



**INSTALLATION, OPERATION,
AND MAINTENANCE MANUAL**

**MAT 60M-450M
TWIN ALTERNATING
METERED 1-1/2" SXT SERIES
COMMERCIAL WATER CONDITIONERS**

COMPLETE FOR FUTURE REFERENCE:

MODEL NO:

SERIAL NO:

DATE INSTALLED:

DEALER:

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MAT 60M-450M SXT 1-1/2" TWIN ALTERNATING METERED

Please Circle and/or Fill in the Appropriate Data for Future Reference:

Softener Model: **MAT**
System Size: **Twin Alternating - Twin Tank**
Configuration: **Timeclock/Electromechanical Metered/SXT Metered/XT Metered**
BW/Regen Time: _____ **AM/PM or OFF**

Additional Notes: _____

IMPORTANT PLEASE READ:

- Warranty of this product extends to manufacturing defects.
- The information, specifications and illustrations in this manual are based on the latest information available at the time of printing. The manufacturer reserves the right to make changes at any time without notice.
- This product should be installed by a plumbing professional on potable water systems only.
- This product must be installed in compliance with all local and state and municipal plumbing and electrical codes. Permits may be required at the time of installation.
- If operating pressure exceeds 100 psi a pressure reducing valve must be installed. If operating pressure drops below 30 psi a booster pump must be installed.
- Do not install the unit where temperatures may drop below 32°F or rise above 100°F.
- A prefilter should be used on installations in which free solids are present.
- A constant voltage of 120V/60Hz (unless otherwise specified) must be supplied to the controller to maintain proper function.
- Union or flange fittings are recommended at the control valve's inlet, outlet, and drain connections
- If distance of drain line is over a 10 ft. vertical or 25 ft. horizontal run, increase drain line one pipe size over that provided on the control valve.
- Do not make a direct connection to the drain. Provide an air gap of at least four times the diameter of the pipe to conform to sanitation codes and to permit observation of the flow.

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COMMERCIAL AND INDUSTRIAL PRODUCT WARRANTY

Marlo, Inc. warrants all commercial and industrial water treatment products manufactured and/or distributed by it to be free from defects in materials and workmanship for a period of one (1) year from the date of shipment. The fiberglass mineral tank(s) alone have a warranty for a period of five (5) year from the date of shipment. If within that period any products shall be proven to Marlo, Inc.'s satisfaction to be defective, those products will be replaced or the price refunded at Marlo Inc.'s option.

Marlo Inc.'s obligations or nonperformance, defective, or any damage caused by its products or their use, and buyer's exclusive remedy therefore, shall be limited to product replacement or refund and shall be conditioned upon Marlo Inc.'s receiving written notice together with a demand for such replacement or refund:

The foregoing warranty is exclusive and in lieu of all other expressed implied warranty (except of title) including but not limited to implied warranty of merchantability and fitness for particular purpose.

Marlo Inc. will not be subject to and disclaims the following:

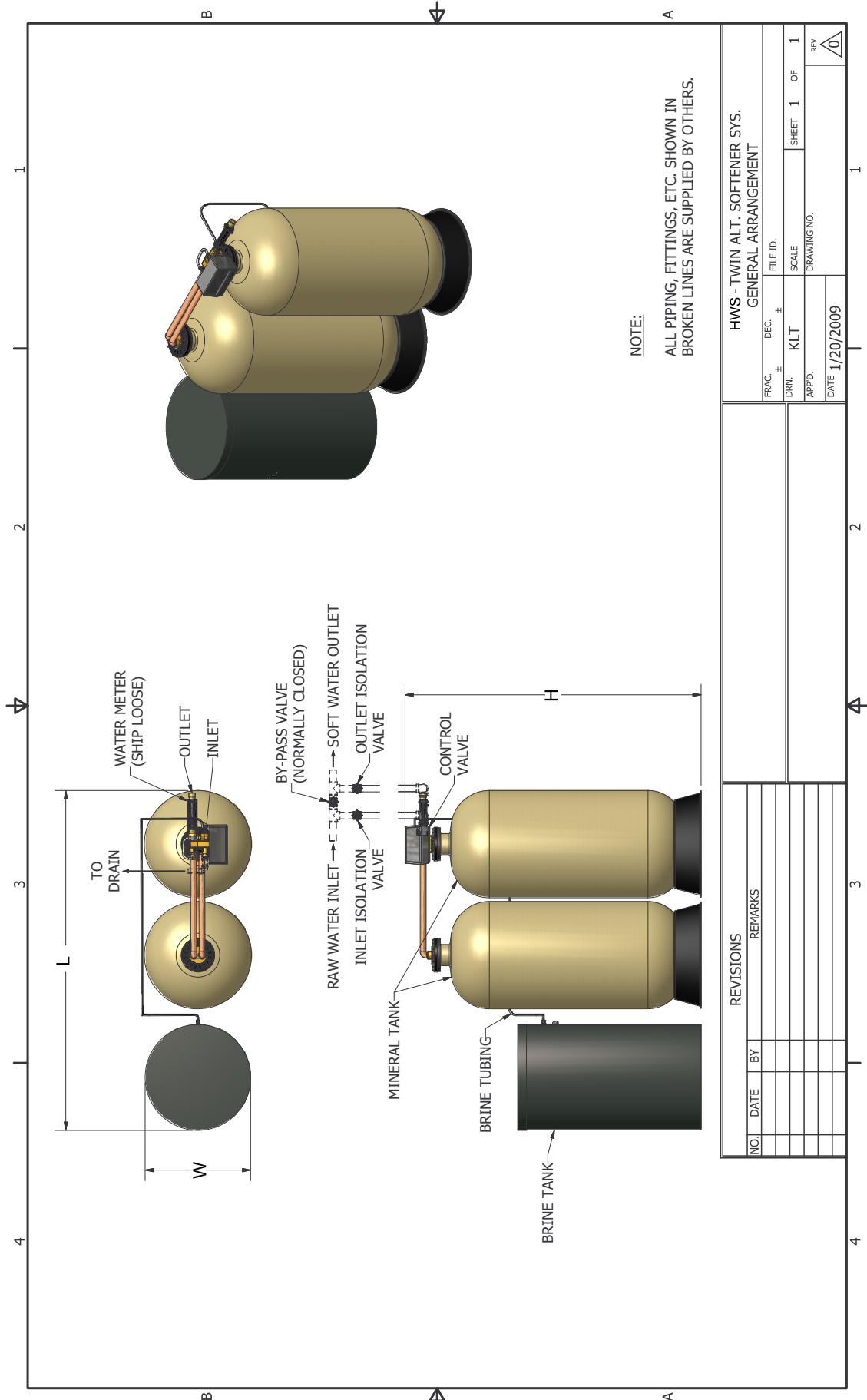
1. Any other obligations or liabilities arising out of breach of contract or out of warranty.
2. Any obligations whatsoever arising from tort claims (including negligence and strict liability or arising under other theories of law with respect to products sold or services rendered by Marlo Inc. or any undertakings, acts, or omissions relating thereto.
3. All consequential, incidental, and contingent damages.
Labor charges, charge backs or handling charges are excluded from Marlo Inc.'s warranty provisions.

COMMERCIAL AND INDUSTRIAL WATER SOFTENER GUARANTEE

Under normal operating conditions:

1. The softener effluent shall be zero soft as determined by a soap test.
2. The loss of softening resin through attrition during the first three (3) years shall not exceed 3% per year.
3. The softening resin shall not be washed out of the system during backwash.
4. The color and turbidity of the softener effluent shall not be greater than the incoming water.
Any mechanical equipment proving defective in workmanship or material within one year after installation or eighteen (18) months after shipment, whichever comes first, shall be replaced FOB factory.





NOTE:

ALL PIPING, FITTINGS, ETC. SHOWN IN
BROKEN LINES ARE SUPPLIED BY OTHERS.

HWS - TWIN ALT. SOFTENER SYS. GENERAL ARRANGEMENT			
FRAC. #	DEC. #	FILE ID.	
DRW. #	KLT	SCALE	SHEET 1 OF 1
APPD.	DATE 1/20/2009	DRAWING NO.	REV. 0

REVISIONS	
NO.	REMARKS

NO.	DATE	BY	REMARKS

DIMENSION CHART

MODEL	INLET SIZE (Inches)	TANK SIZE		LENGTH (Inches)	WIDTH (Inches)	HEIGHT* (Inches)
		SOFTENER (Inches)	BRINE (Inches)			
60	1-1/2	12x52	18x40	36	18	65
90	1-1/2	14x65	18x40	38	18	78
120	1-1/2	16x65	24x40	46	25	78
150	1-1/2	18x65	24x50	48	24	79
210	1-1/2	21x62	24x50	51	24	76
240	1-1/2	24x72	24x50	54	24	86
300	1-1/2	24x72	24x50	54	24	86
450	1-1/2	30x72	30x50	66	30	93

*Leave a minimum 24 inch clearance to the height of the unit for loading media.
Dimensions are for general arrangement use only.

SPECIFICATION CHART

SYSTEM SIZE	MODEL	60	90	120	150	180	210	240	270	300	450	
	VALVE SIZE (IN)	1-1/2	1-1/2	1-1/2	1-1/2	1-1/2	1-1/2	1-1/2	1-1/2	1-1/2	1-1/2	1-1/2
	MAX CAPACITY (KILOGRAINS)	60	90	120	150	180	210	240	270	300	450	
	MIN CAPACITY (KILOGRAINS)	40	60	80	100	120	140	160	180	200	300	
FLOWRATE (GPM)	SERVICE - CONTINUOUS (GPM)	28	31	34	38	41	39	43	42	41	45	
	SERVICE - PEAK (GPM)	39	42	46	50	54	52	57	55	55	62	
	BACKWASH & FAST FLUSH (GPM)	3.5	5	6	8	12	12	15	15	15	25	
	BRINE DRAW & RINSE (GPM)	0.8	0.8	0.8	1.3	2.0	2.0	3.2	3.2	3.2	3.2	
	BRINE TANK REFILL (GPM)	1	1	1	2	2	2	2.2	2	2	5	
TIMER SETTINGS	BACKWASH & FAST FLUSH (MIN)	10	10	10	10	10	10	10	10	10	10	
	BRINE DRAW & RINSE (MIN)	60	60	60	60	60	60	60	60	60	60	
	FAST FLUSH (MIN)	10	10	10	10	10	10	10	10	10	10	
	BRINE TANK REFILL (MIN)	10	16	20	14	16	18	20	22	26	16	
SOFTENER TANK	SIZE (IN)	13x54	14x65	16x65	18x65	21x62	21x62	24x72	24x72	24x72	30x72	
	GRAVEL (LBS)	0	30	35	40	80	80	120	120	120	225	
	RESIN (FT ³)	2	3	4	5	6	7	8	9	10	15	
	FREEBOARD (IN)	16	21	21	24	23	18	30	25	21	22	
BRINE SYSTEMS	EQUIPMENT	TANK SIZE	18x40	18x40	24x40	24x50	24x50	24x50	24x50	24x50	24x50	30x50
		MAX SALT STORAGE (LBS)	270	270	550	630	600	550	530	500	420	640
		INJECTOR CODE	2	3	3	3C	4C	4C	5C	5C	5C	5C
		INJECTOR COLOR	BLU	YEL	YEL	YEL	GRN	GRN	WHT	WHT	WHT	WHT
	SALT	SALT DOSAGE- MAX (LBS)	30	45	60	75	90	105	120	135	150	225
		SALT DOSAGE- MIN (LBS)	12	18	24	30	36	42	48	54	60	90
	REFILL	REFILL TIME - MAX (MIN)	10	16	20	14	16	18	20	22	26	16
		REFILL TIME - MIN (MIN)	4	6	8	6	6	8	8	10	10	6
	REGEN	REGEN PER SALT REFILL-MAX	9	6	9	8	6	5	4	3	2	2
		REGEN PER SALT REFILL-MIN	26	15	23	17	17	17	10	8	6	7
	REGENERATION WASTE VOLUME (GAL)		126	156	188	228	272	366	520	536	544	860

SPECIFICATION NOTES

Maximum salting is 15 pounds of salt per cubic foot of resin.
 Minimum salting is 6 pounds of salt per cubic foot of resin.

The regeneration timer is setup for maximum salting at the factory.
 The Timer Settings are factory set and user adjustable.

On continuous flow rates pressure loss does not exceed 15 psig.
 On peak flow rates pressure loss does not exceed 30 psig.

Minimum operating pressure is 30 psi.
 Maximum operating pressure is 120 psi.

Standard units are designed to soften unheated water within the range of 35-100°F.
 Power requirements are 120 Volt, 60 Hertz, Single Phase, 2 amps non-interrupted.

Freeboard is the distance between the surface of the resin and the top of the tank.
 Salt specifications are pelletized or solar salt, 99% pure, containing less than 1% insolubles.

INSTALLATION INSTRUCTIONS**GENERAL INFORMATION**

1. Minimum operating pressure is 30 psi. If pressure less than 30 psi is encountered, a regulator must be installed

NOTE: The control valve will not operate correctly if feeding into an atmospheric tank. A pressure control device must be added to the outlet to maintain the minimum pressure.

2. Maximum operating pressure is 120 psi. If pressure greater than 120 psi is encountered, a pressure regulator must be installed.

3. Power requirements are shown on a voltage sticker on the motor inside cover of the control valve. You can also tell by wire color on the motor: Black wires are 115 volt. Yellow wires are 220 volt. Blue wires are 24 volt.

4. Standard units are designed to soften unheated water not to exceed 100° F. Special valve assemblies are available to handle heated water supplies exceeding 100°F. Consult factory if applicable.

5. Each softener tank is shipped with distributor manifold and control valve preassembled. Take care when uncrating and erecting so that no items are damaged.

6. The distributor assembly has been shipped inside the fiberglass mineral tank. Check to make sure that there is no damage to the riser pipe, baskets, laterals, or hub prior to loading media.

LAYOUT REQUIREMENTS

1. Select a location that is accessible and near a floor drain that has adequate carrying capacity to handle the softener regeneration flow. See specification table for the flow rate. Allow a minimum of 24” above the tank for loading media.

2. Erect each the softener tanks on a concrete or other firm foundation and level.

NOTE: If the system is skid mounted, it will be prepiped and preloaded at the factory. Skip the following instructions and go to the section “Installation of Connection Piping”.

3. Position the brine tank according to the illustration and supplementary brine tank information. Keep the brine tank as close as possible to the softener tanks.

NOTE: The distance between the softener and brine tanks will affect the brine injector performance, as the distance increases the injector performance decreases. This may cause an inadequate regeneration. Maximum recommended distance is 5 ft.

4. A grounded electric receptacle is required for the control valve transformer.

INSTALLATION INSTRUCTIONS

LOADING TANK

NOTE: If the system is skid mounted, it will be prepiped and preloaded at the factory. Skip the following instructions and go to the section of “Installation of connection piping”.

1. On Models MAT-15, 30, 45, and 60 the softening media has been pre-loaded at the factory. Skip this section and go to “Mounting Control Valve Assembly”.
2. Fill a tank approximately 1/3 full of water using a hose, bucket, etc. Plug the PVC distributor manifold pipe using a plastic cap, cork, rag, etc. No gravel or resin should go into this distributor manifold pipe.
3. Verify the distributor manifold is center in the tank with the distributor resting on the bottom of the tank. Verify the riser pipe is still plugged.

NOTE: Reference the specification table in the front of this manual for the correct quantities of gravel and resin. These quantities are for each tank. Make sure you have the required amounts on site before you begin.

4. With care not to damage any lateral, pour in the gravel provided for each tank through the top opening in the tank and level out evenly. This will cover the distributor assembly.

NOTE: Wetting the gravel in the bags before loading will eliminate the normal amount of dust.

5. When gravel is loaded and leveling is completed, proceed as follows:
6. With the distributor riser pipe still plugged, add the proper amount of resin supplied for each tank through the top opening in the tank.

CAUTION: The softener resin is very slippery. Take care when stepping on any spilled resin. Remove spilled resin from standing surface immediately.

7. When loading is complete, remove plastic cap, cork, or rag that was used to plug the distributor riser pipe. Be careful not to let any foreign debris fall into the pipe. The result could be damage to system.
8. Repeat instruction steps 1-7 for the second softener tank.

MOUNTING WATER METER ASSEMBLY (MAY BE FACTORY CONNECTED)

1. Locate the meter. The water meter has a flow arrow stamped on it. The flow arrow on the meter should be pointing away from the control valve.
2. Attach the meter to the control valve’s outlet water connection.
3. Interconnect meter cable between the control valve timer and water meter dome.

MOUNT CONTROL VALVE ASSEMBLY

1. Verify that the distributor riser pipe is not plugged.
2. Lubricate the distributor o’ring on the bottom of the control valve with silicone.
3. Insert disperser in threaded base of control valve. The threaded base has a groove machined into the inside of the threaded part of the base to allow for the installation of this disperser.
4. Screw control valve into top opening of tank making sure the distributor riser pipe slides easily through the distributor o’ring. Care must be taken not to “nick” this o-ring as hard water leakage could result.
5. Tighten down the control valve to ensure positive o-ring seal at top of tank.
6. Repeat instruction steps 1-5 for each softener tank (if applicable).



INSTALLATION OF CONNECTION PIPING

NOTES:

- Use thread sealing tape on all threaded piping connections.
- Install the piping conforming to federal, provincial, and local codes.
- Unions or flanges are recommended at the control valve's inlet and outlet connections• To enhance the monitoring of the system's performance sample valves and pressure gauges can be installed at the inlet and outlet piping of the softening unit (not provided).
- If distance of drain line is over 10 ft. vertical or 25 ft. horizontal run, increase drain line one pipe size over that provided on the control valve.
- Do not make a direct connection to the drain. Provide an air gap of at least four times the diameter of the pipe to conform to sanitation codes and to permit observation of the flow.
- It is not recommended that an overhead or a long horizontal drain run be used. The increase of backpressure will cause problems when drawing brine.

Caution: All piping must be properly supported. The tank and valve assemblies are not meant to support the connecting piping.

1. Install piping as shown on installation diagram. It is recommended that unions be installed before the inlet and outlet valves to facilitate service of unit. Be sure piping is free of thread chips and other foreign matter. The connecting piping should be the same size or larger than the service inlet and outlet of the control valve.
2. Verify that the flow arrow stamped on the drain flow controller is pointing away from the control valve. See installation diagram or valve manual for the location. Install a drain line from backwash control assembly to an appropriate drain using a minimum of elbows. Install a union near the backwash control to facilitate cleaning. Do not install a valve on the drain line.
3. Interconnect the brine line tubing between the control valve and the brine tank. Verify that the brine line tubing is not kinked or restricted
4. Run flexible tubing (not provided) from the brine tank's over flow fitting to an appropriate, nonelevated, open drain.

START-UP

1. Again, make sure all plumbing is complete and tight including drain line and brine line. Make sure all electrical connections are complete per wiring diagrams provided.
2. Using a bucket or hose, fill brine tank with water to 2” above salt platform. Do not add salt at this time.
3. Make sure inlet and outlet isolation valves are closed. Turn on power to the system.

NOTE: Start up only one (1) tank at a time.


The softening cycle steps are as follows:

- Service
- Step 1 (Backwash)
- Step 2 (Brine Draw/ Slow Rinse)
- Step 3 (Fast Rinse)
- Step 4 (Brine Tank Refill)
- Return to Service

START-UP (continued)**REGENERATION STEPS**

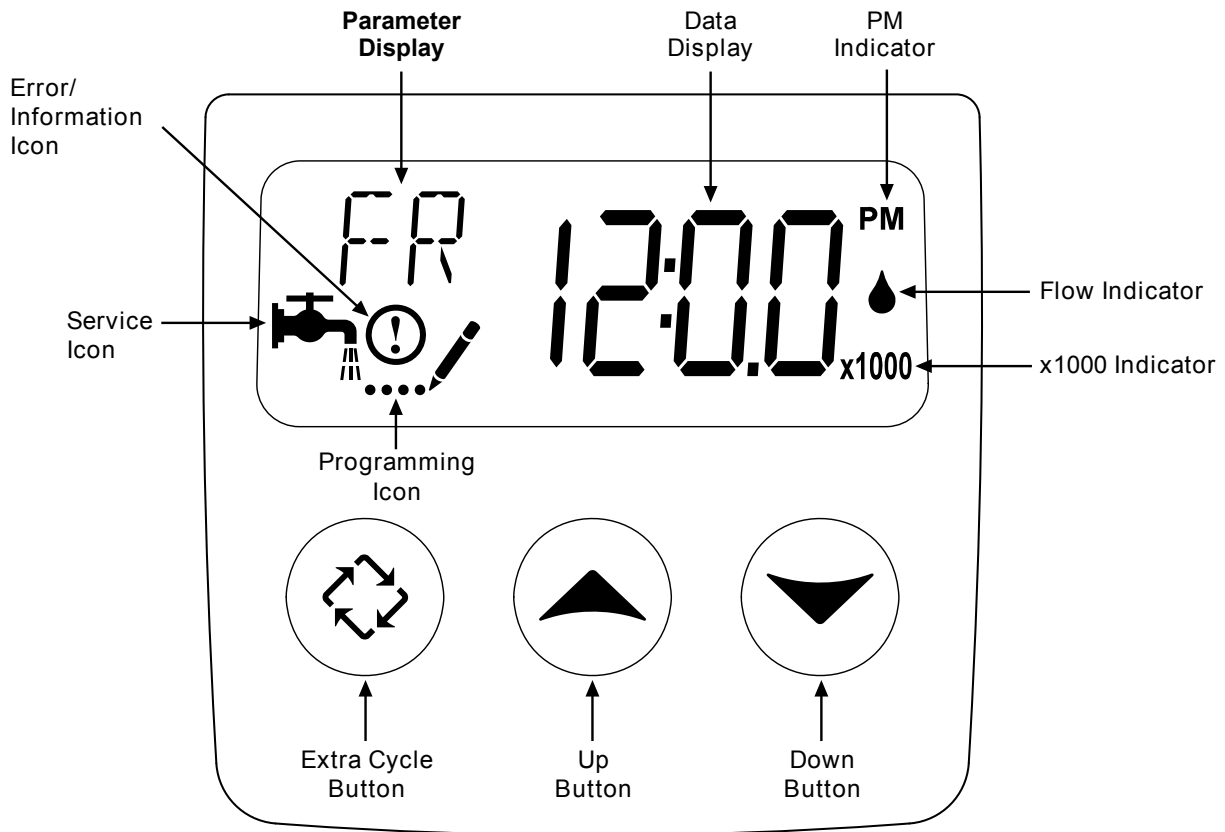
- **Backwash:** The cycle duration is factory set at 10 minutes for clean feed water applications. Increase time duration to 15 minutes when turbidity is present in the feed water.
- **Brine Draw/Rinse:** The cycle duration is factory is set at 60 minutes to assure the required amount of brine is introduced and rinsed from the resin. Increase time duration when the injector feed pressure is below 40 psi.
- **Fast Flush:** The cycle duration is factory set at 10 minutes to rinse chlorides from the resin prior to the softener is placed online. Increase time duration to 15 minutes if traces of chlorides are present in the service outlet water.
- **Brine Tank Refill:** The cycle duration is factory set at the maximum salt to achieve maximum softener capacity. The published minimum salt can be programmed to reduce salt consumption by 50% and reduced softening capacity by 30%.
- **Cycle End:** The cycle duration is factory set at 4 minutes. Its purpose is to identify the end of regeneration and advance the softener control valve to the Standby position.

Note: Brine Draw / Slow Rinse step is actually two events. The brine is suctioned from the brine tank until the level falls to the bottom of the brine valve. An air check in the valve will close once the brine is to low. This is the end for the Brine Draw step and should last about twenty (20) minutes. The rest of the time in Step 2 is Slow Rinse.

4. Locate the extra regeneration button  on the front side of the timer. Press the button for 5 seconds. The softener control valve will advance to Backwash position. Be patient this will take several minutes.
5. Remove electrical power from unit, and then slowly open inlet water valve approximately half open. Water will begin to fill through bottom distributor into tank. When tank is full, water will begin to flow out of drain line. Slowly open inlet valve until full open. Allow water to flow from drain line for approximately 15 minutes. Warning: Monitor this drain water flow carefully. There is a problem if you see softener resin in the drain water. Turn off inlet water immediately and then consult factory.
6. Restore electrical power to unit. Advance the control valve to Brine Draw / Slow Rinse position, using the same method as step 5. Make sure unit draws water from brine tank. There should also be reduced flow at the drain line.
7. Advance the control valve to the Fast Rinse position. Remove electrical power to the unit. Let water run to drain position for approximately 5 minutes or until water runs clear.
8. Restore electrical power to unit. Advance the control valve to Brine Refill position. Water should begin to refill brine tank. Allow the brine tank to refill until water in salt tank is again 2” above the salt platform. There should be no flow to drain in this valve position.
9. Advance control valve to Service position. Brine tank refill should stop. Open outlet valve and run water at the nearest cold water faucet to the water softener system for
10. Repeat instruction steps 1-10 for each softener tank.
11. Add salt to the brine tank. **Use pelletized or solid salt**, 99.0 – 99.8% pure salt containing less than 0.5% insoluble.
12. Use the test kit provided to check water for softness. Check the water hardness daily the first week in order to establish how often the softener should be regenerated. approximately 5 minutes.



TIMER FEATURES



FEATURES OF THE SXT:

- Power backup that continues to keep time and the passage of days for a minimum of 48 hours in the event of power failure. During a power outage, the control goes into a power-saving mode. It does not monitor water usage during a power failure, but it does store the volume remaining at the time of power failure.
- Settings for both valve (basic system) and control type (method used to trigger a regeneration).
- Day-of-the-Week controls.
- While in service, the display alternates between time of day, volume remaining or days to regeneration, and tank in service (twin tank systems only).
- The Flow Indicator flashes when outlet flow is detected.
- The Service Icon flashes if a regeneration cycle has been queued.
- A Regeneration can be triggered immediately by pressing the Extra Cycle button for five seconds.
- The Parameter Display displays the current Cycle Step (BW, BF, RR, etc) during regeneration, and the data display counts down the time remaining for that cycle step. While the valve is transferring to a new cycle step, the display will flash. The parameter display will identify the destination cycle step (BW, BF, RR, etc) and the data display will read "----". Once the valve reaches the cycle step, the display will stop flashing and the data display will change to the time remaining. During regeneration, the user can force the control to advance to the next cycle step immediately by pressing the extra cycle button.

TIMER FEATURES

SETTING THE TIME OF DAY

1. Press and hold either the Up or Down buttons until the programming icon replaces the service icon and the parameter display reads TD.
2. Adjust the displayed time with the Up and Down buttons. When the desired time is set, press the Extra Cycle button to resume normal operation. The unit will also return to normal operation after 5 seconds if no buttons are pressed.



ENTERING MASTER PROGRAMMING MODE

Set the Time Of Day display to 12:01 P.M. Press the Extra Cycle button (to exit Setting Time of Day mode). Then press and hold the Up and Down buttons together until the programming icon replaces the service icon and the Display Format screen appears.

EXITING MASTER PROGRAMMING MODE

Press the Extra Cycle button to accept the displayed settings and cycle to the next parameter. Press the Extra Cycle button at the last parameter to save all settings and return to normal operation. The control will automatically disregard any programming changes and return to normal operation if it is left in Master Programming mode for 5 minutes without any keypad input.

RESETS

Soft Reset: Press and hold the Extra Cycle and Down buttons for 25 seconds while in normal Service mode. This resets all parameters to the system default values, except the volume remaining in meter immediate or meter delayed systems and days since regeneration in the time clock system.

Master Reset: Hold the Extra Cycle button while powering up the unit. This resets all of the parameters in the unit. Check and verify the choices selected in Master Programming Mode.

CONTROLLER OPERATION

METER IMMEDIATE CONTROL

A meter immediate control measures water usage and regenerates the system as soon as the calculated system capacity is depleted. The control calculates the system capacity by dividing the unit capacity (typically expressed in grains/unit volume) by the feedwater hardness and subtracting the reserve. Meter Immediate systems generally do not use a reserve volume. However, in twin tank systems with soft-water regeneration, the reserve capacity should be set to the volume of water used during regeneration to prevent hard water break-through. A Meter Immediate control will also start a regeneration cycle at the programmed regeneration time if a number of days equal to the regeneration day override pass before water usage depletes the calculated system capacity.

METER DELAYED CONTROL

A Meter Delayed Control measures water usage and regenerates the system at the programmed regeneration time after the calculated system capacity is depleted. As with Meter Immediate systems, the control calculates the system capacity by dividing the unit capacity by the feedwater hardness and subtracting the reserve. The reserve should be set to insure that the system delivers treated water between the time the system capacity is depleted and the actual regeneration time. A Meter Delayed control will also start a regeneration cycle at the programmed regeneration time if a number of days equal to the regeneration day override pass before water usage depletes the calculated system capacity.

METER DELAYED CONTROL

A Time Clock Delayed Control regenerates the system on a timed interval. The control will initiate a regeneration cycle at the programmed regeneration time when the number of days since the last regeneration equals the regeneration day override value.

CONTROLLER OPERATION (continued)

DAY OF THE WEEK CONTROL

This control regenerates the system on a weekly schedule. The schedule is defined in Master Programming by setting each day to either “off” or “on.” The control will initiate a regeneration cycle on days that have been set to “on” at the specified regeneration time.

CONTROL OPERATION DURING REGENERATION

During regeneration, the control displays a special regeneration display. In this display, the control shows the current regeneration step number the valve is advancing to, or has reached, and the time remaining in that step. The step number that displays flashes until the valve completes driving to this regeneration step position. Once all regeneration steps are complete the valve returns to service and resumes normal operation.

Pressing the Extra Cycle button during a regeneration cycle immediately advances the valve to the next cycle step position and resumes normal step timing.

CONTROL OPERATION DURING PROGRAMMING

The control only enters the Program Mode with the valve in service. While in the Program Mode, the control continues to operate normally monitoring water usage and keeping all displays up to date. Control programming is stored in memory permanently, eliminating the need for battery backup power.

MANUALLY INITIATING A REGENERATION

1. When timer is in service, press the Extra Cycle button for 5 seconds on the main screen.
2. The timer advances to Regeneration Cycle Step #1 (backwash), and begins programmed time count down.
3. Press the Extra Cycle button once to advance valve to Regeneration Cycle Step #2 (brine draw & slow rinse).
4. Press the Extra Cycle button once to advance valve to Regeneration Cycle Step #3 (rapid rinse).
5. Press the Extra Cycle button once to advance valve to Regeneration Cycle Step #4 (brine refill).
6. Press the Extra Cycle button once more to advance the valve back to in service.

NOTE: If the unit is a filter or upflow, the cycle step order may change.

NOTE: A queued regeneration can be initiated by pressing the Extra Cycle button. To clear a queued regeneration, press the Extra Cycle button again to cancel. If regeneration occurs for any reason prior to the delayed regeneration time, the manual regeneration request shall be cleared.

TIMER FEATURES

CONTROL OPERATION DURING A POWER FAILURE

The SXT includes integral power backup. In the event of power failure, the control shifts into a power-saving mode. The control stops monitoring water usage, and the display and motor shut down, but it continues to keep track of the time and day for a minimum of 48 hours.

The system configuration settings are stored in a non-volatile memory and are stored indefinitely with or without line power. The Time of Day flashes when there has been a power failure. Press any button to stop the Time of Day from flashing.

If power fails while the unit is in regeneration, the control will save the current valve position before it shuts down. When power is restored, the control will resume the regeneration cycle from the point where power failed. Note that if power fails during a regeneration cycle, the valve will remain in its current position until power is restored. The valve system should include all required safety components to prevent overflows resulting from a power failure during regeneration.

The control will not start a new regeneration cycle without line power. If the valve misses a scheduled regeneration due to a power failure, it will queue a regeneration. Once power is restored, the control will initiate a regeneration cycle the next time that the Time of Day equals the programmed regeneration time. Typically, this means that the valve will regenerate one day after it was originally scheduled. If the treated water output is important and power interruptions are expected, the system should be setup with a sufficient reserve capacity to compensate for regeneration delays.



MASTER PROGRAMMING MODE CHART

Master Programming Options				
Abbreviation	Parameter	Option Abbreviation	Options	Entered Values
DF	Display Format	GAL ‡	Gallons	
		Ltr	Liters	
VT	Valve Type	dF1b ‡	Standard Downflow/Upflow Single Backwash	
		dF2b	Standard Downflow/Upflow Double Backwash	
		Fitr	Filter	
		UFbd	Upflow Brine First	
		UFtr	Upflow Filter	
		Othr	Other	
CT	Control Type	Fd	Meter (Flow) Delayed	
		FI ‡	Meter (Flow) Immediate	
		tc	Time Clock	
		dAY	Day of Week	
NT	Number of Tanks	1	Single Tank System	
		2 ‡	Two Tank System	
TS	Tank in Service	U1 ‡	Tank 1 in Service	
		U2	Tank 2 in Service	
C	Unit Capacity		Unit Capacity (Grains)	
H	Feedwater Hardness		Hardness of Inlet Water	
RS	Reserve Selection	SF ‡	Percentage Safety Factor	
		rc	Fixed Reserve Capacity	
SF	Safety Factor	10	Percentage of the system capacity to be used as a reserve	
RC	Fixed Reserve Capacity		Fixed volume to be used as a reserve	
DO	Day Override		The system's day override setting	
RT	Regen Time		The time of day the system will regenerate	
BW, BD, RR, BF	Regen Cycle Step Times	BW: 10 BD: 10 RR: 10 BF: See Note	The time duration for each regeneration step. Adjustable from OFF and 0-199 minutes. NOTE: If "Othr" is chosen under "Valve Type", then R1, R2, R3, etc, will be displayed instead	
D1, D2, D3, D4, D5, D6, & D7	Day of Week Settings		Regeneration setting (On or OFF) for each day of the week on day-of-week systems	
CD	Current Day		The Current day of the week	
FM	Flow Meter Type	t0.7	3/4" Turbine Meter	
		P0.7	3/4" Paddle Wheel Meter	
		t1.0	1" Turbine Meter	
		P1.0	1" Paddle Wheel Meter	
		t1.5	1.5" Turbine Meter	
		P1.5	1.5" Paddle Wheel Meter	
		P2.0	2" Paddle Wheel Meter	
		Gen	Generic or Other Meter - Enter K-value below	
K	Meter Pulse Setting	*	Meter pulses per gallon for generic/other flow meter	

* Refer to programming guide for optional (generic) meter types and K-values

‡ Indicates factory setting

NOTE:

Some items may not be shown depending on timer configuration.

The timer will discard any changes and exit Master Programming Mode if any button is not pressed for sixty seconds.

BF Setting: Refer to specification table for recommended cycle times by model #.

CAUTION: Before entering Master Programming, please contact your local professional water dealer.

MASTER PROGRAMMING MODE

ENTERING MASTER PROGRAMMING MODE

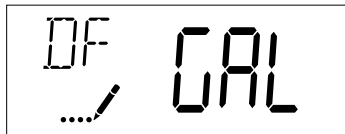
Set the Time Of Day display to 12:01 P.M. Press the Extra Cycle button (to exit Setting Time of Day mode). Then press and hold the Up and Down buttons together until the programming icon replaces the service icon and the Display Format screen appears.

When the Master Programming Mode is entered, all available option setting displays may be viewed and set as needed. Depending on current option settings, some parameters cannot be viewed or set.

1. Display Format (Display Code DF)

This is the first screen that appears when entering Master Programming Mode. The Display Format setting specifies the unit of measure that will be used for volume and how the control will display the Time of Day. This option setting is identified by “DF” in the upper left hand corner of the screen. There are three possible settings:

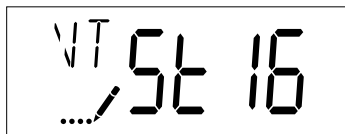
DISPLAY FORMAT SETTING	UNIT OF VOLUME	TIME OF DISPLAY
GAL	U.S. Gallons	12-hour AM/PM
Ltr	Liters	24-Hour
Cu	Cubic Meters	24-Hour



2. Valve Type (Display Code VT)

Press the Extra Cycle button. Use this display to set the Valve Type. The Valve Type setting specifies the type of cycle that the valve follows during regeneration. Note that some valve types require that the valve be built with specific subcomponents. Ensure the valve is configured properly before changing the Valve Type setting. This option setting is identified by “VT” in the upper left hand corner of the screen. There are 5 possible settings:

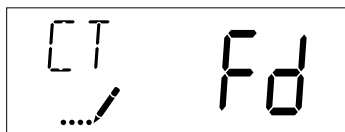
ABBREVIATION	PARAMETER
St1b	Standard Downflow/Upflow, Single Backwash
St2b	Standard Downflow/Upflow, Double Backwash
Filtr	Filter
UFbF	Upflow Brine First
Othr	Other



3. Control Type (Display Code CT)

Press the Extra Cycle button. Use this display to set the Control Type. This specifies how the control determines when to trigger a regeneration. For details on how the various options function, refer to the “Timer Operation” section of this service manual. This option setting is identified by “CT” in the upper left hand corner of the screen. There are four possible settings:

- Meter Delayed: Fd
- Meter Immediate: FI
- Time Clock: tc
- Day of Week: dAY

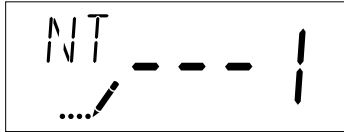


MASTER PROGRAMMING MODE (continued)

4. Number of Tanks (Display Code NT)

Press the Extra Cycle button. Use this display to set the Number of Tanks in your system. This option setting is identified by “NT” in the upper left hand corner of the screen. There are two possible settings:

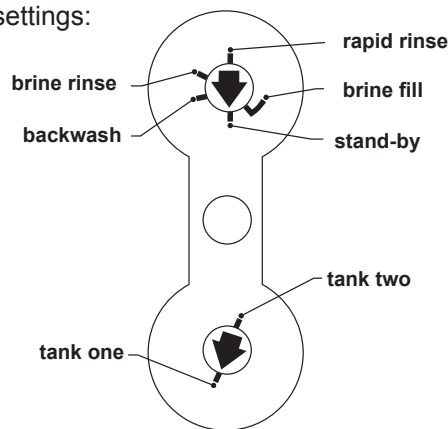
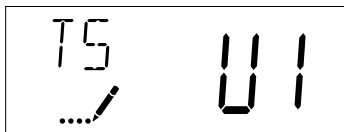
- Single Tank System: 1
- Two-Tank System: 2



5. Tank in Service (Display Code TS)

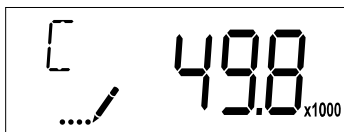
Press the Extra Cycle button. Use this display to set whether tank one or tank two is in service. This option setting is identified by “TS” in the upper left hand corner of the screen. This parameter is only available if the number of tanks has been set to 2. There are two possible settings:

- Tank One in Service: U1
- Tank Two in Service: U2



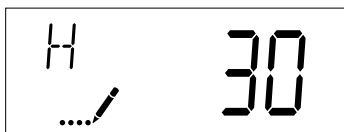
6. Unit Capacity (Display Code C)

Press the Extra Cycle button. Use this display to set the Unit Capacity. This setting specifies the treatment capacity of the system media. Enter the capacity of the media bed in grains of hardness when configuring a softener system, and in the desired volume capacity when configuring a filter system. This option setting is identified by “C” in the upper left hand corner of the screen. The Unit Capacity parameter is only available if the control type has been set to one of the metered options. Use the Up and Down buttons to adjust the value as needed.



7. Feedwater Hardness (Display Code H)

Press the Extra Cycle button. Use this display to set the Feedwater Hardness. Enter the feedwater hardness in grains per unit volume for softener systems, or 1 for filter systems. This option setting is identified by “H” in the upper left hand corner of the screen. The feedwater hardness parameter is only available if the control type has been set to one of the metered options. Use the Up and Down buttons to adjust the value as needed.

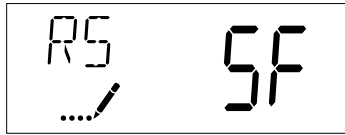


CAUTION: Before entering Master Programming, please contact your local professional water dealer.

MASTER PROGRAMMING MODE (continued)

8. Reserve Selection (Display Code RS)

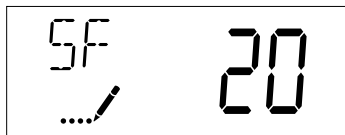
Press the Extra Cycle button. Use this display to set the Safety Factor. Use this display to select the type of reserve to be used in your system. This setting is identified by “RS” in the upper left-hand corner of the screen. The reserve selection parameter is only available if the control type has been set to one of the metered options. There are two possible settings.



RS	SF - Safety Factor
rc	Fixed Reserve Capacity

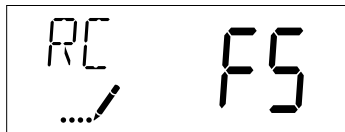
9. Safety Factor (Display Code SF)

Press the Extra Cycle button. Use this display to set the Safety Factor. This setting specifies what percentage of the system capacity will be held as a reserve. Since this value is expressed as a percentage, any change to the unit capacity or feedwater hardness that changes the calculated system capacity will result in a corresponding change to the reserve volume. This option setting is identified by “SF” in the upper left hand corner of the screen. Use the Up and Down buttons to adjust the value from 0 to 50% as needed.



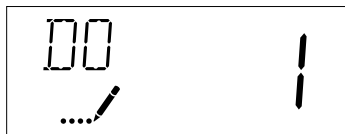
10. Fixed Reserve Capacity (Display Code RC)

Press the Extra Cycle button. Use this display to set the Reserve Capacity. This setting specifies a fixed volume that will be held as a reserve. The reserve capacity cannot be set to a value greater than one-half of the calculated system capacity. The reserve capacity is a fixed volume and does not change if the unit capacity or feedwater hardness are changed. This option setting is identified by “RC” in the upper left-hand corner of the screen. Use the Up and Down buttons to adjust the value as needed.



11. Day Override (Display Code DO)

Press the Extra Cycle button. Use this display to set the Day Override. This setting specifies the maximum number of days between regeneration cycles. If the system is set to a timer-type control, the day override setting determines how often the system will regenerate. A metered system will regenerate regardless of usage if the days since last regeneration cycle equal the day override setting. Setting the day override value to “OFF” disables this function. This option setting is identified by “DO” in the upper left hand corner of the screen. Use the Up and Down buttons to adjust the value as needed.



CAUTION: Before entering Master Programming, please contact your local professional water dealer.

MASTER PROGRAMMING MODE (continued)

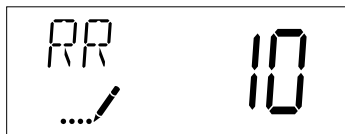
12. Regeneration Time (RT)

Press the Extra Cycle button. Use this display to set the Regeneration Time. This setting specifies the time of day the control will initiate a delayed, manually queued, or day override triggered regeneration. This option setting is identified by “RT” in the upper left hand corner of the screen. Use the Up and Down buttons to adjust the value as needed.



13. Regeneration Cycle Step Times

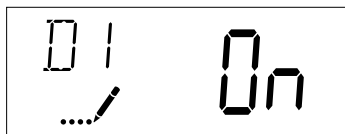
Press the Extra Cycle button. Use this display to set the Regeneration Cycle Step Times. The different regeneration cycles are listed in sequence based on the valve type selected for the system, and are identified by an abbreviation in the upper left-hand corner of the screen. The abbreviations used are listed below. If the system has been configured with the “OTHER” valve type, the regeneration cycles will be identified as R1, R2, R3, R4, R5, and R6. Each cycle step time can be set from 0 to 199 minutes, or “OFF.” Setting a cycle step to “OFF” will disable all of the following steps. Setting a cycle step time to 0 will cause the control to skip that step during regeneration, but keeps the following steps available. Use the Up and Down buttons to adjust the value as needed. Press the Extra Cycle button to accept the current setting and move to the next parameter.



CYCLE STEP	ABBREVIATION
BD	Brine Draw
BF	Brine Fill
BW	Backwash
RR	Rapid Rinse
SV	Service

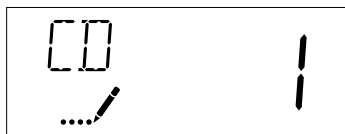
14. Day of Week Settings

Press the Extra Cycle button. Use this display to set the regeneration schedule for a system configured as a Day of Week control. The different days of the week are identified as D1, D2, D3, D4, D5, D6, and D7 in the upper left-hand corner of the display. Set the value to “ON” to schedule a regeneration or “OFF” to skip regeneration for each day. Use the Up and Down buttons to adjust the setting as needed. Press the Extra Cycle button to accept the setting and move to the next day. Note that the control requires at least one day to be set to “ON.” If all 7 days are set to “OFF”, the unit will return to Day One until one or more days are set to “ON.”



15. Current Day (Display Code CD)

Press the Extra Cycle button. Use this display to set the current day on systems that have been configured as Day of Week controls. This setting is identified by “CD” in the upper left-hand corner of the screen. Use the Up and Down buttons to select from Day 1 through Day 7.



CAUTION: Before entering Master Programming, please contact your local professional water dealer.

MASTER PROGRAMMING MODE (continued)

16. Flow Meter Type (Display Code FM)

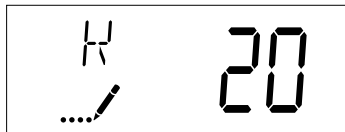
Press the Extra Cycle button. Use this display to set the type of flow meter connected to the control. This option setting is identified by “FM” in the upper left-hand corner of the screen. Use the Up and Down buttons to select one of the 7 available settings.



t0.7	Fleck 3/4” Turbine Meter
P0.7	Fleck 3/4” Paddle Wheel Meter
t1.0	Fleck 1” Turbine Meter
P1.0	Fleck 1” Paddle Wheel Meter
t1.5	Fleck 1 1/2” Turbine Meter
P1.5	Fleck 1 1/2” Paddle Wheel Meter
GEn	Generic/Other Meter

17. Meter Pulse Setting (Display Code K)

Press the Extra Cycle button. Use this display to specify the meter pulse setting for a non-standard flow meter. This option setting is identified by “K” in the upper left-hand corner of the screen. Use the Up and Down buttons to enter the meter constant in pulses per unit volume.



K-FACTOR TABLE - SIGNET 2536
(Pulses per Gallon)

PIPE SIZE (inches)	GENERIC FLOW METER SETTINGS		
	TEE GALVANIZED	TEE PVC	SADDLE IRON
1	213	352	
1-1/4	128	177	
1-1/2	94	118	
2	59	67	54
2-1/2		43	38
3		27	23

AUTO TURBINE METER

METER SIZE	K-FACTOR
1	65
2	15

CLACK METER

METER SIZE	K-FACTOR
1-1/2	37
2	20
3	8

Note: Make sure to select the proper K-factor for the fitting and pipe size of your system.

18. Press the Extra Cycle button to save all settings and exit Master Programming Mode.

CAUTION: Before entering Master Programming, please contact your local professional water dealer.

USER PROGRAMMING MODE

USER PROGRAMMING MODE OPTIONS		
ABBREVIATIONS	PARAMETER	DESCRIPTION
DO	Day Override	The timer's override setting
RT	Regeneration Time	The time of day that the system will regenerate (meter delayed, timeclock, and day-of-week systems)
H	Feed Water Hardness	The hardness of the inlet water - used to calculate system capacity for metered systems
RC	Reserve Capacity	The fixed reserve capacity
CD	Current Day	The current day of week

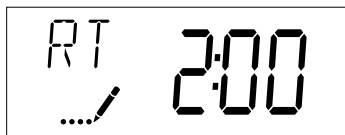
NOTES: Some items may not be shown depending on timer configuration. The timer will discard any changes and exit User Mode if any button is not pressed for sixty seconds.

START-UP

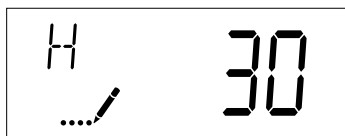
1. Press the Up and Down buttons for five seconds while in service, and the time of day is NOT set to 12:01 PM.
2. Use this display to adjust the Day Override. This option setting is identified by "DO" in the upper left hand corner of the screen.



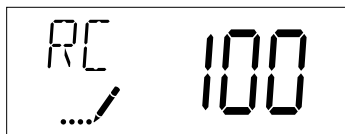
3. Press the Extra Cycle button. Use this display to adjust the Regeneration Time. This option setting is identified by "RT" in the upper left hand corner of the screen.



4. Press the Extra Cycle button. Use this display to adjust the Feed Water Hardness. This option setting is identified by "FH" in the upper left hand corner of the screen.



5. Press the Extra Cycle button. Use this display to adjust the Fixed Reserve Capacity. This option setting is 18 identified by "RC" in the upper left-hand corner of the screen.



6. Press the Extra Cycle button. Use this display to set the Current Day of the Week. This option setting is identified by "CD" in the upper left hand corner of the screen.



7. Press the Extra Cycle button to end User Programming Mode.

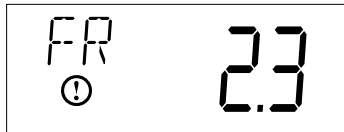
DIAGNOSTIC PROGRAMMING MODE

DIAGNOSTIC PROGRAMMING MODE OPTIONS		
ABBREVIATIONS	PARAMETER	DESCRIPTION
FR	Flow Rate	Displays the current outlet flow rate
PF	Peak Flow Rate	Displays the highest flow rate measured since the last regeneration
HR	Hours In Service	Displays the total hours that the unit has been in service
VU	Volume Used	Displays the total volume of water treated by the unit
RC	Reserve Capacity	Displays the system's reserve capacity calculated from the system capacity, feedwater hardness, and safety factor
SV	Software Version	Displays the software version installed on the controller

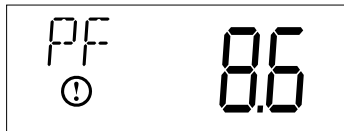
NOTES: Some items may not be shown depending on timer configuration. The timer will discard any changes and exit User Mode if any button is not pressed for sixty seconds.

Diagnostic Programming Mode Steps

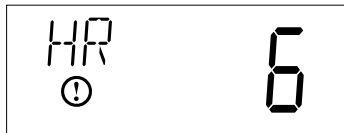
1. Press the Up and Extra Cycle buttons for five seconds while in service.
2. Use this display to view the current Flow Rate. This option setting is identified by “FR” in the upper left hand corner of the screen.



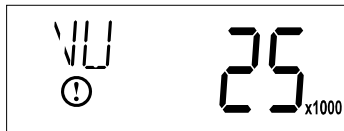
3. Press the UP button. Use this display to view the Peak Flow Rate since the last regeneration cycle. This option setting is identified by “PF” in the upper left hand corner of the screen.



4. Press the UP button. Use this display to view the Hours in Service since the last regeneration cycle. This option setting is identified by “HR” in the upper left hand corner of the screen.



5. Press the UP button. Use this display to view the Volume Used since the last regeneration cycle. This option setting is identified by “VU” in the upper left hand corner of the screen.



CAUTION: Before entering Master Programming, please contact your local professional water dealer.

DIAGNOSTIC PROGRAMMING MODE

6. Press the Up button. Use this display to view the Reserve Capacity. This option setting is identified by “RC” in the upper left hand corner of the screen.



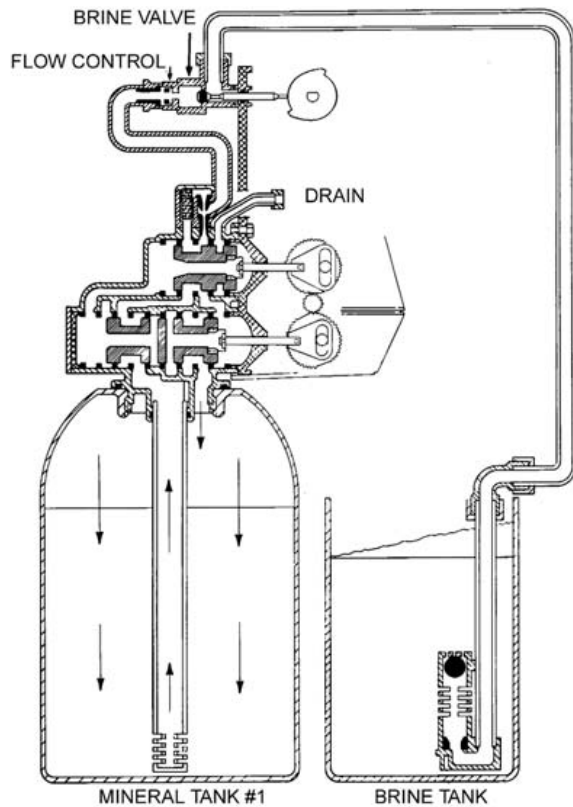
7. Press the Up button. Use this display to view the Software Version. This option setting is identified by “SV” in the upper left hand corner of the screen.



8. Press the Extra Cycle button to end Diagnostic Programming Mode.

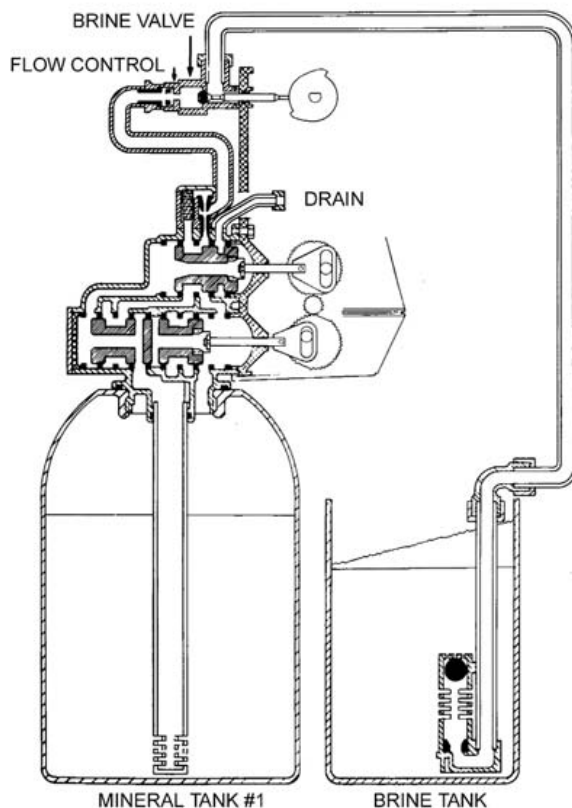
CAUTION: Before entering Master Programming, please contact your local professional water dealer.

FLOW DIAGRAMS



1 - SERVICE POSITION

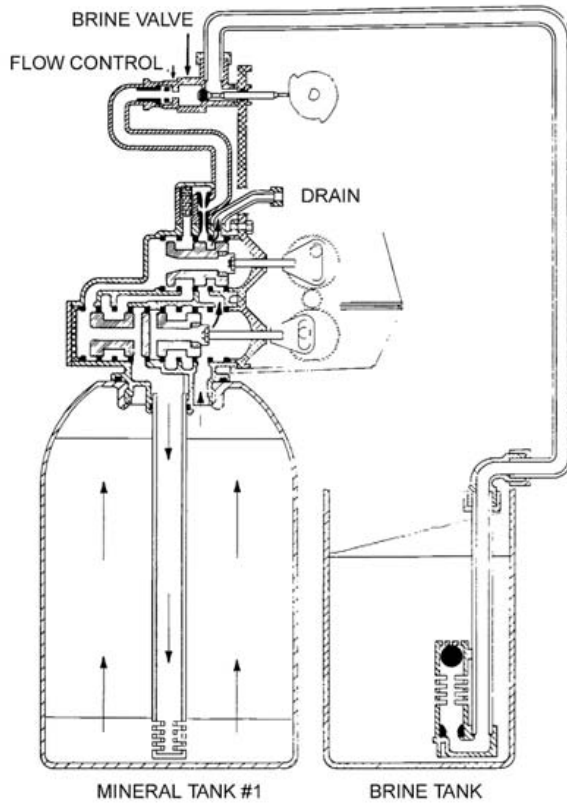
Hard water enters the unit at the valve inlet, flows around the lower piston, and down through the mineral in the first tank. Conditioned water enters the center tube through the bottom distributor, flows up through the center tube, around the lower piston, through the meter, and out the valve outlet. The second mineral tank is regenerated and on standby.



**2 - TANKS SWITCHING
(the meter has initiated a regeneration)**

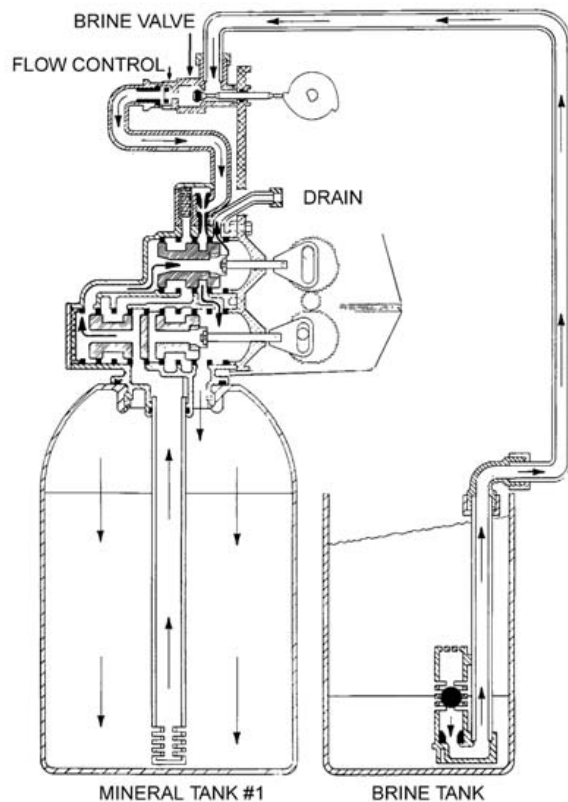
Hard water enters the unit at the valve inlet, flows around the lower piston, through the pipe leading to the second mineral tank, and down through the mineral in the second tank. Conditioned water enters the center tube of the second tank through the bottom distributor, flows up through the center tube, through the pipe leading back to the main valve, around the lower piston, through the meter, and out the valve outlet. The depleted first mineral tank is out of the flow path, and ready for regeneration.

FLOW DIAGRAMS



3 - BACKWASH

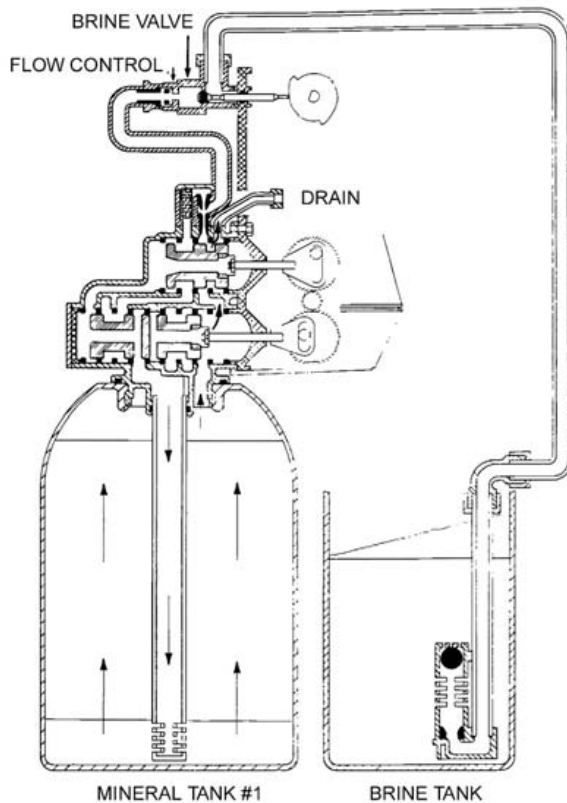
Conditioned water from the second mineral tank flows around the lower piston, around the upper piston, through the center of the lower piston, down the center tube, up through the mineral, around the upper piston, and out the drain line.



4 - BRINE DRAW

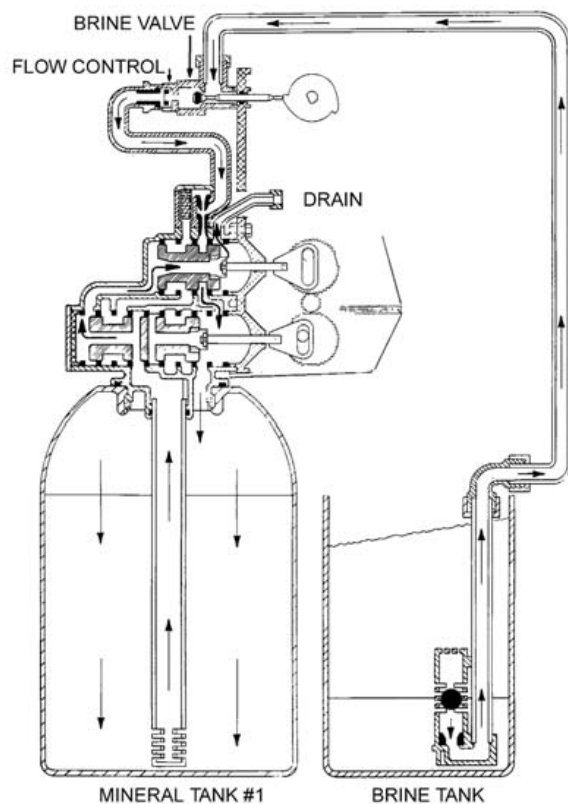
Conditioned water from the second mineral tank flows around the lower piston, around the upper piston, into the injector housing, and down through the nozzle and throat to draw brine from the brine tank. Brine flows around the upper piston, down through the mineral, into the center tube through the bottom distributor, up the center tube, through the center of the lower piston, through the center of the upper piston, and out through the drain line.

FLOW DIAGRAMS



5 - SLOW RINSE

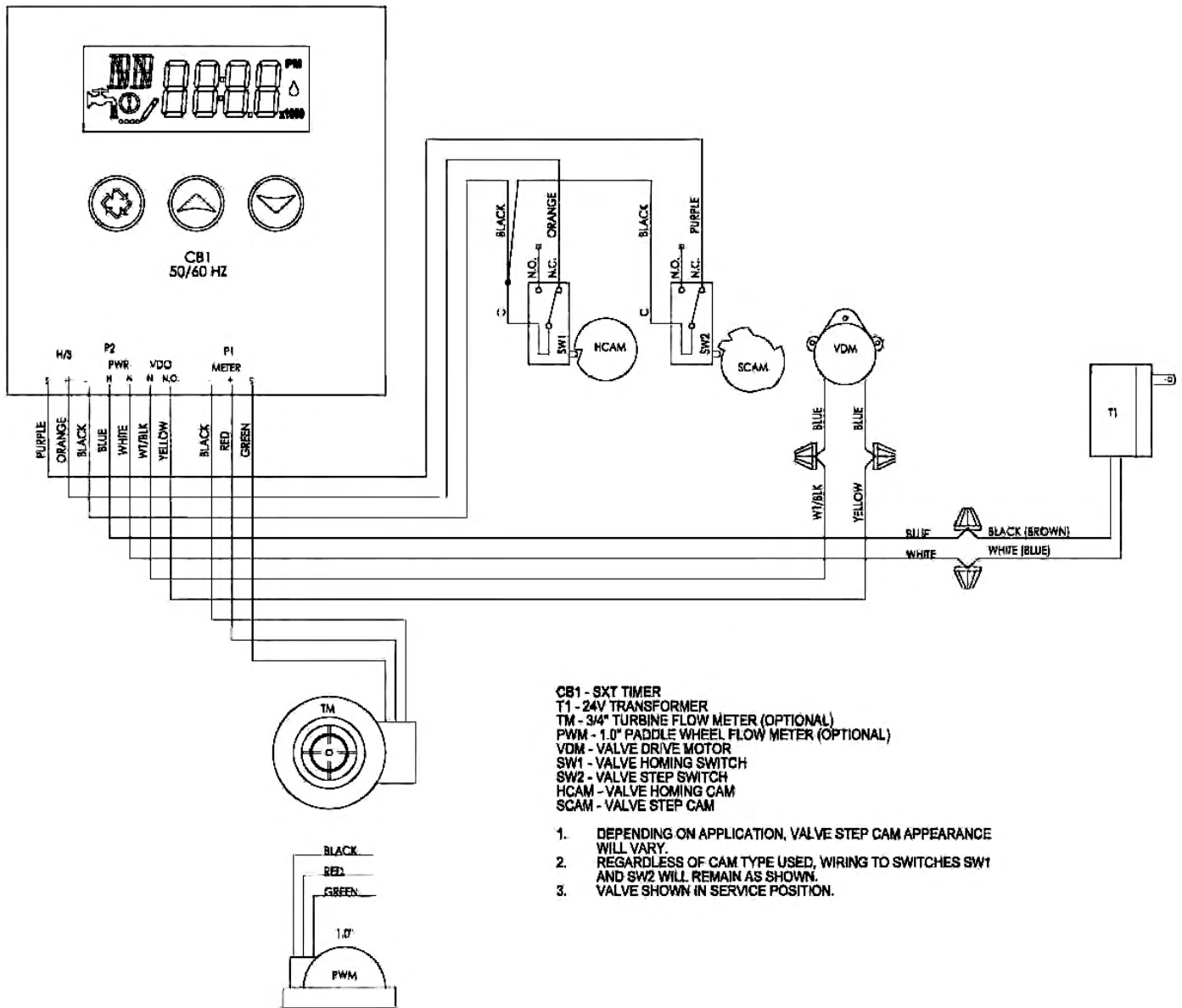
Conditioned water from the second mineral tank flows around the lower piston, around the upper piston, into the injector housing, down through the nozzle and throat, around the upper piston, down through the mineral, into the center tube through the bottom distributor, up the center tube, through the center of the lower piston, through the center of the upper piston, and out through the drain line.



6 - RAPID RINSE

Conditioned water from the second mineral tank flows around the lower piston, around the upper piston, and down through the mineral in the first tank. Rinse water from the mineral bed enters the center tube through the bottom distributor, flows up the center tube, through the center of the lower piston, through the center of the upper piston, and out through the drain line.

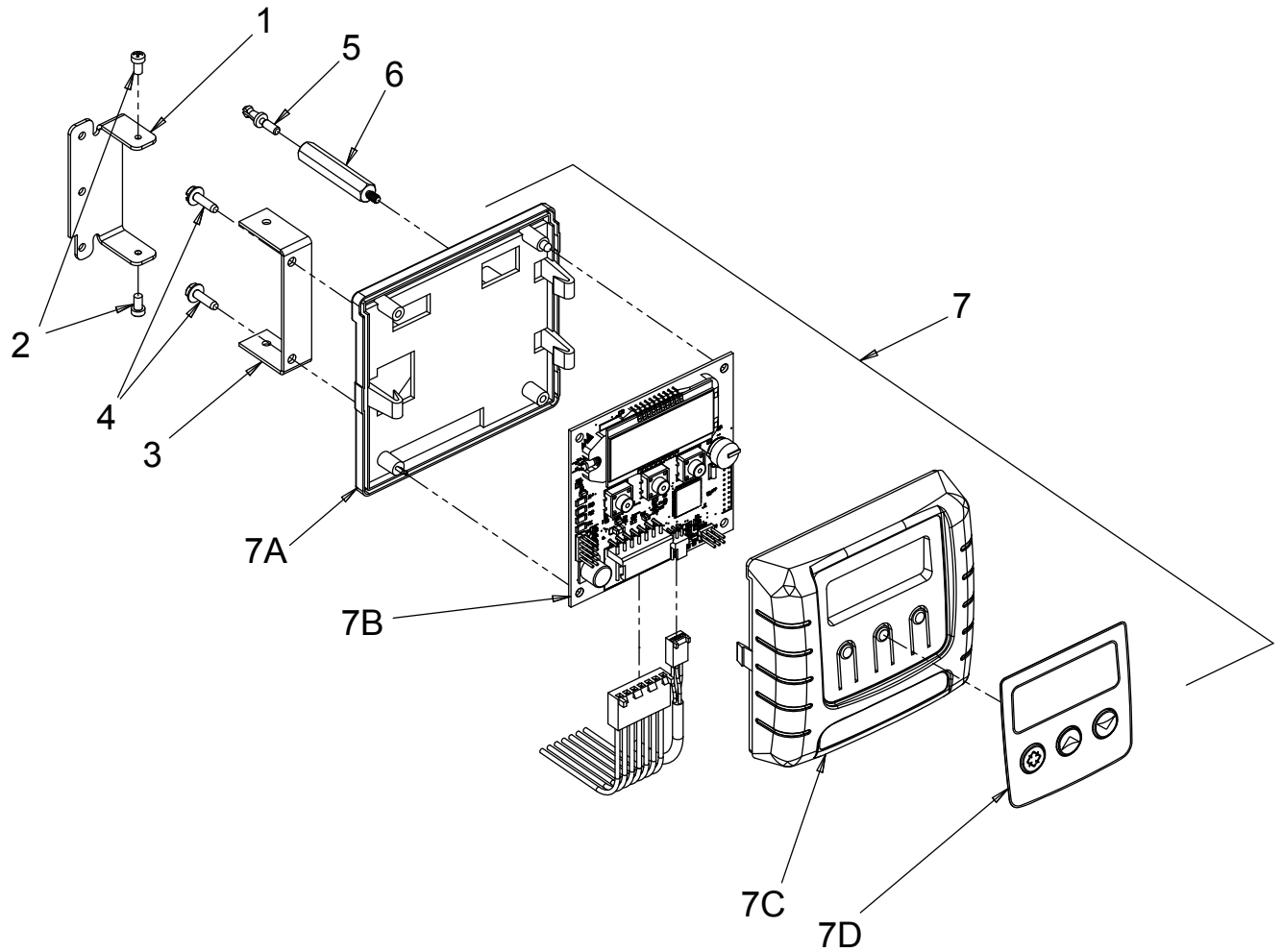
SXT WIRING DIAGRAM



CB1 - SXT TIMER
 T1 - 24V TRANSFORMER
 TM - 3/4" TURBINE FLOW METER (OPTIONAL)
 PWM - 1.0" PADDLE WHEEL FLOW METER (OPTIONAL)
 VDM - VALVE DRIVE MOTOR
 SW1 - VALVE HOMING SWITCH
 SW2 - VALVE STEP SWITCH
 HCAM - VALVE HOMING CAM
 SCAM - VALVE STEP CAM

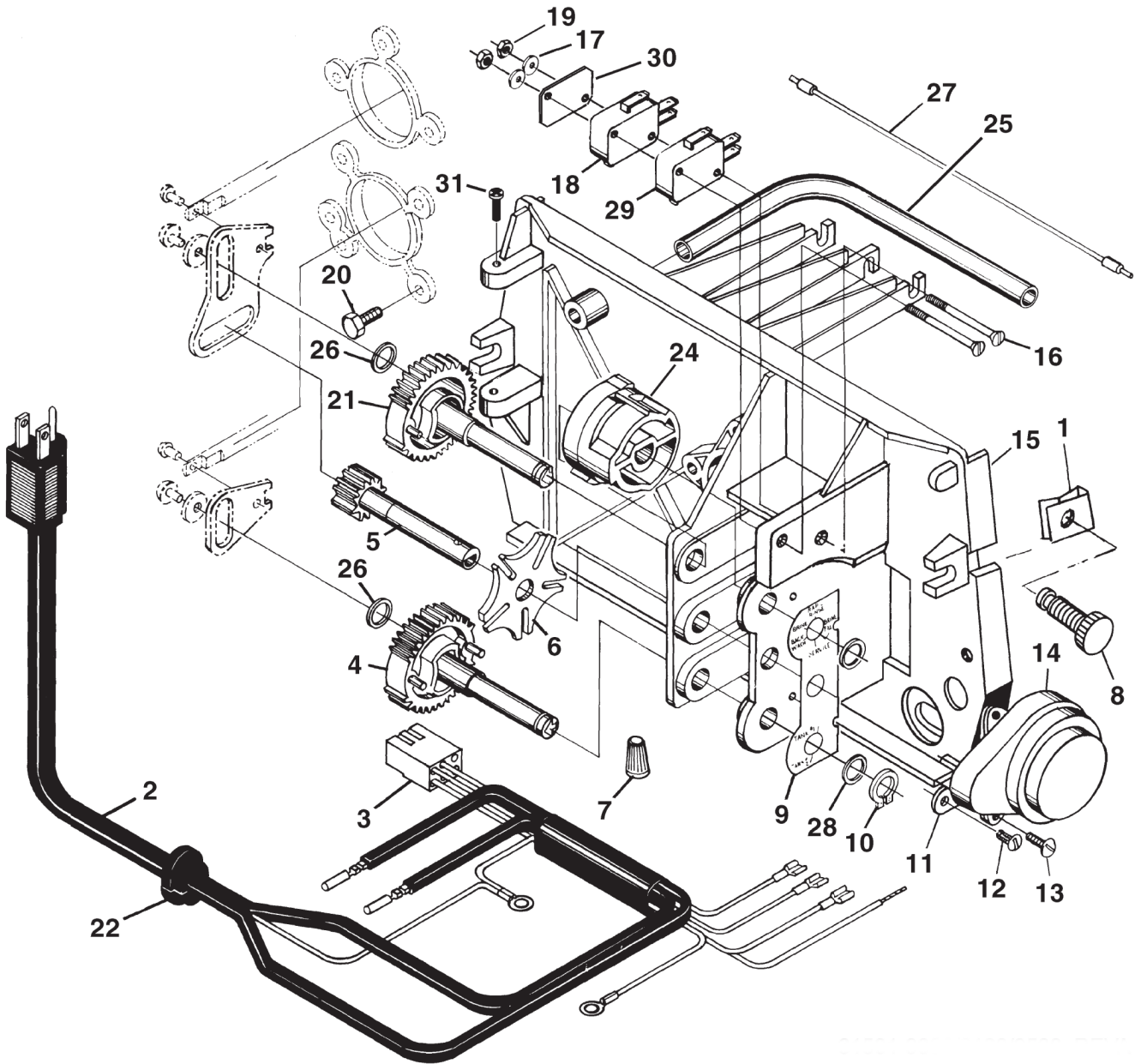
1. DEPENDING ON APPLICATION, VALVE STEP CAM APPEARANCE WILL VARY.
2. REGARDLESS OF CAM TYPE USED, WIRING TO SWITCHES SW1 AND SW2 WILL REMAIN AS SHOWN.
3. VALVE SHOWN IN SERVICE POSITION.

SXT TIMER ASSEMBLY



Item No.	Quantity	Part No.	Description
1.....	1.....	13881.....	BRACKET, HINGE TIMER
2.....	2.....	11384.....	SCREW, PHIL, 6-32 X 1/4
3.....	1.....	42732.....	BRACKET, TIMER, 9000SXT
4.....	2.....	13296.....	SCREW, HEX WSH, 6-20 X 1/2
5.....	1.....	14265.....	CLIP, SPRING
6.....	1.....	42733.....	STAND-OFF, TIMER, 9000SXT
7.....	1.....	61464.....	TIMER, SXT, 2510/2750/9000, D/F
7A.....	1.....	19889.....	HOUSING, CIRCUIT BOARD
7B.....	1.....	42196.....	CIRCUIT BOARD, SE
7C.....	1.....	42635.....	COVER, FRONT, SXT, SQUARE
7D.....	1.....	42637.....	LABEL, DISPLAY, SE

POWERHEAD ASSEMBLY

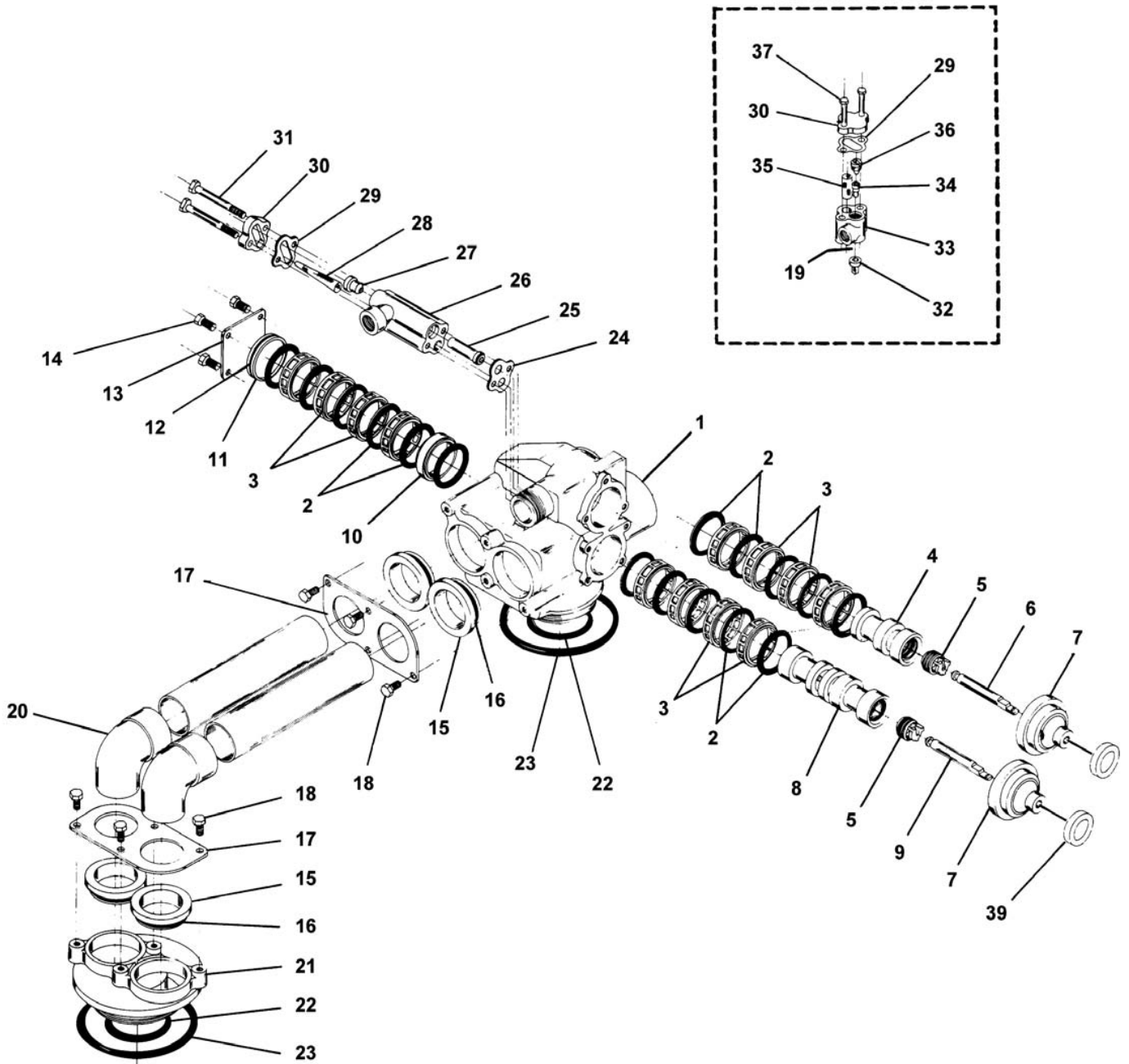


POWERHEAD PARTS LIST

Item No.	Quantity	Part No.	Description
1	2	18728	Nut, Tinnerman, U Type, 8-32
2	1	11838	Power Cord, 6' Fleck
		11839	Power Cord, 12' Fleck
		40084-12	Power Cord, 12' U.S., Round, 120V Sys 5, 6, 7 & 2900/3150/3900 #4
		11545-01	Power Cord Assy, 4' Black, Euro w/Terminals
		14678	Power Cord, U.S., 220/60
		19303-01	Power Cord Assy, Australian w/Terminals
		40085-12	Power Cord, 12' US, Round, 240V
		19674	Transformer, 24V, 9.6VA Residential Valves
		41475	Transformer, 24V, 9.6VA, European
3	1	15202	Harness, 9000/9500, Drive
		14822	Harness, 2900
		40041-06	Harness, Low V, 9000/9500
4	1	15134	Gear Assy, Drive, 1/2" Stroke 9000/9500
5	1	15135	Gear, Drive, 9000
6	1	14896	Wheel, Geneva
7	2	40422	Nut, Wire, Tan
8	2	19367	Screw, Designer Cover, Thumb 8-32 Blank UV Stable Material
9	1	15175	Label, Shaft Position
10	2	14917	Ring, Retaining
11	1	15199	Plate, Ground, 9000/9500
12	1	14430	Screw, Hex Wsh St, 6 x 1/4 Type "B"
13	2	19160	Screw, Phil Pan, Thread 6-32 x 3/8 Type 23 Zinc
14	1	18737	Motor, 24V, 50/60 Hz, 1 RPM
		18738	Motor, 120V, 50/60 Hz 1 RPM
		18739	Motor, 220V, 50/60 Hz 1 RPM
15	1	15131	Backplate, 9000
		17784-05	Panel, Control, 9000/9500 ET
16	2	15172	Screw, Flt Hd Mach, 4-40 x 1 3/8 Steel Zinc Plate
17	2	10340	Washer, Lock #4, Zinc
18		10218	Switch, Micro
19	1	10339	Nut, Hex, 4-40 Zinc Plated
20	1	15331	Screw, Hex Wsh Mach, 10-24 x 3/4 410 S.S.
21	2	15133	Gear Assy, Drive, 3/4" Stroke
22	1	13547	Strain Relief, Flat Cord Heyco #30-1
23	1	15810	Ring, Retaining
24	1	15132	Cam, Triple
		17331	Cam, 9500
		17765	Cam Assy, Aux Switch, 9500
25	1	15368	Tube, Cable Guide, 2-Tank
		17337	Tube, Cable Guide, 9500
26	2	15372	Washer, Thrust, 3/8
27	1	15216	Meter Cable Assy, 15.25"
		15425	Meter Cable, 13.25"
		17744	Meter Cable Assy, 20.75" 1 1/2" Std
		19121-01	Meter Cable Assy, SE, Paddle 6600/6700
		19121-05	Meter Cable Assy, ET, 28" 2750/3150 Systemax 4-6
		19791-01	Meter Cable Assy, Turbine/SE
28	2	15692	Washer, Plain, 3/8"
29	1	16433	Switch, Miniature
30	1	10302	Insulator, Limit Switch
31	2	15173	Screw, Slot Rd Hd Mach, 5-20 x 3/8
		Not Shown	
	1	60232-110	Cover, Designer, 1 Pc Black
	1	60232-112	Cover, Designer, 1 Pc Black w/Left Window
	1	60320-09	Switch Assy, 9000, Drive Cam
	1	60320-10	Switch Assy, 9500, Drive Cam

9500 CONTROL VALVE ASSEMBLY

**OPTIONAL
1600 INJECTOR**

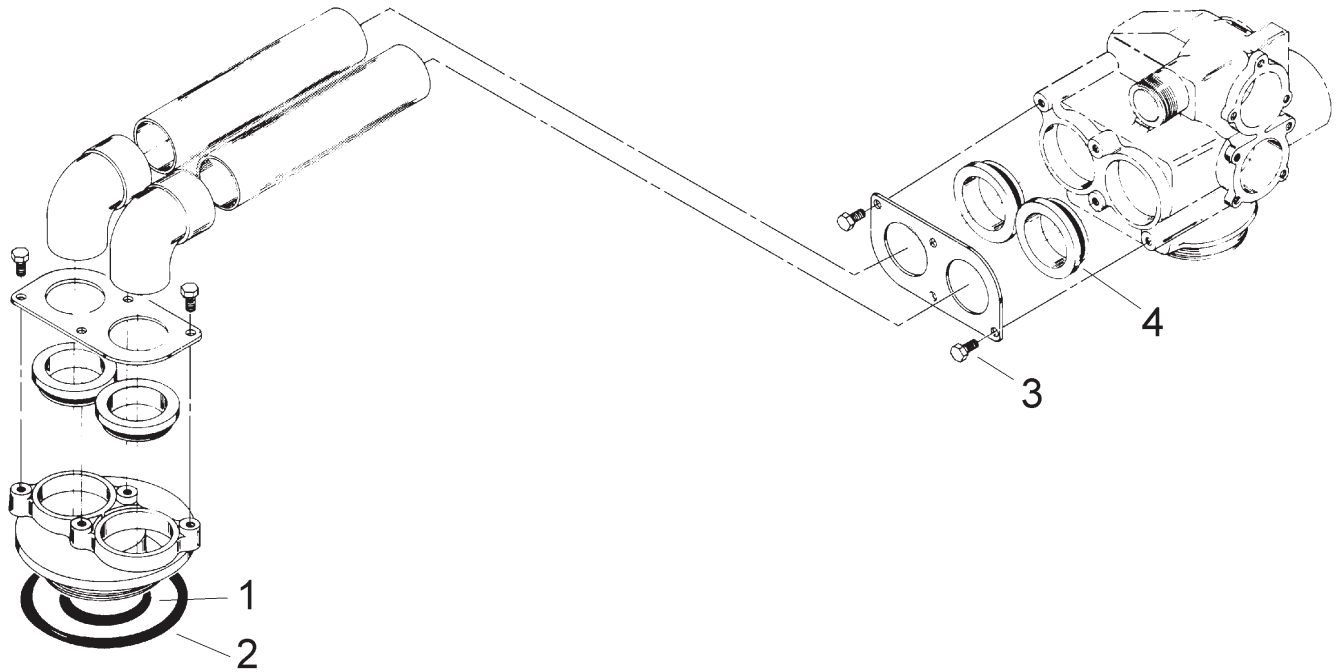


9500 CONTROL VALVE PARTS LIST

Item No.	Quantity	Part No.	Description
1.....	1	16919-01.....	Valve Body
2.....	16	16101.....	Seal
3.....	12	16638-01.....	Spacer
.....		16638.....	Spacer Hot Water
4.....	1	17110.....	Upper Piston
5.....	2	14309.....	Retainer, Piston Rod
.....	2	15110.....	Retainer, Piston Rod, H.W.
6.....	1	16957.....	Upper Piston Rod
7.....	2	17212.....	End Plug Assy.
.....	2	17212-01.....	End Plug Assy. H.W.
8.....	1	17111.....	Lower Piston
9.....	1	16956.....	Lower Piston Rod
10.....	1	17092.....	Spacer Disk
11.....	1	16955.....	End Plug
12.....	3	16394.....	O-Ring -029
13.....	1	14906.....	End Plate
14.....	4	15137.....	Screw, End Plate
.....		17657.....	Metric
15.....	4	17052.....	Coupling, Pipe
16.....	4	17224.....	O-Ring -224
17.....	1	17061.....	Coupling Retainer
18.....	8	10231.....	Screw, Retainer
.....		17659.....	Metric
19.....	1	11475.....	Injector Body Gasket, 1600
20.....	2	17353.....	90° Copper Elbow
21.....	1	16916-01.....	Second Tank Adapter
22.....	2	13577.....	O-Ring -226
23.....	2	16455.....	O-Ring -347
24.....	1	14805.....	Injector Body Gasket, 1700
25.....	1	*14802.....	Injector Throat
26.....	1	17777.....	Injector Body
27.....	1	*14801.....	Injector Nozzle
28.....	1	14803.....	Injector Screen
29.....	1	10229.....	Injector Cover Gasket
30.....	1	11893.....	Injector Cover
31.....	2	14804.....	Screw, Injector Body
.....		17655.....	Metric
32.....	1	16221.....	Air Dispenser
33.....	1	17776.....	Injector Body
34.....	1	10914-3.....	Injector Throat #3, Yellow
35.....	1	10227.....	Injector Screen
36.....	1	10913-3.....	Injector Nozzle #3, Yellow
37.....	2	10692.....	Screw, Injector Body
.....		17656.....	Metric
38.....	1	60366.....	D.L.F.C. 1" NPT (not shown) - Specify Size
39.....	2	17558.....	Spacer
40.....	2	19608-15.....	Dispenser, Upper (not shown)
41.....	1	11248.....	Pin (not shown)

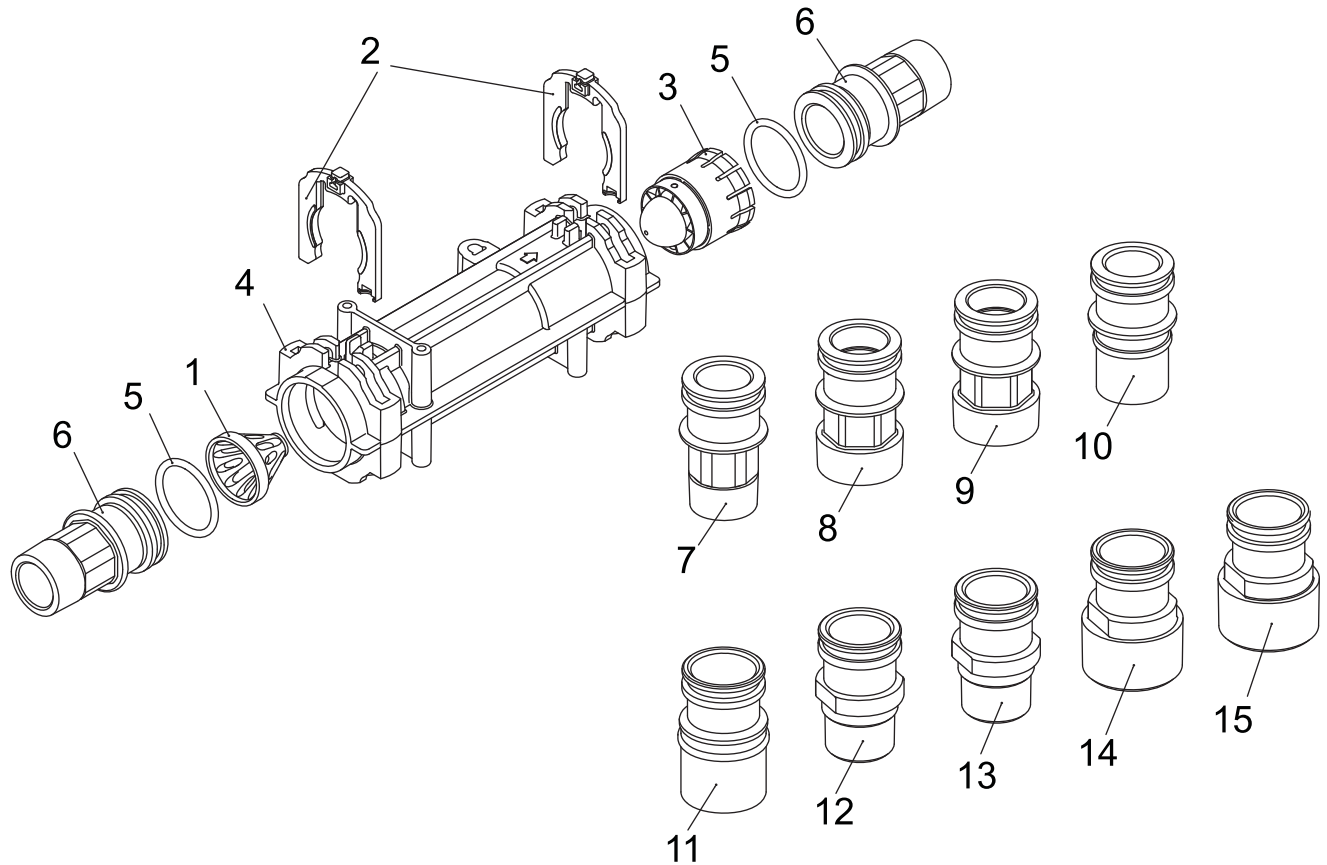
*Injector Throat	Injector Nozzle	Size	Color
14802-03	14801-03	#3C	Yellow
14802-04	14801-04	#4C	Green
14802-05	14801-05	#5C	White
14802-06	14801-06	#6C	Red

9500 SECOND TANK ASSEMBLY



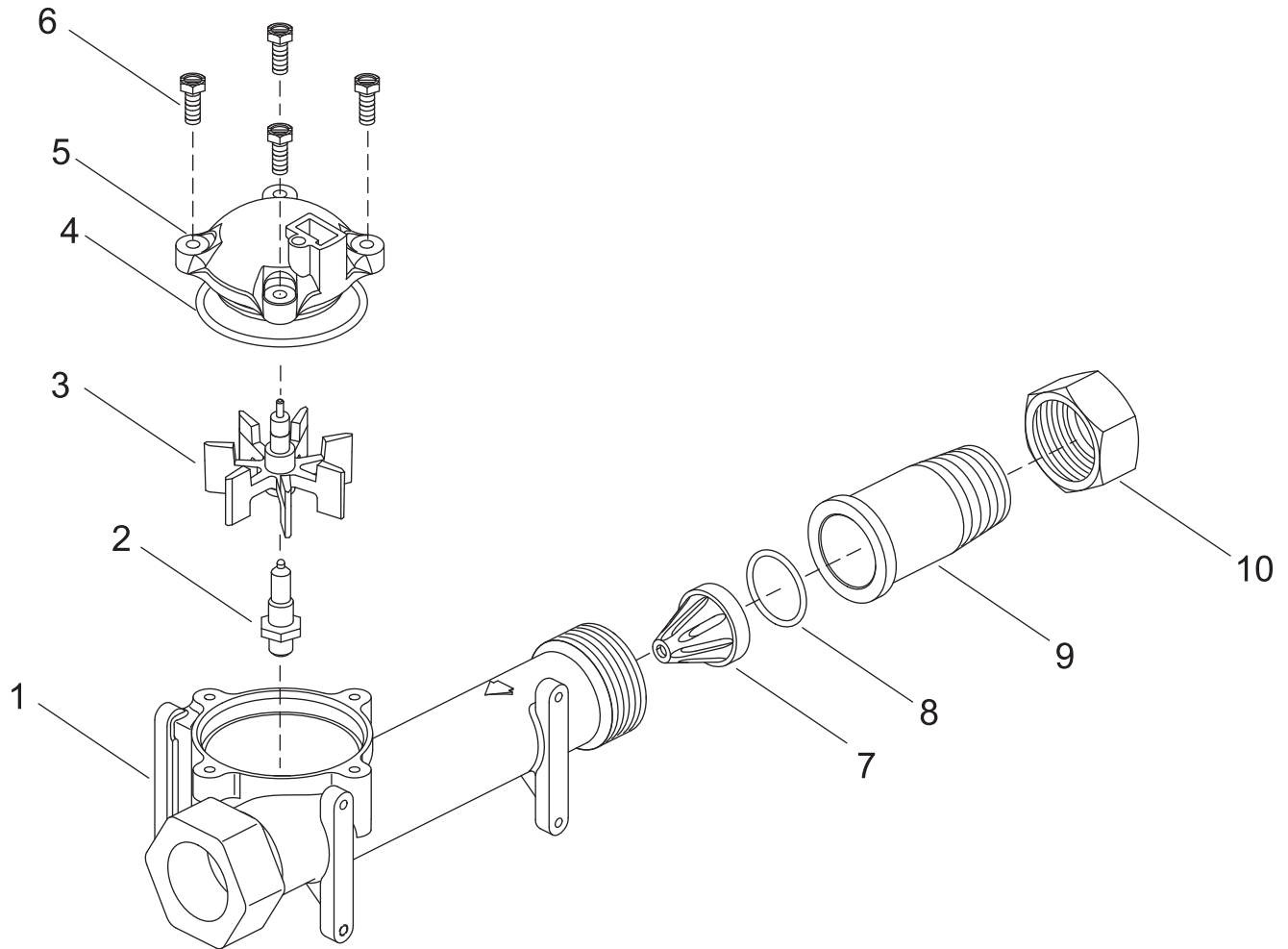
Item No.	Quantity	Part No.	Description
1.....	1.....	13577.....	O-ring, -226
2.....	1.....	16455.....	O-ring, -347
3.....	8.....	10231.....	Screw, Slot Hex, 1/4 - 20 x 1/2
4.....	4.....	17224.....	O-ring, -224

1-1/2" INLINE PLASTIC METER ASSEMBLY



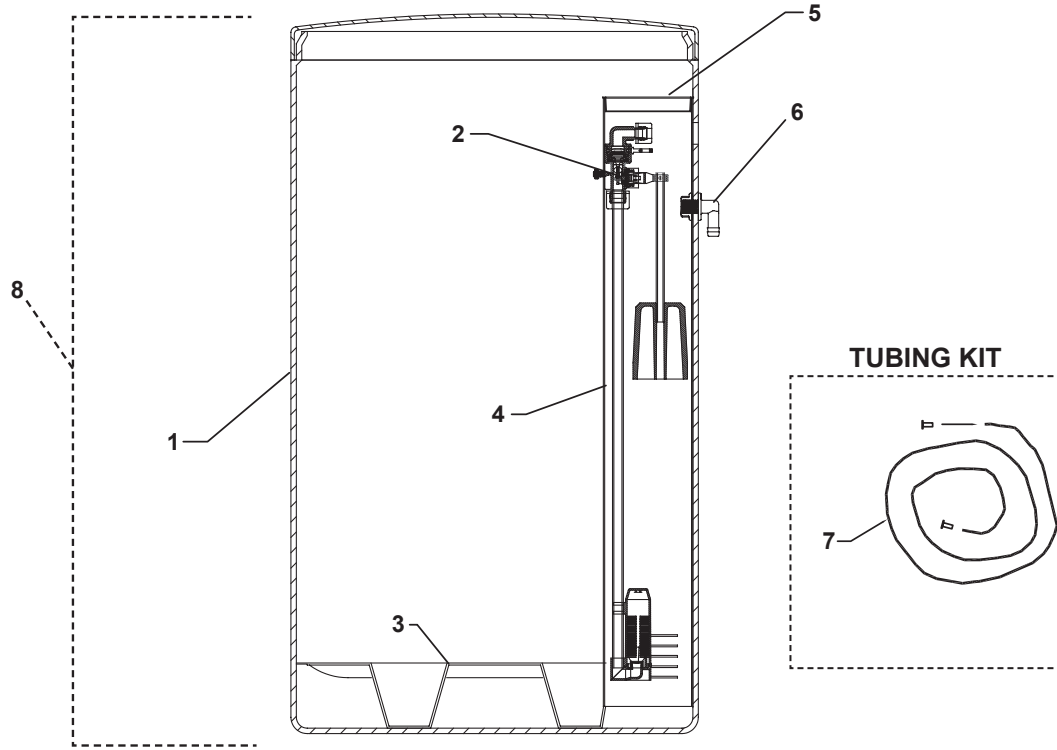
Item No.	Quantity	Part No.	Description
1.....	1.....	17542.....	Flow Straightener
2.....	2.....	40576.....	Clip, H, Plastic, 7000
3.....	1.....	40577.....	Turbine Meter Assy, 7000
4.....	1.....	41555.....	Body, Remote Meter
5.....	2.....	40951.....	O-ring, -220
6.....	2.....	40563.....	Connector, 1" NPT, 7000
7.....	2.....	40563-10.....	Connector, 1" BSP, 7000
8.....	2.....	40565.....	Connector, 1 1/4" NPT, 7000
9.....	2.....	40565-10.....	Connector, 1 1/4" BSP, 7000
10.....	2.....	41242.....	Connector, 1" & 1 1/4" Sweat
11.....	2.....	41243.....	Connector, 1 1/4 & 1 1/2" Sweat
12.....	2.....	41596.....	Connector, Brass, 1" NPT
13.....	2.....	41596-10.....	Connector, Brass, 1" BSP
14.....	2.....	41597.....	Connector, Brass, 1 1/2" NPT
15.....	2.....	41597-10.....	Connector, Brass, 1 1/2" BSP

1-1/2" PLASTIC PADDLE METER



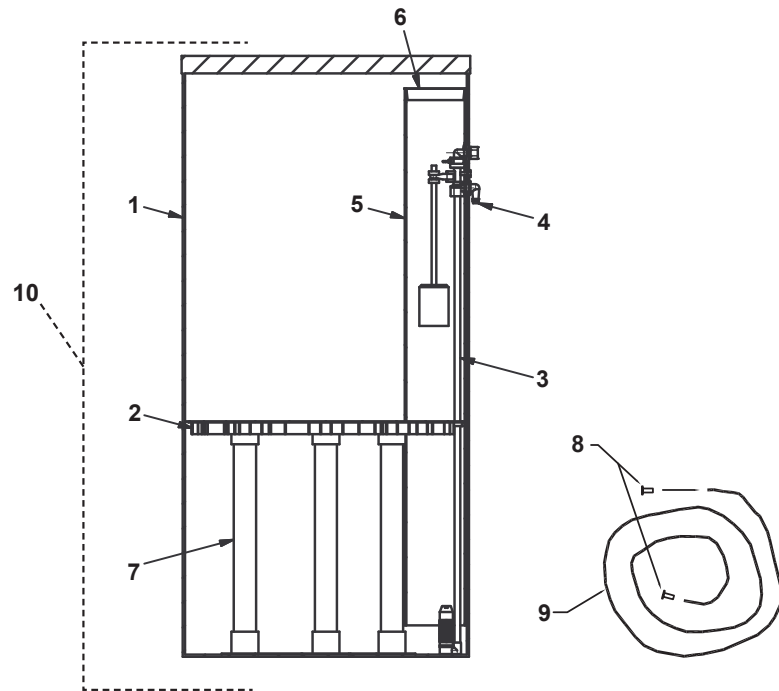
Item No.	Quantity	Part No.	Description
1.....	1	17569.....	Body, Meter, 2850/9500
2.....	1	13882.....	Post, Meter Impeller
3.....	1	13509.....	Impeller, Meter
4.....	1	13847.....	O-ring, -137, Std/560CD, Meter
5.....	1	14716.....	Meter Cap Assy, ET/NT
6.....	4	12112.....	Screw, Hex Hd Mach, 10-24 x 1/2
7.....	1	17542.....	Flow Straightener, 1 1/2"
8.....	1	12733.....	O-ring, -132
9.....	1	17544.....	Fitting, 1 1/2" Quick Connector
10.....	1	17543.....	Nut, 1 1/2", QC

BRINE SYSTEM - MAT 60M-90M



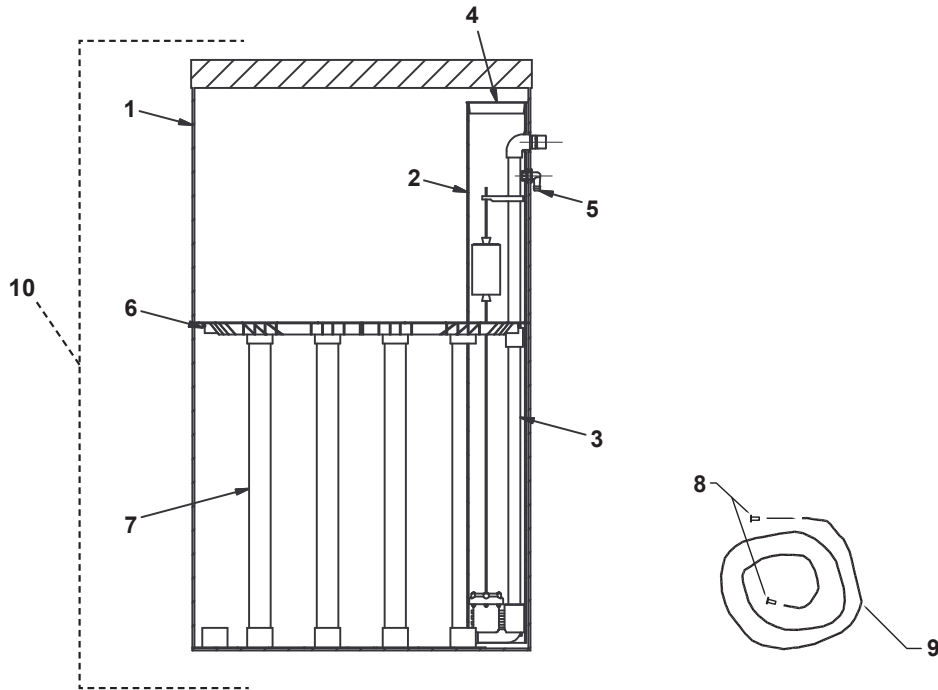
Item Number	Description	Part Number
1	Brine Tank 18"x40"/Black Molded Cover - MAT 60M - 90M	A2042028
2	Brine Valve Assembly 474 w/ Aircheck - MAT 65M - 90M	B1179005
3	5" Grid Plate - Plastic - MAT 60M - 90M	A2284002
	6" Grid Extension - Plastic MAT 60M - 90M	A2215007
4	Slotted Brine Well - 4" x 36" - MAT 60M - 90M	A2071003
5	4" Brine Well Cap	A2072003
6	1/2" Overflow Elbow w/ Nut	A2250003
7	3/8" Tubing Kit	B1020001
8	Complete Brine Tank Assembly for MAT 60M - 90M	A2042064

BRINE SYSTEM FOR MAT 120M-300M



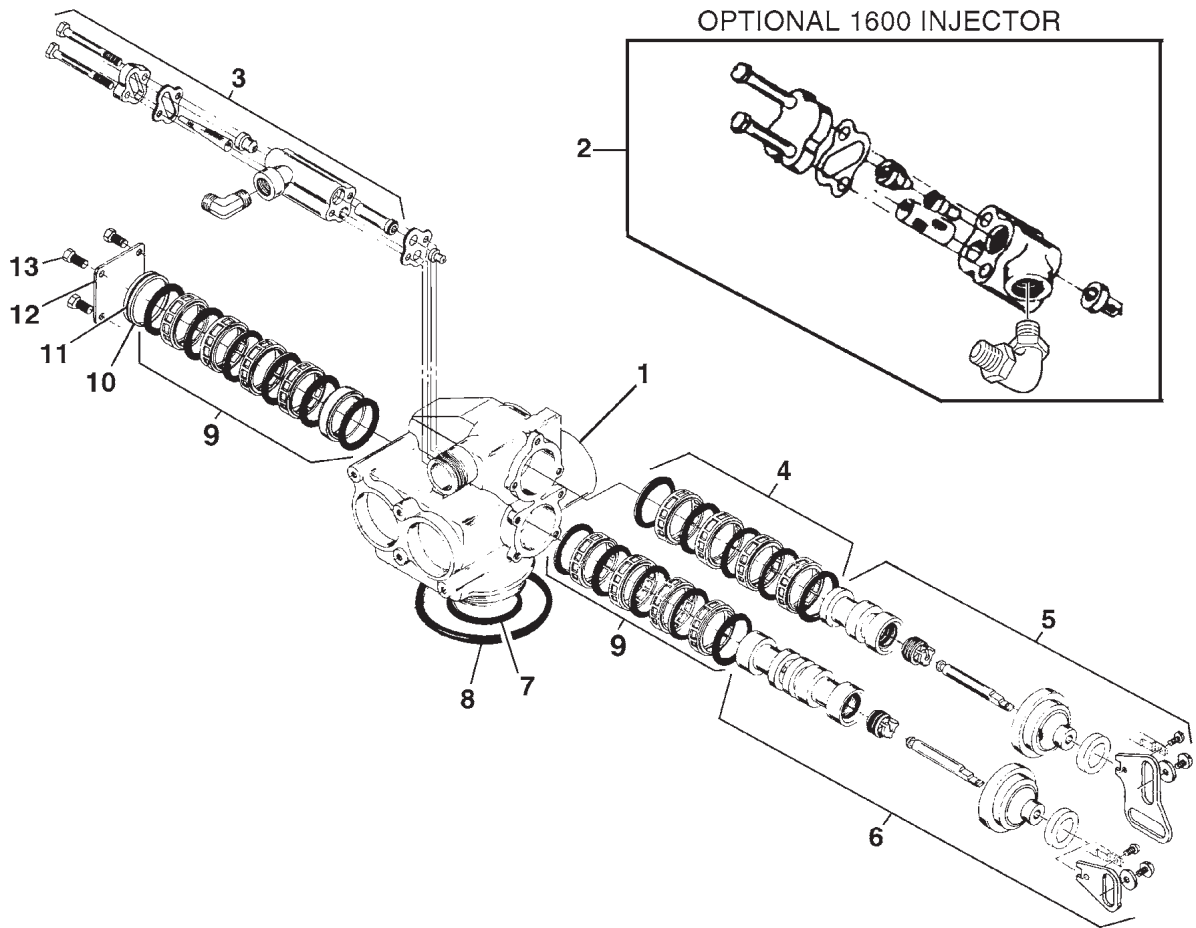
Item Number	Description	Part Number
1	Brine Tank 24" x 41" w/ Holes - MAT 120M	B1002039
	Brine Tank 24"x50" w/ Holes - MAT 150M-300M	B1002016
2	24" Diameter 5BW Plastic Grid Plate	A2284007
3	Brine Valve (474) for MAT 120	B1180014
	Brine Valve (474) for MAT 150	B1180015
	Brine Valve (474) for MAT 180	B1180016
	Brine Valve (474) for MAT 210	B1180017
	Brine Valve (474) for MAT 240	B1180018
	Brine Valve (474) for MAT270	B1180019
	Brine Valve (474) for MAT300	B1180020
4	1/2" Overflow Elbow w/ Nut	A2250003
5	5" x 46" Drilled Brine Well	B1015008
6	5" Red Cap plug	A2072001
7	1-1/2" SDR or SCH40 DWV Pipe	A2275007
8	1/2" Poly Insert	A2476001
9	1/2" x 3/8" Black Poly Tubing	A2165002
10	Complete Brine Tank Assembly for MAT 120M (10" Shelf Height)	B1295015
	Complete Brine Tank Assembly for MAT 150M (13" Shelf Height)	B1295016
	Complete Brine Tank Assembly for MAT 180M (15" Shelf Height)	B1295017
	Complete Brine Tank Assembly for MAT 210M (18" Shelf Height)	B1295018
	Complete Brine Tank Assembly for MAT 240M (20" Shelf Height)	B1295019
	Complete Brine Tank Assembly for MAT 270M (23" Shelf Height)	B1295020
	Complete Brine Tank Assembly for MAT 300M (26" Shelf Height)	B1295021

BRINE SYSTEM FOR MAT 450M



Item Number	Description	Part Number
1	Brine Tank 30" x 50" w/ Holes - MAT 450M	B1002041
2	5" x 48" Drilled Brine Well	B1015005
3	Brine Valve Assembly 16-1/4" x 24"	B1042007
4	5" Red Cap plug	A2072001
5	1/2" Overflow Elbow w/ Nut	A2250003
6	30" Plastic Top/Bottom Grid Plate	A2284010
7	1-1/2" SDR or SCH40 DWV Pipe	A2275007
8	1/2" Poly Insert	A2476001
9	1/2" x 3/8" Black Poly Tubing	A2165002
10	Complete Brine Tank Assembly for MGT 450M	B1141009

9500 SERVICE ASSEMBLIES



Item	Quantity	Part Number	Description	injector number
1	1	16919-01	valve body 9500 NPT, mechanical base	
		16919-01NP	valve body 9500 NPT, mechanical base, nickel-plated	
		16919-21	valve body 9500 BSP/Metric, mechanical base	
		16919-21NP	valve body 9500 BSP/Metric, mechanical base, nickel-plated	
2	1	60080-XX	injector assembly (see chart for dash numbers)	
3	1	60039-XX	injector assembly (see chart for dash numbers)	
				injector number
				blue #2 02
				yellow #3 03
				green #4 04
				white #5 05
4	1	60134	seal and spacer kit, top	
		60134-01	seal and spacer kit, top, hot water	
		60134	seal and spacer kit, top, silicone	
5	1	60108	piston assembly, top	
		60108-01	piston assembly, top, hot water	
6	1	60109	piston assembly, bottom	
		60109-01	piston assembly, bottom, hot water	
7	1	60133	seal and spacer kit, bottom	
		60133-01	seal and spacer kit, bottom, hot water	
		60133-10	seal and spacer kit, bottom, silicone	
8	1	16455	O-ring, 347	
9	1	13577	O-ring, 226	
10	1	16955	end plug	
11	1	16394	O-ring, 029	
12	1	14906	end plate	
13	4	15137	screw, hex washer machine, 1-24 x 3/8	
		17657	screw, hex M5-40, Metric	
<i>Not Shown</i>				
14		16516	tool, seal and spacer stuffer	
15		17623	tool, spacer puller	

SERVICE ASSEMBLIES**COVERS**

A2103128 Designer with Left Window

BRINE LINE FLOW CONTROLS

A2389001 BLFC, .25 GPM, 1600

A2389002 BLFC, .50 GPM, 1600

A2389004 BLFC, 1.0 GPM, 1600

BRINE VALVE ASSEMBLY

60039-XX Brine Valve, 9500/1700, Cold & HW 180°

A2005085 Brine Valve 9500/1700 Blank

A2005025 Brine Valve 9500/1700 2 gpm

PISTON ASSEMBLIES

A2309048 Piston Assy, 9500, Upper, HW 180°

A2309049 Piston Assy, 9500, Lower HW, 180°

SEAL & SPACER KITS

A2435082 Seal & Spacer Kit, 9500, Upper

A2435083 Seal & Spacer Kit, 9500, Lower

SECOND TANK ASSEMBLIES 9500

A2487017 Yoke Assy 14" - 16" Tanks

A2487016 Yoke Assy 20" Tanks

A2487015 Yoke Assy 24" Tanks

B1700001 Yoke Assy 30" Tanks

SERVICE EQUIPMENT

A2475002 Stuffer 2850/9500

A2474002 Puller 2850/9500

A2423002 Silicone, 2 oz. Tube

A2164006 Meter Checker Std. Range

A2164005 Meter Checker Ext. Range



TROUBLESHOOTING

ERROR CODES

NOTE: Error codes appear on the In Service display.

ERROR CODE	PROBABLE CAUSE	RECOVER & RESETTING
[Err0]	Drive motor is stalled	Unplug the unit from the power source[
[Err1]	Drive motor is running continuously	When power is restored to the unit, the Err _ display code clears. If the condition causing the error has not been resolved the Err _ code reappears in the four digit display. Do not at-tempt to troubleshoot this problem any further.
[Err2]	There have been more than 99 days since the last Regeneration. If the Day of the Week mode of regeneration is selected and days since last regeneration exceeds 7 days. [7 - - 5]: There have been more than 7 days since the last regen-eration. All individual settings (d1, d2, d3, d4, d5, d6, d7) are set to 0.	Regeneration must occur for the unit to recover, the display to clear and the valve to function normally. [7 - - 5]: To recover from [Err2], the user must initiate a regeneration or set at least one individual day to 1.
[Err3]	Control board memory failure.	Perform a Master Reset. If the error returns, do not attempt to troubleshoot this problem any further.

ERROR DISPLAY EXAMPLE



NOTE: Unit will flash when error exists.

TROUBLESHOOTING 2900 VALVE

PROBLEM	CAUSE	CORRECTION
1. Softener Fails To Regenerate.	<ul style="list-style-type: none"> A. Electrical Service To Unit Has Been Interrupted. B. Timer Is Defective. C. Power Failure. 	<ul style="list-style-type: none"> A. Assure Permanent Electrical Service (Check Fuse, Plug, Pull Chain or Switch). B. Replace Timer. C. Reset Time of Day.
2. Hard Water.	<ul style="list-style-type: none"> A. By-Pass Valve is Open. B. No Salt in Brine Tank C. Injector Screen Plugged. D. Insufficient Water Flowing Into Brine Tank E. Hot Water Tank Hardness. F. Leak At Distributor Tube. G. Internal Valve Leak H. Service Adapter Did Not Return To Service. 	<ul style="list-style-type: none"> A. Close By-Pass Valve. B. Add Salt To Brine Tank and Maintain Salt Level Above Water Level. C. Clean Injector Screen. D. Check Brine Tank Fill Time And Clean Brine Line Flow Control If Plugged. E. Repeated Flushings Of The Hot Water Tank is Required. F. Make Sure Distributor Tube Is Not Cracked. Check O-Ring And Tube Pilot. G. Replace Seals and Spacers And/ Or Piston. H. Check Drive Motor And Switch.
3. Unit Used Too Much Salt	<ul style="list-style-type: none"> A. Improper Salt Setting. B. Excessive Water in Brine Tank 	<ul style="list-style-type: none"> A. Check Salt Usage and Salt Setting. B. See Problem No. 7.
4. Loss Of Water Pressure.	<ul style="list-style-type: none"> A. Iron Buildup In Line To Water Conditioner. B. Iron Buildup in Water Conditioner. C. Inlet of Control Plugged Due to Foreign Material Broken Loose From Pipes By Recent Work Done On Plumbing System. 	<ul style="list-style-type: none"> A. Clean Line To Water Conditioner. B. Clean Control and Add Mineral Cleaner to Mineral Bed. Increased Frequency of Regeneration. C. Remove Piston and Clean Control.
5. Loss of Mineral Through Drain Line.	<ul style="list-style-type: none"> A. Air In Water System. B. Improperly Sized Drain Line Flow Control. 	<ul style="list-style-type: none"> A. Assure That Well System Has Proper Air Eliminator Control. Check For Dry Well Condition. B. Check For Proper Drain Rate.
6. Iron In Conditioned Water.	<ul style="list-style-type: none"> A. Fouled Mineral Bed. 	<ul style="list-style-type: none"> A. Check Backwash, Brine Draw And Brine Tank Fill. Increase Frequency of Regeneration. Increase Backwash Time.

TROUBLESHOOTING 2900 VALVE (CONTINUED)

PROBLEM	CAUSE	CORRECTION
7. Excessive Water In Brine Tank.	<ul style="list-style-type: none"> A. Plugged Drain Line Flow Control. B. Plugged Injector System. C. Timer Not Cycling. D. Foreign Material In Brine Valve. E. Foreign Material In Brine Line Flow Control. 	<ul style="list-style-type: none"> A. Clean Flow Control. B. Clean Injector and Screen. C. Replace Timer. D. Replace Brine Valve Seat And Clean Valve. E. Clean Brine Line Flow Control.
8. Softener Fails To Draw Brine.	<ul style="list-style-type: none"> A. Drain Line Flow Control Is Plugged. B. Injector Is Plugged. C. Injector Screen Plugged. D. Line Pressure Is Too Low. E. Internal Control Leak F. Service Adapter Did Not Cycle. 	<ul style="list-style-type: none"> A. Clean Drain Line Flow Control. B. Clean Injector. C. Clean Screen. D. Increase Line Pressure To 20 P.S.I. E. Change Seals, Spacers and Piston Assembly. F. Check Drive Motor And Switches.
9. Control Cycles Continuously.	<ul style="list-style-type: none"> A. Misadjusted, Broken or Shorted Switch. 	<ul style="list-style-type: none"> A. Determine If Switch or Timer Is Faulty and Replace It or Replace Complete Power Head.
10. Drain Flows Continuously.	<ul style="list-style-type: none"> A. Valve Is Not Programming Correctly. B. Foreign Material In Control. C. Internal Control Leak 	<ul style="list-style-type: none"> A. Check Timer Program and Positioning of Control. Replace Power Head Assembly If Not Positioning Properly. B. Remove Power Head Assembly And Inspect Bore. Remove Foreign Material and Check Control In Various Regeneration Positions. C. Replace Seals and Piston Assembly.

General Service Hints For Meter Control

Problem: Softener Delivers Hard Water.

Cause could be that . . . Reserve Capacity Has Been Exceeded.

Correction: Check salt dosage requirements and reset program wheel to provide additional reserve.

Cause could be that . . . Program Wheel Is Not Rotating With Meter Output

Correction: Pull cable out of meter cover and rotate manually. Program wheel must move without binding and clutch must give positive “clicks” when program wheel strikes regeneration stop. If it does not, replace timer.

Cause could be that . . . Meter Is Not Measuring Flow.

Correction: Check meter with meter checker.



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