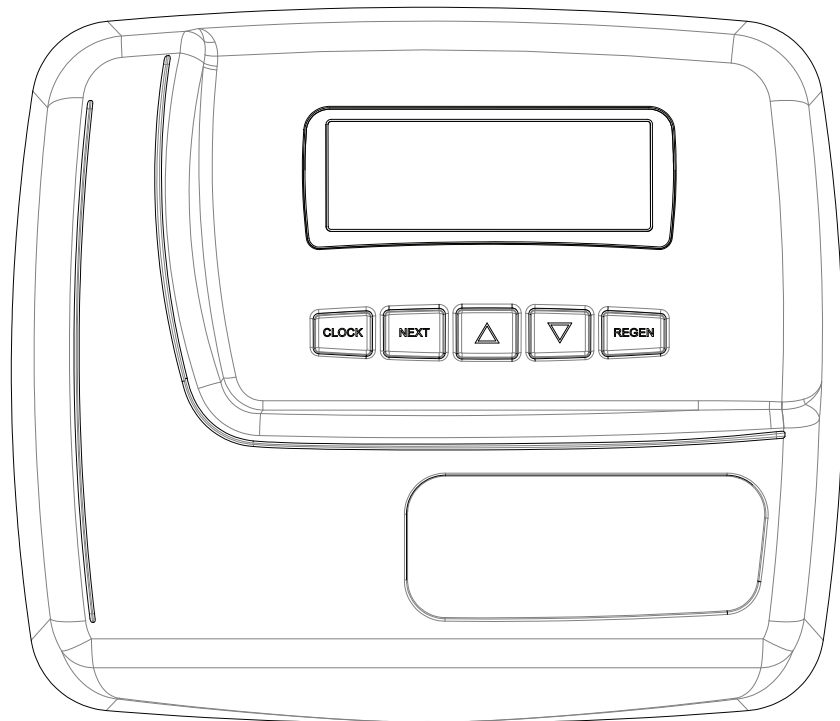


# Water Specialist CD Control Valve Programming and Cover Drawing Manual





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### CD Front Cover and Drive Assembly

Drawing No.	Order No.	Description	Quantity
1	V3984-01	WS1CD FRONT COVER ASSEMBLY	1
2	V3107-01	WS1 MOTOR ASY	1
3	V3106-01	WS1 DRIVE BRACKET & SPRING CLIP	1
4	V3985CD-BOARD	WS1 THRU 2L/2 CD PC 2 MAV BRD REPL	1
5	V3110	WS1 DRIVE REDUCING GEAR 12X36	3
6	V3109	WS1 DRIVE GEAR COVER	1
Not Shown	V3186	WS1 AC ADAPTER 120V-12V	1
	V3186AUS	WS1 AC ADAPTER 220-240V-12V AUST	
	V3186EU	WS1 AC ADAPTER 220-240V-12V EU	
	V3186UK	WS1 AC ADAPTER 220-240V-12V UK	
	V3186-01	WS1 AC ADAPTER CORD ONLY	
Not Shown	V3946	WS1 WIDE DRIVE BACK PLATE	1

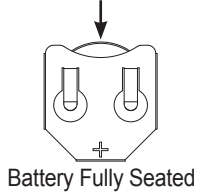
Refer to Control Valve Service Manual for other drawings and part numbers.

Relay Specifications: 12V DC Relay with a coil resistance not less than 80 ohms. If mounting the relay under the cover check for proper mounting location dimensions on the backplate.

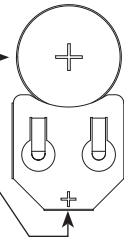
AC Adapter	U.S.	International
Supply Voltage	120 V AC	230V AC
Supply Frequency	60 Hz	50 Hz
Output Voltage	12 V AC	12 V AC
Output Current	500 mA	500 mA

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

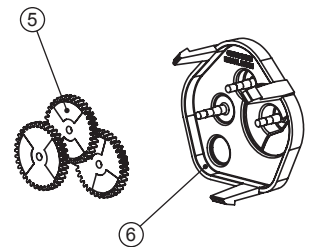
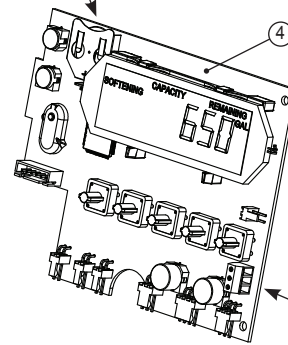
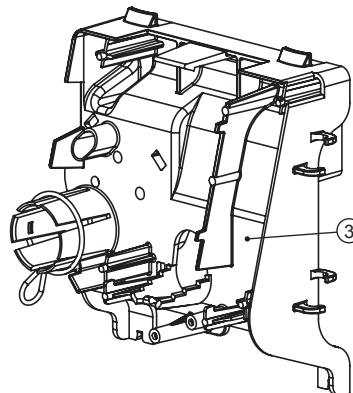
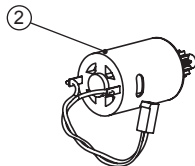
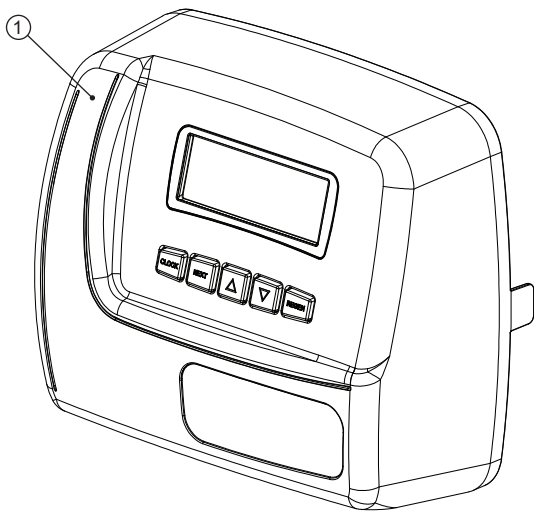
When replacing the battery, align positives and push down to fully seat.



Correct Battery Orientation



Battery replacement is 3 volt lithium coin cell type 2032.



PC Board Relay Terminal Block

**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	WS1CD only Upflow Regenerant Refill After Rinse	WS1CD only Upflow Regenerant Prefill
1 <sup>st</sup> Cycle: Backwash 2 <sup>nd</sup> Cycle: dn Brine 3 <sup>rd</sup> Cycle: Backwash 4 <sup>th</sup> Cycle: Rinse 5 <sup>th</sup> Cycle: Fill	1 <sup>st</sup> Cycle: Fill 2 <sup>nd</sup> Cycle: Softening 3 <sup>rd</sup> Cycle: Backwash 4 <sup>th</sup> Cycle: dn Brine 5 <sup>th</sup> Cycle: Backwash 6 <sup>th</sup> Cycle: Rinse	1 <sup>st</sup> Cycle: UP Brine 2 <sup>nd</sup> Cycle: Backwash 3 <sup>rd</sup> Cycle: Rinse 4 <sup>th</sup> Cycle: Fill	1 <sup>st</sup> Cycle: Fill 2 <sup>nd</sup> Cycle: Softening 3 <sup>rd</sup> Cycle: UP Brine 4 <sup>th</sup> Cycle: Backwash 5 <sup>th</sup> Cycle: Rinse

**Table 2: Regeneration Cycles Filtering**

Downflow Regenerant Refill After Rinse	
1 <sup>st</sup> Cycle:	Backwash
2 <sup>nd</sup> Cycle:	dn Brine
3 <sup>rd</sup> Cycle:	Backwash
4 <sup>th</sup> Cycle:	Rinse
5 <sup>th</sup> 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 which ever comes first, depending upon what settings are selected for Day Override and Gallon Capacity.<sup>1</sup> 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 <sup>2</sup>	
				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 “DELAY REGEN” or “DELAY + IMMEDIATE”. The actual reserve capacity is compared to the gallons capacity remaining immediately prior to the preset regeneration time. A regeneration will occur if the actual reserve capacity is less than the gallons capacity remaining. The actual reserve capacity is calculated by using the estimated reserve capacity and adjusting it up or down for actual usage.

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

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

<sup>2</sup> Days to REGEN and Gallon Capacity can not 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 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 zero when the valve is installed in a new location. To reset to zero, press NEXT and ▼ buttons simultaneously to go to the Softening/Filtering screen. Press ▲ and ▼ simultaneously to reset programming and diagnostic values to zero. Screen will return to User Display.**

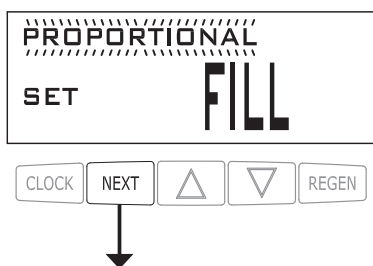
Sometimes it is desirable to have the valve initiate and complete two regenerations within 24 hours and then return to the preset regeneration procedure. It is possible to do a double regeneration if the control valve is set to “DELAYED REGEN” or “DELAY + IMMEDIATE” in OEM Softener System Setup or OEM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

### Proportional Brining

If the system is set up as a prefill 1” upflow softener the control valve can also be set to normal or proportional brining.



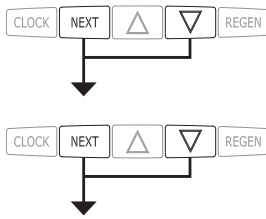
This step will appear after Step 8S and before Step 9S if the system is set up as a prefill upflow softener. The following options can be selected:

- NORMAL FILL - System always prefills with the salt level selected.
- PROPORTIONAL FILL - If proportional brining is selected, the actual salt fill time will be calculated by dividing the actual volume of treated water used by the full volumetric capacity, then multiplying this value by the maximum salt fill time.

Press NEXT to go to the next step. Press REGEN to return to the previous step.

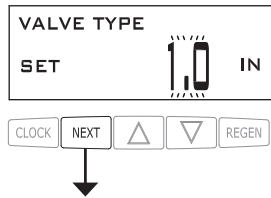
OEM Configuration Setup

**STEP 1CS**



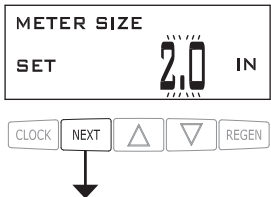
**Step 1CS** – Press NEXT and ▼ simultaneously for 3 seconds and release. Then press NEXT and ▼ simultaneously for 3 seconds and release. If screen in Step 2CS does not appear in 5 seconds the lock on the valve is activated. To unlock press ▼, NEXT, ▲, and CLOCK in sequence, then press NEXT and ▼ simultaneously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

**STEP 2CS**



**Step 2CS** – Use the ▲ or ▼ to select 1.0 for 1” valve, 1.25 for 1.25” valve, 1.5 for 1.5” valve, 2.0L for 2L valve or 2.0 for 2” valve<sup>3</sup>. Press NEXT to go to Step 3CS. Press REGEN to exit OEM cycle sequence.

**STEP 3CS**



**Step 3CS** – When 2.0L 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, 1.5, 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 previous step.



**Note:** When using the WS2 valve, if “2.0L” is set instead of “2.0”, when the valve is in regeneration and the piston drives to the “DRAW” cycle the piston will stall and generate a 102 error code. Clear the error code by pressing “NEXT” and “REGEN” buttons simultaneously until the valve resets, then re-program valve to proper valve type setting.

<sup>3</sup>When using the WS2 control valve, the circuit board software must have valve selection choices of 2.0 and 2.0L. The WS2 valve must be set for the 2.0 valve type during programming. If the software version does not have both the 2.0 and 2.0L selections, consult your equipment supplier for a replacement circuit board. When using the WS2L valve with older version software that does not have both 2.0 and 2.0L selection choices, the valve must be set to 2.0 during programming. If a WS2L valve is being used with newer version software that has both 2.0 and 2.0L selection choices, the valve must be set to 2.0L during programming.

**STEP 4CS**



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

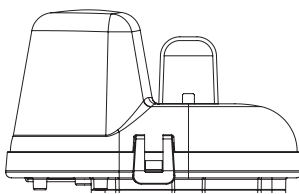
- the Control Valve to act as an alternator; or
- the Control Valve to have a no hard water bypass: or
- the Control Valve to have a Separate Source during the regeneration cycle; or
- the Control Valve to operate with the Clack System Controller.

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.

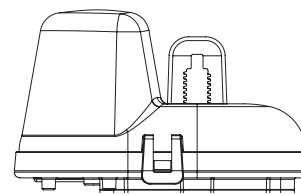
Selecting the Control Valve to act as an alternator:

Prior to starting the programming steps, connect the interconnect cable to each control valve board’s three pin connector labeled “INTERCONNECT”. 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 ALTA Connect ALTA valve to the MAV’s A port and connect the MAV’s two pin wire connector to the two pin connector labeled “MAV DRIVE” on the ALTA valve	Set to ALTB Connect ALTB valve to the MAV’s B port. No connections between the ALTB valve and the MAV are made.
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 3I	Set Day Override to “OFF”	Set Day Override to “OFF”



**Retracted**

Valve “A” in Service Position = MAV piston rod Retracted



**Extended**

Valve “B” in Service Position = MAV piston rod Extended

**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.

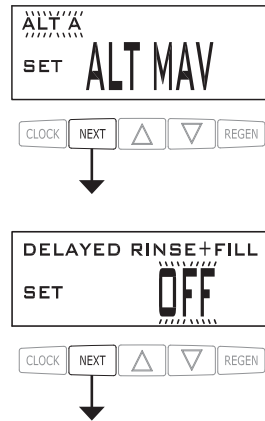


**Step 4CS** (continued) – If set up for a filter, in Step 7F set Volume Capacity in Gallons; in Step 8F select Regeneration Time Option “Immediate”; and in Step 3I select Day Override “OFF”.

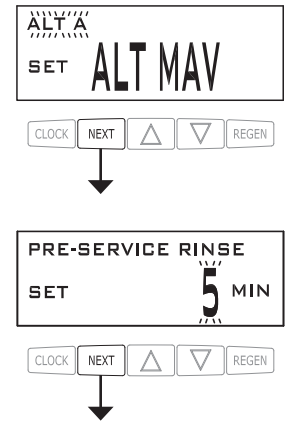
For Clack Corporation alternator systems using **WS1, WS1.25, WS1.5, and WS2L** valves there will be an option to delay the last two cycles of regeneration (only “Rinse” and “Fill”). This feature splits the regeneration into two portions. The first portion of the regeneration will start immediately and 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 **WS2** 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.

**WS1, WS1.25, WS1.5, WS2L Valves**



**WS2 Valve**



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 DRIVE 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 DRIVE 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 Control Valve to operate with Clack System Controller:

Select System Board Enabled 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**

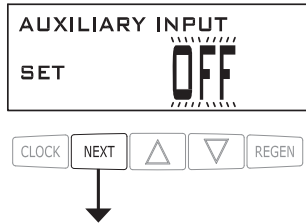


**Step 5CS** – Set Auxiliary Drive Output (MAV only) to operate in one of two modes:

- 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.

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 previous step.

**STEP 6CS**

**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.

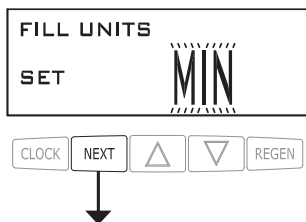
**NOTE: In a twin alternating system each control must have a separate dP signal or dP switch. One dP signal or one dP switch cannot be used for both controls.**

**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 WS1 – WS2L 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 WS1 – WS2L 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 WS1 – WS2L 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 (if 1.5IN was selected in Step 2CS) or to exit Configuration Setup. Press REGEN to return to previous step.

**STEP 7CS**

**Step 7CS** – If 1.5 IN was selected in Step 2CS, this screen will appear, and FILL can be set to LBS or MIN by using ▼ or ▲.

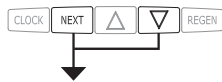
Press NEXT to exit Configuration Setup. Press REGEN to return to previous step.

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	

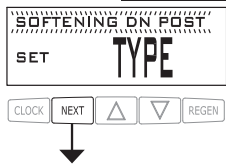
Cycle	Units	Range	Default
Backwash	MIN	1-120 or OFF	8
Rinse	MIN	1-120 or OFF	8
Draw (Up or Down)	MIN	1-160 or OFF	60
Fill (all but 2" valve)	LBS	0.1-200 or OFF	9.5
Fill (1.5" MIN or 2" valve)	MIN	0.1-99.0 or OFF	6
Softening	MIN	1-480 or OFF	240

**STEP 1S**



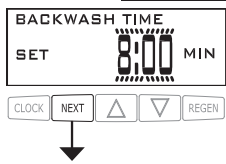
**Step 1S** – Press NEXT and ▼ simultaneously for 3 seconds and release. If screen in Step 2S does not appear in 5 seconds the lock on the valve is activated. To unlock press ▼, NEXT, ▲, and CLOCK in sequence, then press NEXT and ▼ simultaneously for 3 seconds and release.

**STEP 2S**



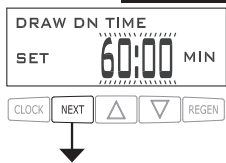
**Step 2S** – Choose the SOFTENING program desired (see table) using ▼ or ▲. Press NEXT to go to Step 3S. Press REGEN to exit OEM Softener System Setup.

**STEP 3S**



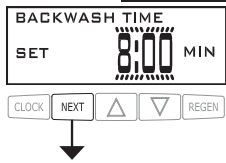
**Step 3S** – Select the time for the first cycle using the ▼ or ▲ button. Press NEXT to go to Step 4S. Press REGEN to return to previous step.

**STEP 4S**



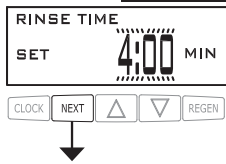
**Step 4S** – Select the time for the second cycle using the ▼ or ▲ button. Press NEXT to go to Step 5S. Press REGEN to return to previous step.

**STEP 5S**



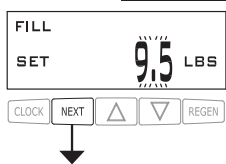
**Step 5S** – Select the time for the third cycle using the ▼ or ▲ button. Press NEXT to go to Step 6S. Press REGEN to return to previous step.

**STEP 6S**



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

**STEP 7S**



**Step 7S** – Select the LBS for the fifth cycle using the ▼ or ▲ button. When both 2.0L and 2.0 are options in Step 2CS, and 2.0 is selected, FILL is in minutes. If 1.5 is selected in Step 2CS, setting Step 7CS determines if the valve is in lbs. or minutes. Press NEXT to go to Step 8S. Press REGEN to return to previous step.

**STEP 8S**

GRAINS OF CAPACITY  
SET 24.0 X1K  
CLOCK NEXT ▲ ▼ REGEN

**Step 8S** –Set Grains Capacity using the ▲ or ▼ button. 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**

GALLONS CAPACITY  
SET AUTO  
CLOCK NEXT ▲ ▼ REGEN

**Step 9S** – Set Volume Capacity using the ▲ or ▼ button. 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**

DELAY+IMMEDIATE  
SET REGEN  
CLOCK NEXT ▲ ▼ REGEN

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

- “DELAYED REGEN” means regeneration will occur at the preset time;
- “IMMEDIATE” means regeneration will occur immediately when the volume capacity reaches 0 (zero); or
- “DELAY + IMMEDIATE” 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” will not be available.

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

**STEP 11S**

REGEN TIME  
SET RELAY 1  
CLOCK NEXT ▲ ▼ REGEN

**Step 11S:** Set Relay 1 operation using the ▲ or ▼ button. 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, which ever comes first.
- Set VOLUME: Relay activates after a set number of gallons have been used while in service and then deactivates after a set period of time or after the meter stops registering flow, whichever comes first.
- Set REGEN VOLUME: Relay activates after a set number of gallons have been used while in service or during regeneration and then deactivates after a set period of time or after the meter stops registering flow, whichever comes first.
- Set HOLD VOLUME: The relay closes every set number of gallons and release when any button is pressed.
- 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**

RELAY 1 SETPOINT  
SET 10 MIN  
CLOCK NEXT ▲ ▼ REGEN

**Step 12S:** Set Relay 1 SETPOINT Time or Volume using the ▲ or ▼ buttons. 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, which ever 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**

RELAY 1 DURATION  
SET 5:00 MIN  
CLOCK NEXT ▲ ▼ REGEN

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

- 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 the ▲ or ▼ buttons. 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 the ▲ or ▼ buttons.

- 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 the ▲ or ▼. Available options are OFF, TIME, ON GAL or BOTH.

Selecting OFF disables this feature. If OFF is selected press NEXT to exit OEM Softener System Setup. If TIME, ON GAL or BOTH is selected press NEXT to select the TIME and/or ON GAL values. See Steps 17S and/or 18S.

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 16S. 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 GAL 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 OEM Softener System Setup. Press REGEN to return to previous step.

**RETURN TO NORMAL MODE**

**Setting Options Table**  
**Filters should only use shaded options.**

Volume Capacity	Regeneration Time Option	Day Override	Result <sup>4</sup>
AUTO	DELAYED REGEN	OFF	Reserve capacity automatically estimated. Regeneration occurs when volume capacity falls below the reserve capacity at the next Regen Set Time
AUTO	DELAYED REGEN	Any number	Reserve capacity automatically estimated. Regeneration occurs at the next Regen Set Time when volume capacity falls below the reserve capacity or the specified number of days between regenerations is reached.
Any number	DELAYED REGEN	OFF	Reserve capacity <u>not</u> automatically estimated. Regeneration occurs at the next Regen Set Time when volume capacity reaches 0.
OFF	DELAYED REGEN	Any number	Reserve capacity <u>not</u> automatically estimated. Regeneration occurs at the next Regen Set Time when the specified number of days between regenerations is reached.
Any number	DELAYED REGEN	Any number	Reserve capacity <u>not</u> automatically estimated. Regeneration occurs at the next Regen Set Time when volume capacity reaches 0 or the specified number of days between regenerations is reached.
AUTO	IMMEDIATE	OFF	Reserve capacity <u>not</u> automatically estimated. Regeneration occurs immediately when volume capacity reaches 0. Time of regeneration will not be allowed to be set because regeneration will always occur when volume capacity reaches 0.
Any number	IMMEDIATE	OFF	Reserve capacity <u>not</u> automatically estimated. Regeneration occurs immediately when volume capacity reaches 0. Time of regeneration will not be allowed to be set because regeneration will always occur when volume capacity reaches 0.
AUTO	DELAY + IMMEDIATE	OFF	Reserve capacity automatically estimated. Regeneration occurs when volume capacity falls below the reserve capacity at the next Regen Set Time or regeneration occurs after 10 minutes of no water usage when volume capacity reaches 0.
AUTO	DELAY + IMMEDIATE	Any number	Reserve capacity automatically estimated. Regeneration occurs at the next Regen Set Time when volume capacity falls below the reserve capacity or the specified number of days between regenerations is reached or regeneration occurs after 10 minutes of no water usage when volume capacity reaches 0.
Any number	DELAY + IMMEDIATE	Any number	Reserve capacity <u>not</u> automatically estimated. Regeneration occurs at the next Regen Set Time when the specified number of days between regenerations is reached or regeneration occurs after 10 minutes of no water usage when volume capacity reaches 0.

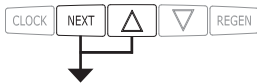
<sup>4</sup> Reserve capacity estimate is based on history of water usage

OEM Filter System Setup

Type	Backwash	Draw	Backwash	Rinse	Fill
Filtering DN Post	8	60	8	8	0.95 GAL
Filtering DN Post (1.5" MIN or 2" valve)	8	60	8	8	6 MIN

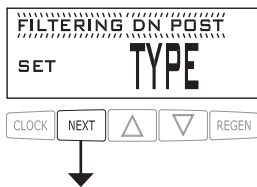
Cycle	Units	Range	Default
Backwash	MIN	1-120 or OFF	8
Rinse	MIN	1-120 or OFF	8
Draw (Up or Down)	MIN	1-160 or OFF	60
Fill (all but 2" valve)	GAL	0.05-20.00 or OFF	0.95
Fill (2" valve)	MIN	0.1-99.0 or OFF	6

STEP 1F



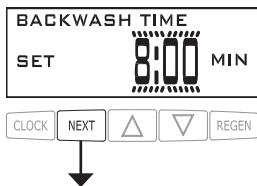
**Step 1F** – Press NEXT and ▼ simultaneously for 3 seconds and release. If screen in Step 2F does not appear in 5 seconds the lock on the valve is activated. To unlock press ▼, NEXT, ▲, and CLOCK in sequence, then press NEXT and ▼ simultaneously for 3 seconds and release.

STEP 2F



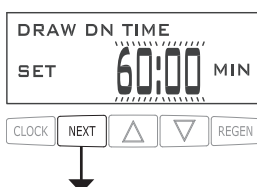
**Step 2F** – Choose FILTERING DN POST using the ▼ or ▲ buttons. Press NEXT to go to Step 3F. Press REGEN to exit OEM Filter System Setup.

STEP 3F



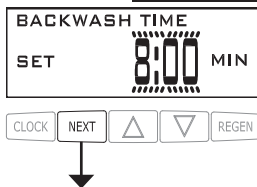
**Step 3F** – Select the time for the first cycle using the ▼ or ▲ button. Press NEXT to go to Step 4F. Press REGEN to return to previous step.

STEP 4F



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

STEP 5F

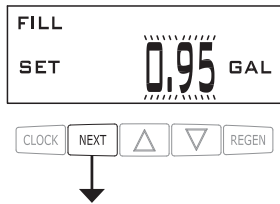


**Step 5F** – Select the time for the third cycle using the ▼ or ▲ button. Press NEXT to go to Step 6F. Press REGEN to return to previous step.

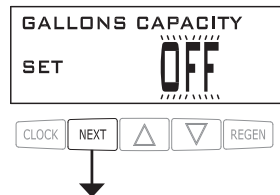
STEP 6F



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

**STEP 7F**

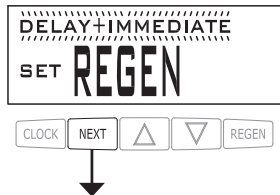
**Step 7F** – Select the gallons for the fifth cycle using the ▼ or ▲ button. When both 2.0L and 2.0 are options in Step 2CS, and 2.0 is selected, FILL is in minutes. Press NEXT to go to Step 8F. Press REGEN to return to previous step.

**STEP 8F**

**Step 8F** – Set Volume Capacity using the ▲ or ▼ button. 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 the ▲ or ▼ button. If “OFF” was selected in Step 7F, this screen will not appear.

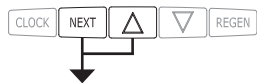
If value is set to:

- “DELAYED REGEN” means regeneration will occur at the preset time;
  - “IMMEDIATE” means regeneration will occur immediately when the volume capacity reaches 0 (zero); or
  - “DELAY + IMMEDIATE” 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” will not be available.

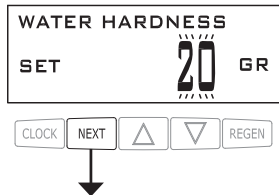
See Setting Options Table for more detail. Press NEXT to go to the remaining Filter System Setup screens. Refer to Softener System Setup starting at Step 11S for details. Press REGEN to return to previous step.



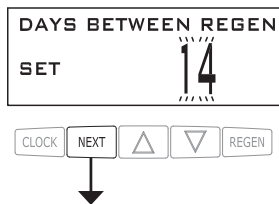
## Installer Display Settings

**STEP 1I**

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

**STEP 2I**

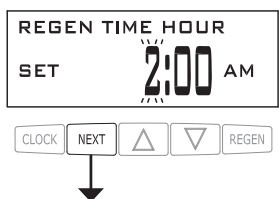
**STEP 2I** – Hardness: Set the amount of hardness in grains of hardness as calcium carbonate per gallon using the ▼ or ▲ buttons. The default is 20 with value ranges from 1 to 150 in 1 grain increments. Note: The grains per gallon can be increased if soluble iron needs to be reduced. This display will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

**STEP 3I**

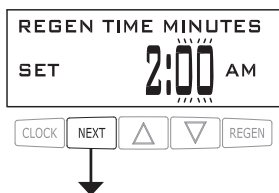
**STEP 3I** – Day Override: When volume capacity is set to “OFF”, sets the number of days between regenerations. When volume capacity is set to AUTO or to a number, sets the maximum number of days between regenerations. If value set to “OFF”, regeneration initiation is based solely on volume used. If 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 ▲ buttons:

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

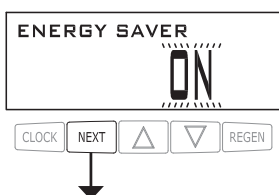
See Setting Options Table for more detail on setup. Press NEXT to go to step 4I. Press REGEN to return to previous step.

**STEP 4I**

**STEP 4I** – Next Regeneration Time (hour): Set the hour of day for regeneration using ▼ or ▲ buttons. AM/PM toggles after 12. The default time is 2:00 AM. This display will show “REGEN IMMEDIATE ON ZERO GAL” 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 ▲ buttons. 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

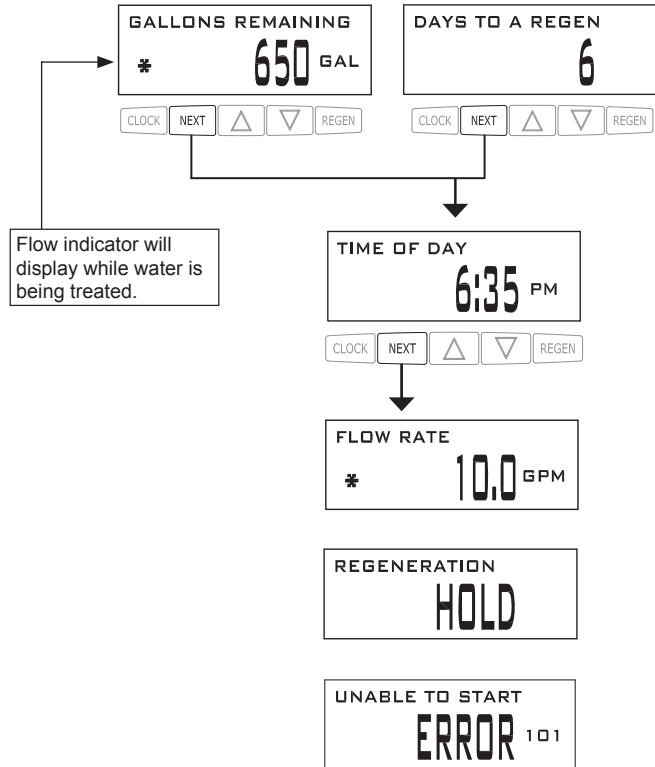
**General Operation**

When the system is operating, one of six 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. The second display is one of the following: days remaining or volume remaining. Days to a Regen is the number of days left before the system goes through a regeneration cycle. Capacity remaining is the gallons that will be treated before the system goes through a regeneration cycle. Pressing the ▼ button while in the Capacity 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.

The third display shows the current treated water flow rate through the system. The fourth display will display the phone number and banner text if it was edited. For concerns with phone number or banner text displays, contact OEM for instructions. The fifth display will show either dP or hold if the dP switch is closed. The sixth display indicates the user should call for service. The sixth display will not appear if OFF is selected in Step 17S of OEM Softener System Setup. To clear the Service Call reminder, press the ▲ and ▼ buttons 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, GPM 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.



STAND BY will be displayed in Alternator Systems when a valve is in Standby state.



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**

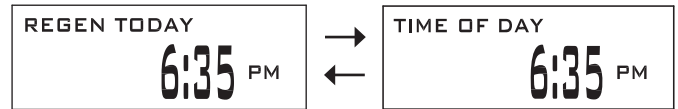
Typically a system is set to regenerate at a time of low water usage. An example of a time with low water usage is when a household is asleep. If there is a demand for water when the system is regenerating, untreated water will be used.



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 REGEN" or "DELAY + IMMEDIATE", 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" there is no set delayed regeneration time so "REGEN TODAY" will not activate if "REGEN" button is pressed.

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

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

**Set Time of Day**

The user can also set the time of day. Time of day should only need to be set 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.

**STEP 1U**



**STEP 1U** – Press CLOCK.

**STEP 2U**



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



**STEP 3U**



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



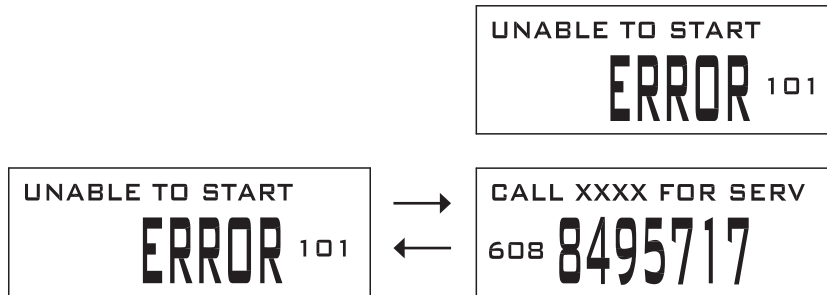
**RETURN TO NORMAL MODE**

**Power Loss**

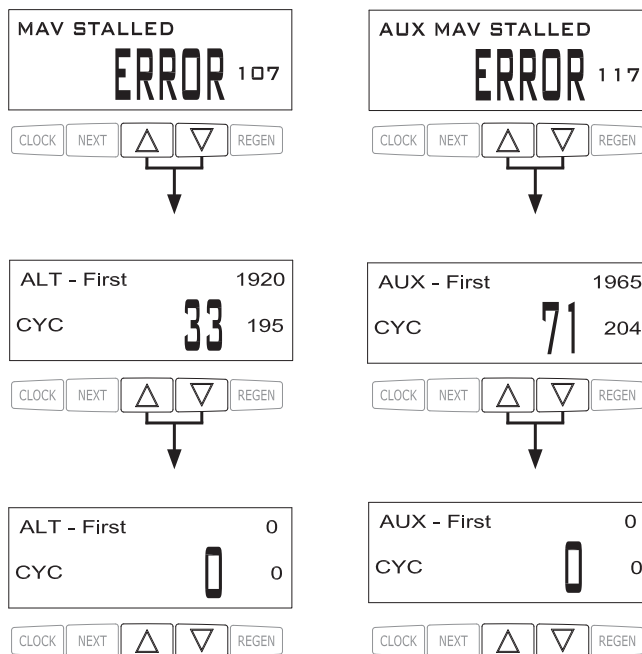
If the power goes out the system will keep time until the battery is depleted. If an extended power outage occurs, the time of day will flash on and off which indicates the time of day should be reset and the non rechargeable battery replaced. The system will remember the rest.

**Error Message**

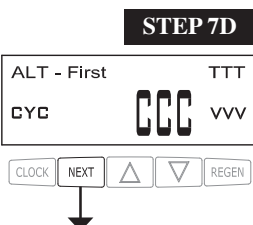
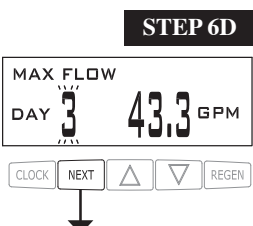
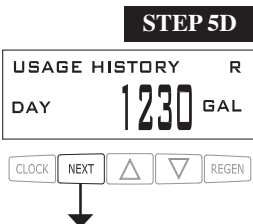
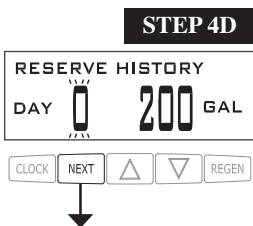
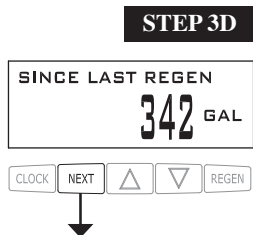
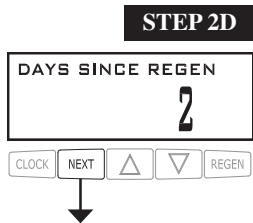
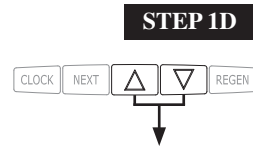
If the word "ERROR" and a number are displayed contact the OEM for help. This indicates that the valve was not able to function properly. If the number and banner text in the Contact Screens has been edited, the two displays below will alternate.



Whenever a MAV drive error occurs, press ▲ and ▼ for about 3 seconds until the Diagnostics MAV Drive History screen appears. Press ▲ or ▼ until the two screens of the MAV (ALT or AUX) with the drive error appear. After first reviewing the information contained in these screens, they must be cleared in order to restore proper MAV operation. Press ▲ and ▼ for about 3 seconds from either screen until this history is cleared. Pressing NEXT will return to the Error screen in the User Display, which is reset by pressing and holding NEXT and REGEN.



## Diagnostics



## RETURN TO NORMAL MODE

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

**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 the NEXT button 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 the NEXT button 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 the ▲ button will show day 1 (which would be yesterday) and the reserve capacity used. Pressing the ▲ button again will show day 2 (the day before yesterday) and the reserve capacity. Keep pressing the ▲ button to show the capacity for days 3, 4, 5 and 6. The ▼ button 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 the NEXT button at any time to go to Step 5D. Press REGEN to return to previous step.

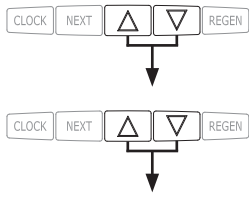
**STEP 5D** – Volume, 63-day usage history: This display shows day 0 (for today), day 1 (for yesterday), etc., and the volume of water treated that day. Press the ▲ button to show the volume of water treated for the last 63 days. If a regeneration occurred on the day the letter “R” will also be displayed.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

**STEP 6D** – Flow rate, maximum last seven days: Use the ▲ 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 the NEXT button to go to Step 7D. Press REGEN to return to previous step.

**STEP 7D** – 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. NOTE: After a drive error occurs or 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. Press NEXT to exit Diagnostics. Press REGEN to return to previous step.

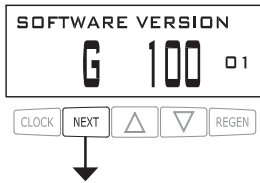
### Valve History

#### STEP 1VH



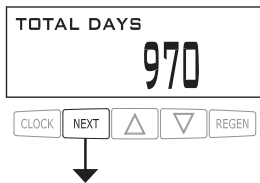
**STEP 1VH** – Press ▲ and ▼ simultaneously for three seconds and release. Then press ▲ and ▼ simultaneously and release. If screen in step 2VH does not appear in 5 seconds the lock on the valve is activated. To unlock press ▼, NEXT, ▲, and CLOCK in sequence, then press ▲ and ▼ simultaneously for 3 seconds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

#### STEP 2VH



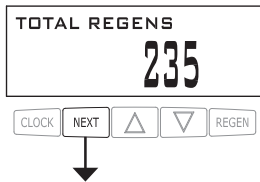
**STEP 2VH** – Software version. Displays the current software version. Press NEXT to go to Step 3VH. Press REGEN to exit Valve History.

#### STEP 3VH



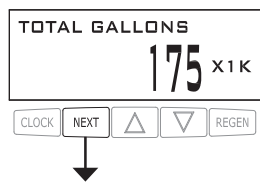
**STEP 3VH<sup>5</sup>** – Days, total since start-up: This display shows the total days since startup. Press the NEXT button to go to Step 4VH. Press REGEN to return to previous step.

#### STEP 4VH



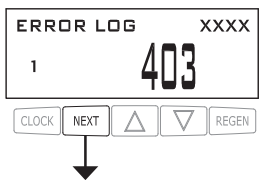
**STEP 4VH** – Regenerations, total number since start-up: This display shows the total number of regenerations that have occurred since startup. Press the NEXT button to go to Step 5VH. Press REGEN to return to previous step.

#### 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 the NEXT button 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. With 102/106/116 errors, the drive position at the time of stall detection is also recorded. Press NEXT to exit Valve History. Press REGEN to return to previous step.

RETURN TO NORMAL MODE

<sup>5</sup> Values in steps 2VH through 5VH cannot be reset.



