



AQUA MAGIC PRO
1TFB

Owner and Operational Manual

Model: _____

Serial Number: _____

Install Date: _____

Installed By: _____

Service Phone: _____

Sold By: _____



Please read this manual carefully before proceeding with installation. Your failure to follow any of these instructions or operating parameters may lead to personal injury or damage to the equipment and/or personal property. Do not use this water treatment system with water that is microbiologically unsafe or of unknown quality, without adequate disinfection before or after the system. This water treatment system contains replaceable treatment components critical for effective performance. It is the user's responsibility to periodically test the product water to verify the system is performing satisfactorily. Failure to properly maintain this water treatment system may cause a health risk.

Save this manual for future reference

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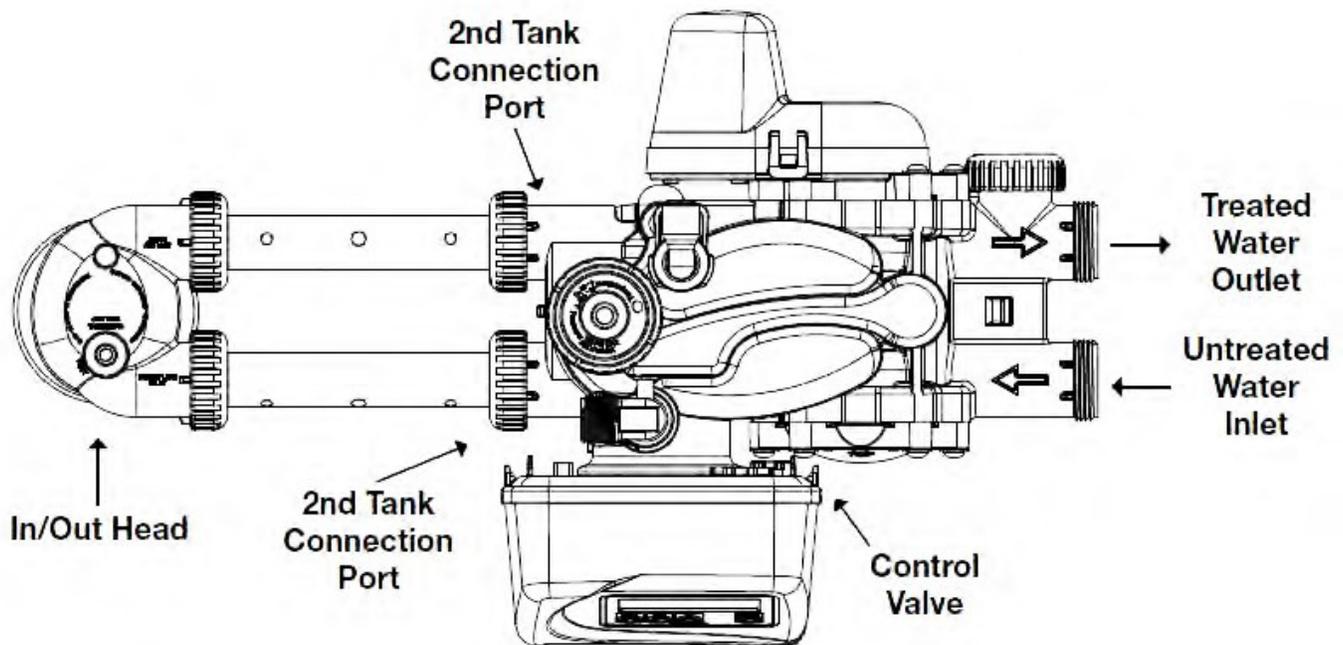
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Twin Valve Installation Tips:

We have had a number of instances where customers have incorrectly installed the in/out head to the untreated water inlet/treated water outlet of the control valve, rather than to the 2nd tank connection ports.

Below are a number of situations that will occur when the in/out head is incorrectly installed to the untreated water inlet/treated water outlet of the control valve.

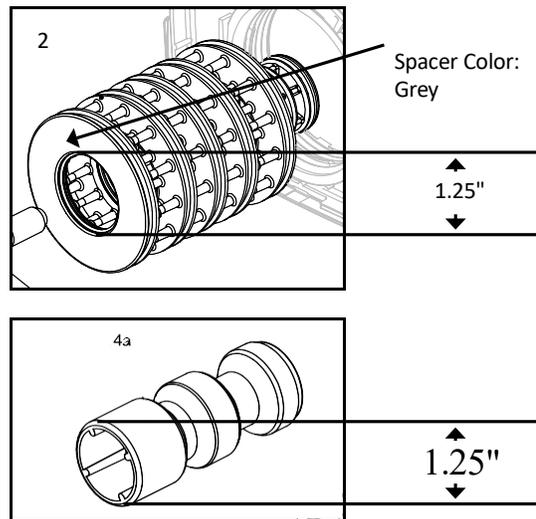
- 1) When "A" is in the draw cycle it will not draw brine and will put water into the salt tank. The "B" tank will draw properly.
- 2) When "B" is in the backwash cycle, "A" will have no flow to service.
- 3) The transfer disc seals may be forced out of their cavities on the back/motor side of the transfer discs, and it is possible that one of the seals could get pushed up into the valve and get stuck in the top of tank port of the spacer stack assembly.



Valve Body Compliance Table

Application	Injector and/or Plug(s)	Main Piston	Regenerant Piston	Stack	Body*
1" Downflow Softener or Regenerating Filter	Injector in "DN" hole, Plug in "UP" hole	V3011	V3174	V3005-02	V3031
1" Backwash Only Filter	Plug in "DN" and "UP" holes, Install Refill Port Plug	V3011	None	V3005-02	V3031
1" Upflow Softener	Injector in "UP" hole, Plug in unlabeled hole	V3011-01	V3174	V3005-02	V3031

1.050" Distributor Tube Opening Identification



Note: The downflow piston is a solid amber color. The Upflow piston is black and amber.

Front Cover and Drive Assembly

Drawing No.	Order No.	Description	Quantity
1	V4441-01	Fb Cover Asy	1
2	V3107-01	Motor Asy	1
3	V3002-A	Drive Bracket Asy	1
4	V4461FB-BOARD	Thru2 Fb Pcb Replace	1
5	V3110	Drive Reducing Gear 12x36	3
6	V3109	Drive Gear Cover	1
Not Shown	V3186-06	Power Supply Us 15vdc Hocp	1
	V3186AUS-05OD	Power Supply Aus 15vdc Vi Outdoor	
	V3186EU-06	Power Supply Eu 15vdc Hocp	
	V3186UK-06	Power Supply Uk 15vdc Hocp	
	V3186-01	Power Cord Only	
Not Shown	V3946	Wide Drive Back Plate	1

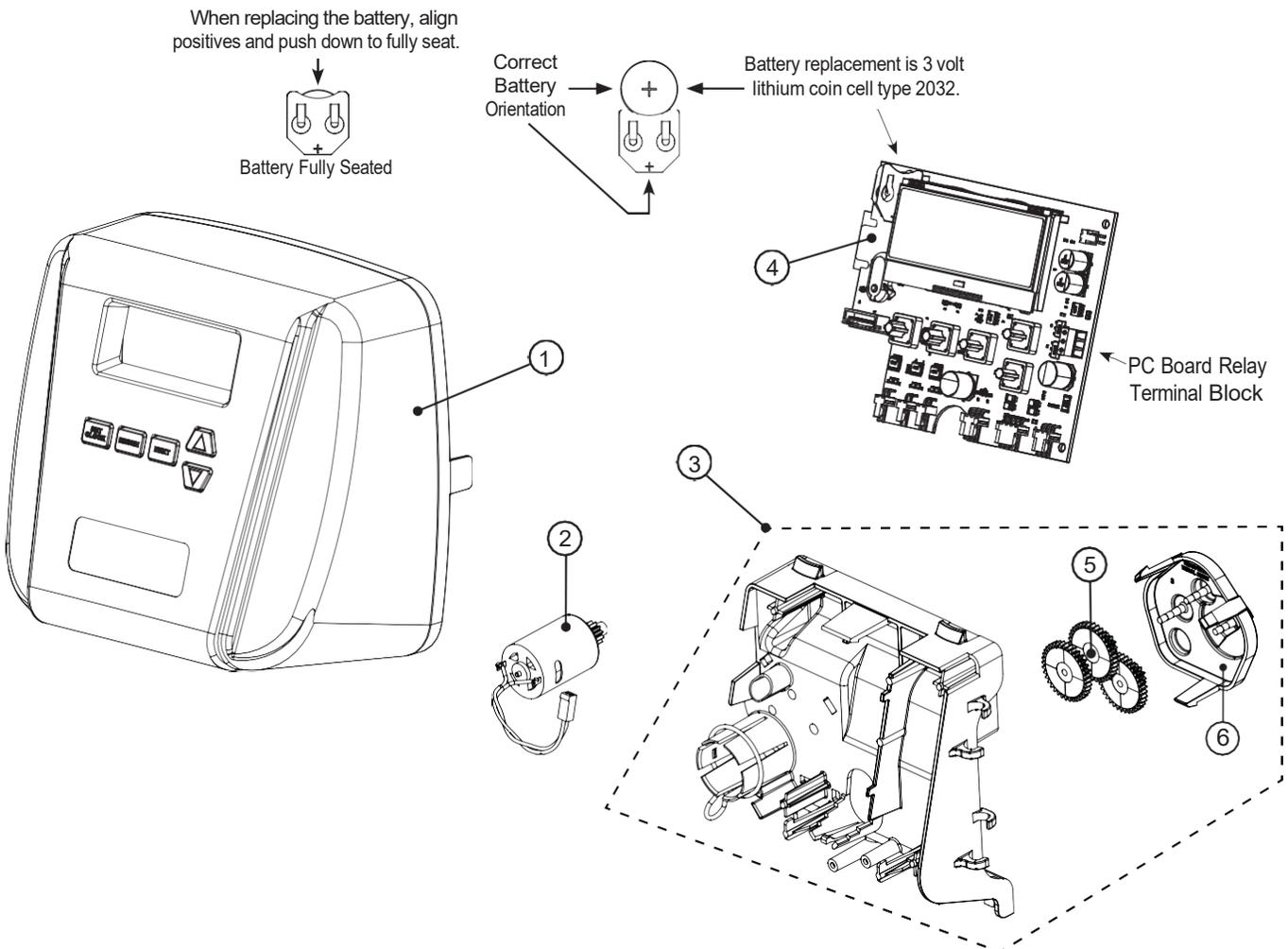
Refer to Control Valve Service Manual for other drawings and part numbers.

Relay Driver Output Type – Dual Solid-State 12VDC “wet” contacts - N.O.
 Relay Driver Output Capacity - 12VDC @100mA per relay output (total current through both outputs not to exceed 200mA).

NOTE: Check for proper mounting dimensions on valve backplate prior to mounting an external relay under control cover.

Power Supply	U.S.	International
Supply Voltage	100-120 VAC	100-240 VAC
Supply Frequency	50/60 Hz	50/60 Hz
Output Voltage	15 VDC	15 VDC
Output Current	500 mA	500 mA

Wiring for Correct On/Off Operation	
PC Board Relay Terminal Block	Relay
RLY 1	Coil -
V +	Coil +
RLY 2	Coil -



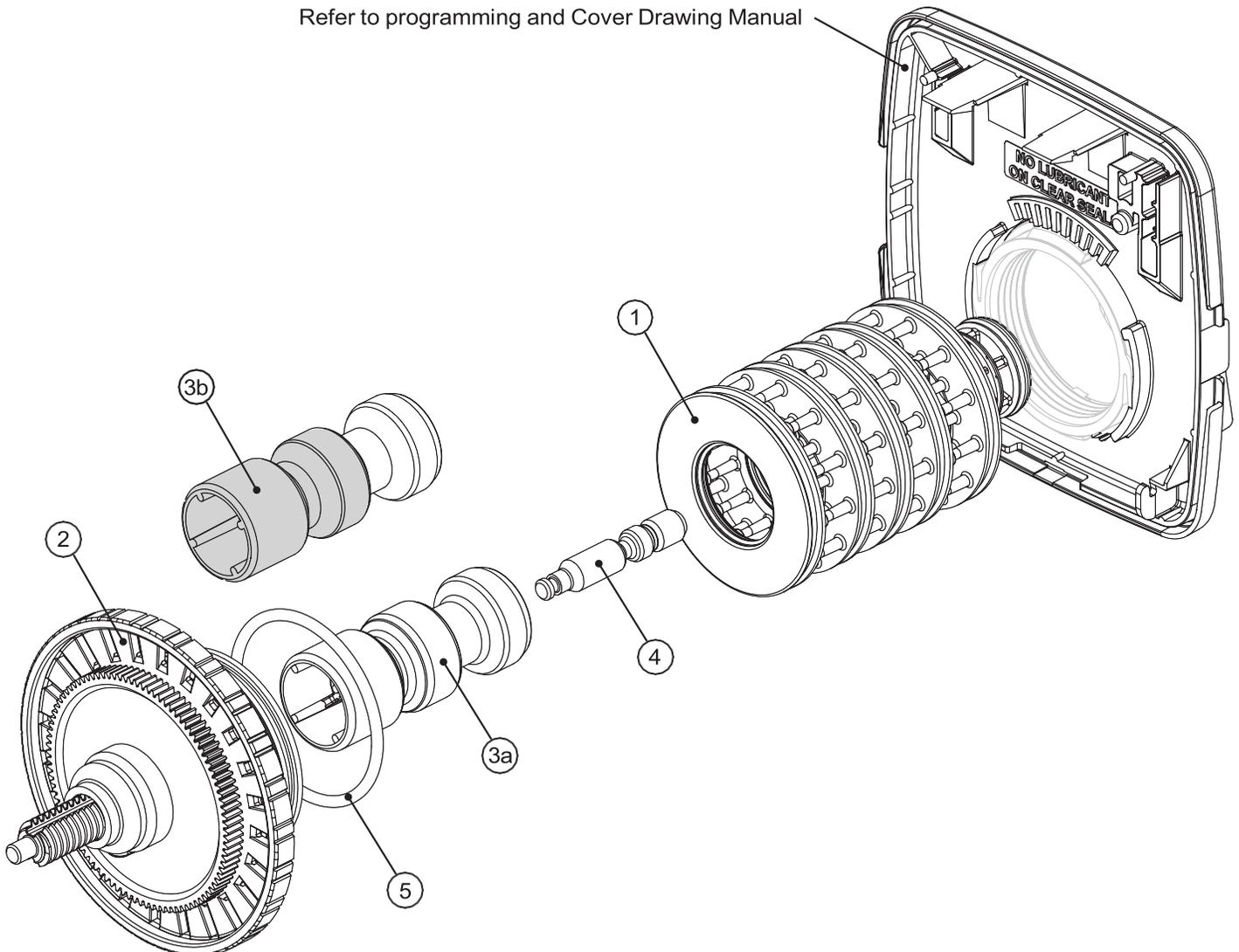
Drive Cap Assembly, Down flow Piston, Up flow Piston, Regenerant Piston and Spacer Stack Assembly

Drawing No.	Order No.	Description	Quantity
1	V3005-02	Spacer Stack Assembly	1
2	V3004	Drive Cap ASY	1
3	V3946	AM1 Wide Drive Backplate	1
4a	V3011*	Piston Downflow ASY	1
4b	V3011-01*	Piston Upflow ASY	
5	V3174	Regenerant Piston	1
6	V3135	O-ring 228	1
7	V3180	O-ring 337	1
8	V3105	O-ring 215 (Distributor Tube)	1
Not Shown	V3001	Body ASY Downflow	1
	V3001-02	Mixing Valve Body ASY	
	V3001UP	Body ASY Upflow	
	V3001-02UP	Mixing Valve Body Upflow ASY	
Not Shown	V3193-02	Service Spanner Wrench	

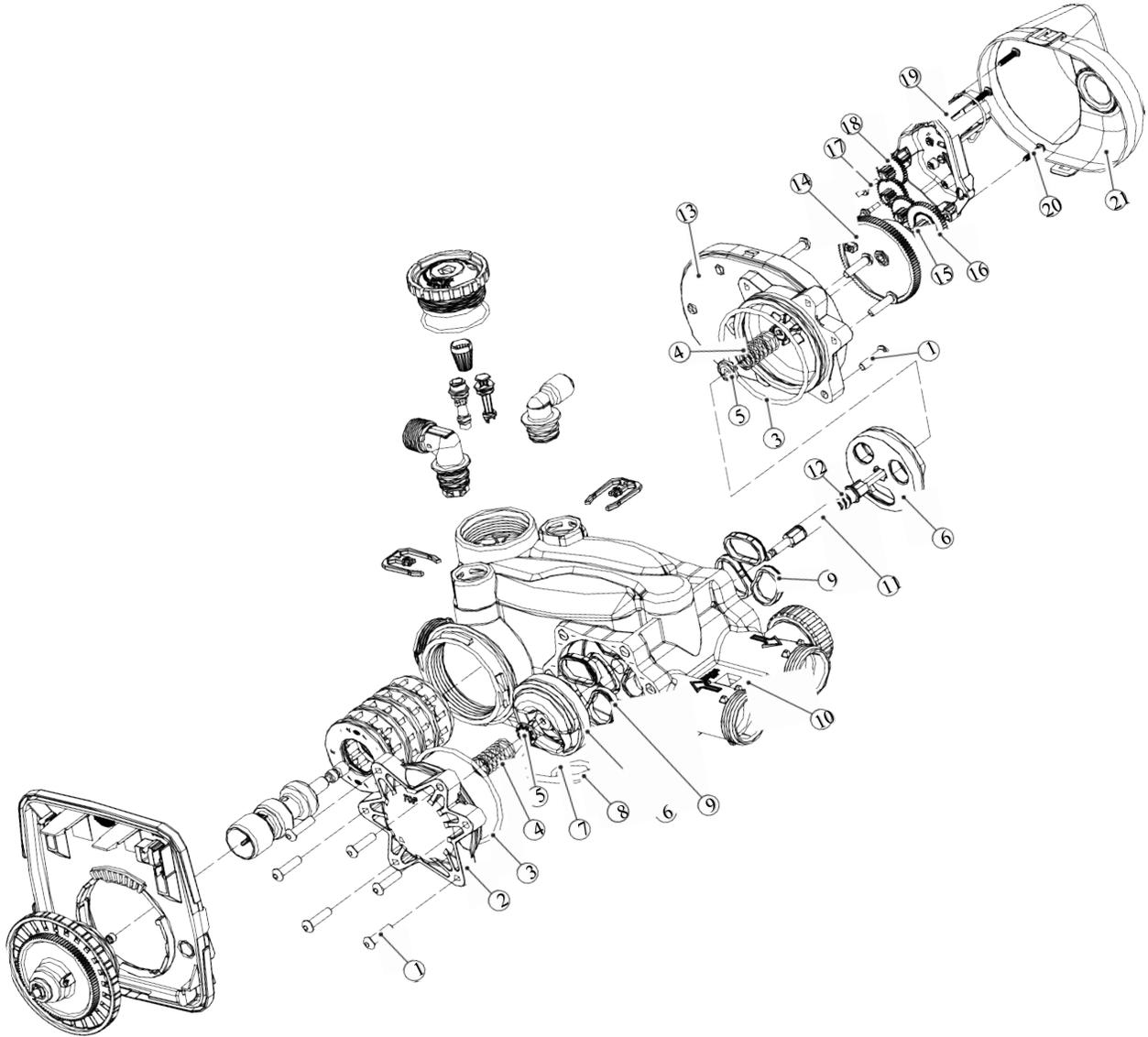
*V3011 is labeled with DN and V3011-01 is labeled with UP. Up flow option is not applicable to TC control valves.

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

Refer to programming and Cover Drawing Manual



Twin Transfer



Twin Transfer

Drawing No.	Order No.	Description	Quantity
1	V3470	Screw Bhc 1/4-20 X 1 Ss	12
2	V4005-01	T1 Transfer Capasy	1
3	V4029	O-Ring 236	2
4	V4015	T1 Transfer Spring	2
5	V4014	T1 Transfer Spring Support	2
6	V4036	T1 Rotor Disk Asy	2
7	V3105	O-Ring 215 (Distributor Tube)	1
8	V3180	O-Ring 337	1
9	V4016	T1 Transfer Seal	6
10	V3031	T1 Body Sft Wtr Regen	1
11	V4023	T1 Transfer Drive Shaft Asy	1
12	V3287	O-Ring 110	2
13	V4006-01	T1 Transfer Drive Capasy	1
14	V4011-01	T1 Transfer Drive Gear Asy	1
15	V4012	T1 Transfer Drive Gear Axle	1
16	V4013	T1 Transfer Reduction Gear	1
17	V3264	Am2h Bypass Reduction Gearaxle	3
18	V3110-01	Drive Reducing Gear Plain	3
19	V3262-01	.5&2alt/2by Reducgearcvrasy	1
20	V3592	Screw #8-1 Phpn T-25 Ss	3
21	V4049	T1 Cover Assembly	1
NOT SHOWN	V4043	T1 Transfer Motor Asy	1
NOT SHOWN	V3151	Nut 1 Qc	1
NOT SHOWN	V4055*	Twin Tank Meter Asy	1
NOT SHOWN	V4017-01	T1 Interconnect Fitting Asy	1
NOT SHOWN	D1400	1191 In/Out Head	1

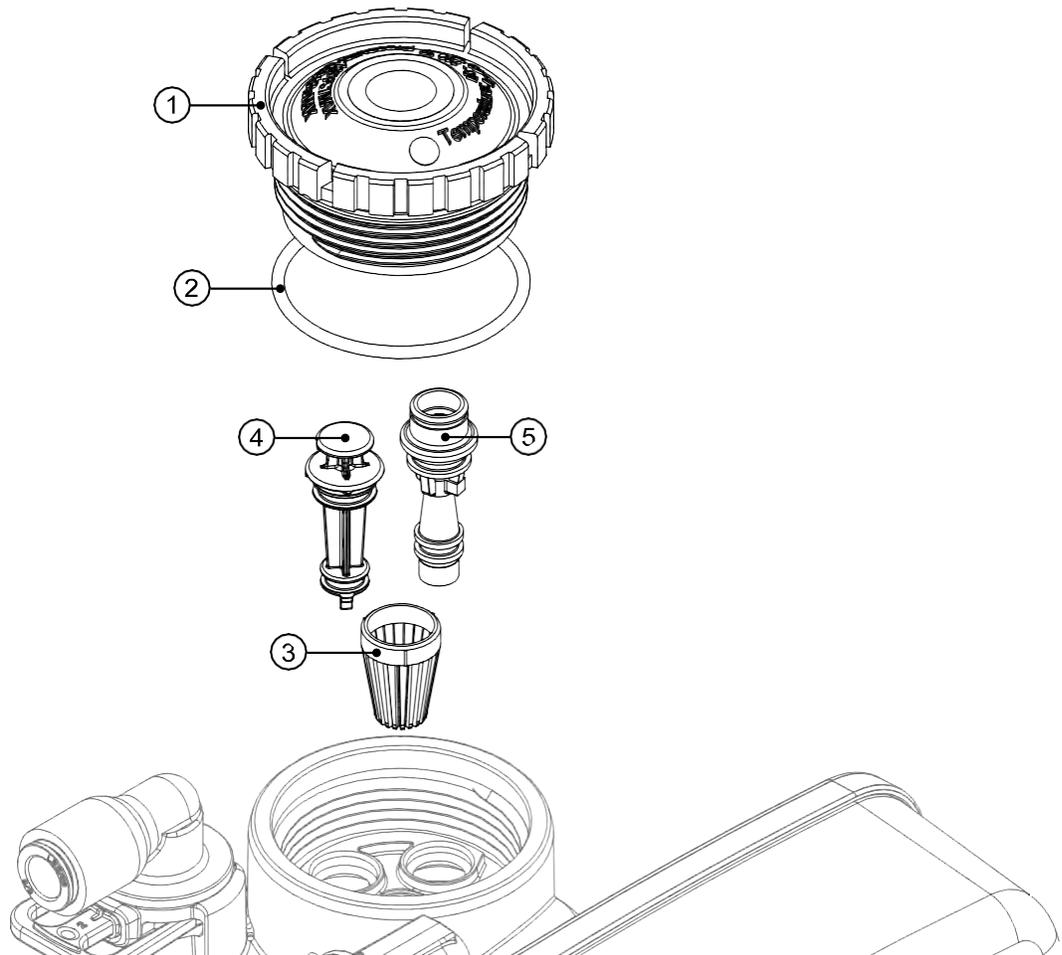
***THIS WATER METER SHOULD NOT BE USED AS THE PRIMARY MONITORING DEVICE FOR CRITICAL OR HEALTH EFFECT APPLICATIONS.**

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	V3177-01	Injector Screen Cage	1
4	V3010-1Z	Injector Asy Z Plug	1
5	V3010-1A	Injector Asy A Black	1
	V3010-1B	Injector Asy B Brown	
	V3010-1C	Injector Asy C Violet	
	V3010-1D	Injector Asy D Red	
	V3010-1E	Injector Asy E White	
	V3010-1F	Injector Asy F Blue	
	V3010-1G	Injector Asy G Yellow	
	V3010-1H	Injector Asy H Green	
	V3010-1I	Injector Asy I Orange	
	V3010-1J	Injector Asy J Light Blue	
V3010-1K	Injector Asy K Light Green		
Not Shown	V3170	O-Ring 011	*
Not Shown	V3171	O-Ring 013	*

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

Note: For upflow position, injector is located in the up hole and injector plug is in the other hole.
For a filter that only backwashes, injector plugs are located in both holes.



Injector Order Information

Injector Order Number	Injector Color	Typical Tank Diameter	
		Down	Up
V3010-1A	Black	6"	6"
V3010-1B	Brown	7"	6"
V3010-1C	Violet	8"	6"
V3010-1D	Red	9"	7"
V3010-1E	White	10"	8"
V3010-1F	Blue	12"	10"
V3010-1G	Yellow	13"	10"
V3010-1H	Green	14"	12"
V3010-1I	Orange	16"	14"
V3010-1J	Light Blue	18"	
V3010-1K	Light Green	21"	

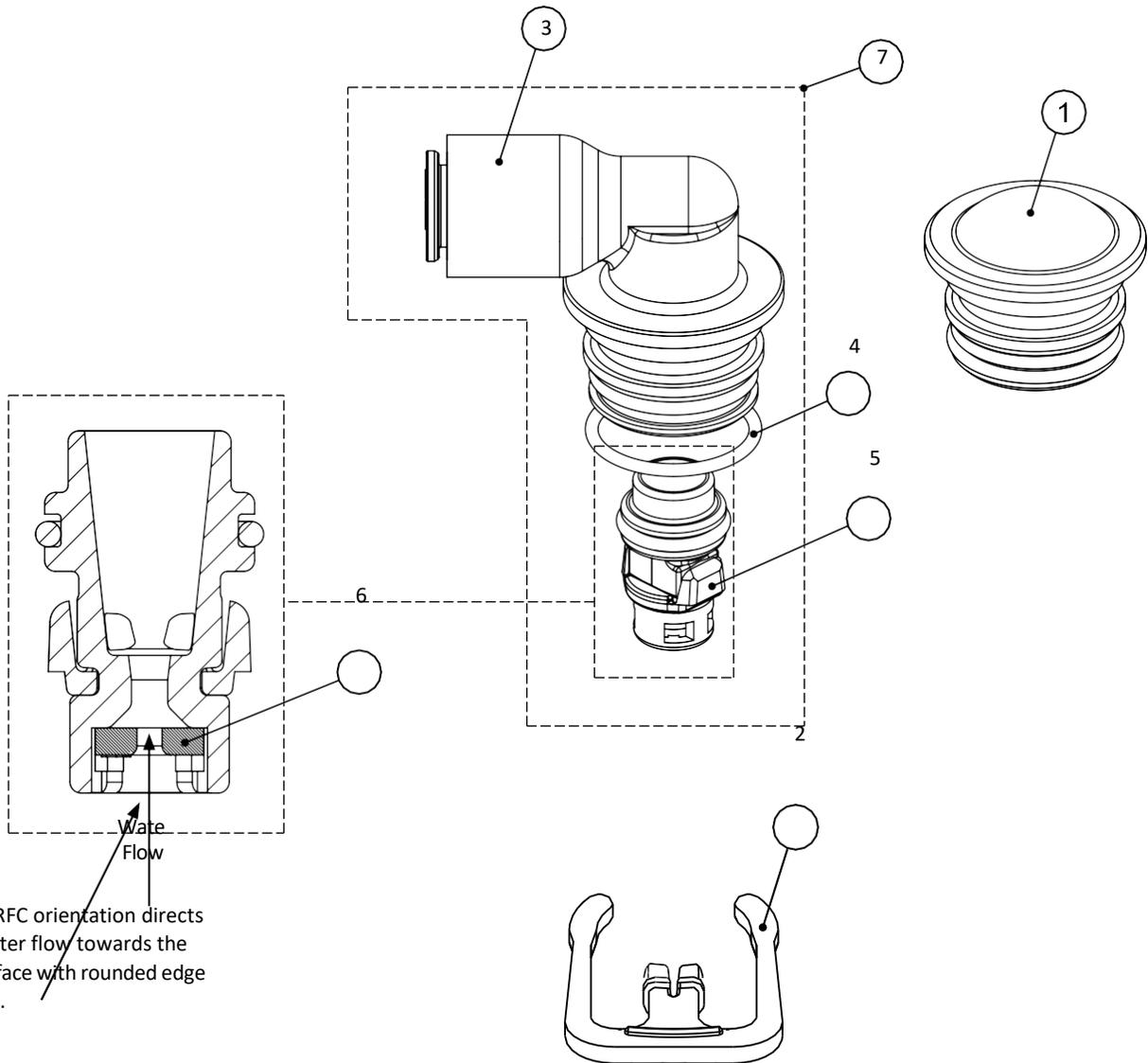
Actual tank size used may vary depending on the design and application of the system. Tank diameter is an approximation for the following:

1. downflow softener using standard mesh synthetic cation exchange media regenerating with sodium chloride.
2. Upflow softener using standard mesh synthetic cation exchange media regenerating with sodium chloride, an inlet water pressure of 30 to 50 psi (2.1 to 3.4 bar) and water temperature of 60°F (15.6°C) water or warmer. Higher pressures or lower temperatures would need smaller injectors to avoid lifting the bed.

Refill Flow Control Assembly and Refill Port Plug

Drawing No.	Order No.	Description	Quantity
1	V3195-01	Refill Port Plug Asy	This part is required for backwash only systems
2	H4615	Elbow Locking Clip	1
3	H4628	Elbow 3/8 Brine QC	1
4	V3163	O-ring 019	1
5	V3165-01*	RFC Retainer Asy (0.5 gpm)	1
6	V3182	RFC	1
7	V4144-01	Elbow 3/8 Brine QC w/RFC	1
Not Shown	V3552	Brine Elbow Asy w/RFC	Option
Not Shown	H4650	Elbow 1/2" with nut and insert	Option

*Assembly includes V3182 (0.5 gpm) RFC.

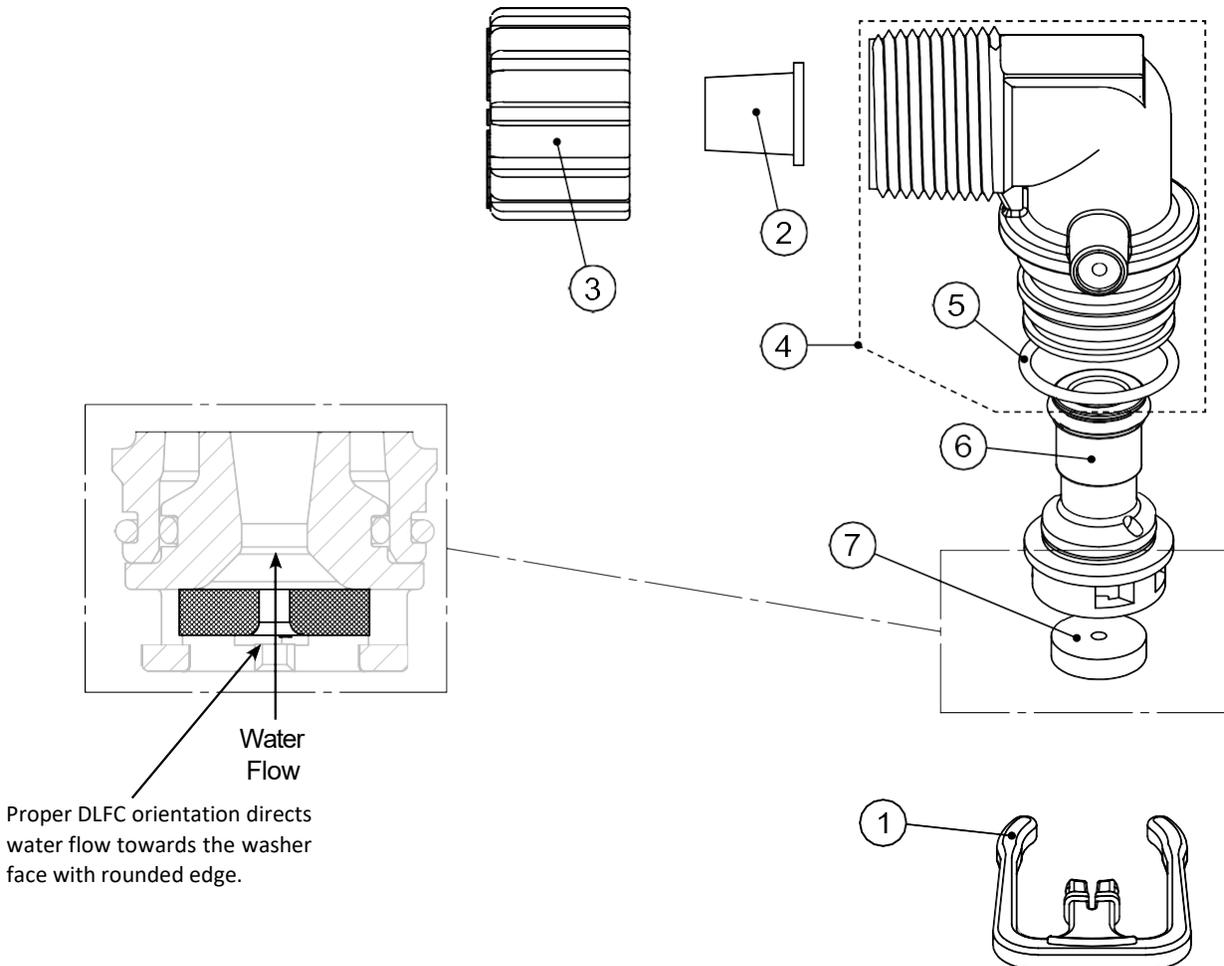


Drain Line – 3/4”

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

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

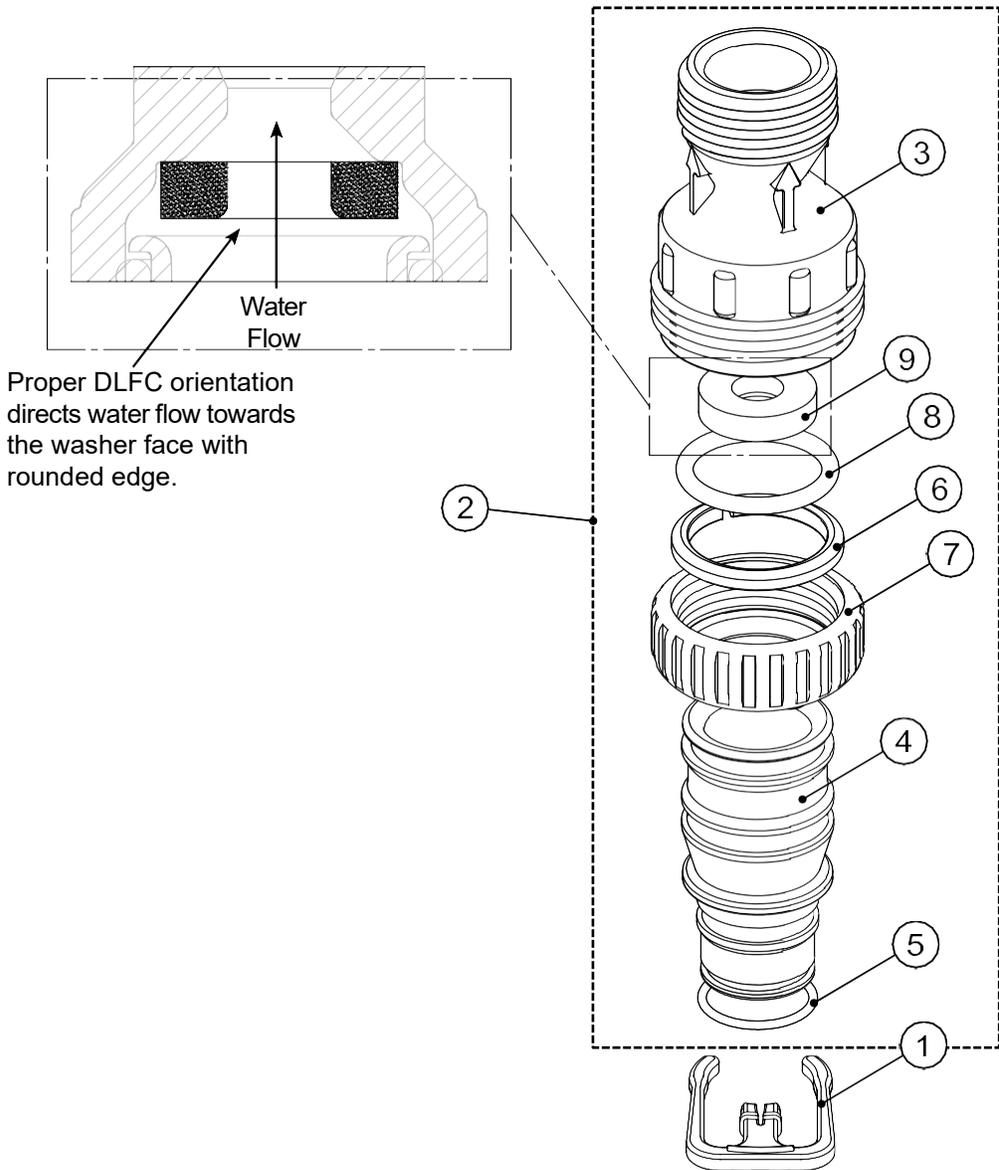
Valves are shipped without drain line flow control (DLFC) - install DLFC before using. Valves are shipped without 3/4 nut for drain elbow (polytube installation only) and 5/8" polytube insert (polytube installation only).



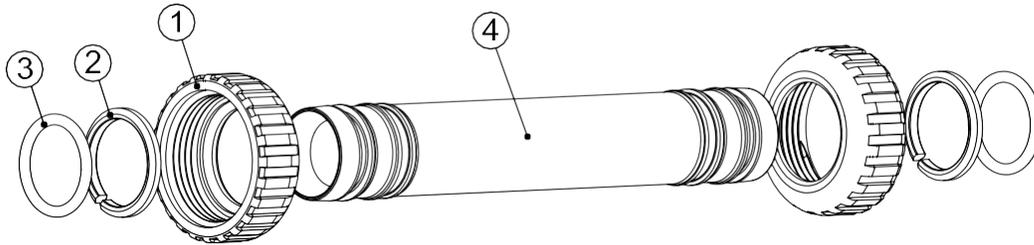
Drain Line - 1"

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

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

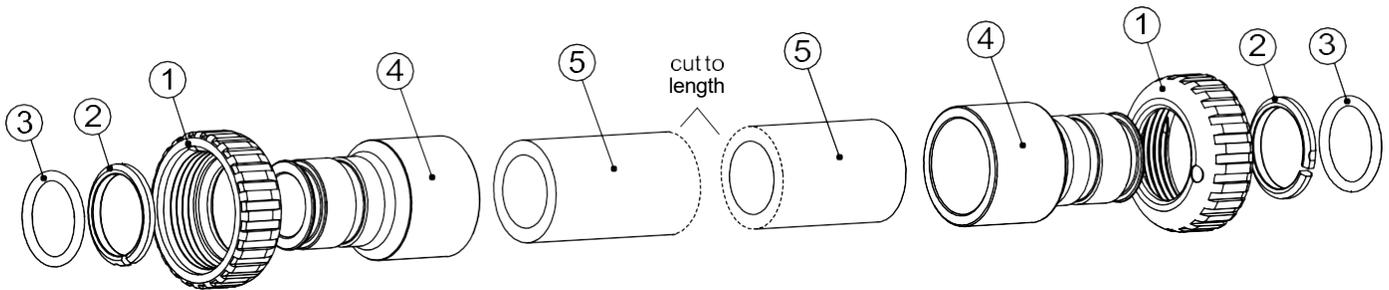


V4017-01 TT Interconnect Fitting Assembly up to 10" tanks



Drawing No.	Order No.	Description	Quantity
1	V3151	NUT 1" QUICK CONNECT	4
2	V3150	SPLIT RING	4
3	V3105	O-RING 215	4
4	V4017	T1 INTERCONNECT FITTING	2

V4052-01 TT Interconnect Fitting Assembly for 12" to 21" Tanks



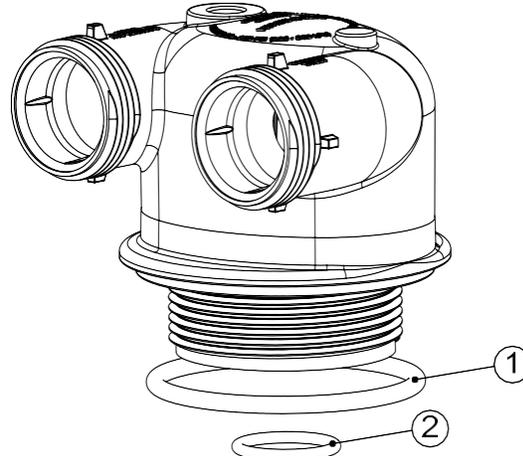
Drawing No.	Order No.	Description	Quantity
1	V3151	NUT 1" QUICK CONNECT	4
2	V3150	SPLIT RING	4
3	V3105	O-RING 215	4
4	V3352	FITTING 1¼" & 1½" PVC SOLVENT	4
5	V4052	PIPE PVC SCH 80 1¼" X 2"	2

Fitting Installation Instructions:

- Installation fittings are designed to accommodate minor plumbing misalignments, but are not designed to support the weight of a system or the plumbing.
- Slide nut on first, then the split ring and o-ring.
- Hand tighten the nut only.

The V4017-01 twin tank control valve interconnect kit can be used on tanks up to 10" in diameter and is packed in with control valve. **If using 12" diameter tanks or larger order optional kit number V4052-01 twin tank control valve interconnect kit for 12" thru 21" diameter tanks.**

D1400 1191 In/Out Head



Drawing No.	Order No.	Description	Quantity
1	V3180	O-RING 337	1
2	V3105	O-RING 215 (DISTRIBUTOR TUBE)	1

Introduction

This manual is about a control valve to be used on water softeners or water filters. The manual is designed to aid water treatment equipment manufacturers in the selection of the various control valve options. Information in this manual is different than what is needed for installation and servicing of a particular water treatment system. This manual is not intended to be used as a manual for a complete water softener or filter.

General 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.

HYDROCARBONS SUCH AS KEROSENE, BENZENE, GASOLINE, ETC., MAY DAMAGE PRODUCTS THAT CONTAIN O-RINGS OR PLASTIC COMPONENTS. EXPOSURE TO SUCH HYDROCARBONS MAY CAUSE THE PRODUCTS TO LEAK. DO NOT USE THE PRODUCT(S) CONTAINED IN THIS DOCUMENT ON WATER SUPPLIES THAT CONTAIN HYDROCARBONS SUCH AS KEROSENE, BENZENE, GASOLINE, ETC.

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

Do not use Vaseline, oils, other hydrocarbon lubricants or spray silicone anywhere. A silicone lubricant may be used on black O-rings but is not necessary.

The nuts and caps are designed to be unscrewed or tightened by hand or with the special plastic wrench. 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 a screwdriver in the slots on caps and/or tap with a hammer.

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

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

All plumbing should be done in accordance with local plumbing codes. The pipe size for the drain line should be a minimum of ½". Backwash flow rates in excess of 7 gpm (26.5 lpm) or length in excess of 20' (6.1m) require ¾" drain line.

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

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

Plug into an electrical outlet. Note: All electrical connections must be connected according to local codes. (Be certain the outlet is uninterrupted.)

Install grounding strap on metal pipes.

This glass filled Noryl¹ (or equivalent) fully automatic control valve is designed as the primary control center to direct and regulate all cycles of a water softener or filter.

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

Control valve installation is made easy because the distributor tube can be cut ½" above to ½" below the top of tank thread. The distributor tube is held in place by an O-ring seal and the control valve also has a bayonet lock feature for upper distributor baskets.

The power adapter comes with a 15-foot power cord and is designed for use with the control valve. The power adapter is for dry location use only. The control valve remembers all settings until the battery power is depleted if the power goes out.

After the battery power is depleted, the only item that needs to be reset is the time of day; other values are permanently stored in the nonvolatile memory. The control valve battery is not rechargeable but is replaceable.

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

Quick Reference Specifications

Service flow rate 1"	28 gpm (106 lpm, 6.36 m ³ /h) @15 psig (103 kPa) drop
Backwash flow rate 1"	15 gpm (57 lpm, 3.4 m ³ /h) @25 psig (172 kPa) drop
Minimum/Maximum Operating Pressures	20 psi (138 kPa or 1.4 bar) -125 psi (862 kPa or 8.6 bar)
Minimum/Maximum Operating Temperatures	40°F (4°C) - 110°F (43°C)
Power Adapter: Supply Voltage Supply Frequency Output Voltage Output Current	See Programming and Cover Drawing Manual page 4
Regenerant Refill Rate	0.5 gpm (1.9 lpm)
Injectors	See pages 9-13
Drain Line Flow Controls	See pages 15-16
Distributor Tube Opening Valve	1.05" outside diameter (3/4" NPS), height ± 0.05"
Tank Thread	2 1/2" - 8 NPSM
Control Valve Weight	16 lbs. 7.25 kg
PC Board Memory	Nonvolatile EEPROM (electrically erasable programmable read only memory)
Compatible with regenerants/chemicals	Sodium chloride, potassium chloride, potassium permanganate, sodium bisulfite, chlorine and chloramines

Allow one foot of clearance to service the valve.

The valve will withstand transportation and storage temperatures of -13 °F (-25 °C) to 131 °F (55 °C) and for short periods up to 158 °F (70 °C). If valve has been exposed to freezing conditions let valve warm up to room temperature before running water through it. The valve has been packaged to prevent damage from the effects of normal humidity, vibration and shock.

The control valves consist of the following components:

- | | |
|--|---|
| 1. Drive Assembly | 6. Drain Line Flow Control and Fitting Assembly |
| 2. Drive Cap Assembly, Main Piston and Regenerant Piston | 7. Water Meter |
| 3. Spacer Stack Assembly | 8. Twin Transfer Valve |
| 4. Injector Cap, Screen, Injector Plug and Injector | |
| 5. Refill Flow Control Assembly or Refill Port Plug | |

Drive Assembly

The drive assembly consists of the following parts:

- Drive Bracket
- Printed Circuit (PC) Board
- Motor
- Drive Gears
- Drive Gear Cover

The drive bracket holds the PC board, the motor, the drive gears and the drive gear cover in place.

The PC board receives and retains information, displays the information, determines when to regenerate and initiates regeneration. The display shows different types of information in the initial system set up (for softeners or filters), installer display settings, diagnostics, valve history or user display settings.

The PC board powers the motor. The PC board's two-prong jack connects wires to the direct current (DC) motor. The motor is held in place on the drive bracket by a spring-loaded clip and a small bulge in the plastic, which fits in one of the slots on the motor housing. The motor turns drive gears that drive the piston to cycle positions for backwashing, regeneration, rinsing, refill or service. The motor is fully reversible (turns both ways) and changes direction of rotation to change the direction of piston motion. The motor is easily replaced if necessary.

There are three drive gears held in place by the drive gear cover. All three drive gears are the same size. A reflective coating is applied to the gears. As the center drive gear turns, light shines on the coating and a light sensing diode determines if a light pulse was returned. The PC board counts the pulses and determines when to stop driving the motor.

Drive Cap Assembly, Main Piston and Regenerant Piston

The drive gears turn the main gear of the drive cap assembly, which moves the piston. The screw-driven, horizontally moving piston stops at specific positions to direct the flow of water to backwash, regenerate, rinse or refill. The PC board determines the position of the piston by counting pulses produced when the piston is moved. An optical sensor looking at one of the reduction drive gears generates these pulses. Each cycle position is defined by a number of pulses. The counter is zeroed each time the valve goes to the service position. The PC board finds the service position by noting the increase in current delivered to the motor when the mechanical stop at the service position is reached. This method of controlling piston position allows for greater flexibility and requires no switches or cams (U.S. Patent 6444127).

One of two main pistons is always used:

1. A 1.25" diameter downflow piston is used when the control valve is used as a downflow softener, regenerating filter or non-regenerating filter.
2. A 1.25" diameter upflow piston is used when the control valve is used as an upflow softener.

If the control valve is used as a softener or a regenerating filter, a regenerant piston must be attached to the main piston. If the control valve is to be used on a system that does not require a regenerant to be added, the regenerant piston must be removed.

Spacer Stack Assembly

The spacer stack assembly provides the necessary flow passage for water during the different cycles. The all-plastic spacer stack assembly (U.S. Patent 6402944) is a one-piece design which allows the stack to be removed using your fingers.

The exterior of the stack is sealed against the body bore with self-lubricating EPDM O-rings, while the interior surface is sealed against the piston using slippery self-cleaning directional (one-way) silicone lip seals. The lip seals are clear in color and have a special slippery coating so that the piston does not need to be lubricated.

Injector Cap, Screen, Injector Plug and Injector

The screen, injector and/or injector plug(s) are installed under the injector cap in an easy to access location on top of the valve. The injector cap contains four slots so no water accumulates in the cap. The injector cap is designed to be hand tightened.

Under the injector cap there is an easy to clean removable screen to prevent fouling of the injector. There are two holes under the injector cap labeled "DN" and "UP". The holes will be filled with a plug or an injector.

The plug (Order # V3010-1Z) prevents water from traveling a certain pathway. The injector lets water pass through the pathway. The self-priming injector increases the velocity of the water, creating a zone of negative pressure that draws in the concentrated liquid regenerant, such as sodium chloride (brine), potassium permanganate, etc. The regenerant blends with the stream of water, which passes through the media to regenerate the bed.

The injector provides a consistent regenerant/water mixture ratio over the entire operating pressure range of the control valve. The injector provides good performance in a variety of applications, which may involve elevated drain lines and long regenerant draw lengths. Injectors are chosen by knowing the type, amount, and regenerant flow rate for a particular type of media. Guidelines can be found in the media manufacturer's literature. The color-coded injectors give different regenerant draw, slow rinse and total flow rates over the pressure range. See injector graphs (pages 10-13) for total, slow rinse and draw flow rates.

The control valve has been manufactured to be one of the following:

- regeneration downflow (for softeners or regenerating filters install injector in DN location, plug in UP location)
- regeneration upflow (Upflow option is for softeners only. Install injector in UP location, plug in other hole location)
- no regenerant (both the DN and UP holes have injector plugs installed) and plug installed for the refill elbow

NOTE: It is okay to field convert valves from upflow to downflow and vice versa with the valve as long as software supports upflow brine.

Refill Flow Control Assembly or Refill Port Plug

The refill flow control assembly consists of an elbow, flow control retainer and flow control washer. The flow control retainer fits in the elbow. The flow control retainer houses the flow control washer which controls the flow rate when the regenerant tank is being refilled. The flow control is a flexible washer-like part with a small orifice and a precision molded contour that delivers a steady 0.5 GPM regenerant tank refill rate at varying inlet pressures.

Refill is accomplished with filtered water on filters and soft water on water softeners.

The refill flow control elbow assembly is attached to the control valve with a locking clip. The locking clip allows the elbow to rotate 270 degrees so the outlet can be orientated towards the regenerant tank.

The control valve has a standard refill elbow to which a 3/8" flexible tube can be connected. An optional elbow can be ordered which accommodates a 1/2" flexible tube for a high regenerant draw rate situation (G injectors and larger). Both elbows use the same refill flow control and retainer.

If the control valve is to be used as a non-regenerant filter control valve, the refill elbow is removed and replaced with a refill port plug P/N V3195-01.

Drain Line Flow Control and Fitting Assembly

The drain line flow control assembly includes a drain line flow control and a fitting. The drain line flow control allows proper media bed expansion by regulating the flow rate to the drain. The drain line flow control is a flexible washer-like part with an orifice and a precision molded contour. The flow rates are within $\pm 10\%$ over the pressure range of 20 psi to 125 psi (1.4 bar to 8.6 bar). See table for flow rate information.

Drain Line Flow Control and Fitting Assembly Information

Drain Line Fitting	Drain Line Flow Control Order No.	Number on Drain Line Flow Control	Backwash Flow Rate (gpm)	Backwash Flow Rate (lpm)
3/4"	V3162-007	007	0.7	2.6
3/4"	V3162-010	010	1.0	3.8
3/4"	V3162-013	013	1.3	4.9
3/4"	V3162-017	017	1.7	6.4
3/4"	V3162-022	022	2.2	8.3
3/4"	V3162-027	027	2.7	10.2
3/4"	V3162-032	032	3.2	12.1
3/4"	V3162-042	042	4.2	15.9
3/4"	V3162-053	053	5.3	20.1
3/4"	V3162-065	065	6.5	24.6
3/4"	V3162-075	075	7.5	28.4
3/4"	V3162-090	090	9.0	34.1
3/4"	V3162-100	100	10.0	37.9
1"	V3190-090	090	9.0	34.1
1"	V3190-100	100	10.0	37.9
1"	V3190-110	110	11	41.6
1"	V3190-130	130	13	49.2
1"	V3190-150	150	15	56.8
1"	V3190-170	170	17	64.3
1"	V3190-200	200	20	75.7
1"	V3190-250	250	25	94.6

The drain line flow control and fitting are located on top of the control valve and replaceable without the use of special tools.

The drain line flow control can be installed in the standard 3/4" drain line elbow, which accommodates 5/8" polytube or 3/4" NPT drain line connections. The optional nut and polytube insert for the 3/4" drain line elbow is designed for use with flexible polytube only.

The 3/4" drain line elbow can be rotated 180 degrees so the outlet can be orientated to the nearest drain. The same retainer is used for all drain line flow controls for the 3/4" fitting. Drain line flow controls designed for the 3/4" fitting are available for flow rates ranging from 0.7 to 10 gpm (2.6 to 37.9 lpm).

An optional 1" straight drain line fitting is available to accommodate drain line flow rates ranging from 9 to 25 gpm (34.1 to 94.6 lpm). This fitting is straight but still connects to the control valve using the same locking clip. The drain line flow control is located between two fitted parts (i.e. the fitting acts as the retainer). The nut is unscrewed to access the drain line flow control.

Service Instructions



When servicing the valve, water may leak from the valve. Water from the valve may create a slip hazard. Clean up water spills.



Disconnect from electrical power prior to servicing the valve.

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 power source plug connects to the four-pin jack. The motor plug connects to the two-pin jack on the left-hand side of the PC board. 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 forward. 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 toward 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 the drive gears, the drive gear cover needs to be removed. Before trying to remove the gear cover, the drive bracket must be removed from the drive back plate. (Refer to the instructions above regarding removing the drive bracket from the drive back plate. The drive gear cover can be removed from the drive bracket without removing the motor or the PC board.) 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. With the PC board facing up, push in and down on the large clip on the drive gear cover. Handle the cover and the gears carefully so that the gears do not fall off the pegs in the cover.

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.

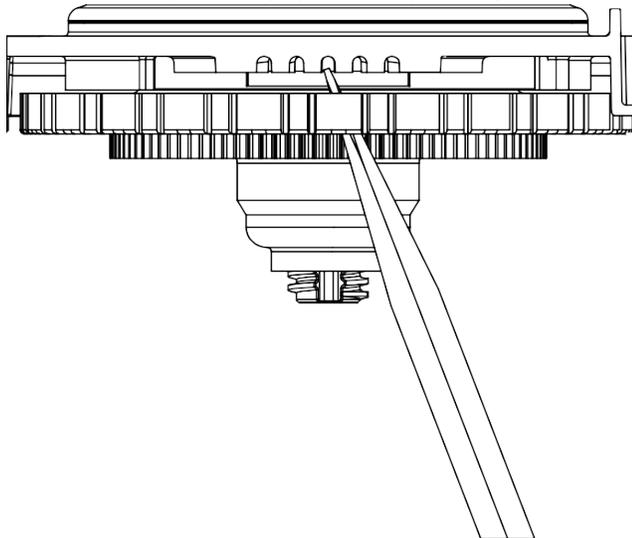
The drive bracket does not need to be removed from the drive plate if the motor needs to be removed. To remove the motor, disconnect the power and motor plugs from the jacks on the PC board. Move the spring clip loop to the right and hold. Rotate the motor at least a ¼ turn in either direction so the wires are vertical (up & down) 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. To reinstall the motor, move the spring clip loop to the right and hold. Gently turn the motor while inserting so that the gear on the motor meshes with the gears under the drive gear cover. Release the spring clip loop and continue to rotate the motor until the wires are horizontal and the motor housing engages the small plastic bulge inside the drive bracket motor retainer. Reconnect the motor plug to the two-pronged jack on the lower left side of the PC board. If the motor will not easily engage with the drive gears when reinstalling, lift and slightly rotate the motor before reinserting. Reconnect the power plug.

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



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 (downflow or upflow) 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 pressing sideways and 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. 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 involving the drive assembly or the drive cap assembly and pistons unplug power source jack from the printed circuit board (black wire) and plug back in or press and hold NEXT and REGEN buttons for 3 seconds. This resets the electronics and establishes the service piston position. The display should flash all wording, then flash the software version 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 clear lip seals for wear or damage. Replace the entire stack if necessary. 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.

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

After completing any valve maintenance involving the drive assembly or the drive cap assembly and pistons unplug power source jack from the printed circuit board (black wire) and plug back in or press and hold NEXT and REGEN buttons for 3 seconds. This resets the electronics and establishes the service piston position. The display should flash all wording, then flash the software version 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 ensure 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. Refer to Valve Body Compliance Table at the beginning of this manual.

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 flat blade 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 silicone lubricant may be used on the O-ring on the elbow or the white retainer.

Water Meter

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 disconnect 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.

THIS WATER METER SHOULD NOT BE USED AS THE PRIMARY MONITORING DEVICE FOR CRITICAL OR HEALTH EFFECT APPLICATIONS. OPERATING PRESSURES: 20 PSI MINIMUM / 125 PSI MAXIMUM • OPERATING TEMPERATURES: 40°F MINIMUM / 110°F MAXIMUM

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.

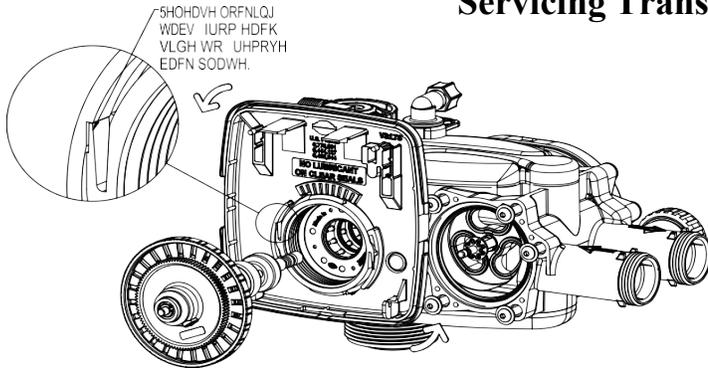
With the nut removed, a slot at the top of the water meter is visible. Twist a flat blade screwdriver in the slot between the control valve body and the meter. When the meter is part way out it is easy to remove the water meter from the housing. Once the water meter is removed from the control valve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

Do not use a wire brush to clean the turbine. 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 pre-lubricated. Do not use Vaseline, oils, or other unacceptable lubricants on the O-ring. A silicone lubricant may be used on the black O-ring.

Reinsert the water meter into the side slot, hand tighten the nut. Do not use a pipe wrench to tighten nut.

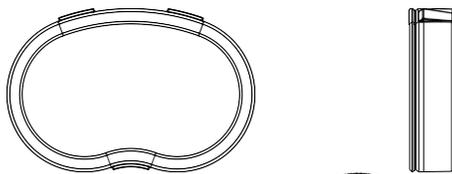
Servicing Transfer Cap Assemblies



The control valves backplate must be removed first to allow access to removing the transfer cap assembly. NOTE: Hold slight downward pressure on the top left corner of the backplate while using a thin flat screwdriver or knife blade to push in on the locking tabs, this will release the backplate and it will twist to the left off of the valve body. For removal of the drive motor side, you will need to remove the drive cover assembly to access the motorized drive. The drive motor can be removed by pressing the spring clip loop to the right then rotate the

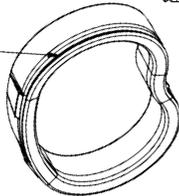
motor a ¼ turn and pull outward to remove the motor from the reducing gear cover assembly. Remove the three Phillips head stainless steel screws that retain the reducing gear cover to the drive cap. Once the cover is removed you have access to the reducing drive gears simply slide them off of the gear axes with your fingers to inspect / check them there are 3 small black gears with foil decals and 1 larger black reducing gear. Remove the large white drive gear from the stainless-steel drive shaft. To remove the large white transfer drive gear firmly grab the outside edge of the gear with your fingers and pull it outward away from the control valve assembly. Now you can use a 5/32" or 4mm Allen Wrench to remove the ¼-20 screws that retain the transfer drive cap assemblies on both sides of the valve.

NOTE: Once the screws are removed from retaining the inlet side transfer valve cap and the outlet drive motor transfer cap from the control valve the cap will spring out away from the valve body. At this point the



transfer discs may be removed by pulling the discs outward off of the shaft away from the valve body with your hand. With the disc out you can inspect the flat surface area to be sure it's clean and smooth free of any debris or scratches. Note that the disc is keyed to the drive shaft so that it will only assemble in one orientation. The transfer discs may be chemically cleaned with a dilute sodium bisulfate solution, vinegar or just wiped with a soft clean cloth.

6HDO"/LS" IHDWXUH



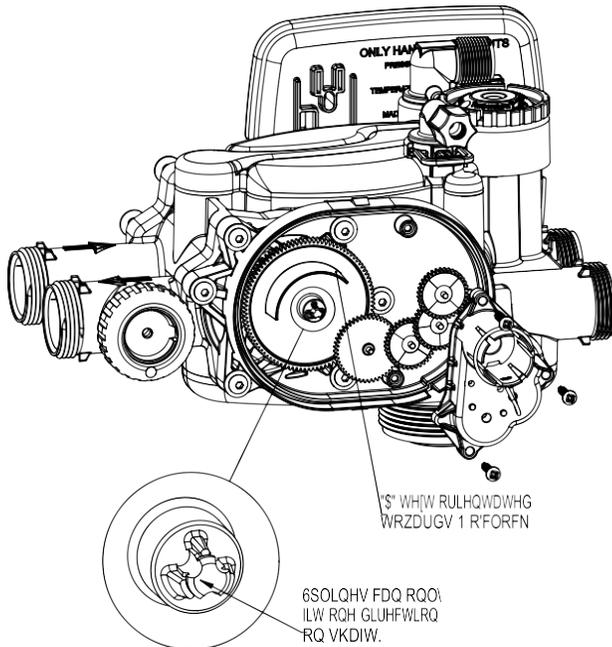
To remove seals gently pull out on the outer lip of the seal to lift the seal out from its cavity being careful not to damage the face surface of the seal. To reassemble re-seat seals into the seal cavity of the control valve body being sure that the lip of the seal is facing outward. With seals in place put a thin film of Dow #7 on the tops of the seals

and the flat surface of the discs. Prior to reinstalling the discs, the drive shaft should be removed and the O-rings cleaned, inspected and lubricated with Dow #7. The shaft can then be installed into the disc prior to installation. With the outlet disc assembled to the shaft the orientation of the shaft to inlet disc can be assured by installing the set with the through hole on the outlet disc at the 6 o'clock position.

The easiest thing would be to remove both disc drives and assemble the outlet side first. Then each disc could be fitted on the shaft individually. At this point the transfer valve cap assemblies can be reinstalled.

Note: That both transfer caps only mount in one orientation. Prior to installation of cap assembly be sure to check that the stainless-steel spring and the plastic spring support is in place attached to the inside of the cap assembly. Next you can wipe the outside edge of the O-ring on the cap and the inside mating area of the valve with a clean cloth & re-apply a thin layer of silicone lubricant like Dow #7.

BE SURE NOT TO USE ANYTHING HYDROCARBON BASED SUCH AS VASELINE OR PETROLEUM JELLY TO LUBRICATE PLASTIC COMPONENTS OR O-RINGS AS THEY WILL BE DAMAGED BY THE HYDROCARBONS AND POTENTIALLY CAUSE FAILURES THAT CAN RESULT WITH LEAKS.



Noting the one possible orientation of the transfer drive cap, use one hand to press in and support the transfer drive cap while using the opposing hand to start two screws in, one on the top and one opposing it on the bottom.

Tighten the screws in evenly so the cap seats the O-ring without getting pinched or damaged. Screws should only be hand tightened with a 5/32" or 4mm Allen Wrench, **DO NOT OVER TIGHTEN SCREWS.**

NOTE: be careful and make sure the meter cable doesn't get under the drive cap while tightening as it will result in damaging the cable.

Position the large white drive gear with the "A" pointing toward the 1 o'clock position and then press it onto the stainless-steel drive shaft, make sure it snaps & locks into position. NOTE: The white drive gear is splined to the drive shaft and will only assemble in one orientation. Because of this it is not necessary that the discs and gear be exactly positioned, the positioning needs to be approximate but they have to fit on the shaft.

Next install the larger black reducing gear onto the stainless-steel shaft, then install the remaining smaller reducing gears from left to right. Re- install the grey reducing gear cover over the gears and affix with the 3 stainless steel screws. Now you can re-install the drive motor by pressing the spring clip loop to the right then rotate the motor as you are inserting it so the gear of the motor meshes properly with the reducing gears. Release the spring clip loop and rotate the motor until the motor housing engages with the plastic nub inside the housing that holds the motor in place and make sure that the top of the motor is flush with the top of the grey gear housing. Press the drive motor wires down into the strain relief of the drive cap, now you can re-install the cover assembly.

After completing any valve maintenance involving the valve drive assembly or the transfer drive assembly please press and hold the NEXT & the REGEN buttons simultaneously for 3 to 5 seconds to perform a soft reset which will synchronize the control valves positions.

OEM General Programming Instructions

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

- OEM Configuration Setup
- OEM Softener System Setup
- OEM Filter System Setup
- Installer Display Settings
- User Display Settings
- Diagnostics
- Valve History

Tables 1 and 2 show examples when the valve is set up as a softener or filter.

Table 1: Regeneration Cycles Softening

Downflow Regenerant Refill After Rinse	Downflow Regenerant Prefill	Upflow Regenerant Refill After Rinse	Upflow Regenerant Prefill
1 st Cycle: Backwash 2 nd Cycle: dn Brine 3 rd Cycle: Backwash 4 th Cycle: Rinse 5 th Cycle: Fill	1 st Cycle: Fill 2 nd Cycle: Softening 3 rd Cycle: Backwash 4 th Cycle: dn Brine 5 th Cycle: Backwash 6 th Cycle: Rinse	1 st Cycle: UP Brine 2 nd Cycle: Backwash 3 rd Cycle: Rinse 4 th Cycle: Fill	1 st Cycle: Fill 2 nd Cycle: Softening 3 rd Cycle: UP Brine 4 th Cycle: Backwash 5 th Cycle: Rinse

Table 2: Regeneration Cycles Filtering

Downflow Regenerant Refill After Rinse
1 st Cycle: Backwash 2 nd Cycle: dn Brine 3 rd Cycle: Backwash 4 th Cycle: Rinse 5 th Cycle: Fill

The control valve with a water meter can be set for Demand Initiated Regeneration (DIR) only, Time Clock operation only, or DIR and Time Clock whichever comes first, depending upon what settings are selected for Day Override and Gallon Capacity.¹ See Table 3.

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

**Table 3
DIR/Time Clock Options**

DIR	Time Clock	Reserve Capacity	Softener	Filter		Settings ²	
				Regenerant	Backwash Only	Days to REGEN	Gallon Capacity
Yes		Automatically calculated	Yes			Off	Auto
Yes		If desired enter a value less than estimated capacity	Yes	Yes	Yes	Off	Any Number
Yes	Yes	Automatically calculated	Yes			Any Number	Auto
Yes	Yes	If desired enter a value less than estimated capacity	Yes	Yes	Yes	Any Number	Any number
	Yes	None	Yes	Yes	Yes	Any Number	Off

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

A unique feature of this control valve is the ability to display actual water usage for the last 63 days. The values are initially stored as “ ”.

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

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

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

¹ See Installer Display Settings, OEM Softener System Setup, and OEM Filter System Setup for explanations of Day Override and Gallon Capacity.

² Days to REGEN and Gallon Capacity cannot both be set to “OFF” at the same time. Once the OEM Cycle Sequence has been set, the other procedures can be accessed in any order. Details on each of the procedures are provided on the following pages.

To “lock out” access to diagnostic and valve history displays and modifications to settings except for hardness, day override, time of regeneration, and time of day by anyone but the manufacturer, press ▼, NEXT, ▲, and CLOCK in sequence after settings are made. To “unlock”, so other displays can be viewed and changes can be made, press ▼, NEXT, ▲, and CLOCK in sequence.

When in operation normal user displays such as time of day, volume remaining before regeneration, present flow rate, or days remaining before regeneration are shown. 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 OEM Softener Setup, OEM Filter Setup, Installer Display Settings, Diagnostics, or Valve History press CLOCK. Any changes made prior to the exit are incorporated.

To clear the Service Call reminder, press ▲ and ▼ simultaneously while CALL is displayed.

When desired, all programming and information in Diagnostics may be reset to defaults when the valve is installed in a new location. To reset to defaults, press ▲ and ▼ simultaneously twice, then set clock & Regen to reset programming and diagnostic values to defaults. The screen will return to User Display.

Sometimes it is desirable to have the valve initiate and complete two regenerations within 24 hours and then return to the preset regeneration procedure. It is possible to do a double regeneration if the control valve is set to “DELAYED REGEN” or “DELAY + IMMEDIATE” in OEM Softener System Setup or OEM Filter System Setup. To do a double regeneration:

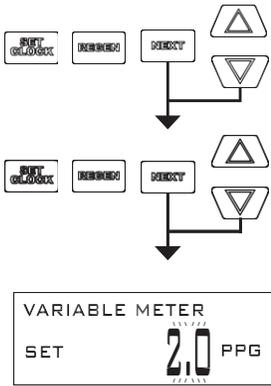
1. Press the “REGEN” button once. REGEN TODAY will flash on the display.
2. Press and hold the “REGEN” button for three seconds until the valve regeneration initiates.

Once the valve has completed the immediate regeneration, the valve will regenerate one more time at the preset regeneration time.

For Valve Type 1.0T, press and hold CLOCK and ▲ for about 3 seconds to initiate an exchange of the tank in Service without cycling the regeneration valve. After tank switch, days remaining and capacity remaining status is retained for each tank until the next regeneration.

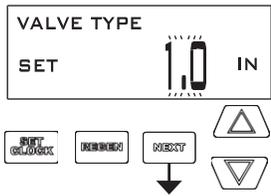
OEM Configuration Setup

STEP 1CS



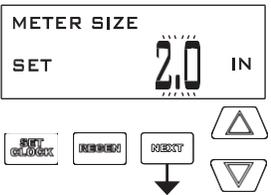
Step 1CS – Press NEXT and ▼ simultaneously for 3 seconds and release. Then press NEXT and ▼ simultaneously for 3 seconds and release. If screen in Step 2CS does not appear in 5 seconds the lock on the valve is activated. To unlock press ▼, NEXT, ▲, and CLOCK in sequence, then press NEXT and ▼ simultaneously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

STEP 2CS



Step 2CS – Use ▲ or ▼ 1.0 for 1” valve, 1.25 for 1.25” valve, 1.5 for 1.5” valve, 2.0 for 2” valve or 1.0T for the twin valve.
 Press NEXT to go to Step 3CS.
 Press REGEN to exit the OEM cycle sequence.

STEP 3CS



Step 3CS – When 1.5 or 2.0 is selected, an additional screen will appear. It is used to select which size flow meter is to be used with the valve 1.0r, 1.5, 2.0, or 3.0. Variable meter pulses of 0.1-150.0 PPG can also be selected.
 Press NEXT to go to Step 4CS.
 Press REGEN to return to the previous step.



Step 4CS – Allows selection of one of the following using ▲ or ▼:

- the Control Valve to act as an alternator; or
- the Control Valve to have a no hard water bypass: or
- the Control Valve to have a Separate Source during the regeneration cycle; or
- the control valve to operate as part of a Progressive Flow system; or
- the Control Valve to operate with the Clack System Controller.

Select OFF when none of these features are used.

Only use Clack No Hard Water Bypass Valves or Clack Motorized Alternating Valves (MAV) with these selections. Clack No Hard Water Bypass Valves (1" or 1.25" V3070FF or V3070FM) are not designed to be used with the alternator function or separate source.

This display will not appear if 1.0T is selected in Step 2CS. Selecting the Control Valve to act as an alternator:

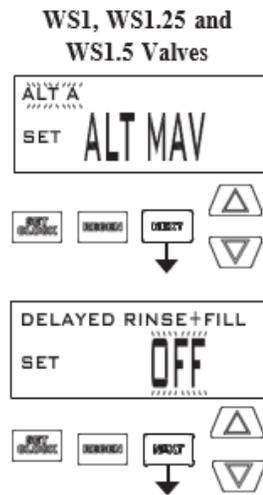
Prior to starting the programming steps, connect the interconnect cable to each control valve board's three pin connector labeled COMM CABLE. Also connect the meter cord to either control valve to the three pin connector labeled METER.			
Softener valve programming steps			
OEM Configuration Setup	Step 4CS	Set to ALT A Connect the outlet plumbing of the ALT A valve to the MAV's A port and connect the MAV's two pin wire connector to the two pin connector labeled MAV on the ALT A valve	Set to ALT B Connect the outlet plumbing of the ALT B valve to the MAV's B port. No electrical connections are required between the ALT B valve and the MAV
Softener System Setup	Step 9S	Set to AUTO	Set to AUTO
Softener System Setup	Step 10S	Set regeneration time option to IMMEDIATE.	Set regeneration time option to IMMEDIATE.
Installer Display Setting	Step 4I	Set Day Override to OFF	Set Day Override to OFF

If set up for a filter, in Step 7F set Volume Capacity in Gallons; in Step 8F select Regeneration Time Option "Immediate"; and in Step 3I select Day Override "OFF".

For Clack Corporation alternator systems using **AM1, AM1.25 and AM1.5** valves there will be an option to delay the last two cycles of regeneration (only Rinse and Fill). This feature splits the regeneration into two portions. The first portion of the regeneration will start immediately and all programmed cycles before the Rinse and Fill cycles will be performed. After all programmed cycles before Rinse and Fill are completed the control valve will drive to the service position (displaying Delayed Rinse + Fill Pending). When the volume of the on-line unit is depleted to 10% of its programmed capacity, the control valve will be triggered to finish the second portion of the regeneration. Once Rinse and Fill are completed, the valve will re-enter Standby mode until requested to come on-line for Service.

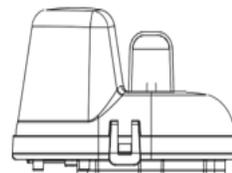
For Clack Corporation alternator systems using the **AM2** valve, when NEXT is pressed after selecting ALT A or ALT B, a display will allow the user to set the amount of pre-service rinse time for the stand-by tank just prior to returning to service.

With 1.0T set, the same display appears and is set in a similar manner.



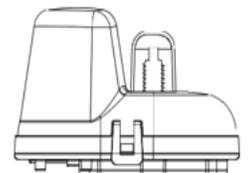
Note: Clack Twin Alternator Operations

- Twin alternating systems can be programmed with a day override setting combined with the normal volume-based regeneration programming. A twin alternating system in this configuration will then regenerate based on the volume used or the day override if there is a period of low water usage.
- Twin alternating systems can be programmed as a time clock only based regenerating system. In this configuration, the days remaining are counted only on the unit that is in service. The unit in Stand-by Mode only notes days in diagnostics, which results in time clock only twin regeneration initiation.
- Twin alternating systems can be programmed for a delayed regeneration time. The system will allow an immediate transfer of the MAV to switch tanks and place a fully regenerated unit in service once a unit becomes exhausted. The exhausted unit will then be placed into Stand-by Mode and allowed to have a delayed regeneration at the pre-set time



Retracted

Valve A in Service
Position = MAV piston
rod Retracted

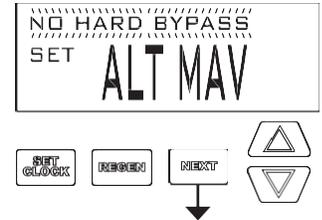


Extended

Valve B in Service Position
= MAV piston rod
Extended

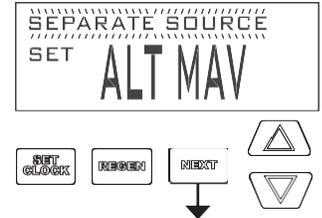
Configuring the Control Valve for No Hard Water Bypass Operation:

Select NO HARD BYPASS for control operation. For no hard water bypass operation, the three wire connector is not used. Selection requires that a connection to MAV or a Clack No Hard Water Bypass Valve is made to the two pin connector labeled MAV located on the printed circuit board. If using a MAV, the A port of the MAV must be plugged and the valve outlet connected to the B port. When set to No Hard Bypass the MAV will be driven closed before the first regeneration cycle that is not FILL or SOFTENING or FILTERING, and be driven open after the last regeneration cycle that is not FILL. NOTE: If the control valve enters into an error state during regeneration mode, the no hard water bypass valve will remain in its current state until the error is corrected and reset.



Configuring the Control Valve for Separate Source Operation:

Select SEPARATE SOURCE for control operation. For separate source operation, the three wire connector is not used. Selection requires that a connection to a Clack Motorized Alternator Valve (MAV) is made to the two pin connector labeled MAV located on the printed circuit board. The C port of the MAV must be connected to the valve inlet and the A port connected to the separate source used during regeneration. The B port must be connected to the feed water supply. When set to Separate Source the MAV will be driven closed before the first regeneration cycle, and be driven open after the last regeneration cycle. NOTE: If the control valve enters into an error state during regeneration mode, the MAV will remain in its current state until the error is corrected and reset.

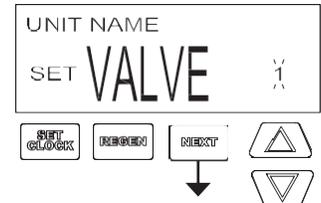
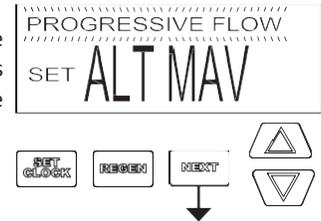


Configuring the valve for Progressive Flow operation:

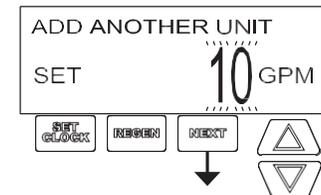
Select Progressive Flow from the Alt MAV Output Operation display. Operation in Progressive Flow Mode requires 2 to 4 valves plumbed in parallel, each with a separate flow meter and No Hard Water Bypass unit. For proper progressive flow operation, three-wire communication cables are required to be connected to each valve in the system via the 3-pin Comm Cable connector.

NOTE: All cabling must be connected before starting initial valve programming. Once all valves in the system have their COMM CABLE inputs connected AND are fully programmed, perform a Next/Regen Reset on each valve to initiate normal system operation.

Press NEXT to go to the UNIT NAME display. Set the UNIT NAME as required by the position of the control valve in the system. Each Valve needs to be set to Progressive Flow and have different addresses, 1, 2, 3, and 4. Valve 1 will be the controlling valve of the system.



If setting Valve 1, press NEXT to go to the ADD ANOTHER UNIT display and set the required flow rate adder value. The ADD ANOTHER UNIT setting will add or subtract the number of units currently in service, based on the overall flow rate through the system. The ADD ANOTHER UNIT screen will only appear on Valve 1.

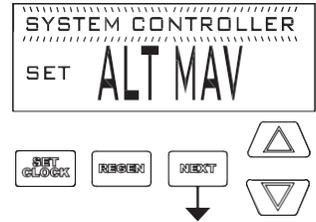


Complete valve setup by pressing NEXT to advance through the remaining displays and make any other required changes prior to exiting programming.

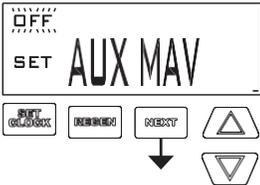
Configuring the Control Valve to operate with Clack System Controller:

Select SYSTEM CONTROLLER to link the Control Valve to the Clack System Controller. For communication between the Control Valve and the System Controller a three wire communication cable is required.

Press NEXT to go to Step 5CS. Press REGEN to return to previous step.



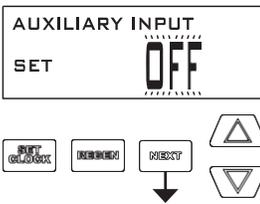
STEP 5CS



Step 5CS – Set Auxiliary Drive Output (MAV only) to operate in one of two modes:

- TIME – Output is activated at a set time after the start of regeneration, for a specified length of time.
- Set SEP SOURCE: Allows Auxiliary MAV to switch positions before the start of regeneration and then switch back at the end of regeneration.
- Set OFF: Deactivates this output.

STEP 5CS



Only use Clack Motorized Alternating Valves (MAV) with these selections. Clack No Hard Water Bypass Valves (1" or 1.25" V3070FF or V3070FM) are not designed to be used with the TIME or SEPARATE SOURCE functions.

Press NEXT to go to Step 6CS. Press REGEN to return to the previous step.

Step 6CS – This allows the use of an outside signal to control the initiation of a regeneration. Selection only matters if a connection is made to the two pin connector labeled DP SWITCH located on the printed circuit board. Following is an explanation of the options:

OFF – Feature not used.

NOTE: In a twin alternating system each control must have a separate dP signal or dP switch. One dP signal or one dP switch cannot be used for both controls.

IMMED REG – If the dP switch is closed for an accumulative time of 2 minutes a regeneration will be signaled to the unit. In a twin alternating system the MAV will transition first to switch units so that the signaled unit can start regeneration. After the MAV is fully transitioned the regeneration begins immediately. Note: For AM1 – AM1.5 control valves programmed for twin alternating: if the dP function "IMMED REG" is set, the Delayed Rinse and Fill feature is not available.

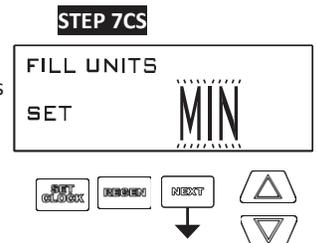
DELAY REG – If the dP switch is closed for an accumulative time of 2 minutes a regeneration will occur at the scheduled delayed regeneration time. In a twin alternating system once the dP switch is triggered the PC Board will display "REGEN TODAY" and when the delayed regen time comes the control will switch tanks and the triggered unit will then go into regeneration. Note: For AM1 – AM1.5 control valves programmed for twin alternating: if the dP function "DELAY REG" is set, the Delayed Rinse and Fill feature is not available.

HOLD REG – If the dP switch is closed a regeneration will be prevented from occurring while there is switch closure. In a twin alternating system the regeneration of a unit can be prevented upon switch closure. If the unit depletes the capacity down to zero it will not be allowed to switch tanks to regenerate until the switch is open. Note: For AM1 – AM1.5 control valves programmed for twin alternating the Delayed Rinse and Fill feature can be set in conjunction with the "HOLD REG" if desired.

Press NEXT to go to Step 7CS or to exit Configuration Setup. Press REGEN to return to previous step.

STEP 7CS Step 7CS – If set as a softener, and 1.5 was selected in Step 2CS, this screen will appear, and FILL can be set to LBS or MIN by using ▼ or ▲. Press NEXT to exit Configuration Setup. Press REGEN to return to previous step.

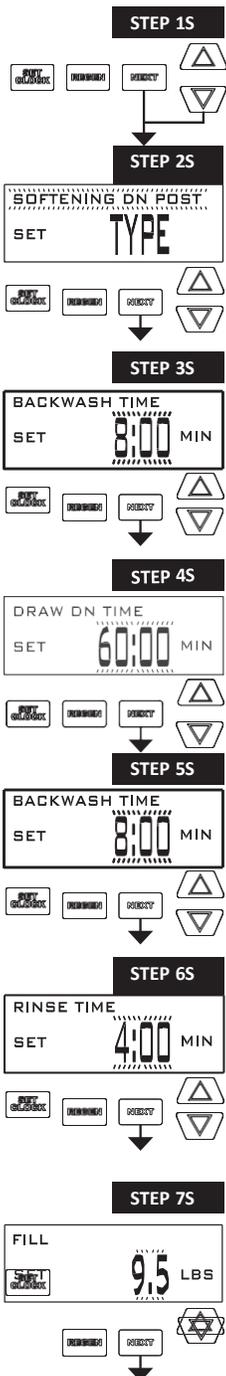
RETURN TO NORMAL MODE



OEM Softener System Setup

Type	Fill	Service	Backwash	Draw	Backwash	Rinse	Fill
Softening DN Post			8	60	8	8	9.5 LBS
Softening DN Pre	9.5 LBS	240	8	60	8	8	
Softening UP Post				60	8	8	9.5 LBS
Softening UP Pre	9.5 LBS	240		60	8	8	
Softening DN Post 2.0" Valve			8	60	8	8	6 MIN
Softening DN Pre 2.0" Valve	6 MIN	240	8	60	8	8	

Cycle	Units	Range	Default
Backwash	MIN	1-120 or OFF	8
Rinse	MIN	1-120 or OFF	8
Draw (Up or Down)	MIN	1-160 or OFF	60
Fill (all but 2" valve)	LBS	0.1-200 or OFF	9.5
Fill (1.5" MIN or 2" valve)	MIN	0.1-99.0 or OFF	6
Softening	MIN	1-480 or OFF	240



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

Step 2S – Choose the SOFTENING program desired (see table) using ▼ or ▲. Press NEXT to go to Step 3S. Press REGEN to exit OEM Softener System Setup.

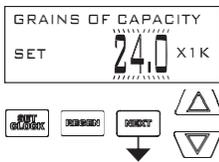
Step 3S – Select the time for the first cycle using ▼ or ▲. Press NEXT to go to Step 4S. Press REGEN to return to previous step.

Step 4S – Select the time for the second cycle using ▼ or ▲. Press NEXT to go to Step 5S. Press REGEN to return to previous step.

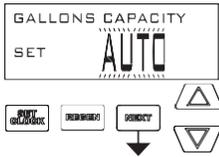
Step 5S – Select the time for the third cycle using ▼ or ▲. Press NEXT to go to Step 6S. Press REGEN to return to previous step.

Step 6S – Select the time for the fourth cycle using ▼ or ▲. Press NEXT to go to Step 7S. Press REGEN to return to previous step.

Step 7S – Select the LBS for the fifth cycle using ▼ or ▲. If 2.0 was selected in Step 2CS, or MIN was selected in Step 7CS, FILL is in minutes. Press NEXT to go to Step 8S. Press REGEN to return to previous step.

STEP 8S

Step 8S –Set Grains Capacity using ▲ or ▼. The ion exchange capacity is in grains of hardness as calcium carbonate for the system based on the pounds of salt that will be used. Calculate the pounds of salt using the fill time previously selected. Grains capacity is affected by the fill time. The grains capacity for the selected fill time should be confirmed by OEM testing. The capacity and hardness levels entered are used to automatically calculate reserve capacity when volume capacity is set to AUTO. Press NEXT to go to Step 9S. Press REGEN to return to previous step.

STEP 9S

Step 9S – Set Volume Capacity using ▲ or ▼. If value is set to:

- AUTO capacity will be automatically calculated and reserve capacity will be automatically estimated;
- OFF regeneration will be based solely on the day override set (see Installer Display Settings Step 3I); or
- a number, regeneration initiation will be based off the value specified.

If OFF or a number is used, hardness display will not be allowed to be set in Installer Display Settings Step 2I.

If OFF is selected, Regeneration Time is automatically “Delayed”, so Step 10S will not appear.

See Setting Options Table for more detail. Press NEXT to go to Step 10S. Press REGEN to return to previous step.

STEP 10S

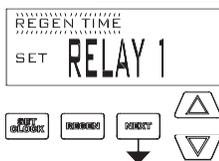
Step 10S – Set Regeneration Time Options using ▼ or ▲. If value is set to:

- DELAYED REGENERATION means regeneration will occur at the preset time;
- IMMEDIATE REGENERATION means regeneration will occur immediately when the volume capacity reaches 0 (zero); or
- DELAY + IMMEDIATE REGENERATION means regeneration will occur at one of the following:
 - the preset time when the volume capacity falls below the reserve or the specified number of days between regenerations is reached whichever comes first; or
 - immediately after 10 minutes of no water usage when the volume capacity reaches 0 (zero). DELAYED REGEN is the default if Step 4CS is set to ALTA or ALTB, and DELAY + IMMEDIATE REGENERATION will not be available.

IMMEDIATE REGENERATION is the default if Step 2CS is set to 1.0T, and “DELAY + IMMEDIATE REGENERATION will not be available.

This screen will not appear if OFF is selected in Step 9S.

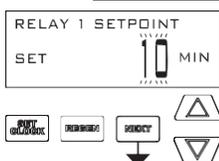
See Setting Options Table for more detail. Press NEXT to go to Step 11S. Press REGEN to return to previous step.

STEP 11S

Step 11S: Set Relay 1 operation using ▲ or ▼. The choices are:

- Set REGEN TIME: Relay activates after a set time at the beginning of a regeneration and then deactivates after a set period of time. The start of regeneration is defined as the first backwash cycle or Regenerant Draw UP (1” only) or DN, whichever comes first.
- Set VOLUME: Relay activates after a set volume has been used while in service, then deactivates after the meter stops registering flow and the set time period has expired.
- Set REGEN VOLUME: Relay activates after a set volume has been used while in service or during regeneration, then deactivates after the meter stops registering flow and the set time period has expired.
- Set OFF: If set to Off, Steps 12S and 13S will not be shown.

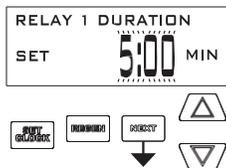
Press NEXT to go to Step 12S. Press REGEN to return to previous step.

STEP 12S

Step 12S: Set Relay 1 SETPOINT Time or Volume using ▲ or ▼. The choices are:

- Relay Actuation Time: After the start of a regeneration the amount of time that should pass prior to activating the relay. The start of regeneration is defined as the first backwash cycle or Regenerant Draw UP (1” only) or DN, whichever comes first. Ranges from 0 to 500 minutes.
- Relay Actuation Volume or Regen Volume: Relay activates after a set number of gallons have passed. Ranges from 1 to 20,000 gallons.
- Relay Actuation Hold Volume: The relay and related display activate after the set number of gallons have passed. The relay output and related display are reset when any button is pressed.

Press NEXT to go to Step 13S. Press REGEN to return to previous step.

STEP 13S

Step 13S: Set Relay DURATION TIME using ▲ or ▼.

- If TIME is selected in Step 11S, the relay will deactivate after the time set has expired. Ranges from 0:01 to 500:00 minutes.

- If VOLUME or REGEN VOLUME is selected in Step 11S, the relay will deactivate after the time set has expired.

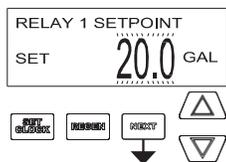
Press NEXT to go to Step 14S. Press REGEN to return to previous step.

STEP 14S

Step 14S: Set Relay 2 operation using ▲ or ▼. The choices are the same as Step 11S, with the addition of ERROR MONITOR. If set to ERROR MONITOR, the relay closes whenever the valve enters error mode, and immediately deactivates when error mode is exited.

If set to OFF, Steps 15S and 16S will not be shown.

Press NEXT to go to Step 15S. Press REGEN to return to previous step.

STEP 15S

Step 15S: Set Relay 2 SETPOINT Time or Volume using ▲ or ▼. The choices are the same as Step 12S.

Press NEXT to go to Step 16S. Press REGEN to return to previous step.

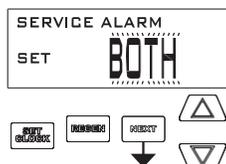
STEP 16S

Step 16S: Set Relay DURATION TIME using ▲ or ▼.

- If TIME is selected in Step 14S the relay will deactivate after the time set has expired.

- If VOLUME or REGEN VOLUME is selected in Step 14S the relay will deactivate after the time set has expired or after the meter stops registering flow, whichever comes first.

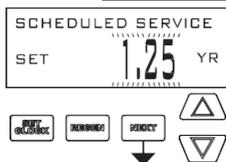
Press NEXT to go to Step 17. Press REGEN to return to previous step.

STEP 17S

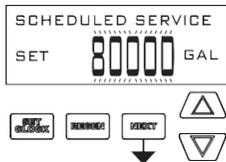
Step 17S: Set scheduled service alarm using ▲ or ▼. Available options are OFF, TIME, GALLONS or BOTH.

Selecting OFF disables this feature. If OFF is selected press NEXT to exit OEM Softener System Setup. If TIME, GALLONS or BOTH is selected press NEXT to select the TIME and/or GALLONS values. See Steps 18S and/or 19S.

Press REGEN to return to the previous step.

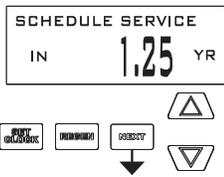
STEP 18S

Step 18S: Time remaining until Service Alarm generation. Only appears if TIME or BOTH is set in Step 17S. To change duration time, use ▲ or ▼ to select the new value. Press NEXT to exit OEM Softener System Setup or go to Step 19S if BOTH was selected in Step 17S. Press REGEN to return to the previous step.

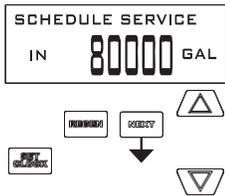
STEP 19S

Step 19S: Volume remaining until Service Alarm generation. Only appears if GALLONS or BOTH is set in Step 17S.

To change the volume between service calls, use ▲ or ▼ to select the new value. Press NEXT to go to Step 20S. Press REGEN to return to the previous step.

STEP 20S

Step 20S: Status display only, if Step 17S is set to TIME or BOTH. Shows time remaining to Service Alarm. Can be reset to the initial value by pressing ▲ and ▼ for approximately 3 seconds. Press NEXT to exit OEM Softener System Setup or to go to Step 21S. Press REGEN to return to previous step.

STEP 21S

Step 21S: Status display only, if Step 17S is set to TIME or BOTH. Shows time remaining to Service Alarm. Can be reset to the initial value by pressing ▲ and ▼ for approximately 3 seconds. Press NEXT to exit Softener System. Press REGEN to return to previous step.

RETURN TO NORMAL MODE

Setting Options Table⁴

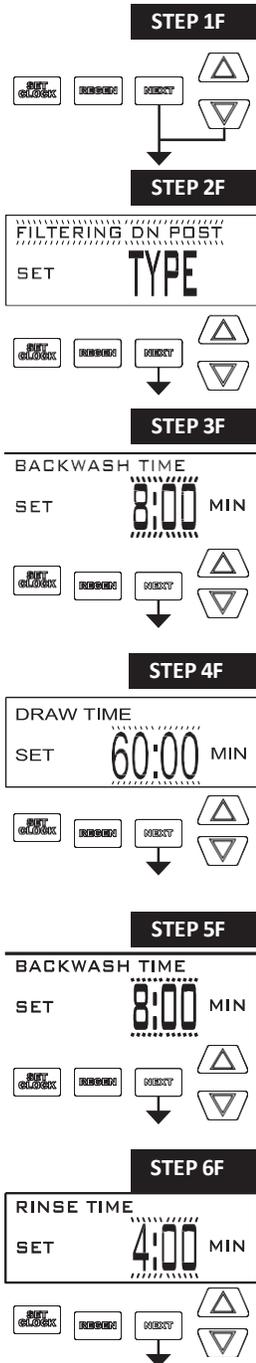
System Type	Regeneration Option	Regeneration Type	Day Override	
Softening	Auto	Normal	1-28 days	Regeneration occurs at the next regeneration time when volume capacity falls below the reserve capacity, or the specified number of days is reached, whichever comes first.
Softening	Auto	Normal	OFF	Regeneration occurs at the next regeneration time when volume capacity falls below the reserve capacity.
Softening or Filtering	20 – 1,500,000 Gallons	Normal	1-28 days	Regeneration occurs at the next regeneration time when volume capacity reaches 0, or the specified number of days is reached, whichever comes first.
Softening or Filtering	20 – 1,500,000 Gallons	Normal	OFF	Regeneration occurs at the next regeneration time when volume capacity reaches 0.
Softening or Filtering	OFF	Normal	1-28 days	Time Clock operation. Regeneration occurs at the next regeneration time the specified number of days is reached.
Softening	Auto or 20 – 1,500,000 Gallons	On 0	1-28 days	Regeneration occurs immediately when volume capacity reaches 0, or the specified number of days is reached, whichever comes first.
Softening or Filtering	20-1,500,000 Gallons	On 0	OFF	Regeneration occurs immediately when volume capacity reaches 0.
Softening	Auto	Normal + On 0	1-28 days	Regeneration occurs at the next regeneration time when volume capacity falls below the reserve capacity, or the specified number of days is reached, or regeneration occurs after 10 minutes of no water usage when volume capacity reaches 0.
Softening or Filtering	20 – 1,500,000 Gallons	Normal + On 0	1-28 days	Regeneration occurs at the next regeneration time the specified number of days is reached or regeneration occurs after 10 minutes of no water usage when volume capacity reaches 0.
Softening	Auto	Normal + On 0	OFF	Regeneration occurs at the next regeneration time when volume capacity falls below the reserve capacity, or regeneration occurs after 10 minutes of no water usage when volume capacity reaches 0.

⁴ Reserve capacity estimate is based on history of water usage. Reserve Capacity estimate is not available with alternator systems or Twin Tank Valve.

OEM Filter System Setup

Type	Backwash	Draw	Backwash	Rinse	Draw	Fill
Filtering DN Post	8	60	8	8		0.95 gal.
Filtering DN Post (2" valve)	8	60	8	8		6 min.

Cycle	Units	Range	Default
Backwash	MIN	1-120 or OFF	8
Rinse	MIN	1-120 or OFF	8
Draw (Up or Down)	MIN	1-160 or OFF	60
Fill (all but 2" valve)	GAL	0.05-20.00 or OFF	0.95
Fill (2" valve)	MIN	0.1-99.0 or OFF	6



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

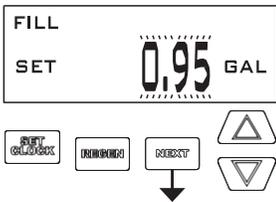
Step 2F – Choose FILTERING DN POST using ▼ or ▲. Press NEXT to go to Step 3F. Press REGEN to exit OEM Filter System Setup.

Step 3F – Select the time for the first cycle using ▼ or ▲. Press NEXT to go to Step 4F. Press REGEN to return to previous step.

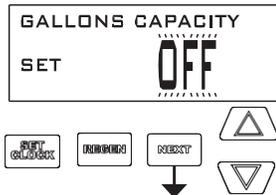
Step 4F – Select the time for the second cycle using ▼ or ▲. Press NEXT to go to Step 5F. Press REGEN to return to previous step.

Step 5F – Select the time for the third cycle using ▼ or ▲. Press NEXT to go to Step 6F. Press REGEN to return to previous step.

Step 6F – Select the time for the fourth cycle using ▼ or ▲. Press NEXT to go to Step 7F. Press REGEN to return to previous step.

STEP 7F

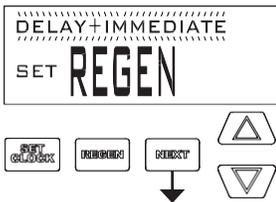
Step 7F – Select the gallons for the fifth cycle using ▼ or ▲. When 2.0 is selected in Step 2CS, FILL is in minutes. Press NEXT to go to Step 8F. Press REGEN to return to previous step.

STEP 8F

Step 8F – Set Volume Capacity using ▲ or ▼. If value is set to:

- “OFF” regeneration will be based solely on the day override set (see Installer Display/Settings Step 3I); or
- a number, regeneration initiation will be based off the value specified.

See Setting Options Table for more detail. Press NEXT to go to Step 9F. Press REGEN to return to previous step.

STEP 9F

Step 9F – Set Regeneration Time Options using ▲ or ▼. If “OFF” was selected in Step 7F, this screen will not appear.

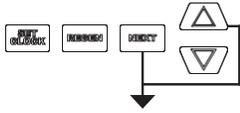
If value is set to:

- DELAYED REGENERATION means regeneration will occur at the preset time;
- IMMEDIATE REGENERATION means regeneration will occur immediately when the volume capacity reaches 0 (zero); or
- DELAY + IMMEDIATE REGENERATION means regeneration will occur at one of the following:
 - the preset time when the volume capacity falls below the reserve or the specified number of days between regenerations is reached whichever comes first; or
 - immediately after 10 minutes of no water usage when the volume capacity reaches 0 (zero). DELAYED REGENERATION is the default if Step 4CS is set to ALTA or ALTB, and DELAY + IMMEDIATE REGENERATION will not be available. IMMEDIATE REGENERATION is the default if Step 2CS is set to 1.0T, and DELAY + IMMEDIATE REGENERATION will not be available.

See Setting Options Table for more detail. Press NEXT to go to the remaining Filter System Setup screens. Refer to Softener System Setup starting at Step 11S for details. Press REGEN to return to previous step.

Installer Display Settings

STEP 1I



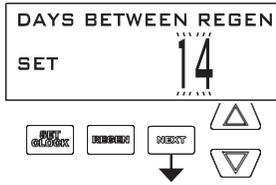
STEP 1I - Press NEXT and ▲ simultaneously for 3 seconds.

STEP 2I



STEP 2I – Hardness: Set the amount of hardness in grains of hardness as calcium carbonate per gallon using ▼ or ▲. 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 not appear if “FILTERING” is selected in Step 2F or if OFF or a number is set in Step 9S. Press NEXT to go to step 3I. Press REGEN to return to the previous step.

STEP 3I



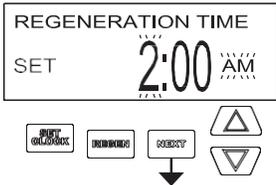
STEP 3I – Day Override: When volume capacity is set to “OFF”, sets the number of days between regenerations. When volume capacity is set to AUTO or to a number, sets the maximum number of days between regenerations. If value set to “OFF”, regeneration initiation is based solely on volume used. If value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

Day Override using ▼ or ▲:

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

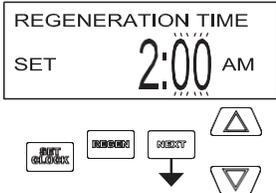
See Setting Options Table for more detail on setup. Press NEXT to go to step 4I. Press REGEN to return to previous step.

STEP 4I



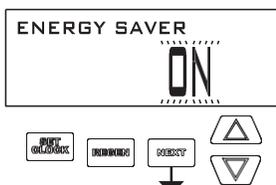
STEP 4I – Next Regeneration Time (hour): Set the hour of day for regeneration using ▼ or ▲. AM/ PM toggles after 12. The default time is 2:00 AM. This display will not appear if IMMEDIATE is selected in Set Regeneration Time Option in OEM Softener System Setup Step 10S. Press NEXT to go to step 5I. Press REGEN to return to previous step.

STEP 5I



STEP 5I – Next Regeneration Time (minutes): Set the minutes of day for regeneration using ▼ or ▲. This display will not be shown if IMMEDIATE is selected in Set Regeneration Time Option in OEM Softener System Setup Step 10S. Press NEXT to go to Step 6I. Press REGEN to return to previous step.

STEP 6I



STEP 6I – As an energy-saving feature, the control will automatically turn off the display illumination after 5 minutes of keypad inactivity. Any further keypad activity or water use will re-illuminate the display for 5 minutes. The Energy Saver feature default is ON.

Press NEXT to exit Installer Display Settings. Press REGEN to return to previous step.

RETURN TO NORMAL MODE

User Display Settings

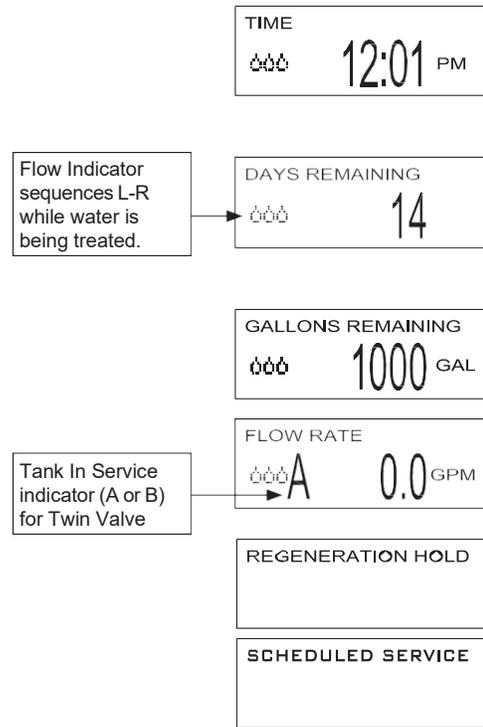
General Operation

When the system is operating, one of several displays may be shown. The displays normally rotate, however pressing NEXT will pause on the selected display for 5 minutes. Pressing NEXT will alternate between the displays. One of the displays is always the current time of day. Days Remaining is the number of days left before the system goes through a regeneration cycle. Gallons Remaining is the gallons that will be treated before the system goes through a regeneration cycle. Pressing ▼ while in the Gallons Remaining display will decrease the capacity remaining in 10 gallon increments and will also increase the volume used impacting the recorded values in Diagnostics Steps 3D, 4D and 5D and Valve History, Step 4VH.

Another display shows the current treated water flow rate through the system. Either REGENERATION DP or REGENERATION HOLD will be displayed if the dP switch is closed. To clear the Service Call reminder, press ▲ and ▼ simultaneously while the number and banner text screen is displayed.

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

If a water meter is installed, the flow indicator flashes on the display when water is being treated (i.e. water is flowing through the system).



REGEN PENDING will be displayed in Alternator Systems whenever a unit is waiting to initiate the first cycle step of regeneration. The name of an active MAV will also be indicated in this display.



STAND BY will be displayed in Alternator Systems when a valve is in Standby state. The name of an active MAV will also be indicated in this display.

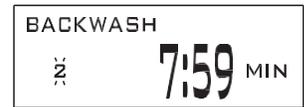


DELAYED RINSE+FILL PENDING will be displayed whenever a zero-capacity tank has transferred to an off-line state and is currently waiting to initiate the second portion of a regeneration cycle. Viewed only when Delayed Rinse and Fill is set to ON.



Regeneration Mode

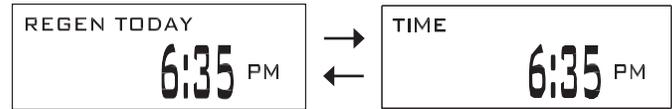
Typically a system is set to regenerate at a time of low water usage. An example of a time with low water usage is when a household is asleep. If there is a demand for water when the system is regenerating, untreated water will be used.



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.



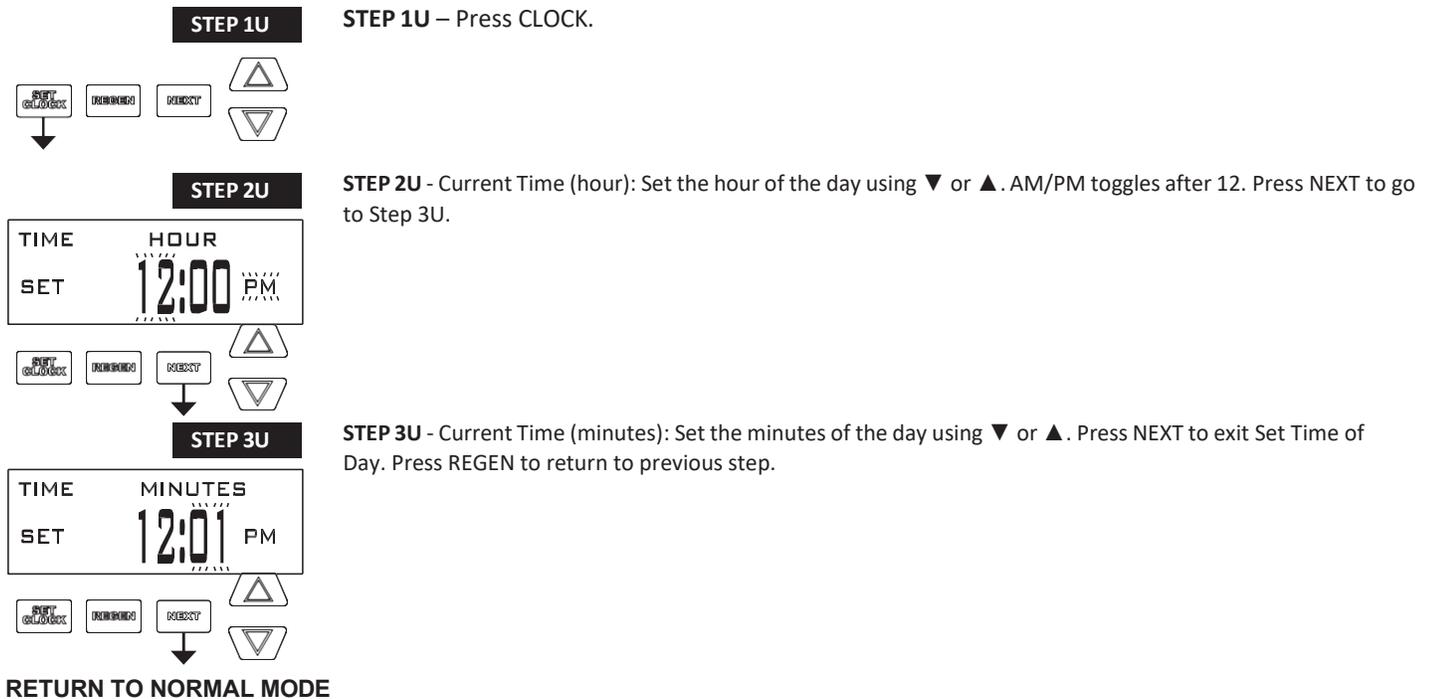
To initiate a manual regeneration at the preset delayed regeneration time, when the regeneration time option is set to DELAYED REGENERATION or DELAY + IMMEDIATE REGENERATION, press and release REGEN. The words REGEN TODAY will periodically be shown on the display to indicate that the system will regenerate 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 IMMEDIATE REGENERATION there is no set delayed regeneration time so REGEN TODAY will not activate if REGEN 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 if the battery has been depleted because of 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. The non rechargeable battery should also be replaced.

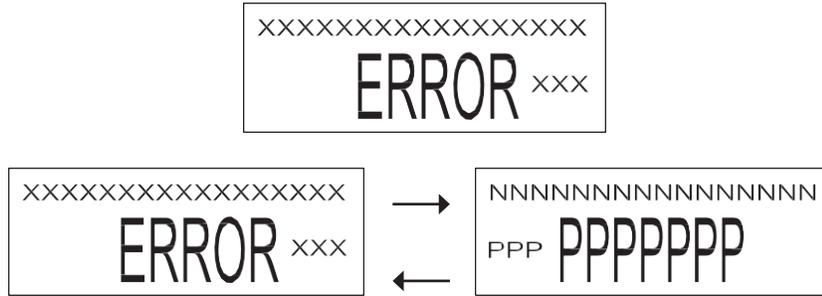


Power Loss

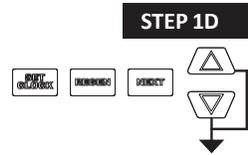
If the power goes out the system will keep time until the battery is depleted. If an extended power outage occurs, the time of day will flash on and off which indicates the time of day should be reset and the non rechargeable battery replaced. The system will remember the rest.

Error Message

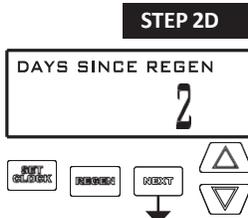
If the word "ERROR" and a number are displayed contact the OEM for help. This indicates that the valve was not able to function properly. If the number and banner text in the Contact Screens has been edited, the two displays below will alternate.



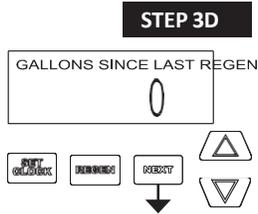
Diagnostics



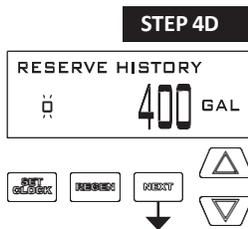
STEP 1D – Press ▲ and ▼ simultaneously for three seconds. If screen in step 2D does not appear in 5 seconds the lock on the valve is activated. To unlock press ▼, NEXT, ▲, and CLOCK in sequence, then press ▲ and ▼ simultaneously for 3 seconds.



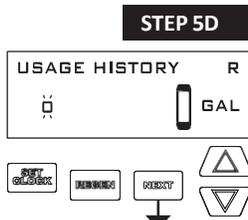
STEP 2D – Days, since last regeneration: This display shows the days since the last regeneration occurred. Press NEXT to go to Step 3D. Press REGEN to exit Diagnostics.



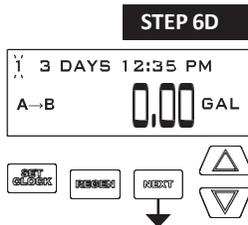
STEP 3D – Volume, since last regeneration: This display shows the volume of water that has been treated since the last regeneration. This display will equal zero if a water meter is not installed. Press NEXT to go to Step 4D. Press REGEN to return to previous step.



STEP 4D – Reserve History Volume used for last 7 days: If the valve is set up as a softener, a meter is installed and Set Volume Capacity is set to “Auto,” this display shows 0 day (for today) and the reserve capacity. Pressing ▲ will show day 1 (which would be yesterday) and the reserve capacity used. Pressing ▲ again will show day 2 (the day before yesterday) and the reserve capacity. Keep pressing ▲ to show the capacity for days 3, 4, 5 and 6. ▼ can be pressed to move backwards in the day series. This screen is not displayed if filter, time clock, meter immediate, alternator or volume override regeneration is selected. Press NEXT at any time to go to Step 5D. Press REGEN to return to previous step.

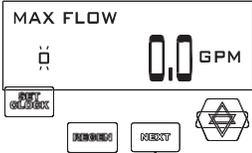


STEP 5D - Volume, 63-day usage history: This display shows day 0 (for today), day 1 (for yesterday), etc., and the volume of water treated that day. Press ▲ to show the volume of water treated for the last 63 days. If a regeneration occurred on the day the letter “R” will also be displayed. This display will show dashes if a water meter is not installed. Press NEXT at any time to go to Step 6D. Press REGEN to return to previous step.



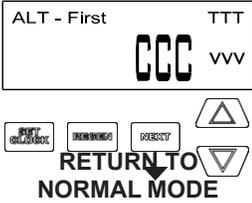
STEP 6D - Tank Transfer History. Only displayed when 1.0T is selected in Step 2CS. Use ▲ or ▼ to scroll through the last 10 tank transfers. “1”= transfer number – 10 transfers maximum. “A” = tank transferring. “3 DAYS” = days ago of transfer – 99 days maximum. “0.00 GAL” = gallons used at time of tank transfer. “12:35 PM” = time of transfer. Press NEXT to go to Step 7D. Press REGEN to return to previous step.

STEP 7D



STEP 7D – Flow rate, maximum last seven days: Use ▲ or ▼ to display the maximum flow rate in gallons per minute that occurred in each of the last seven days. This display will equal zero if a water meter is not installed. Press NEXT to go to Step 8D. Press REGEN to return to previous step.

STEP 8D



STEP 8D – MAV Drive History: Displays the drive time histories of all active MAV drives. Use ▲ or ▼ to review the history of all active MAV outputs. TTT – measured MAV drive time; VVV – measured MAV drive voltage; CCC – total number of drives (in or out); “+” indicates piston drive out of MAV; “-” indicates piston drive in to MAV. If a MAV is replaced, it is recommended that the diagnostics screen for that MAV be cleared. That is done by selecting the + or – screen for that MAV. Press and hold ▲ and ▼ for about 3 seconds. Failure to do this may result in inconsistent MAV operation.

When a MAV error occurs, the Drive History will automatically be reset. To view previously recorded history, press and hold CLOCK and ▲. The display will be similar to the normal MAV drive history display, with the addition of EEE – MAV error code present at the time of reset. If the display shows “---”, there was no MAV error before the reset.

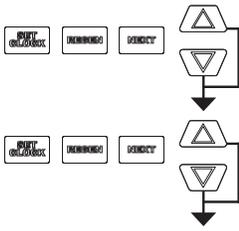


Press NEXT to exit Diagnostics. Press REGEN to return to previous step.

When desired, all programming and information in Diagnostics may be reset to defaults when the valve is installed in a new location. To reset to defaults, press NEXT and ▼ simultaneously to go to the Softening/Filtering screen. Press ▲ and ▼ simultaneously to reset programming and diagnostic values to defaults. Screen will return to User Display.

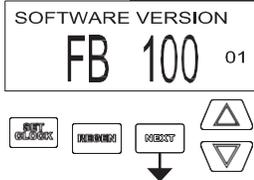
Valve History

STEP 1VH



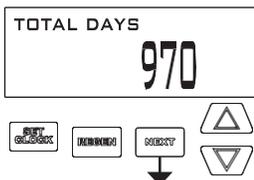
STEP 1VH – Press ▲ and ▼ simultaneously for three seconds and release. Then press ▲ and ▼ simultaneously and release. If screen in step 2VH does not appear in 5 seconds the lock on the valve is activated. To unlock press ▼, NEXT, ▲, and CLOCK in sequence, then press ▲ and ▼ simultaneously for 3 seconds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

STEP 2VH



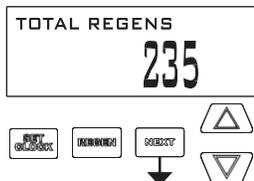
STEP 2VH – Software version. Displays the current software version. Press NEXT to go to Step 3VH. Press REGEN to exit Valve History.

STEP 3VH



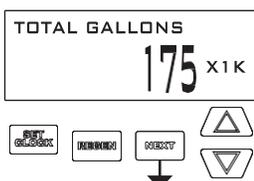
STEP 3VH⁵ – Days, total since start-up: This display shows the total days since startup. Press NEXT to go to Step 4VH. Press REGEN to return to previous step.

STEP 4VH



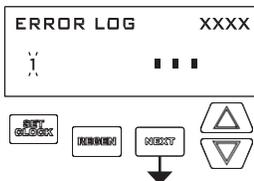
STEP 4VH – Regenerations, total number since start-up: This display shows the total number of regenerations that have occurred since startup. Press NEXT to go to Step 5VH. Press REGEN to return to previous step.

STEP 5VH



STEP 5VH – Volume, total used since start-up: This display shows the total gallons treated since startup. This display will equal zero if a water meter is not installed. Press NEXT to go to Step 6VH. Press REGEN to return to previous step.

STEP 6VH



STEP 6VH – Error Log. This display shows a history of the last 10 errors generated by the control during operation. The motor position count at the time of drive error detection is recorded in the top line of the display. Press ▲ or ▼ to view each error recorded. Press NEXT to exit Valve History. Press REGEN to return to previous step.

RETURN TO NORMAL MODE

⁵ Values in steps 2VH through 5VH cannot be reset.

Troubleshooting

Problem	Possible Cause	Solution
1. No Display on PC Board	a. No power at electric outlet	a. Repair outlet or use working outlet
	b. Control valve Power Adapter not plugged into outlet or power cord end not connected to PC board connection	b. Plug Power Adapter into outlet or connect power cord end to PC Board connection
	c. Improper power supply	c. Verify proper voltage is being delivered to PC Board
	d. Defective Power Adapter	d. Replace Power Adapter
	e. Defective PC Board	e. Replace PC Board
2. PC Board does not display correct time of day	a. Power Adapter plugged into electric outlet controlled by light switch	a. Use uninterrupted outlet
	b. Tripped breaker switch and/or tripped GFI	b. Reset breaker switch and/ or GFI switch
	c. Power outage	c. Reset time of day. If PC Board has battery backup present the battery may be depleted. See Front Cover and Drive Assembly drawing for instructions.
	d. Defective PC Board	d. Replace PC Board
3. Display does not indicate that water is flowing. Refer to user instructions for how the display indicates water is flowing	a. Meter is not connected to meter connection on PC Board	a. Connect meter to three pin connection labeled METER on PC Board
	b. Restricted/ stalled meter turbine	c. Remove meter and check for rotation or foreign material
	c. Meter wire not installed securely into three pin connector	c. Verify meter cable wires are installed securely into three pin connector labeled METER
	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 outage	a. Reset time of day. If PC Board has battery backup present the battery may be depleted. See Front Cover and Drive Assembly drawing for instructions.
	b. Time of day not set correctly	b. Reset to correct time of day
	c. Time of regeneration set incorrectly	c. Reset regeneration time
	d. Control valve set at "on 0" (immediate regeneration)	d. Check programming setting and reset to NORMAL (for a delayed regen time)
	e. Control valve set at "NORMAL + on 0" (delayed and/ or immediate)	e. Check programming setting and reset to NORMAL (for a delayed regen time)
5. Time of day flashes on and off	a. Power outage	a. Reset time of day. If PC Board has battery backup present the battery may be depleted. See Front Cover and Drive Assembly drawing for instructions.
6. Control valve does not regenerate automatically when the REGEN button is depressed and held.	a. Broken drive gear or drive cap assembly	a. Replace drive gear or drive cap assembly
	b. Broken Piston Rod	b. Replace piston rod
	c. Defective PC Board	c. Defective PC Board
7. Control valve does not regenerate automatically but does when the REGEN button is depressed and held.	a. Meter is not connected to meter connection on PC Board	a. Connect meter to three pin connection labeled METER on PC Board
	b. Restricted/ stalled meter turbine	b. Remove meter and check for rotation or foreign material
	c. Incorrect programming	c. Check for programming error
	d. Meter wire not installed securely into three pin connector	d. Verify meter cable wires are installed securely into three pin connector labeled METER
	e. Defective meter	e. Replace meter
	f. Defective PC Board	f. Replace PC Board

Problem	Possible Cause	Solution
8. Hard or untreated water is being delivered	a. Media is exhausted due to high water usage	a. Check program settings or diagnostics for abnormal water usage
	b. Meter not registering	b. Remove meter and check for rotation or foreign material
	c. Water quality fluctuation	c. Test water and adjust program values accordingly
	d. No regenerant or low level of regenerant in regenerant tank	d. Add proper regenerant to tank
	e. Control fails to draw in regenerant	e. Refer to Trouble Shooting Guide number 12
	f. Insufficient regenerant level in regenerant tank	f. Check refill setting in programming. Check refill flow control for restrictions or debris and clean or replace
	g. Damaged seal/stack assembly	g. Replace seal/stack assembly
	h. Control valve body type and piston type mix matched	h. Verify proper control valve body type and piston type match
	i. Fouled media bed	i. Replace media bed
9. Control valve uses too much regenerant	a. Improper refill setting	a. Check refill setting
	b. Improper program settings	b. Check program setting to make sure they are specific to the water quality and application needs
	c. Control valve regenerates frequently	c. Check for leaking fixtures that may be exhausting capacity or system is undersized
10. Residual regenerant being delivered to service	a. Low water pressure	a. Check incoming water pressure – water pressure must remain at minimum of 25 psi
	b. Incorrect injector size	b. Replace injector with correct size for the application
	c. Restricted drain line	c. Check drain line for restrictions or debris and clean
11. Excessive water in regenerant tank	a. Improper program settings	a. Check refill setting
	b. Plugged injector	b. Remove injector and clean or replace
	c. Drive cap assembly not tightened in properly	c. Re-tighten the drive cap assembly
	d. Damaged seal/ stack assembly	d. Replace seal/ stack
	e. Restricted or kinked drain line	e. Check drain line for restrictions or debris and or straighten drain line
	f. Plugged backwash flow controller	f. Remove backwash flow controller and clean or replace
	g. Missing refill flow controller	g. Replace refill flow controller
12. Control valve fails to draw in regenerant	a. Injector is plugged	a. Remove injector and clean or replace
	b. Faulty regenerant piston	b. Replace regenerant piston
	c. Regenerant line connection leak	c. Inspect regenerant line for air leak
	d. Drain line restriction or debris cause excess back pressure	d. Inspect drain line and clean to correct restriction
	e. Drain line too long or too high	e. Shorten length and or height
	f. Low water pressure	f. Check incoming water pressure – water pressure must remain at minimum of 25 psi
13. Water running to drain	a. Power outage during regeneration	a. Upon power being restored control will finish the remaining regeneration time. Reset time of day.
	b. Damaged seal/ stack assembly	b. Replace seal/ stack assembly
	c. Piston assembly failure	c. Replace piston assembly
	d. Drive cap assembly not tightened in properly	d. Re-tighten the drive cap assembly

Problem	Possible Cause	Solution
<p>14. E1, Err – 1001, Err – 101 = Control unable to sense motor movement</p>	<p>a. Motor not inserted full to engage pinion, motor wires broken or disconnected</p>	<p>a. Disconnect power, make sure motor is fully engaged, check for broken wires, make sure two pin connector on motor is connected to the two pin connection on the PC Board labeled MOTOR. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.</p>
	<p>b. PC Board not properly snapped into drive bracket</p>	<p>b. Properly snap PC Board into drive bracket and then Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.</p>
	<p>c. Missing reduction gears</p>	<p>c. Replace missing gears</p>
<p>15. E2, Err – 1002, Err – 102 = Control valve motor ran too short and was unable to find the next cycle position and stalled</p>	<p>a. Foreign material is lodged in control valve</p>	<p>a. Open up control valve and pull out piston assembly and seal/ stack assembly for inspection. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.</p>
	<p>b. Mechanical binding</p>	<p>b. Check piston and seal/ stack assembly, check reduction gears, check drive bracket and main drive gear interface. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.</p>
	<p>c. Main drive gear too tight</p>	<p>c. Loosen main drive gear. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.</p>
	<p>d. Improper voltage being delivered to PC Board</p>	<p>d. Verify that proper voltage is being supplied. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.</p>
<p>16. E3, Err – 1003, Err – 103 = Control valve motor ran too long and was unable to find the next cycle position</p>	<p>a. Motor failure during a regeneration</p>	<p>a. Check motor connections then Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.</p>
	<p>b. Foreign matter built up on piston and stack assemblies creating friction and drag enough to time out motor</p>	<p>b. Replace piston and stack assemblies. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.</p>
	<p>c. Drive bracket not snapped in properly and out enough that reduction gears and drive gear do not interface</p>	<p>c. Snap drive bracket in properly then Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.</p>

Problem	Possible Cause	Solution
<p>17. Err – 1004, Err – 104 = Control valve motor ran too long and timed out trying to reach home position</p>	<p>a. Drive bracket not snapped in properly and out enough that reduction gears and drive gear do not interface</p>	<p>a. Snap drive bracket in properly then Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.</p>
<p>18. Err -1006, Err – 106, Err - 116 = MAV/ SEPS/ NHBP/ AUX MAV valve motor ran too long and unable to find the proper park position</p> <p>Motorized Alternating Valve = MAV</p> <p>Separate Source = SEPS</p> <p>No Hard Water Bypass = NHBP</p> <p>Auxiliary MAV = AUX MAV</p>	<p>a. Control valve programmed for ALT A or b, nHbP, SEPS, or AUX MAV without having a MAV or NHBP valve attached to operate that function</p>	<p>a. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect. Then re-program valve to proper setting</p>
	<p>b. MAV/ NHBP motor wire not connected to PC Board</p>	<p>b. Connect MAV/ NHBP motor to PC Board two pin connection labeled DRIVE. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.</p>
	<p>c. MAV/ NHBP motor not fully engaged with reduction gears</p>	<p>c. Properly insert motor into casing, do not force into casing Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.</p>
	<p>d. Foreign matter built up on piston and stack assemblies creating friction and drag enough to time out motor</p>	<p>d. Replace piston and stack assemblies. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.</p>
<p>19. Err – 1007, Err – 107, Err - 117 = MAV/ SEPS/ NHBP/ AUX MAV valve motor ran too short (stalled) while looking for proper park position</p> <p>Motorized Alternating Valve = MAV</p> <p>Separate Source = SEPS</p> <p>No Hard Water Bypass = NHBP</p> <p>Auxiliary MAV = AUX MAV</p>	<p>a. Foreign material is lodged in MAV/ NHBP valve</p>	<p>a. Open up MAV/ NHBP valve and check piston and seal/ stack assembly for foreign material. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.</p>
	<p>b. Mechanical binding</p>	<p>b. Check piston and seal/ stack assembly, check reduction gears, drive gear interface, and check MAV/ NHBP black drive pinion on motor for being jammed into motor body. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.</p>

Water Treatment System Warranty

This quality FRAKCO water softener is designed and built to provide many years of satisfactory performance under normal use. FRAKCO, INC. pledges to the original owner that for sixty months, all non-wearable items of the above-described water treatment system proven to be defective due to workmanship and/or materials will be replaced or repaired. Our pledge does not apply if the damage is caused by defective installation; water pressure in excess of eighty pounds per square inch; water temperature in excess of 110° F.; misuse; unauthorized alterations; freezing; accident; fire; neglect; or damage caused by shipping.

To obtain service under this warranty, notify FRAKCO, INC in writing of any defects in workmanship within thirty days of the appearance of such defects. Such written notice must include the date of purchase, the part number, and a description of the defect. Upon receiving such notice and determining that the defect is covered by this warranty, FRAKCO, INC. will replace or repair the defective item. Replacement of a defective item will be at FRAKCO'S factory in Luverne, MN, and the purchaser must ship the defective item at its own expense to FRAKCO'S factory. Replacement items will be shipped by FRAKCO F.O.B. Luverne, Minnesota, with a shipping carton furnished. In the event certain models or colors of the replacement item are out of stock, FRAKCO, INC. may, after notifying the purchaser, furnish another model or color of the replacement item. The factory will not pay for service charges and will not perform any repair or service functions other than at its home office. Please follow the enclosed instructions and local codes in installing your water treatment system. Failure to do so will void this warranty. Nothing in the warranty may be construed as involving the factory in the relationship between Dealer and Owner.

This warranty gives the purchaser specific legal rights. The purchase may also have implied warranty rights. In the event of a problem with warranty service or performance, the purchaser may be able to go to a Small Claims Court, a State Court, or a Federal District Court. This warranty complies with the 1975 Federal Warranty Law.

Model No. _____ Serial No. _____

Date Installed _____ Dealer _____

Address _____

*MANUFACTURED BY: FRAKCO, INC.
500 N BLUE MOUND AVE
LIVERNE, MINNESOTA
56156 WWW.FRAKCO.COM*

