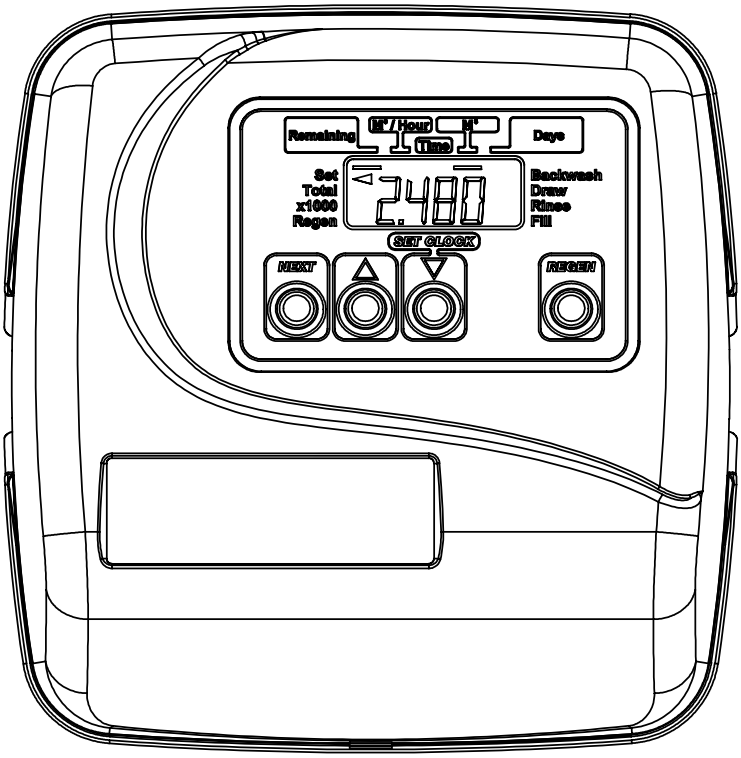
Water Specialist SQ
Control Valve
Programming and Cover Drawing Manual



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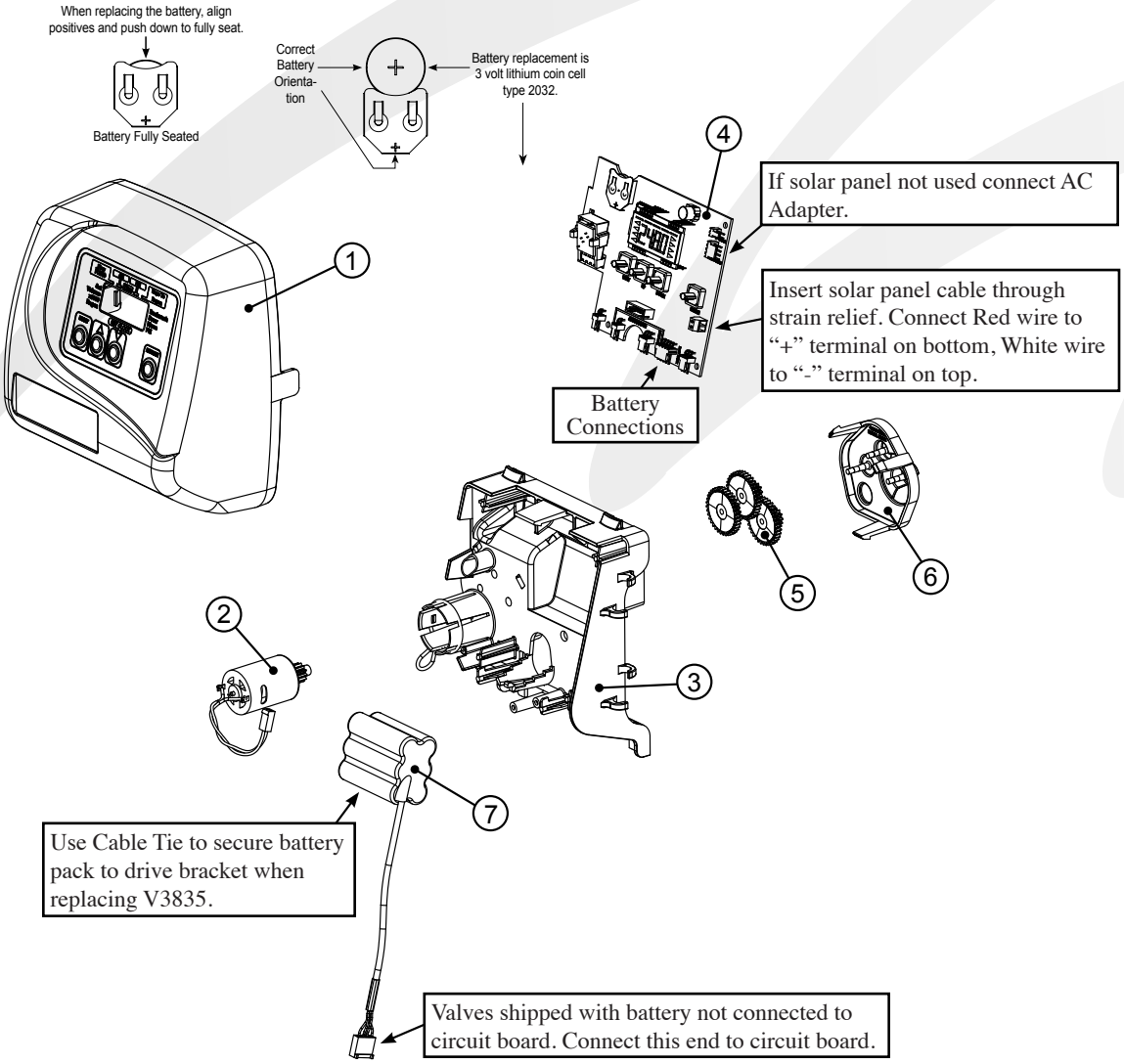
SQ Front Cover and Drive Assembly

Drawing No.	Order No.	Description	Quantity
1	V3175EI-01	WS1EI FRONT COVER ASSEMBLY	1
2	V3107-01	WS1 MOTOR	1
3	V3814-01	WS1 DRIVE BRACKET SOLAR & SPRING CLIP	1
4	V3836SQ-01BOARD	WS1THRU2L/2 SQPCB AC/DC REPL	1
5	V3110	WS1 DRIVE GEAR 12X36	3
6	V3109	WS1 DRIVE GEAR COVER	1
7	V3835-02	WS1SP BATTERY PACK CHARGED W/TIE	1
Not Shown	V3842	WS1SP SOLAR PANEL W/BRKT ASY	1
Not Shown	V3186	WS1 AC ADAPTER 120V-12V	1
Not Shown	V3178	WS1 Drive Back Plate	1

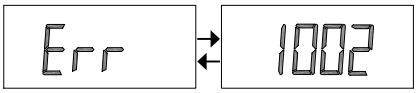
Refer to Control Valve Service Manual for other drawings and part numbers.

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

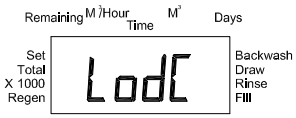


Regeneration and Error Screens

Regen Screen
Displays the time remaining in the current cycle. Pressing REGEN advances to the next cycle.



Error Screen
Alternated flashing Err and error code every 3 seconds. Clear by dissconnecting the power supply at the PC board and reconneting, or press NEXT and REGEN simutaneously for 3 seconds.



Low Battery Voltage Screen
Display is shown when the voltage level of the battery pack is below a minimum level. The valve does not have enough power to regenerate when this display is shown. When the battery is sufficiently charged the display will disappear and regeneration will occur at the next delayed regeneration time or if on 0 was selected immediately.

Button Operation and Function

NEXT — Scrolls to the next display.

REGEN — Pressing once and releasing will schedule a regeneration at the preset delayed regeneration time.
Pressing again and releasing will cancel the regeneration.
Pressing and holding for 3 seconds will initiate an immediate regeneration
Pressing while in regeneration will advance to the next cycle.
Pressing in the program levels will go backwards to the previous screen

△ ▽ — Changes variable being displayed.

▽ NEXT REGEN △ — Key sequence to lock and unlock program settings.

NEXT REGEN — Holding for 3 seconds initiates a control reset. The software version is displayed and the piston returns to the home/service position, resynchronizing the valve.

Regeneration Cycles and Times

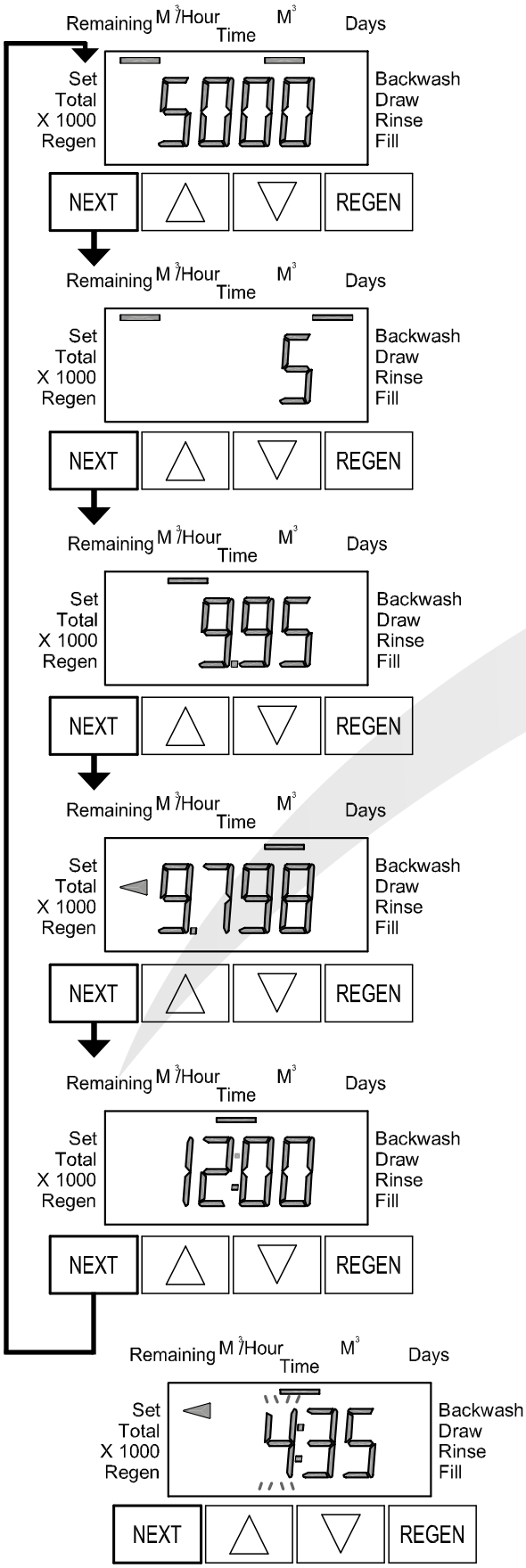
Cycle	Range of times (min.)
1. Backwash 1st (upflow)	1 - 95
2. Regenerant Draw/Slow Rinse (downflow)	1 - 180
3. Backwash 2nd (upflow)	1 - 95
4. Fast Rinse (downflow)	1 - 95
5. Regenerant Refill (with treated water)	0.1 - 99.9 or OFF
6. Service (downflow)	

The user can initiate manual regeneration. The user has the option to request the manual regeneration at the delayed regeneration time or to have the regeneration occur immediately:

1. Pressing and releasing the REGEN button. " ◄ " will flash towards Regen on the display and the regeneration will occur at the delayed regeneration time. The user can cancel the request by pressing and releasing the REGEN button.
2. Pressing and holding the REGEN button for approximately 3 seconds will immediately start the regeneration. The user cannot cancel this request, except by resetting the control by pressing NEXT and REGEN simultaneously for 3 seconds.

User Displays

General Operation



When the system is operating, one of five displays may be shown. Pressing NEXT will alternate between the displays shown below.

User 1

Typical user display. If volume is selected in Configuration Settings Step 4CS, shows volume remaining to regeneration. If volume is not selected in Configuration Settings Step 4CS, this screen will not be shown. If a meter is not used this display will not change.

User 2

Displays number of days to next regeneration.

User 3

Displays flow rate M^3/Hour. If a meter is not used this display will be shown but 0 will be displayed.

User 4

Displays total flow in cubic meters since last reset. If a meter is not used this display will be shown but 0 will be displayed.

PRESS ▼ FOR 3 SECONDS TO RESET TO 0.

User 5

Shows current time.

Setting Time of Day

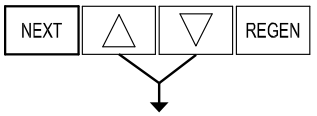
Push NEXT until time of day screen is displayed. Press and hold ▲ or ▼ until the SET indicator is displayed and the hour flashes. Press ▲ or ▼ until the correct hour is displayed.

Then press NEXT. The minutes will flash. Press ▲ or ▼ until the correct minute is displayed.

Press NEXT to return to the Display Screens. Time of day should only need to be set if the battery has been depleted and a power outage greater than 8 hours occurs. If a power outage lasting more than 8 hours occurs, the time of day will flash on and off which indicates the time of day should be reset. If a power outage lasts less than 8 hours and the time of day flashes on and off, the time of day should be reset and the battery replaced.

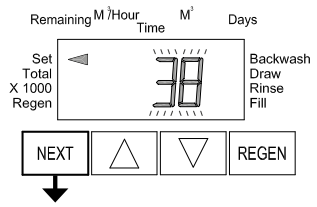
Configuration Settings

Step 1CS



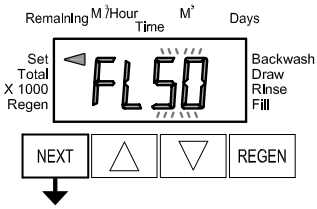
Step 1CS – Press ▲ and ▼ simultaneously for 5 seconds and release. If screen in Step 2CS does not appear, the lock on the valve is activated. To unlock press ▼, NEXT, REGEN, ▲ in sequence, then press ▲ and ▼ simultaneously for 5 seconds and release.

Step 2CS



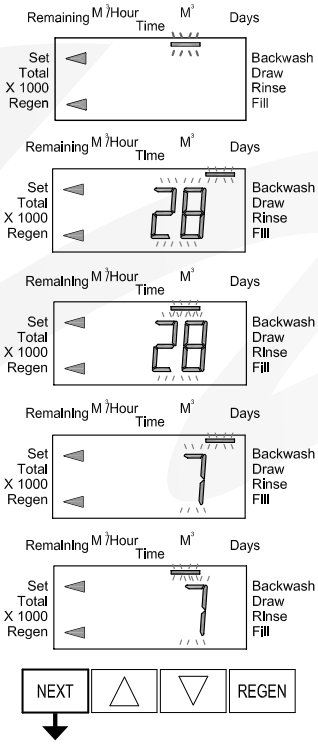
Step 2CS – Select 25 for 1” (25 mm), 32 for 1.25” (32 mm), 38 for 1.5” (38 mm), 50L for 2L (50mm) or 50 for 2” (50mm) valve [1]. Press NEXT to go to Step 3CS. Press REGEN to exit Configuration Settings.
Note: When using the WS2 valve, if 50L is set instead of 50, when the valve is in regeneration and the piston drives to the DRAW cycle the piston will stall and generate a 1002 error code. Clear the error code by pressing NEXT and REGEN simultaneously until the valve resets, then re-program valve to proper valve type setting.

Step 3CS



Step 3CS – When 50L or 50 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” (38) or 2.0” (50).
Press NEXT to go to Step 4CS. Press REGEN to return to previous step.

Step 4CS

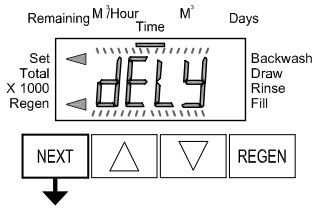


Step 4CS – Press ▲ or ▼ to select one of the following:

- If Volume (M^3) is selected the regeneration will occur after the specific volume has been used or on the day override (if selected) whichever comes first.
- If 28 is selected the regeneration will occur on the day (1 through 28) selected in Installer Display Settings. The total flow and flow rate user displays and the volume display in Diagnostics will not be shown even if a meter is used.
- If 28/Volume (M^3) is selected the regeneration will occur on the day (1 through 28) selected in Installer Display Settings. If a meter is not used the total flow and flow rate user displays and the volume display in Diagnostics will be shown as 0.
- If 7 is selected the regeneration will occur on the selected day(s) of the week (see instructions contained in Installer Display Settings). The total flow and flow rate user displays and the volume display in Diagnostics will not be shown even if a meter is used.
- If 7/Volume (M^3) is selected the regeneration will occur on the selected day(s) of the week (see instructions contained in Installer Display Settings). If a meter is not used the total flow and flow rate user displays and the volume display in Diagnostics will be shown as 0.

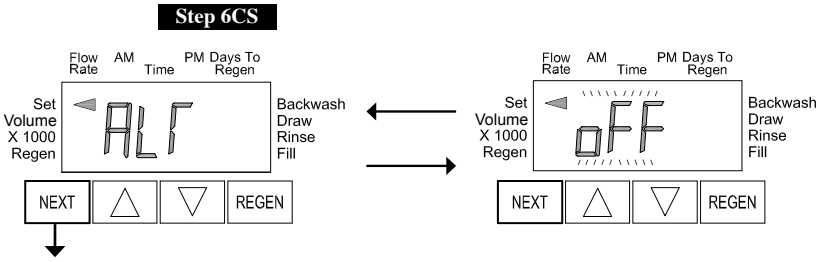
Press NEXT to go to Step 5CS. Press REGEN to return to previous step.

Step 5CS



Step 5CS – Press ▲ or ▼ to select to regenerate immediately on 0, rES (reserve capacity is automatically estimated and regeneration occurs at a delayed time) or dELY (reserve capacity is not automatically estimated and regeneration occurs at a delayed time). Immediately on 0 or rES can only be selected if Volume (M3) was selected in Step 4CS and a meter must be installed. Delay is the only option for the other Step 4CS selections.
Press NEXT to go to Step 6CS. Press REGEN to return to previous step.

[1] When using the WS2 control valve, the circuit board software must have meter selection choices of 50 and 50L. The WS2 valve must be set for the 50 meter selection during programming. If the software version does not have both the 50 and 50L selections, consult your equipment supplier for a replacement circuit board. When using the WS2L valve with older version software that does not have both 50 and 50L selection choices, the valve must be set to 50, if using a 2” meter or 38 if using a 1.5” meter. If a WS2L valve is being used with newer version software that has both 50 and 50L selection choices, the valve must be set for 50L during programming.

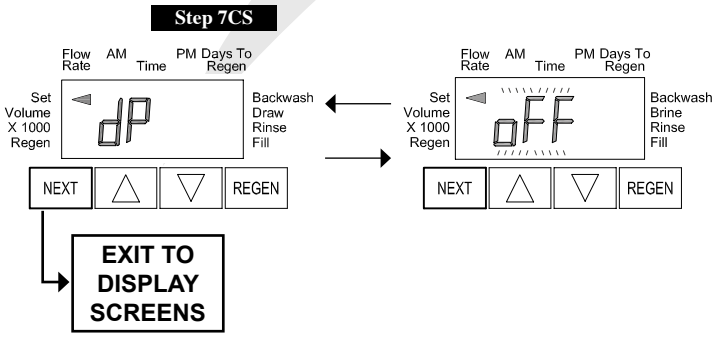


Step 6CS – Allows selection of one of the following using the ▲ or ▼ buttons:
• the Control Valve to have a no hard water bypass: or
• the Control Valve to have a Separate Source during the regeneration cycle.
Select OFF when none of these features are used. Only use Clack No Hard Water Bypass Valves 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 separate source mode.

Configuring the Control Valve for No Hard Water Bypass Operation:
Select "nHbP" 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 "nHbP", 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 "SEPS" 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 "SEPS", 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.

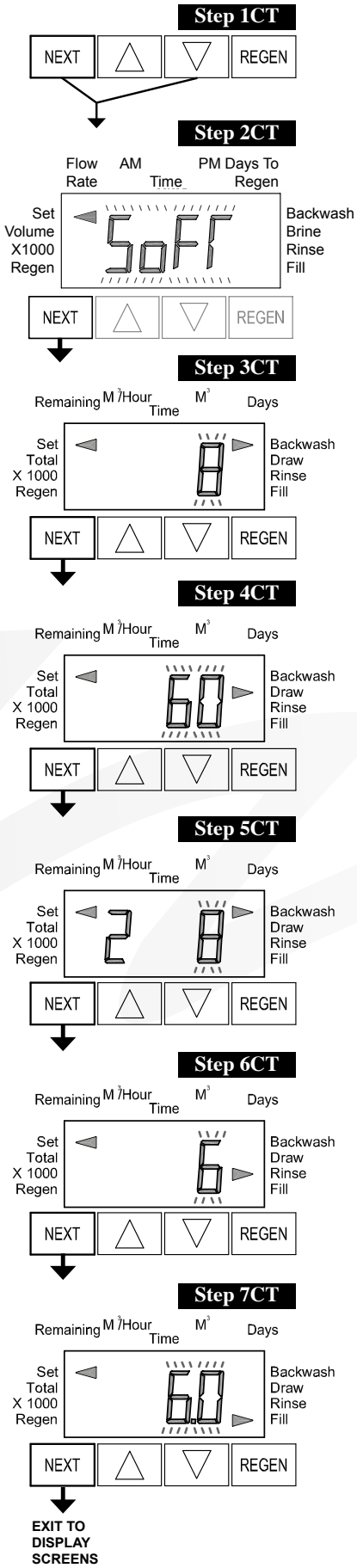
Press NEXT to go to Step 7CS. Press REGEN to return to previous step.



Step 7CS
Selecting the use of an outside signal to initiate 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.
on0 - If the dP switch is closed for an accumulative time of 2 minutes a regeneration will occur immediately.
dELy - If the dP switch is closed for an accumulative time of 2 minutes a regeneration will occur at the scheduled regeneration time.
HoLd - If the dP switch is closed a regeneration will be prevented from occurring.

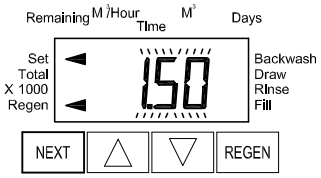
Press NEXT to exit Configuration Settings. Press REGEN to return to previous step.

Setting Regeneration Cycle Times



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

Step 2CT - Select between SOFTENING or FILTERING. Press NEXT to go to Step 3CT, or if Soft was selected in Step 2CT and rES was selected in step 5CS, the next display will require entry of the ion exchange capacity (in kg. of CaCO3) using ▲ or ▼. Press NEXT after ion exchange capacity is selected to go to Step 3CT. Press REGEN to exit Regeneration Cycle Times.



Step 3CT - Adjust the length of the backwash from 1-95 minutes using ▲ or ▼.

Press NEXT to go to Step 4CT. Press REGEN to return to previous step.

Step 4CT - Adjust the length of the regenerant draw from 1-180 minutes using ▲ or ▼.

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

Step 5CT - Adjust the length of the second backwash from 1-95 minutes using ▲ or ▼.

Press NEXT to go to Step 6CT. Press REGEN to return to previous step.

Step 6CT - Adjust the length of rinse from 1-95 minutes using ▲ or ▼.

Press NEXT to go to Step 7CT. Press REGEN to return to previous step.

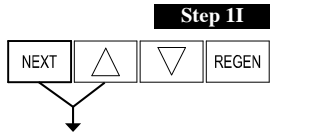
Step 7CT - Adjust the length of fill from 0.1-99.0 minutes or OFF. WS2 valves are shipped from the factory with a refill flow control of 2.2 gpm (8.3 lpm). All other control valves are shipped from the factory with a refill flow control of 0.5 gpm (1.9 lpm).

Press NEXT to exit Regeneration Cycle Times. Press REGEN to return to previous step.

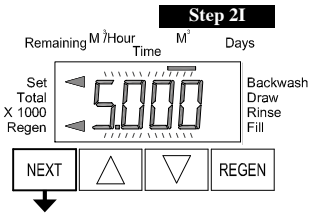
Installer Display Settings

One of three sets of displays will be shown depending on what was selected in Configuration Settings Step 4CS.

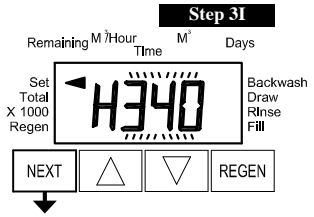
Volume (M^3) selected in Configuration Settings Step 4CS



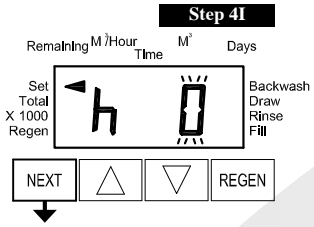
Step 1I - To enter Installer Display press NEXT and ▲ simultaneously for 5 seconds and release.



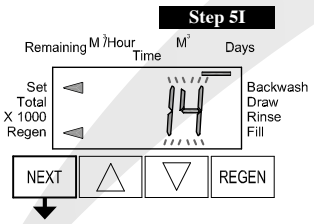
Step 2I - Volumetric capacity in cubic meters to regeneration. This step will not be viewed if rES is selected in Step 5CS. Press NEXT to go to Step 3I. Press REGEN to exit Installer Display.



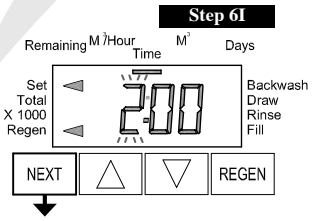
Step 3I - If Soft was selected in Step 2CT and rES was selected in step 5CS, select the inlet water hardness in PPM using ▲ or ▼. Default is 340 with value ranges from 1 to 2500 PPM. Note: The PPM can be increased if soluble iron needs to be reduced.
Press NEXT after hardness is selected to go to Step 4I.
Press REGEN to exit Installer Display.



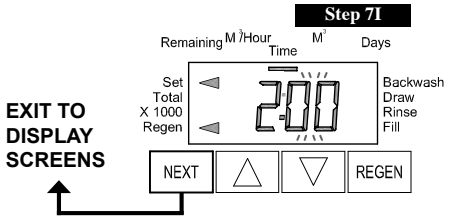
Step 4I - Select the desired outlet water hardness in PPM using ▲ or ▼. Default is 0 PPM.
Press NEXT to go to Step 5I. Press REGEN to return to previous step.



Step 5I - Adjust day override from 1 - 28 or OFF. Press NEXT to go to Step 6I. Press REGEN to return to previous step.

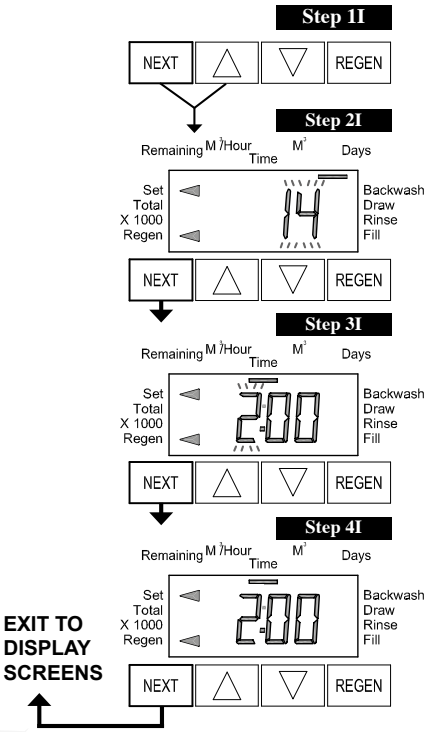


Step 6I - Use ▲ or ▼ to set the regen hour.
Press NEXT to go to Step 7I. Press REGEN to return to the previous step.



Step 7I - Use ▲ or ▼ to set the regen minutes. Press NEXT to exit Installer Display. Press REGEN to return to previous step.

28 Day or 28/Volume (M^3) selected in Configuration Settings Step 4CS



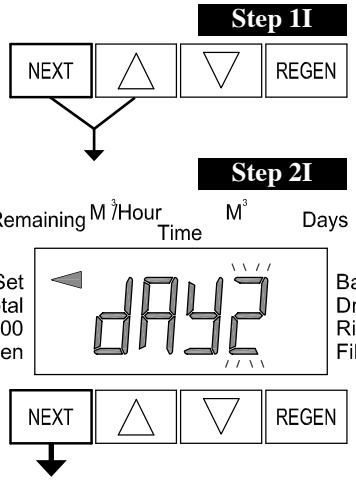
Step 1I - To enter Installer Display press the NEXT and ▲ simultaneously for five seconds and release.

Step 2I - Adjust days from 1 - 28. Press NEXT to go to Step 3I. Press REGEN to exit Installer Display.

Step 3I - Use ▲ or ▼ to set time of the regen hour. Press NEXT to go to Step 4I. Press REGEN to return to previous step.

Step 4I - Use ▲ and ▼ to set the regen minutes. Press NEXT to exit Installer Display. Press REGEN to return to previous step.

7 Day or 7/Volume (M^3) selected in Configuration Settings Step 4CS

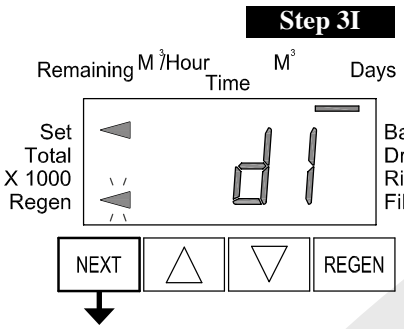


Step 1I - To enter Installer Display press NEXT and ▲ simultaneously for 5 seconds and release.

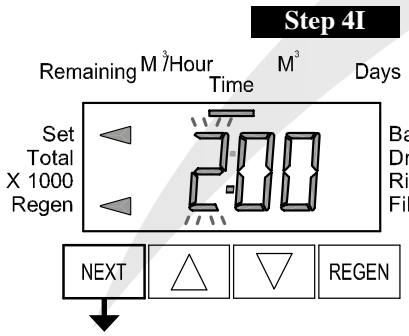
Step 2I - Use ▲ or ▼ to set the current day of the week.
Default = 2 (Monday)

1 = SUNDAY
2 = MONDAY
3 = TUESDAY
4 = WEDNESDAY
5 = THURSDAY
6 = FRIDAY
7 = SATURDAY

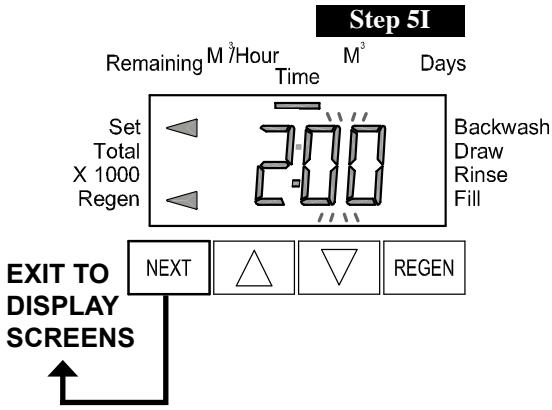
Press NEXT to go to Step 3I. Press REGEN to exit Installer Display.



Step 3I - Scroll through days 1 to 7 using NEXT. Use ▲ or ▼ to turn regen on or off for each individual day (regen indicator on means regeneration will happen). After completing the 7th day, press NEXT to go to Step 4I. Press REGEN to go to previous display.

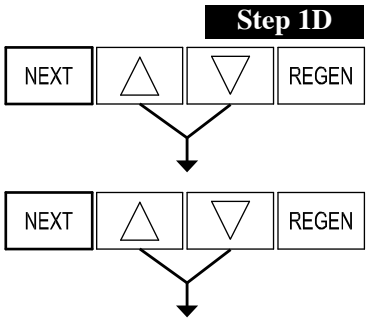


Step 4I - Use ▲ or ▼ to set the regen hour. Press NEXT to go to Step 5I. Press REGEN to go to previous display.

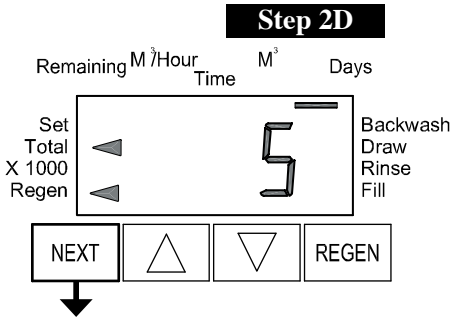


Step 5I - Use ▲ or ▼ to set the regen minutes. Press NEXT to exit Installer Display. Press REGEN to return to previous display.

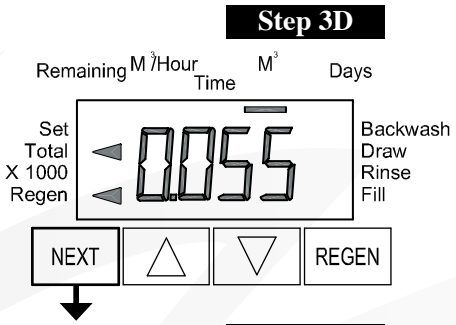
Diagnostics



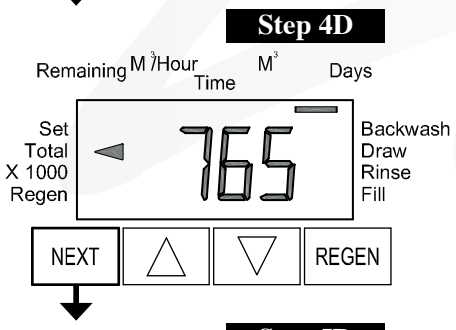
Step 1D - Press ▲ and ▼ simultaneously for 5 seconds and release. Then press ▲ and ▼ simultaneously for 3 seconds and release. If screen in Step 2D does not appear the lock on the valve is activated. To unlock press ▼, NEXT, REGEN, ▲ in sequence, then press ▲ and ▼ simultaneously for 5 seconds and release.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



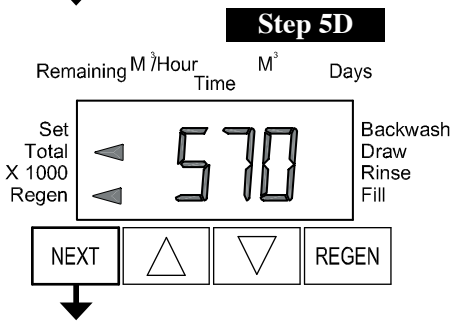
Step 2D - Display shows the number of days since a regeneration last occurred. Press NEXT to go to Step 3D. Press REGEN to exit Diagnostics.



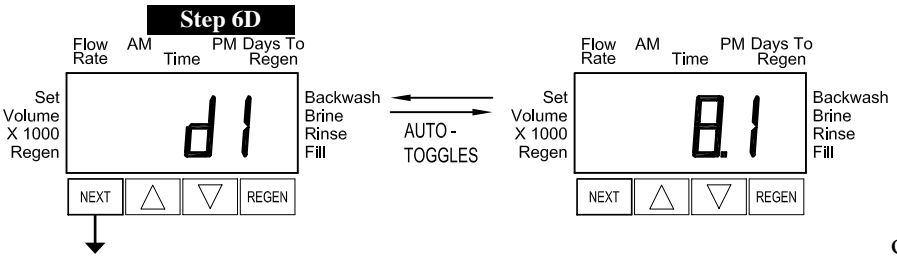
Step 3D - Display shows the volume of water treated in M^3 treated since the last regeneration. If Volume (M^3), 28/Volume (M^3), or 7/Volume (M^3) was selected in Step 3CS and no meter is installed this display will read 0. Press NEXT to go to Step 4D. Press REGEN to return to previous step.



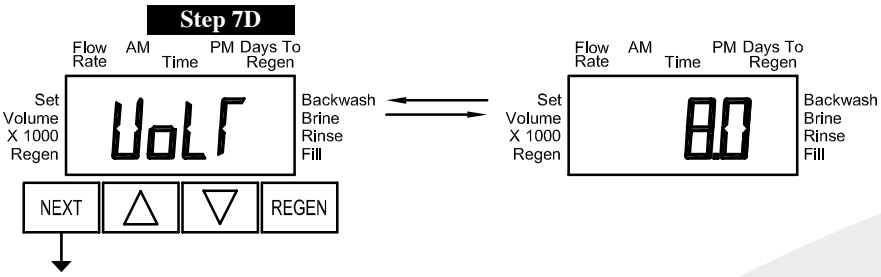
Step 4D - Display shows the days in service since start up. Press NEXT to go to Step 5D. Press REGEN to return to previous step.



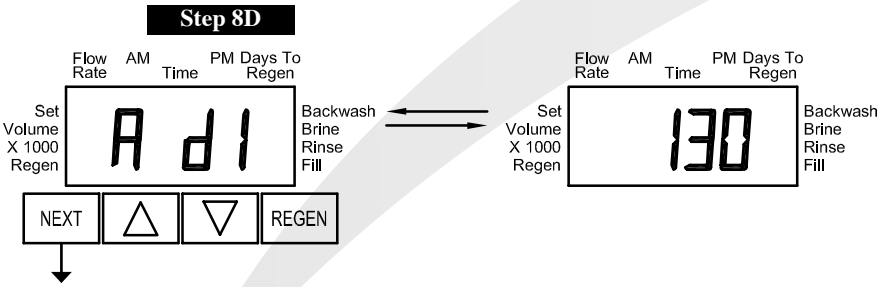
Step 5D - Display shows the total number of regeneration cycles since start up. Press NEXT to go to Step 6D. Press REGEN to return to previous step.



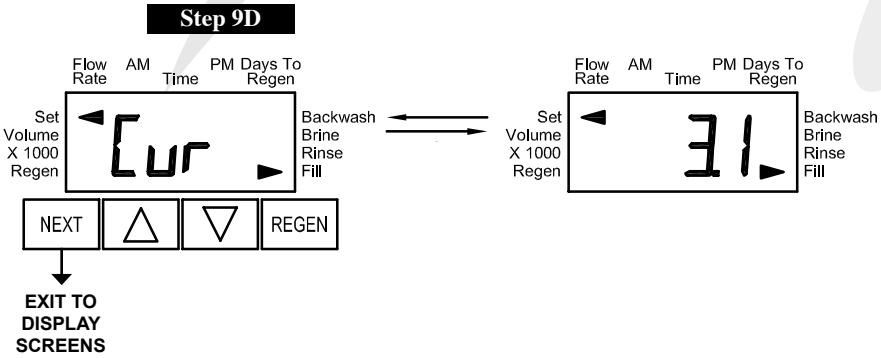
Step 6D - Display shows the daily voltage level of the battery pack. The first display is the day and the second display is the voltage. The voltage is recorded at midnight. The number of days ranges from 1 to 127. Press NEXT to go to Step7D.
Press REGEN to return to previous step.



Step 7D - Display shows the latest measured voltage of the battery pack. Pressing and holding the ▲ and ▼ buttons simultaneously for approximately 5 seconds will initiate a test of voltage. (Normally this test is automatically conducted at 12:00 am daily.)
Press NEXT to go to Step 8D. Press REGEN to return to previous step.



Step 8D - Display shows the daily measured mA/hr charge of the battery pack. An active Regen Arrow indicates that a regeneration cycle occurred on that day.
Press NEXT to go to Step 9D. Press REGEN to return to previous step.



Step 9D - Display shows the present measured charge current of the solar panel, measured in mA. An active Set Arrow indicates that the control is currently determining whether to activate the charging circuit. Active Set and Fill Arrows indicate that the charging circuit is currently activated. Pushing ▲ once temporarily turns on the charging circuit, and activates the SET and FILL arrows. Pushing ▼ temporarily turns off the charging circuit.
Press NEXT to exit Diagnostics. Press REGEN to return to previous step.

U.S. Patents: 6,402,944 • 6,444,127 • 6,776,901

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