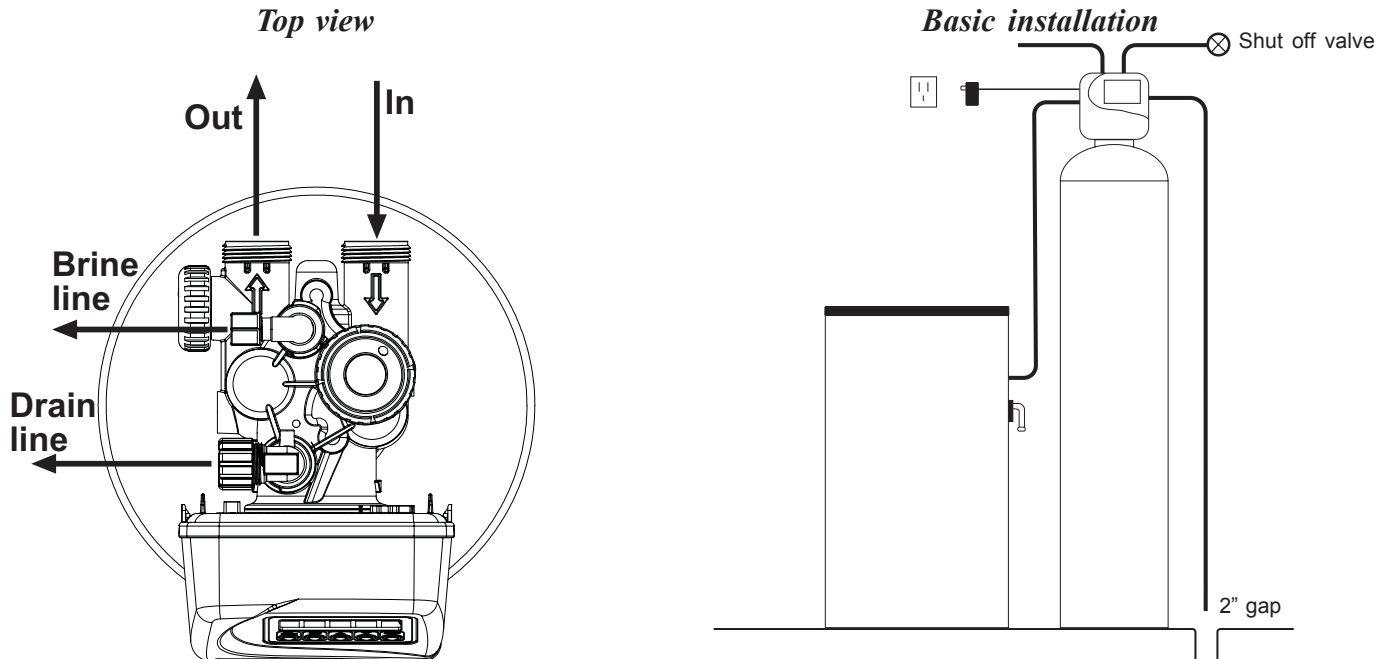


**WS1TC Series
Installation and Operation
Manual**

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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 1/4" 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

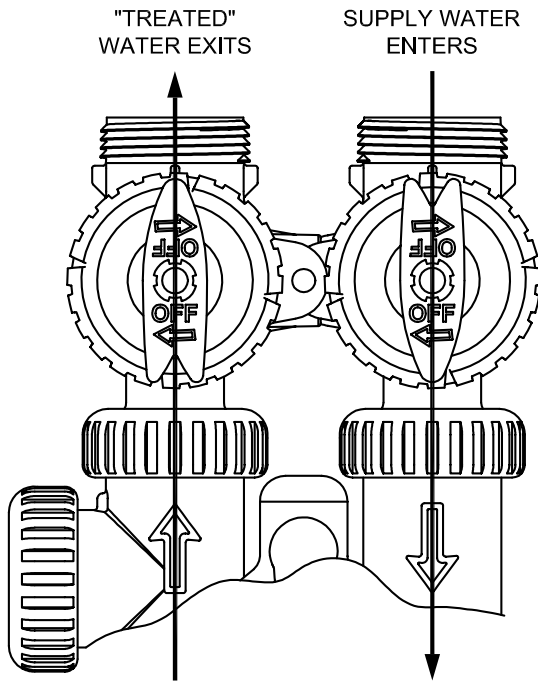


Figure 2

BYPASS OPERATION

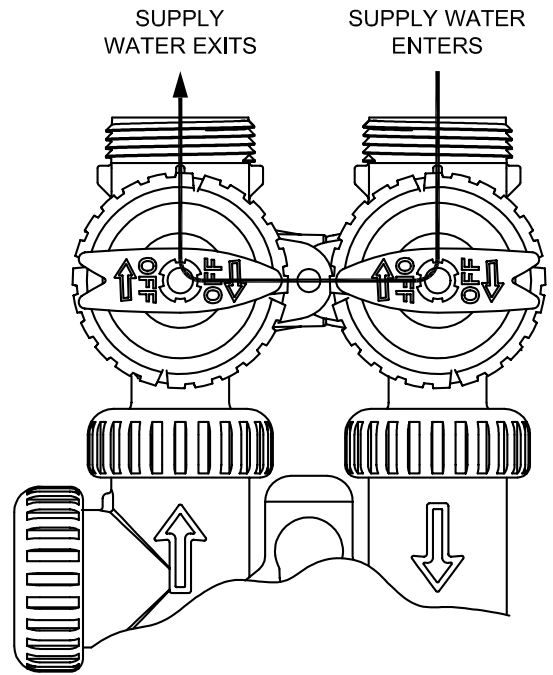


Figure 3

DIAGNOSTIC MODE

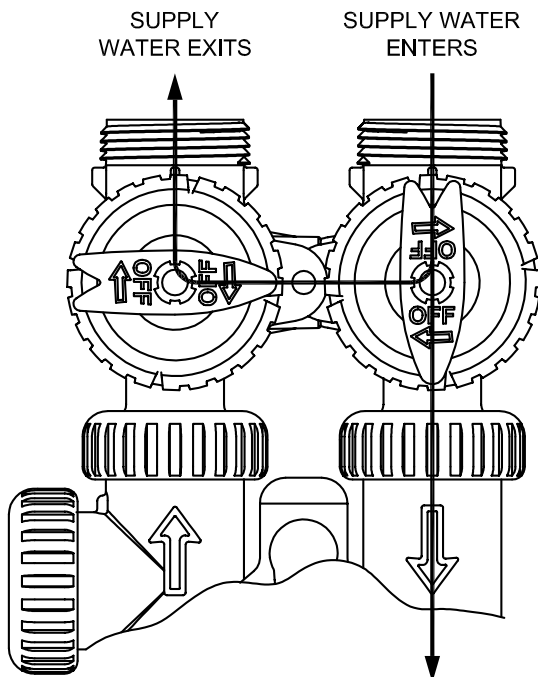
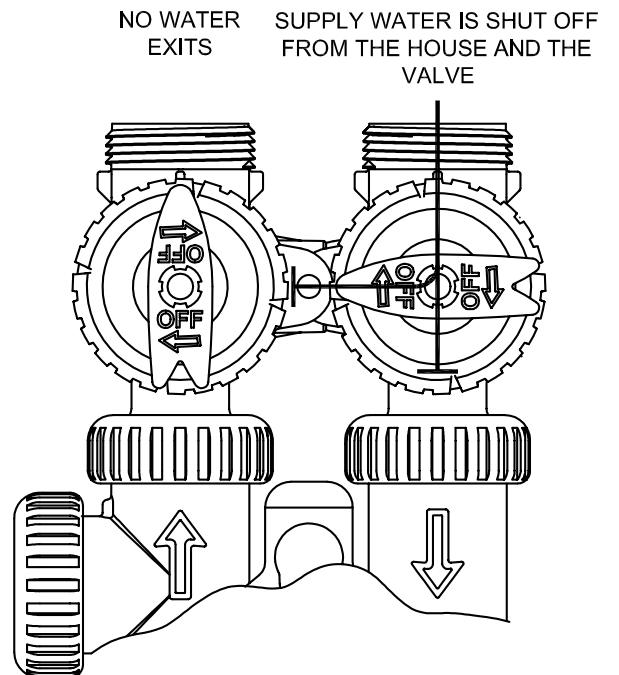


Figure 4

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 UP and DOWN buttons simultaneously for three seconds until the drive motor starts. Wait until the motor stops and the display reads “C1.”

 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 UP button to advance the control to the brine position C2.

 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 UP 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 C3 or C4 depending on the program used. If C3 is displayed press the UP button to advance the control to the rinse position C4. Allow water to run to drain until clear.

 7. Press the UP button to advance the control to where the display reads C5. This will allow water to run into the brine tank and prepare it for the next regeneration. Allow the brine tank to fill automatically.

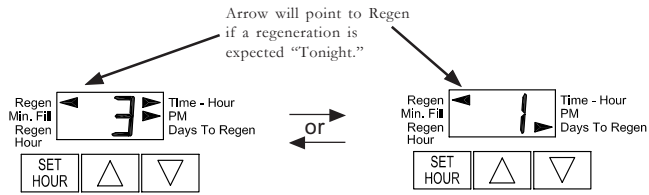
 8. While the brine tank is filling, load it with water softener salt.

 9. SANITIZE! For each cubic foot of resin, add two ounces of 51/4% household chlorine bleach to the water in the brine tank brine well. Press and hold the UP and DOWN buttons simultaneously 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

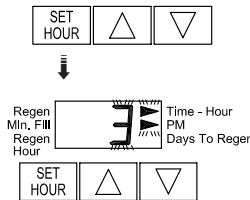
GENERAL OPERATION

When the system is operating one of two displays will be shown: time of day or days until the next regeneration. Pressing UP or DOWN will toggle between the two choices.



TO SET TIME OF DAY

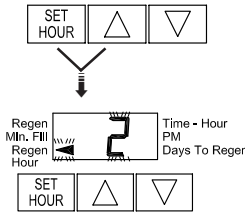
In the event of a power outage, time of day needs to be reset. All other information will be stored in memory no matter how long the power outage. Please complete the steps as shown to the right. To access this mode, press SET HOUR.



1. Accessed by pressing SET HOUR.
2. Adjust to the nearest hour using UP or DOWN. An arrow points to PM during p.m. hours.
3. Press SET HOUR to complete and return to normal operation.

TO SET 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 SET HOUR and UP simultaneously for 3 seconds.



1. Accessed by pressing SET HOUR and UP simultaneously for 3 seconds.
2. Adjust time of regeneration hour using the UP or DOWN. An arrow points to PM during p.m. hours. Simultaneously press SET HOUR and DOWN to return to normal operation.

MANUAL REGENERATION

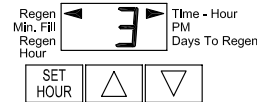
NOTE: For softeners, if brine tank does not contain salt, fill with salt and wait at least 2 hours before regeneration.

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

For Immediate Regeneration:

Press and hold UP and DOWN simultaneously until valve motor starts (typically 3 seconds).

Arrow will point to Regen if a regeneration is expected "Tonight."



For Regeneration Tonight:

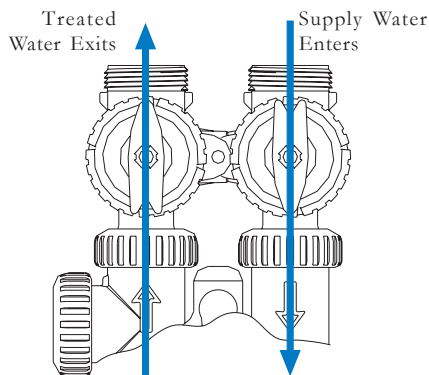
Press and release UP and DOWN simultaneously (notice that arrow points to Regen).

If the display shows "E1," "E2" or "E3" (for error), call a service technician.

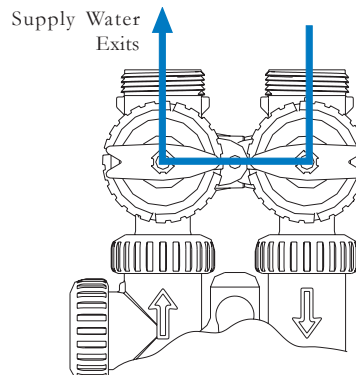


To **shut off water** to the system, please position arrow handles as shown in the **bypass operation** diagram below. If your valve doesn't look like the diagram below, contact your service technician for instructions on how to shut off water.

NORMAL OPERATION



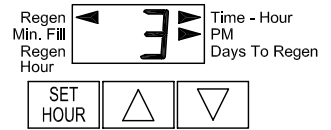
BYPASS OPERATION



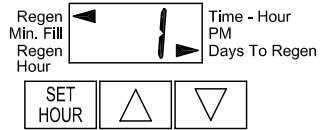
User Displays

General Operation

When the system is operating one of two displays will be shown. Pressing UP or DOWN button will alternate between the displays. One of the displays is always the current time of day (to the nearest hour). The second display is the days remaining until the next regeneration. If the days remaining is equal to one, a regeneration will occur at the next preset regeneration time. The user can scroll between displays as desired.



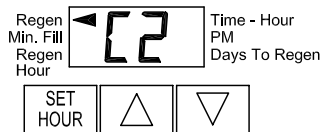
If the system has called for a regeneration that will occur at the preset time of regeneration, the arrow will point to Regen.



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.

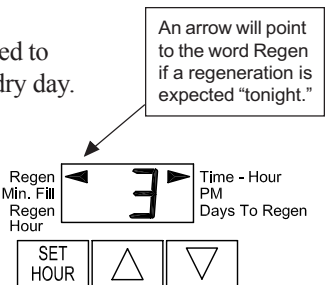
When the system begins to regenerate, the display will change to indicate the cycle of the regeneration process (see Table 3) that is occurring and an arrow will also point to Regen. The system will run through the steps automatically and will reset itself to provide treated water when the regeneration is completed.



Manual Regeneration

Sometimes there is a need to regenerate the system, sooner than when the system calls for it, usually referred to as a 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, simultaneously press UP + DOWN buttons together and release. The arrow will point to the word Regen if a regeneration is expected "tonight." To cancel the regeneration simultaneously press UP + DOWN buttons and release.



To initiate a manual regeneration immediately, simultaneously press UP + DOWN buttons together 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.

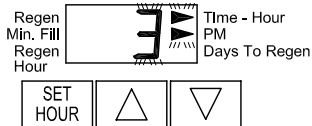
STEP 1U

Set Time of Day



STEP 1U – Press SET HOUR

STEP 2U



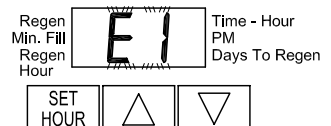
STEP 2U – Current time: Set the clock to the closest hour by using the UP and DOWN button. An arrow points to PM after 12. After a power outage, the time of day will need to be reset. Press SET HOUR to exit.

Power Loss

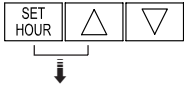
If the power goes out current time of day will need to be reset. If the power goes out while the system is regenerating, the cycle picks up where it was interrupted when the power returns. Note: The display will flash if a power outage has occurred.

Error Message

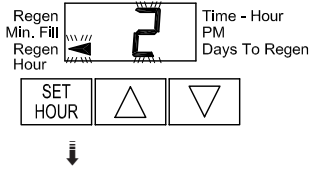
If "E1," "E2" or "E3" appears on the display contact the OEM for help. This indicates that the valve did not function properly.



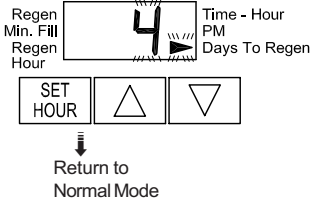
STEP 1ID



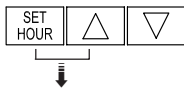
STEP 2ID



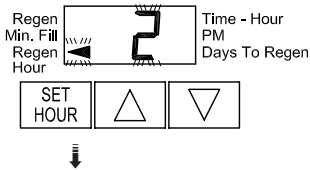
STEP 3ID



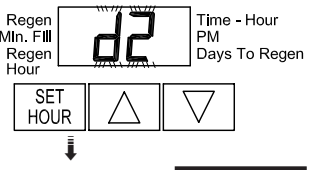
STEP 1I7



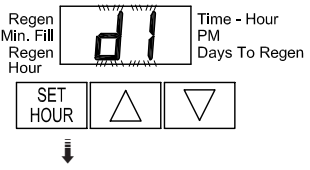
STEP 2I7



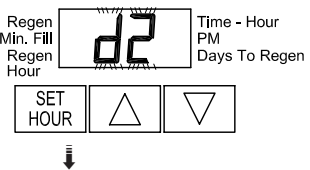
STEP 3I7



STEP 4I7



STEP 5I7



Installer Displays & Settings (1-99 Days Between Regeneration option)

STEP 1ID – From normal mode, press SET HOUR + UP buttons simultaneously for 3 seconds and release.

STEP 2ID – Regeneration Time: Set the clock to the hour the regeneration should occur by using the UP or DOWN buttons. An arrow points to PM after 12. Press SET HOUR to go to STEP 3ID.

STEP 3ID – Days To Regen: Set the number of days between regenerations. The allowable range is 1 to 99. Press SET HOUR to exit Installer Displays & Settings.

Installer Displays & Settings (7 day option)

STEP 1I7 – From normal mode, press SET HOUR + UP buttons simultaneously for 3 seconds and release.

STEP 2I7 – Regeneration Time: Set the clock to the hour the regeneration should occur by using the UP or DOWN buttons. An arrow points to PM after 12. Press SET HOUR to go to STEP 3I7.

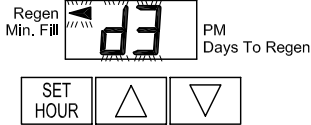
STEP 3I7 – Current Day of Week: Set the current day of the week by using the UP or DOWN buttons (See chart at right for date codes). Press SET HOUR to go to STEP 4I7.

Display	Day of Week
d1	Sunday
d2	Monday
d3	Tuesday
d4	Wednesday
d5	Thursday
d6	Friday
d7	Saturday

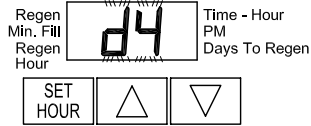
STEP 4I7 – Sunday Regeneration: To regenerate on Sunday use the UP or DOWN button until the arrow points to Regen. If the arrow does not point to Regen a regeneration will not occur on Sunday. Press SET HOUR to go to STEP 5I7.

STEP 5I7 – Monday Regeneration: To regenerate on Monday use the UP or DOWN button until the arrow points to Regen. If the arrow does not point to Regen a regeneration will not occur on Monday. Press SET HOUR to go to STEP 6I7.

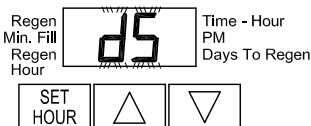
STEP 6I7



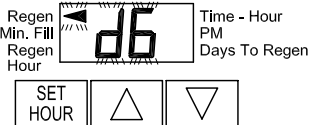
STEP 7I7



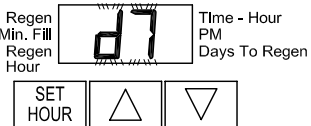
STEP 8I7



STEP 9I7



STEP 10I7



Return to Normal Mode

STEP 6I7 – Tuesday Regeneration: To regenerate on Tuesday use the UP or DOWN button until the arrow points to Regen. If the arrow does not point to Regen a regeneration will not occur on Tuesday. Press SET HOUR to go to STEP 7I7.

STEP 7I7 – Wednesday Regeneration: To regenerate on Wednesday use the UP or DOWN button until the arrow points to Regen. If the arrow does not point to Regen a regeneration will not occur on Wednesday. Press SET HOUR to go to STEP 8I7.

STEP 8I7 – Thursday Regeneration: To regenerate on Thursday use the UP or DOWN button until the arrow points to Regen. If the arrow does not point to Regen a regeneration will not occur on Thursday. Press SET HOUR to go to STEP 9I7.

STEP 9I7 – Friday Regeneration: To regenerate on Friday use the UP or DOWN button until the arrow points to Regen. If the arrow does not point to Regen a regeneration will not occur on Friday. Press SET HOUR to go to STEP 10I7.

STEP 10I7 – Saturday Regeneration: To regenerate on Saturday use the UP or DOWN button until the arrow points to Regen. If the arrow does not point to Regen a regeneration will not occur on Saturday. Press SET HOUR to exit Installer Displays & Settings.

NOTE: If all arrows are turned off in d1-d7, Days to Regen in the User Displays will always read 7 and a regeneration will never occur.

System Instructions

The control valve offers multiple procedures that allow the valve to be modified to suit the needs of the installation. These procedures are:

- System Setup
- Installer Displays & Settings (either 1-99 Days Between Regeneration option or 7-Day option)
- User Displays

These procedures can be accessed in any order. Details on each of the procedures are provided below and on the following pages.

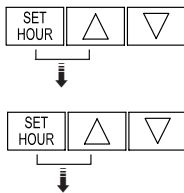
When in operation, normal user displays show the time of day or days remaining before regeneration. When stepping through a procedure if no buttons are pressed within five minutes the display returns to a normal user display. Any changes made prior to the five minute time out are incorporated.

To quickly exit Installer Displays & Settings or Setup simultaneously press SET HOUR + DOWN. Any changes made prior to the exit are incorporated.

To reinitialize the control valve check to make sure the valve is in the User Display. Then simultaneously press SET HOUR + DOWN or unplug power source plug (black wire) on the circuit board, and plug back in.

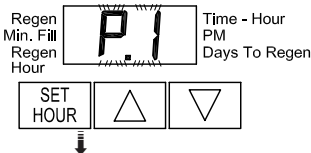
STEP 1SS

System Setup



STEP 1SS – From normal mode, press SET HOUR + UP buttons simultaneously for 3 seconds and release. Then press SET HOUR + UP buttons simultaneously for 3 seconds and release.

STEP 2SS



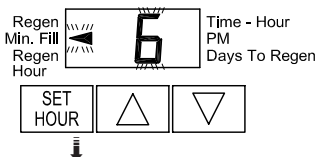
STEP 2SS – Choose the desired program by pressing the UP or DOWN buttons. Press SET HOUR button to go to Step 3SS.

Regeneration Cycles and Times for Different Programs

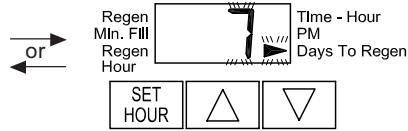
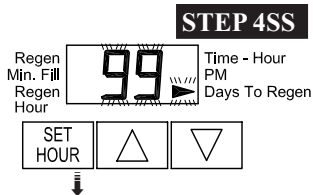
Program	All Times in Minutes				
	C1 1 st Backwash	C2 Regenerate	C3 2 nd Backwash	C4 Rinse	C5 Fill
P0	3	50	3	3	1-99
P1	8	50	8	4	1-99
P2	8	70	10	6	1-99
P3	12	70	12	8	1-99
P4	10	50	Skipped	8	1-99
P5	4	50	Skipped	4	1-99
P6	12	6	Skipped	12	1-99
P7	6	Skipped	Skipped	4	Skipped
P8	10	Skipped	Skipped	6	Skipped
P9	14	Skipped	Skipped	8	Skipped

Note: During regeneration the display will show C1, C2, etc. If the cycle is skipped, that cycle number will not be displayed.

STEP 3SS



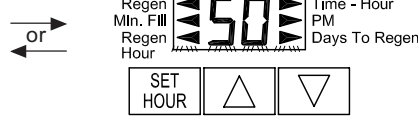
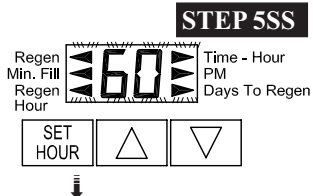
STEP 3SS – If program P0 through P6 was selected, enter in the minutes of fill using the UP or DOWN buttons. The allowable values vary from a low of 1 to a high of 99. If program P7, P8 or P9 was selected, dashes will appear for minutes of fill. Press SET HOUR button to go to Step 4SS. Note: For each minute of fill 0.5 gallons of water is added to the solution tank. With salt (sodium chloride) this equates to approximately 1 1/2 pounds of salt per minute of fill.



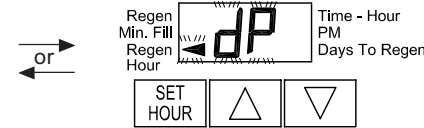
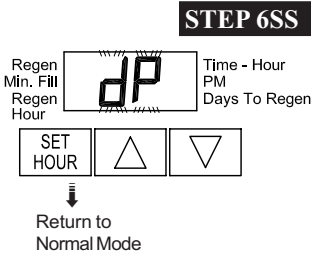
STEP 4SS — Use UP or DOWN buttons to switch between:

- 1-99 Days Between Regen; or
- 7-Day.

Press SET HOUR button to go to Step 5SS.



STEP 5SS — Use UP or DOWN buttons to switch between 60 Hz or 50 Hz option. Supply your own transformer if using 50 Hz option. Press SET HOUR button to go to Step 6SS.



STEP 6SS — If a differential pressure switch is installed and actuated:

- a regeneration will occur immediately if no arrow points at Regen Hour; or
- a regeneration will occur at the delayed regeneration hour if an arrow points at Regen Hour.

Use UP or DOWN buttons to switch between the two choices. If a differential switch is not installed the settings in this display are ignored. Press SET HOUR to exit system setup.



NOTE: A regeneration will be initiated or scheduled after the control has received a signal for five minutes.

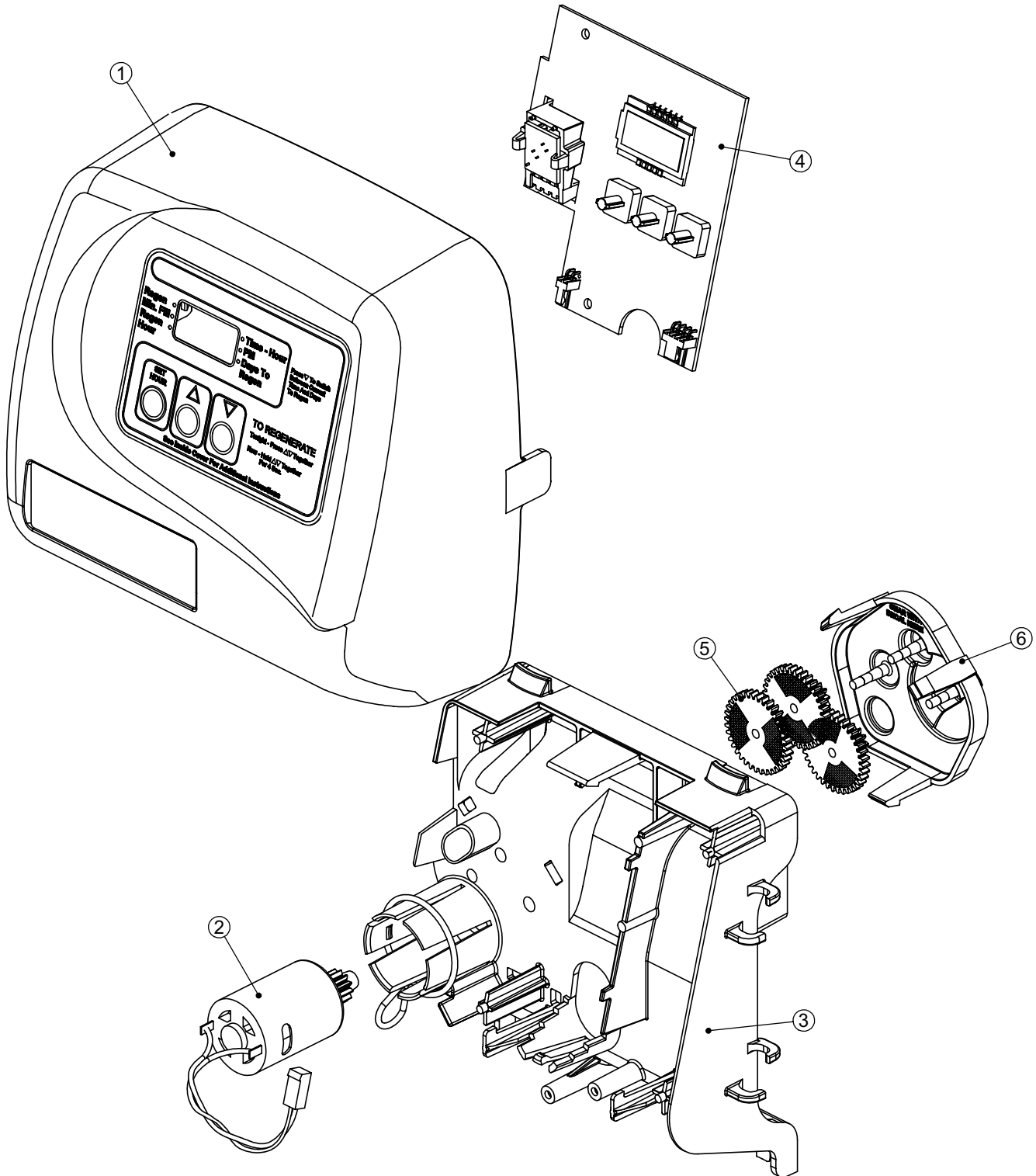
- A. Differential pressure switch connection
- B. Motor wire connection
- C. Transformer wire connection

Drawings and Part Numbers

Front Cover and Drive Assembly

Drawing No.	Order No.	Description	Quantity
1	V3175TC-01	WS1TC Front Cover ASY	1
2	V3107-01	WS1 Motor	1
3	V3106-01	WS1 Drive Bracket&Spring Clip	1
4	V3108TC	WS1TC PC Board	1
5	V3110	WS1 Drive Gear 12x36	3
6	V3109	WS1 Drive Gear Cover	1
	V3002TC	WS1TC Drive ASY	*
Not Shown	V3186	WS1 Transformer 110V-12V	1

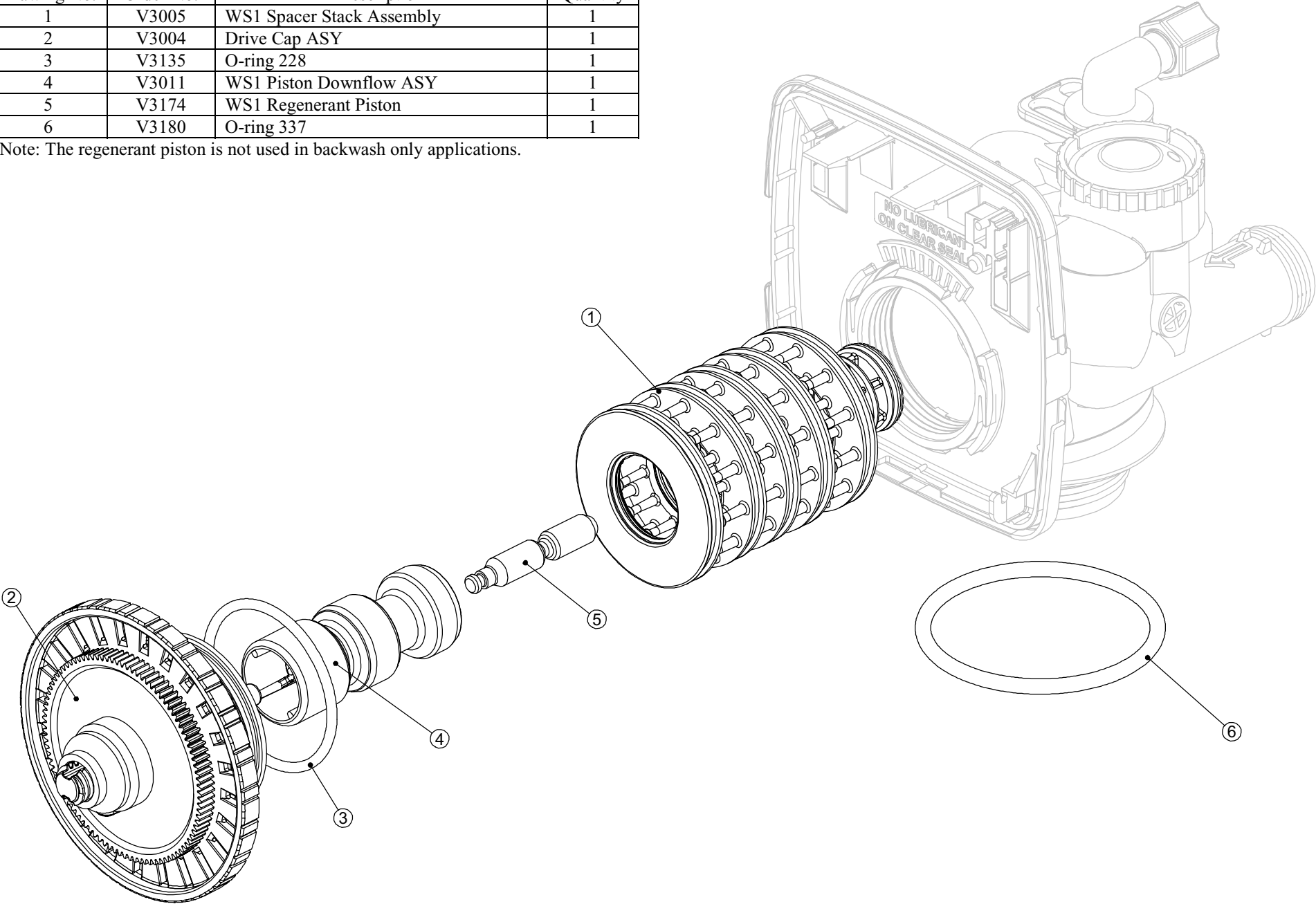
* Drawing number parts 2 through 6 may be purchased as a complete assembly, part V3002TC.



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
4	V3011	WS1 Piston Downflow ASY	1
5	V3174	WS1 Regenerant Piston	1
6	V3180	O-ring 337	1

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

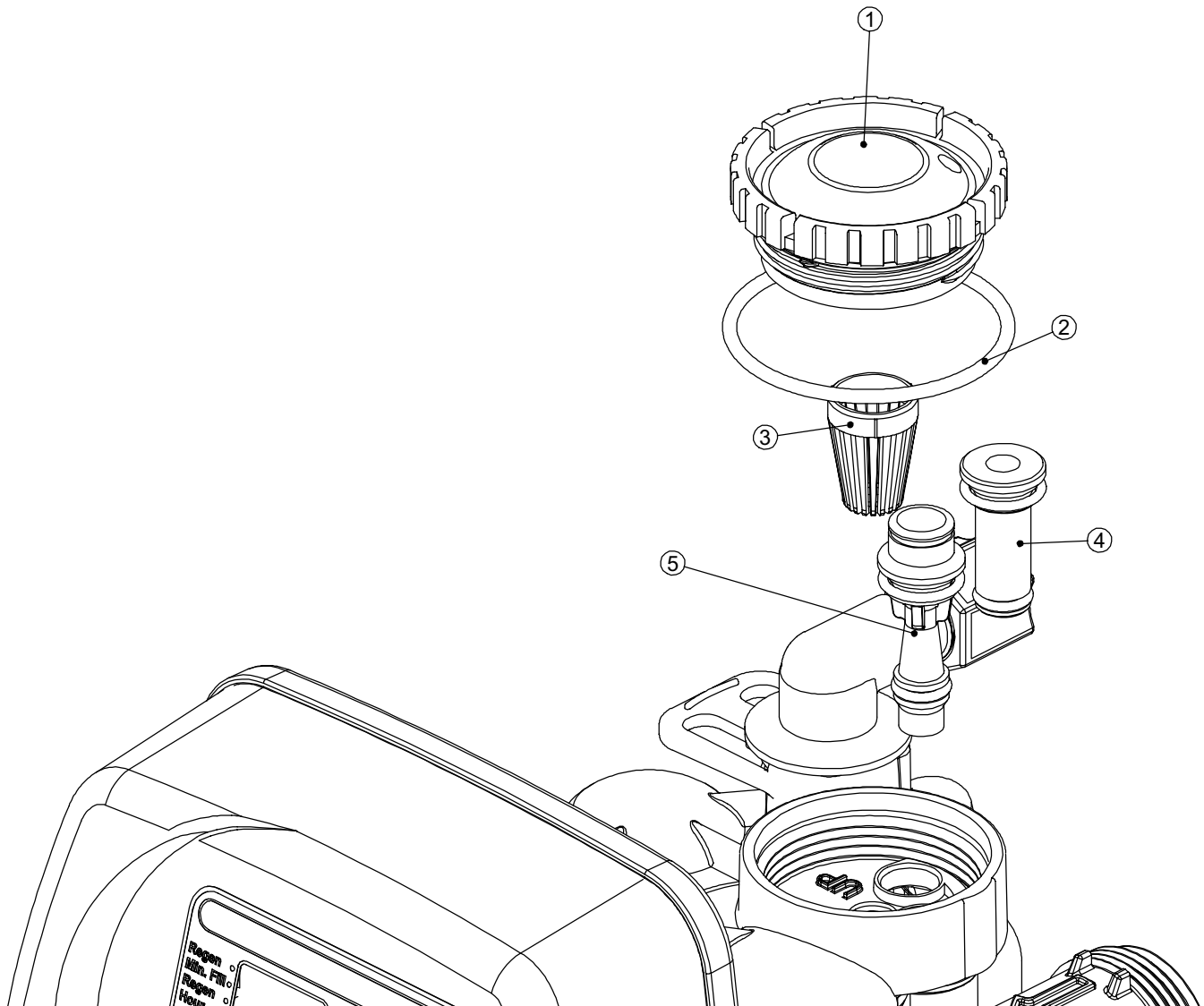


Injector Cap, Injector Screen, Injector, Plug and O-Ring

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.

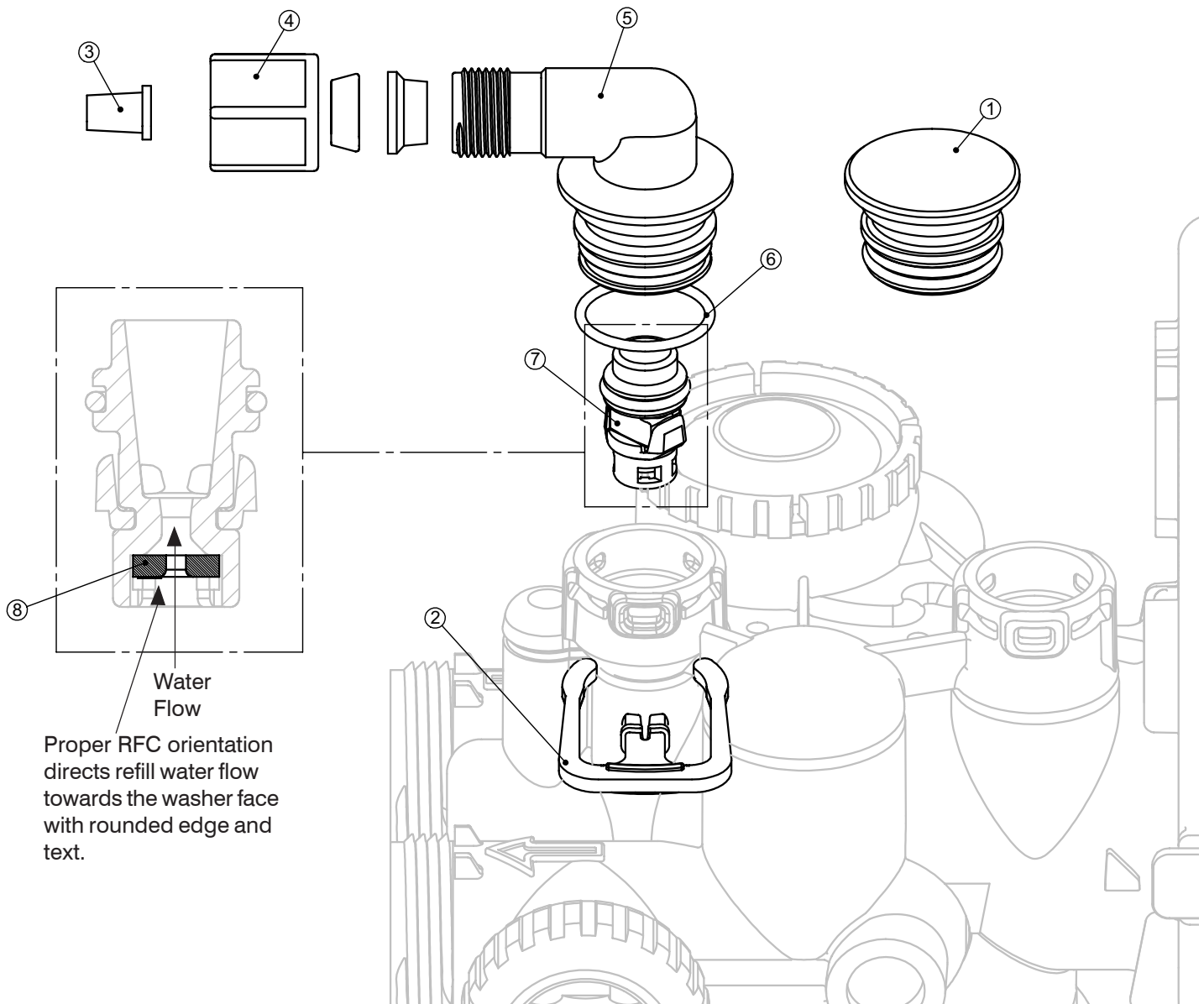
Note: For downflow, injector is located in the down hole and injector plug in the up hole. For a filter that only backwashes, injector plugs are located in both holes, and regenerant piston must be removed.



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

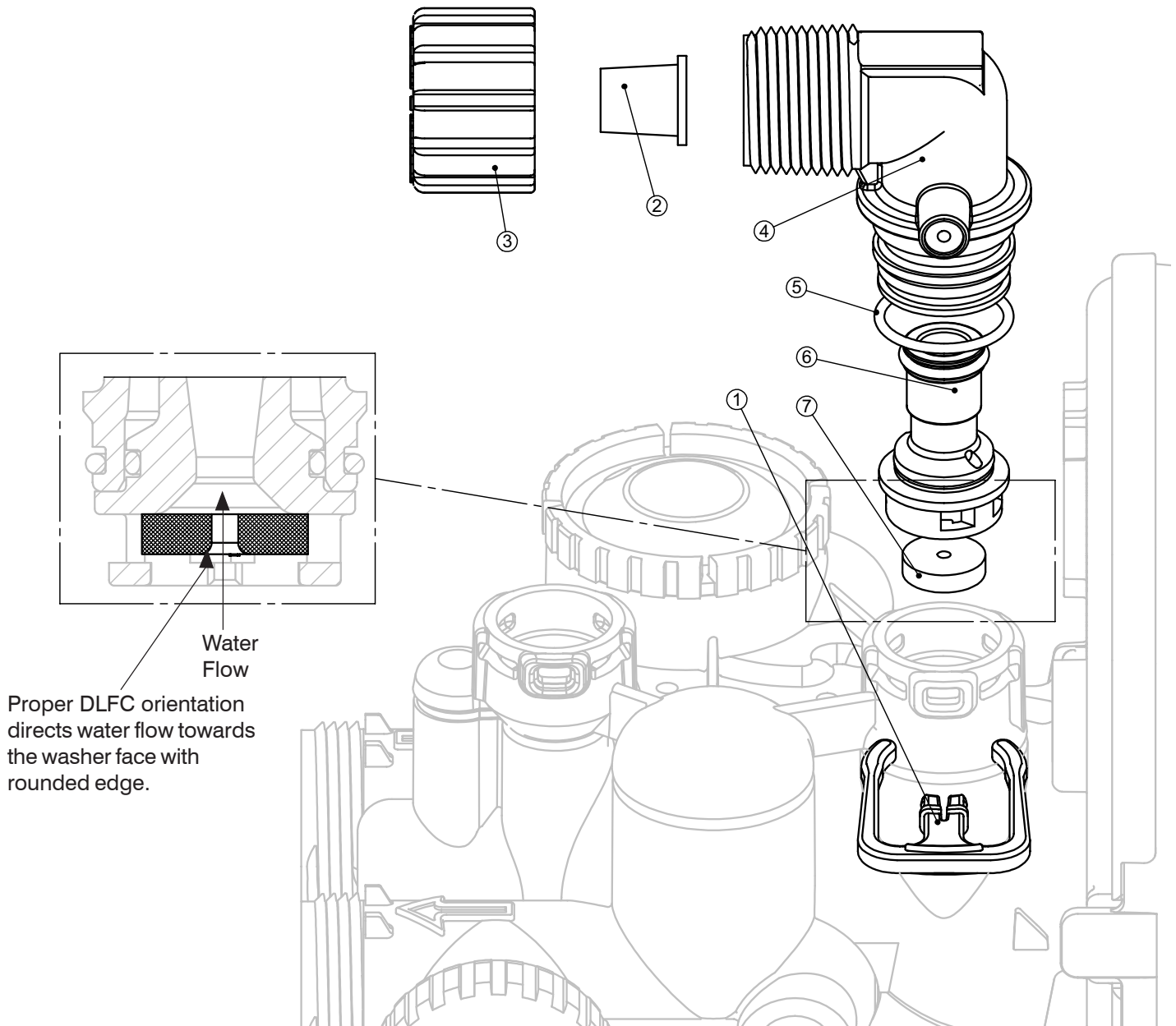
*Assembly includes WS1 RFC.



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		

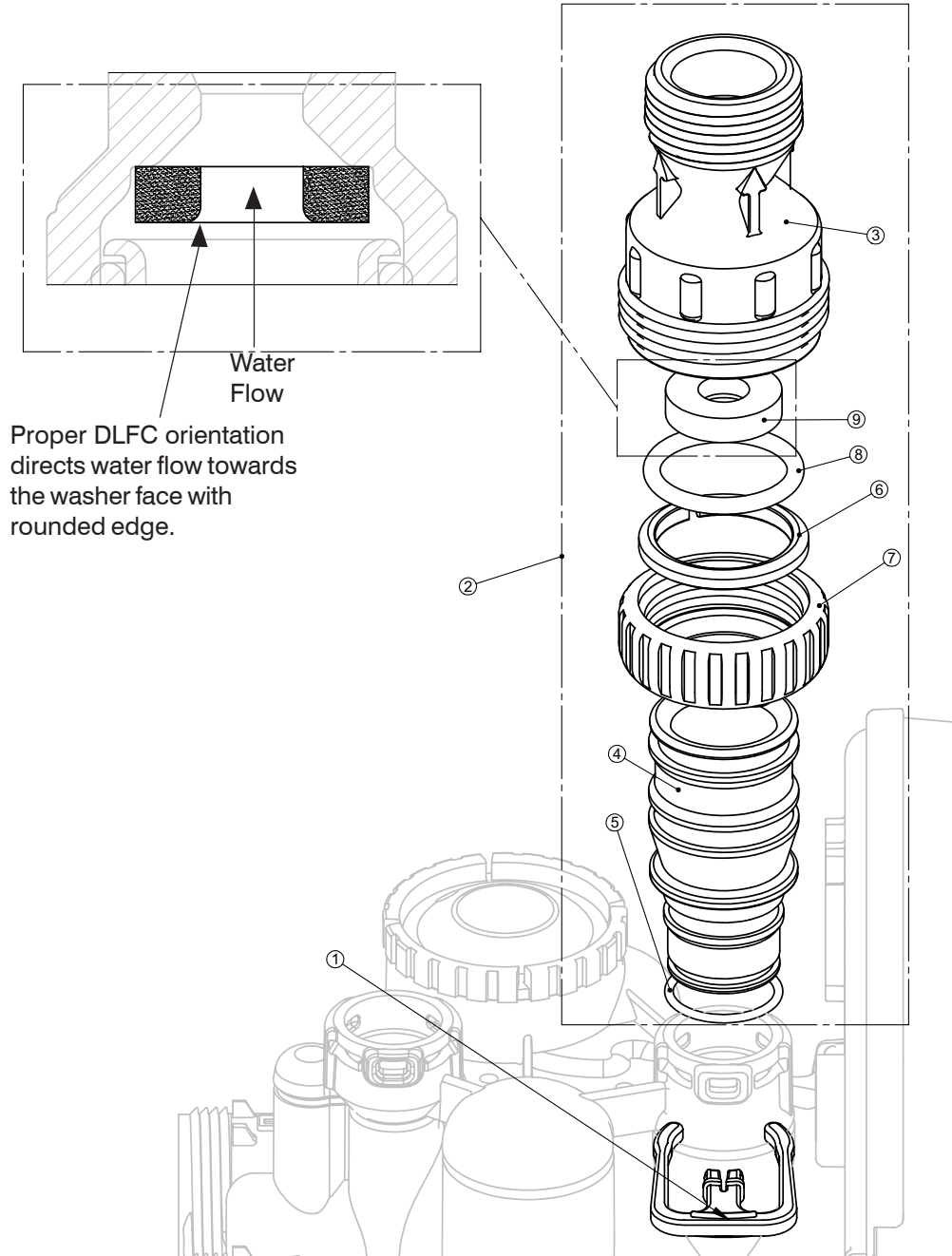
Valves are shipped without drain line flow control (DLFC) – install DLFC before using. Valves are shipped without 3/4" nut for drain elbow (polytube installation only) and 5/8" polytube insert (polytube installation only).



Drain Line – 1”

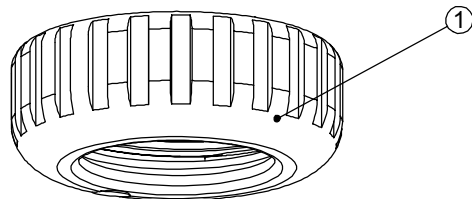
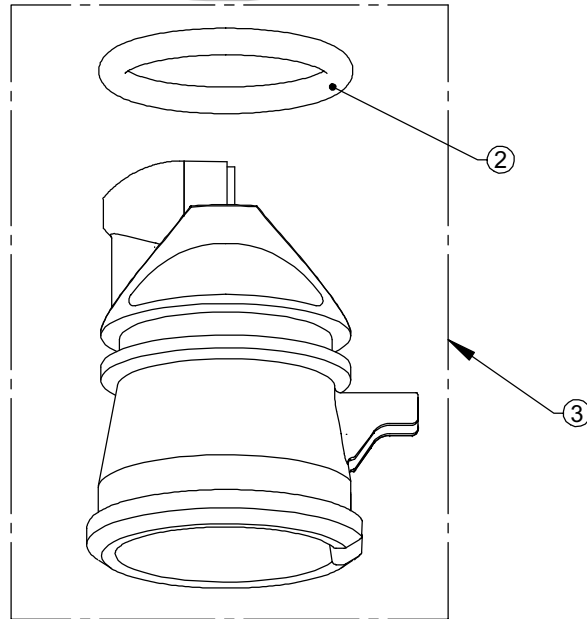
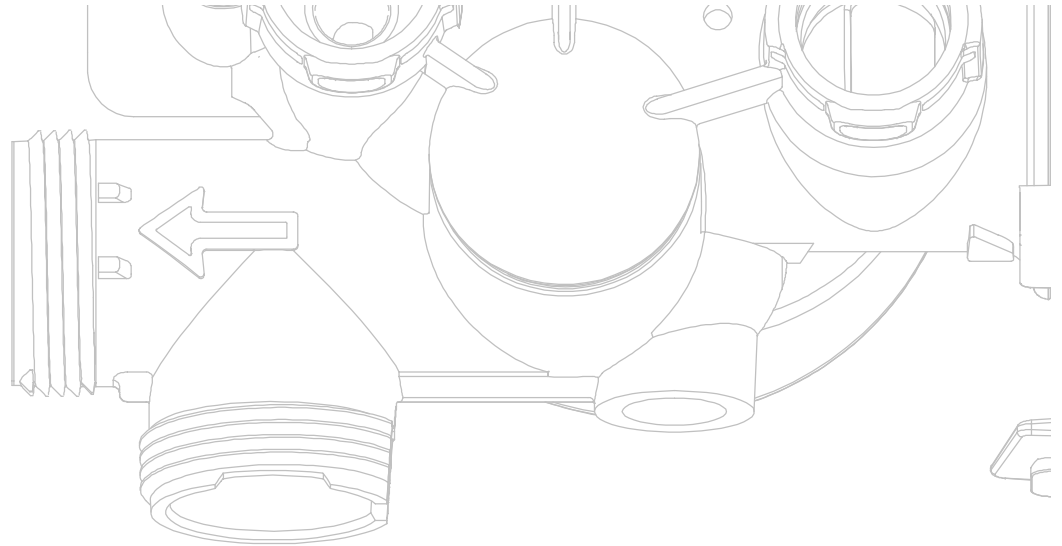
Drawing No.	Order No.	Description	Quantity
1	H4615	Elbow Locking Clip	1
2	V3008-02	WS1 Drain FTG 1 Straight	1
3*	V3166	WS1 Drain FTG Body 1	1
4*	V3167	WS1 Drain FTG Adapter 1	1
5*	V3163	O-ring 019	1
6*	V3150	WS1 Split Ring	1
7*	V3151	WS1 Nut 1" QC	1
8*	V3105	O-ring 215	1
9	V3190-090	WS1 DLFC 9.0 gpm 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.



Meter Plug

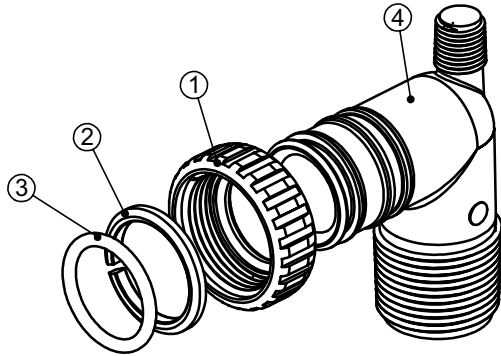
Drawing No.	Order No.	Description	Quantity
1	V3151	WS1 Nut 1" QC	1
2	V3105	O-ring 215	1
3	V3003-01	WS1 Meter Plug ASY	1



Installation Fitting Assemblies

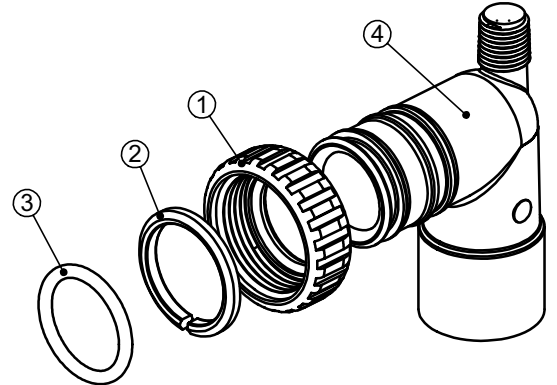
Order No: **V3007**
 Description: **WS1 Fitting 1" PVC Male NPT Elbow Assembly**

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



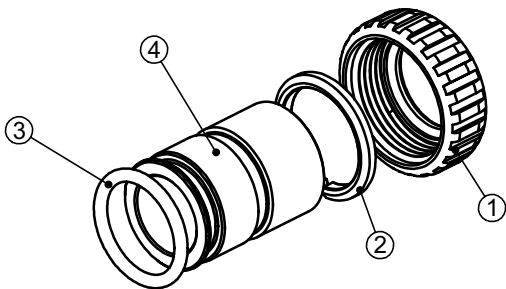
Order No: **V3007-01**
 Description: **WS1 Fitting 3/4" & 1" PVC Solvent 90° ASY**

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



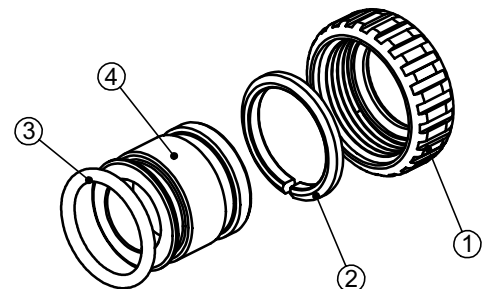
Order No: **V3007-02**
 Description: **WS1 Fitting 1" Brass Sweat Assembly**

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	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

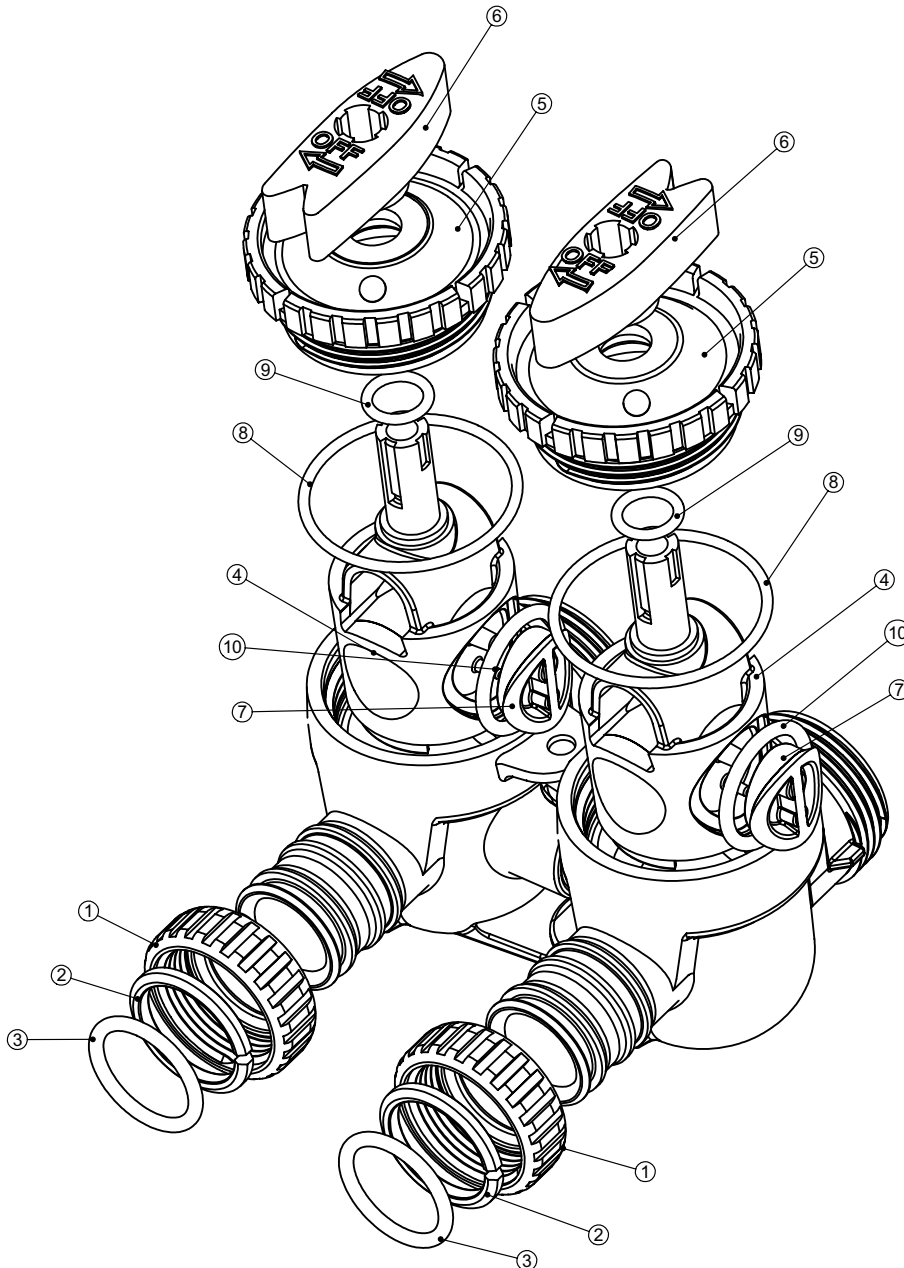


Bypass Valve

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

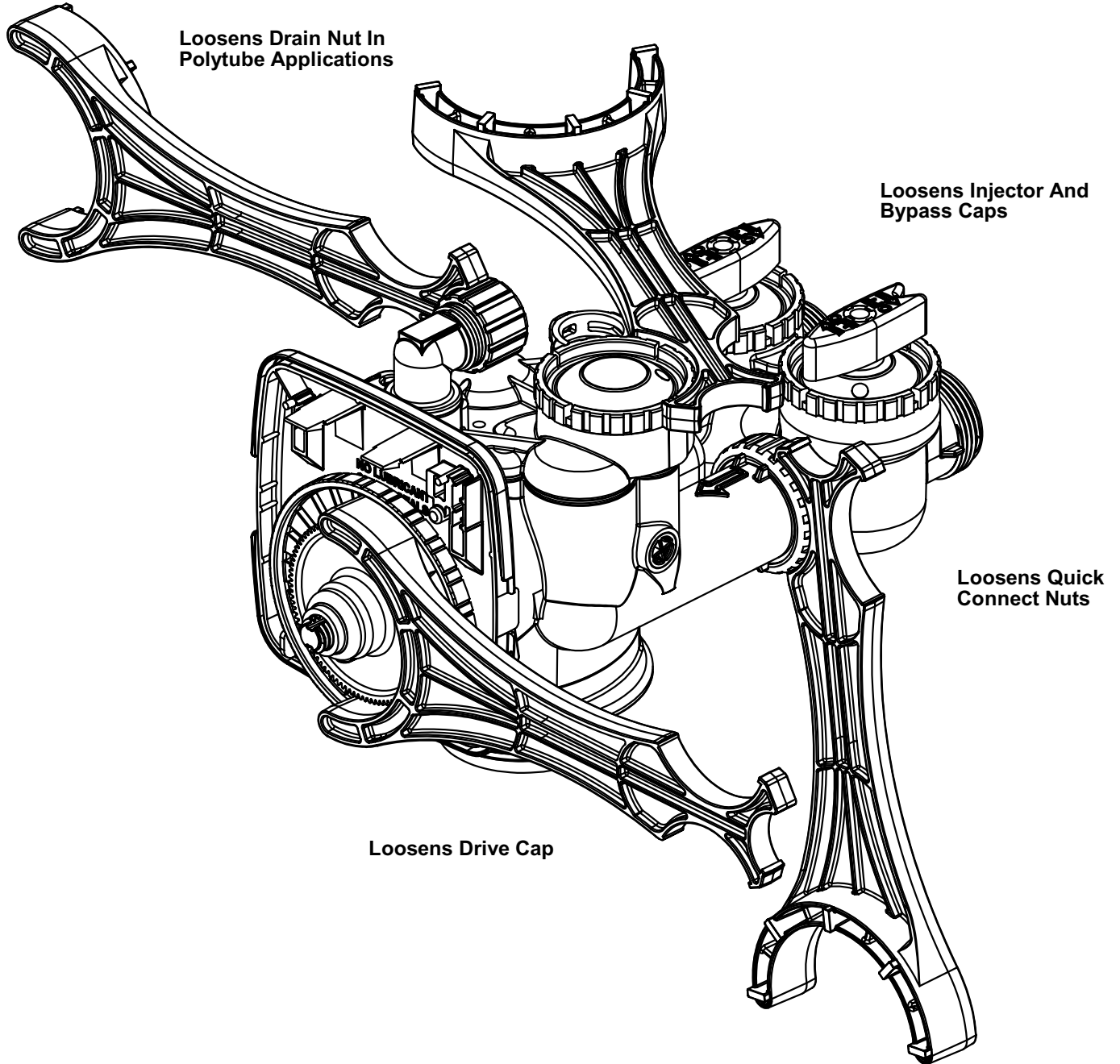
(Not Shown) Order No. V3191-01, Description: WS1 Bypass Vertical Adapter Assembly

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 plug 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 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 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 one plastic pin that fits into the hole 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 the pin. To reinstall the PC board, position the lower edge of the PC board so that the hole in the PC board lines up with the plastic pin. Push the top of the PC board towards the valve. Align the upper hole on lefthand side of PC board with the pin and push in until the PC board snaps under the middle latch, weave the power wire into the holders and reconnect the motor 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 plug for the power source. Unweave the wire 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 power wire is 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 SET HOUR and DOWN buttons for 3 seconds or unplug power source jack (black wire) from the circuit board and plug back in. This resets the electronics and establishes the service piston 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 1/4" to 1/2" 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.

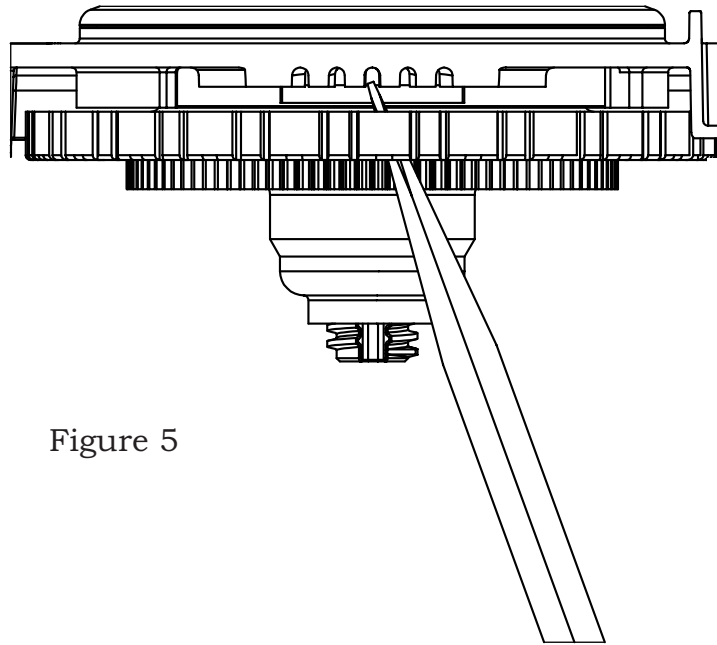


Figure 5

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 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 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 the special wrench or 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 SET HOUR and DOWN buttons for 3 seconds or unplug power source jack (black wire) from the circuit board and plug back in. This resets the electronics and establishes the service piston 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 SET HOUR and DOWN buttons for 3 seconds or unplug power source jack (black wire) from the circuit board and plug back in. This resets the electronics and establishes the service piston 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; or
- b. 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.

Meter Plug

This control valve does not come equipped with a meter, instead a plug is installed. The plug should not need to be serviced.

To remove the meter plug 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 meter plug is visible. Twist a flat blade screwdriver in the slot between the control valve body and the meter plug. When the meter plug is part way out it is easy to remove the meter plug from the housing.

Do not use a wire brush to clean. Wipe with a clean cloth or chemically clean in dilute sodium bisulfite or vinegar.

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

Reinsert the meter plug 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 SET HOUR and DOWN buttons for 3 seconds or unplug power source jack (black wire) from the circuit board and plug back in. This resets the electronics and establishes the service piston position.

Table 6
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. 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
4. E1, E2 or E3 E1 - Unable to recognize start of regeneration E2 – Unexpected stall E3 – Motor ran to long, timed out trying to reach the next cycle position or trying to reach home position	a. Control valve has just been serviced	a. Press SET HOUR and DOWN for 3 seconds or unplug power source jack (black wire) from the circuit board 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 SET HOUR and DOWN for 3 seconds or unplug power source jack (black wire) from the circuit board 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
	5. Control valve stalled in regeneration	a. Motor not operating
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
6. Control valve does not regenerate automatically when UP and DOWN buttons are 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
7. Control valve does not regenerate automatically but does when UP and DOWN buttons are depressed	a. Defective PC board	a. Replace PC board
	b. Set-up error	b. Check control valve set-up procedure