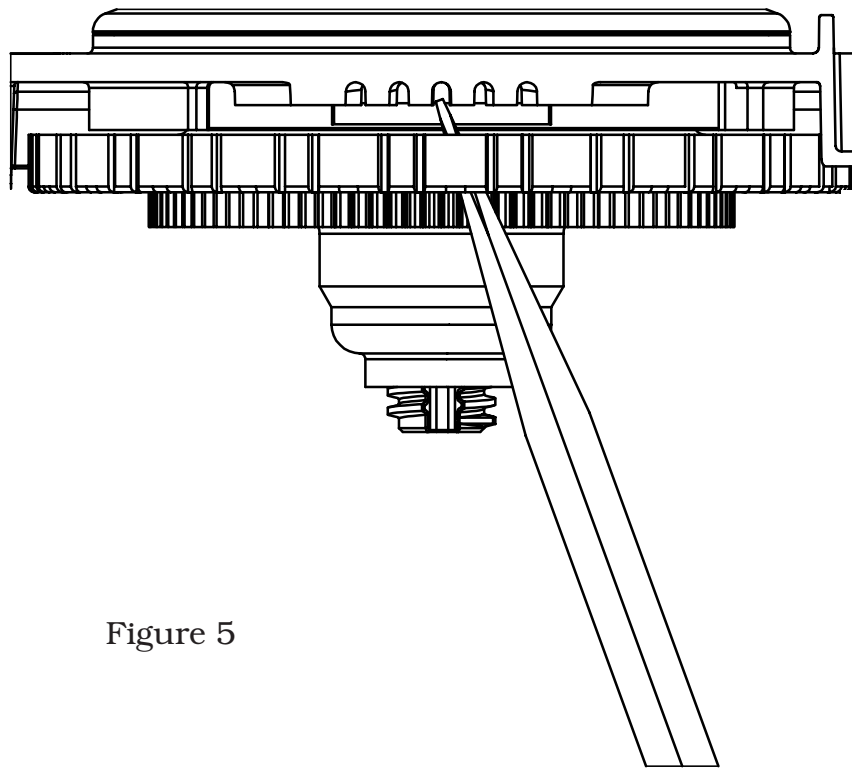


Figure 5

The drive cap assembly contains the drive cap, the main drive gear, drive cap spline, piston rod and various other parts that should not be disassembled in the field. The only replaceable part on the drive cap assembly is the o-ring. Attached to the drive cap assembly is the main piston (down flow or up flow) and if a regenerant is used, a regenerant piston.

The regenerant piston (the small diameter one behind the main piston) is removed from the main piston by unsnapping it from its latch. Chemically clean in dilute sodium bisulfite or vinegar or replace the regenerant piston if needed. To remove the main down flow or up flow piston fully extend the piston rod and then unsnap the main piston from its latch by pressing on the side with the number. Chemically clean in dilute sodium bisulfite or vinegar or replace the main piston.

Reattach the main piston to the drive cap assembly. Reattach the regenerant piston (if needed) to the main piston. Do not lubricate the piston rod, main piston or regenerant piston. Lubricant will adversely affect the red or clear lip seals. Reinsert the drive cap assembly and piston into the spacer stack assembly and hand tighten the drive cap assembly. Continue to tighten the drive cap assembly using a screwdriver as a ratchet until the black o-ring on the spacer stack assembly is no longer visible through the drain port. Excessive force can break the notches molded into the drive back plate. Make certain that the main drive gear still turns freely. The exact position of the piston is not important as long as the main drive gear turns freely.

Reattach the drive assembly to the control valve and connect all plugs. After completing any valve maintenance, press and hold NEXT and REGEN buttons for 3 seconds or unplug power source jack (black wire) and plug back in. This resets the electronics and establishes the service piston position. The display should flash all wording, then flash the soft ware version (e.g. 154) and then reset the valve to the service position.

### Spacer Stack Assembly

To access the spacer stack assembly remove the drive assembly, drive cap assembly and piston. The spacer stack assembly can be removed easily without tools by using thumb and forefinger. Inspect the black o-rings and red or clear lip seals for wear or damage. Replace the entire stack if necessary. The spacer stack assembly has been 100% tested at the factory to insure proper orientation of one way seals. Do not disassemble the stack.

The spacer stack assembly may be chemically cleaned (dilute sodium bisulfite or vinegar) or wiped with a soft cloth.

The spacer stack assembly can be pushed in to the control valve body bore by hand. Since the spacer stack assembly can be compressed it is easier to use a blunt object (5/8" to 1-1/8" in diameter) to push the center of the assembly into the control valve body. The assembly is properly seated when at least four threads are exposed (approximately 5/8"). Do not force the spacer stack assembly in. The control valve body bore interior can be lubricated with silicone to allow for easy insertion of the entire stack. Do not use silicone or any other type of lubricant on the red or clear lip seals or the piston.

Reattach the drive cap assembly and piston(s) and the drive assembly.

After completing any valve maintenance, press and hold NEXT and REGEN buttons for 3 seconds or unplug power source jack (black wire) and plug back in. This resets the electronics and establishes the service piston position. The display should flash all wording, then flash the soft ware version (e.g. 154) and then reset the valve to the service position.

### Injector Cap, Screen, Injector Plug and Injector

Unscrew the injector cap and lift off. Loosen cap with special plastic wrench or pliers if necessary. Attached to the injector cap is a screen. Remove the screen and clean if fouled.

The plug and/or injector can be pried out with a small screwdriver. The plug can be wiped clean. If the plug leaks replace the entire plug. The injector consists of a throat and a nozzle. Chemically clean the injector with vinegar or sodium bisulfite. The holes can be blown out with air. Both pieces have small diameter holes that control the flow rates of water to insure that the proper concentration of regenerant is used. Sharp objects, which can score the plastic, should not be used to clean the injector. Scoring the injector or increasing the diameter of the hole could change the operating parameters of the injector.

Two holes are labeled DN and UP. Check for compliance with one of the following:

- a. for down flow systems, the appropriate size injector is located in the "DN" hole, a plug is in the "UP" hole and that the piston is a combination of the down flow main piston and the regenerant piston;
- b. for up flow systems, the appropriate size injector is located in the "UP" hole, a plug is in the "DN" hole and that the piston is a combination of the up flow main piston and the regenerant piston; or
- c. for backwash only systems, a plug is in the "DN" hole and in the "UP" hole, and that the piston only has a down flow main piston (the regenerant piston must be removed) and a plug is in the refill flow control position.

Push the plug(s) and/or injectors firmly in place, replace the screen and hand tighten the injector cap.

### Refill Flow Control Assembly or Refill Port Plug

To clean or replace the refill flow control, pull out the elbow-locking clip and then pull straight up on the elbow. Replace the elbow locking clip in the slot so that it is not misplaced. Twist to remove the white flow control retainer. The flow control can be removed by prying upward through the side slots of the retainer with a small blade flat screwdriver.

Chemically clean the flow control or the white flow control retainer using dilute sodium bisulfite or vinegar. Do not use a wire brush. If necessary, replace the flow control, o-ring on the flow control retainer, or the o-ring on the elbow.

Reseat the flow control so the rounded end is visible in the flow control. Reseat the white flow control retainer by pushing the retainer into the elbow until the o-ring seats. Remove locking clip, push down on elbow to reseat and insert locking clip.

Do not use Vaseline, oils, or other unacceptable lubricants on o-rings. A silicon lubricant may be used on the o-ring on the elbow or the white retainer.

### Water Meter or Meter Plug

The water meter assembly is connected to the PC board by a wire. If the entire water meter assembly is to be replaced, remove the control valve cover and remove the power source and water meter plugs from the PC board. Unlatch the drive assembly and lean it forward. Unthread the water meter wire from the side of the drive assembly and through the drive back plate. To reinstall, rethread the water meter wire through the drive back plate and the side of the drive assembly. Reattach the drive assembly and the water meter and power plugs.

If no water meter wire is visible, then a plug is installed not a water meter.

The water meter wire does not need to be removed from the PC board if the water meter is only being inspected and cleaned. To remove the water meter assembly, unscrew the meter cap on the left side of the control valve. Pliers may be used to unscrew the nut if necessary.

With the nut removed, a slot at the top of the water meter is visible. Twist a flat blade screwdriver in the slot between the control valve body and the meter. When the meter is part way out it is easy to remove the water meter from the housing. Once the water meter is removed from the control valve body, use your fingers to gently pull forward on the turbine to remove it from the shaft.

Do not use a wire brush to clean. Wipe with a clean cloth or chemically clean in dilute sodium bisulfite or vinegar. The turbine can be immersed in the chemical. Do not immerse electronics. If the turbine is scored or damaged or the bearings on the turbine are worn replace the turbine.

Do not lubricate the turbine shaft. The turbine shaft bearings are prelubricated. Do not use Vaseline, oils, or other unacceptable lubricants on the o-ring. A silicon lubricant may be used on the black o-ring.

Snap the turbine on the shaft and reinsert the water meter into the side slot. Hand tighten the nut. Do not use a pipe wrench to tighten nut.

### Bypass Valve

The working parts of the bypass valve are the rotor assemblies that are contained under the bypass valve caps. Before working on the rotors, make sure the system is depressurized. Turn the red arrow shaped handles towards the center of the bypass valve and back to the arrow direction several times to ensure rotor is turning freely.

The nuts and caps are designed to be unscrewed or tightened by hand. If necessary a pliers can be used to unscrew the nut or cap. Do not use a pipe wrench to tighten or loosen nuts or caps. Do not place screwdriver in slots on caps and/or tap with a hammer. To access the rotor, unscrew the cap and lift the cap, rotor and handle out as one unit. Twisting the unit as you pull it out will help to remove it more easily. There are three o-rings: one under the rotor cap, one on the rotor stem and the rotor seal. Replace worn o-rings. Clean rotor. Reinstall rotor.

When reinstalling the red arrow handles be sure that:

1. O-rings on both rotors face to the right when being viewed from the front of the control valve when the handle pointers are lined up with the control valve body arrows; or
2. Arrows point toward each other in the bypass position.

Since the handles can be pulled off, they could be accidentally reinstalled 180° from their correct orientation. To install the red arrow handles correctly, keep the handles pointed in the same direction as the arrows engraved on the control valve body while tightening the bypass valve caps.

After completing any valve maintenance, press and hold NEXT and REGEN buttons for 3 seconds or unplug power source jack (black wire) and plug back in. This resets the electronics and establishes the service piston position. The display should flash all wording, then flash the software version (e.g. 154) and then reset the valve to the service position.

**Table 15  
Troubleshooting Procedures**

Problem	Possible Cause	Solution
1. Timer does not display time of day	a. Transformer unplugged	a. Connect power
	b. No electric power at outlet	b. Repair outlet or use working outlet
	c. Defective transformer	c. Replace transformer
	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 transformer	c. Replace transformer
	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. Transformer unplugged	a. Connect transformer
	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 transformer was unplugged and then plugged back into the wall outlet, the transformer 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