



TECH SERIES CONTROL VALVES

FILTERS, SOFTENERS, CONDITIONERS



1 INCH TECH SERIES CONTROL VALVE MODEL: WS1

1.25 INCH TECH SERIES CONTROL VALVE MODEL: WS1.25

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Control Valve Function and Cycles of Operation

This glass-filled Noryl¹ (or equivalent) fully automatic control valve is designed as the primary control center to direct and regulate all cycles of a water softener or filter. When the WS1 or WS1.25 control valve is manufactured as a softener, the control valve can be ordered to perform downflow or upflow regeneration. When the WS1 or WS1.25 control valve is set up as a filter, the control valve can be set to perform downflow regeneration or simply backwash. The control valve can be set to regenerate on demand (consumption of a predetermined amount of water) and/or as a time clock (passage of a particular number of days). The control valve can be set so that a softener can meet the Water Quality Association (WQA) Standard S100 or NSF/ANSI Standard 44 efficiency rating.

*** NOTE: It is NOT recommended to change control valves from downflow to upflow brining or vice versa in the field. The valve bodies for downflow and upflow are unique to the regeneration type and should not be interchanged. A mismatch of valve body and regeneration piston will result in hard water bypass during service.**

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

The control valve uses no traditional fasteners (e.g. screws); instead clips, threaded caps and nuts, and snap type latches are used. Caps and nuts only need to be firmly hand tightened because radial seals are used. Tools required to service the valve include one small blade screwdriver, one large blade screwdriver, pliers, and a pair of hands. A plastic wrench is available which eliminates the need for screwdrivers and pliers. Disassembly for servicing takes much less time than comparable products currently on the market. Control valve installation is made easy because the distributor tube can be cut 0.5 inch above to 0.5 inch below the top of tank thread. The distributor tube is held in place by an o-ring seal, and the control valve also has a bayonet lock feature for upper distributor baskets.

The AC adapter power pack comes with a 15 foot power cord and is designed for use with the control valve. The AC adapter power pack is for dry location use only. The control valve remembers all settings for up to 8 hours if the power goes out and the battery is not depleted. After 8 hours, the only item that needs to be reset is the time of day; other values are permanently stored in the nonvolatile memory. If a power loss lasts less than 8 hours and the time flashes on and off, the time of day should be reset and the non-rechargeable battery should be replaced.

Table 1 (below) shows the order of the cycles when the valve is set up as a softener. When the WS1 or WS1.25 control valve is used as a downflow softener, two backwashes always occur. The WS1.25 control valve may not be used as an upflow softener. When the WS1 control valve is used as an upflow softener (1 inch only), only one backwash occurs after brining. The regenerant can refill after the rinse cycle or prefill before regeneration. When the regenerant prefills before regeneration, the prefill starts two hours before the regeneration time set. During the 2-hour period in which the brine is being made, treated (softened) water is still available. For example: If a downflow softener regeneration time is set for 2:00 a.m. with the prefill option selected, then the fill cycle occurs at 12:00 a.m. and the start of the backwash cycle occurs at 2:00 a.m.

Table 1
Regeneration Cycles for Softening (See above * NOTE)

WS1 & WS1.25 — Downflow Regenerant Refill After Rinse	WS1 & WS1.25 — Downflow Regenerant Prefill	WS1 & WS1.25 — Upflow Regenerant Refill After Rinse	WS1 & WS1.25 — Upflow Regenerant Prefill
1st Cycle: Backwash	1st Cycle: Fill / Dissolve	1st Cycle: Regenerate	1st Cycle: Fill / Dissolve
2nd Cycle: Regenerate	2nd Cycle: Backwash	2nd Cycle: Backwash	2nd Cycle: Regenerate
3rd Cycle: Backwash	3rd Cycle: Regenerate	3rd Cycle: Rinse	3rd Cycle: Backwash
4th Cycle: Rinse	4th Cycle: Backwash	4th Cycle: Fill / Dissolve	4th Cycle: Rinse
5th Cycle: Fill / Dissolve	5th Cycle: Rinse	5th Cycle: Service	5th Cycle: Service
6th Cycle: Service	6th Cycle: Service		

1. Noryl is a trademark of SABIC Innovative Plastics Company.

When set up as a softener, the backwash and rinse cycles automatically increase with increasing salt dosage. Backwashes can be set to be NORMAL or LONGER. The option selected will apply to all backwashes. Tables 2 and 3 (below) show the length of the cycles when the valve is set up as a softener.

Table 2
Backwash NORMAL Length Softener
Cycle Times in Minutes

		WS1 & WS1.25 Downflow Softener			WS1 & WS1.25 Upflow Softener		
Grains Capacity / Lb. NaCl		6000 to 3501	3500 to 2501	2500 to 1700	6000 to 3501	3500 to 2501	2500 to 1700
Lbs. NaCl / Cu.Ft. Resin *		Less than 7.5	7.5 to 12	More than 12	Less than 7.5	7.5 to 12	More than 12
Cycle Time in Minutes	Backwash Normal	6	8	8	—	—	—
	Regenerate	45	60	75	45	60	75
	Backwash Normal	3	8	10	6	10	12
	Rinse	3	4	6	3	4	6
	Total **	57	80	99	54	74	93

* These are reference numbers that approximate the amount of salt needed. The actual capacity in grains per pound of salt is used in calculations.

** Total Time does not include Fill Time, which is dependent upon the amount of salt needed. When in the Fill Mode the system is providing treated water.

Table 3
Backwash LONGER Length Softener
Cycle Times in Minutes

		WS1 & WS1.25 Downflow Softener			WS1 & WS1.25 Upflow Softener		
Grains Capacity / Lb. NaCl		6000 to 3501	3500 to 2501	2500 to 1700	6000 to 3501	3500 to 2501	2500 to 1700
Lbs. NaCl / Cu.Ft. Resin *		Less than 7.5	7.5 to 12	More than 12	Less than 7.5	7.5 to 12	More than 12
Cycle Time in Minutes	Backwash Normal	8	10	12	—	—	—
	Regenerate	45	60	75	60	70	80
	Backwash Normal	8	10	12	12	14	16
	Rinse	4	6	8	5	7	9
	Total **	65	86	107	77	91	105

* These are reference numbers that approximate the amount of salt needed. The actual capacity in grains per pound of salt is used in calculations.

** Total Time does not include Fill Time, which is dependent upon the amount of salt needed. When in the Fill mode the system is providing treated water.

Table 4 (page 5) shows the order of the cycles when the valve is set up as a filter. When the control valve is used as a downflow regenerating filter (i.e. both backwash and regeneration), it allows the option to specify one backwash or two backwashes. Regenerating filters also have the option of having the regenerant refill after the rinse cycle or prefill before regeneration. If the regenerant prefills before regeneration, the prefill starts two hours before the regeneration time set. During the 2-hour period in which the regenerant is being made, treated water is still available. For example: If a downflow filter regeneration time is set for 2:00 a.m. with the prefill option selected, then the fill cycle occurs at 12:00 a.m. and the start of the backwash cycle occurs at 2:00 a.m. There is only one rinse. Backwashes can be set to NORMAL or LONGER. The option selected will apply to all backwashes. Tables 5 and 6 (page 5) show the length of the cycles when the valve is set up as a filter.

When the control valve is used as a non-regenerating filter (backwash only), it has the option to specify one backwash or two backwashes. If two backwashes are specified, two rinses occur. Tables 5 and 6 (page 5) show the length of the cycles when the valve is set up as a filter. When used as a non-regenerating filter, the downflow piston must be installed, the regenerant piston removed, injector plugs must be installed in both the DN and UP injector locations, and the refill elbow must be replaced with a refill port plug.

Table 4
Regeneration Cycles Filtering

WS1 & WS1.25 — Downflow Regenerant Refill After Rinse	WS1 & WS1.25 — Downflow Regenerant Prefill	WS1 & WS1.25 — No Regeneration
1st Cycle: Backwash	1st Cycle: Fill	1st Cycle: Backwash
2nd Cycle: Regenerate	2nd Cycle: Backwash	2nd Cycle: Rinse
3rd Cycle: <i>Second Backwash *</i>	3rd Cycle: Regenerate	3rd Cycle: <i>Second Backwash *</i>
4th Cycle: Rinse	4th Cycle: <i>Second Backwash *</i>	4th Cycle: <i>Second Rinse **</i>
5th Cycle: Fill	5th Cycle: Rinse	5th Cycle: Service
6th Cycle: Service	6th Cycle: Service	

* Second Backwash is optional

** Second rinse only occurs if “Second Backwash” option is selected.

Table 5
**Regenerating Filter
Cycle Times in Minutes**

	WS1 & WS1.25 Single Backwash		WS1 & WS1.25 Double Backwash	
	NORMAL	LONGER	NORMAL	LONGER
Backwash	14	16	8	12
Regenerate	60	60	60	60
2nd Backwash	—	—	10	12
Rinse	8	10	8	10
Total *	82	86	86	94

* Total Time does not include Fill Time, which is dependent upon the amount of fill needed. When in the Fill mode the system is providing treated water.

Table 6
**Non-Regenerating Filter
Cycle Times in Minutes**

	WS1 & WS1.25 Single Backwash		WS1 & WS1.25 Double Backwash	
	NORMAL	LONGER	NORMAL	LONGER
Backwash	14	16	8	12
Regenerate	8	10	6	6
2nd Backwash	—	—	10	12
Rinse	—	—	8	10
Total *	22	26	32	40

The control valve with a water meter can be set for Demand Initiated Regeneration (DIR) only, Time Clock operation only, or DIR and Time Clock whichever comes first, depending upon the settings selected for Day Override and Gallon Capacity.² See Table 7 (page 6).

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.”

2. See Installer Display Settings Step 3-NA (page 11), Softener Setup Step 6-SS (page 8), and Filter Setup Step 5-FS (page 10) for explanations of Day Override and Gallon Capacity.

Table 7
DIR/Time Clock Options

DIR	Time Clock	Reserve Capacity	Softener	Filter		Settings *	
				Regenerant	Backwash Only	Day Override	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

* Day Override and Gallon Capacity can not both be set to "oFF" at the same time.

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 0 (zero), unless the value is manually set (i.e. the manufacturer intentionally sets the Gallon Capacity number below the calculated capacity of the system).

The Tech WS1 & WS1.25 Control Valves can also be set to regenerate immediately or at the next regeneration time by changing the Regeneration Time Option. There are three choices for settings:

1. "NORMAL" means regeneration will occur at the preset regeneration time.
2. "on 0" means regeneration will occur when the Gallons Capacity reaches 0 (zero).
3. "NORMAL" and "on 0" (NORMAL + on 0) means the regeneration will occur at the preset regeneration time unless the Gallons Capacity reaches 0 (zero). If the Gallons Capacity reaches 0 (zero), the regeneration will begin 10 minutes after no water usage.

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 "Regen Today" 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. This method of manually initiating regeneration is not allowed when the system is set to "on 0" (i.e. to immediately regenerate when the Gallon Capacity reaches zero).
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 buttons simultaneously for 3 seconds.

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 "Normal" or "Normal + on 0." 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.

General Instructions

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

1. Softener Setup
2. Filter Setup
3. Installer Displays & Settings
4. User Displays & Settings
5. Diagnostics
6. Valve History

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

At the discretion of the manufacturer, the field technician can access all settings. 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 SET CLOCK in sequence after settings are made. To “unlock,” so other displays can be viewed and changes can be made, press ▼, NEXT, ▲, and SET CLOCK in sequence.

When in operation, normal user displays such as time of day, gallons remaining, 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. The one exception is the current flow rate display under the diagnostic procedure. The current flow rate display has a 30 minute time-out feature.

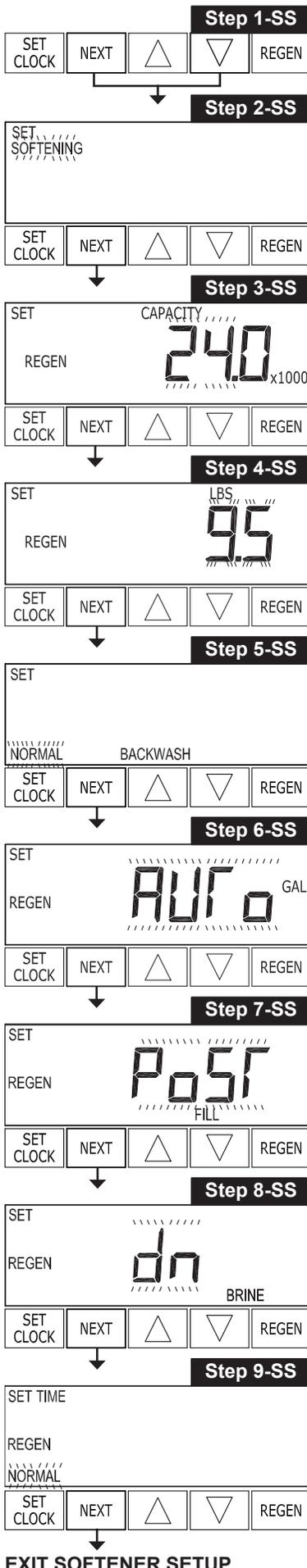
To quickly exit Softener Setup, Filter Setup, Installer Display Settings, Diagnostics, or Valve History, press SET CLOCK. Any changes made prior to the exit are incorporated.

All information in Diagnostics may be reset to 0 (zero) when the valve is moved to a new location. To reset to 0 (zero), press NEXT and ▼ buttons simultaneously to go to the Setup screen, and release. Press ▲ and ▼ simultaneously to reset diagnostic values to 0 (zero). The screen will return to User Display.

Sometimes it is desirable to have the valve initiate and complete two regenerations within 24 hours and then return to the preset regeneration procedure. It is possible to do a double regeneration if the control valve is set to “NORMAL” or “NORMAL + on 0” in Step 9-SS (page 8) or Step 7-FS (page 10). 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 3 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.



EXIT SOFTENER SETUP

Softener Setup

STEP 1-SS – Press NEXT and buttons simultaneously for 3 seconds. If screen in Step 2-SS does not appear in 5 seconds, the lock on the valve is activated. To unlock, press , NEXT, , and SET CLOCK in sequence, then press NEXT and simultaneously for 3 seconds.

STEP 2-SS – *Mode*: Choose “SOFTENING” using or buttons. Press NEXT to go to Step 3-SS. Press REGEN to exit Softener Setup.

STEP 3-SS – *Hardness*: Enter the ion exchange capacity in grains of hardness (5,000 to 200,000 grains) as calcium carbonate for the system based on test data using or buttons. Press NEXT to go to Step 4-SS. Press REGEN to return to the previous step.

STEP 4-SS – *Salt*: Enter the pounds of salt per regeneration (0.8 to 117 lbs) using or buttons. Press NEXT to go to Step 5-SS. Press REGEN to return to the previous step.

STEP 5-SS – *Backwash*: Set to “NORMAL” or “LONGER” using or buttons. See Tables 2 and 3 (page 4) for backwash times. Press NEXT to go to Step 6-SS. Press REGEN to return to the previous step.

STEP 6-SS – *Gallons Capacity*: Set gallons capacity using or buttons:

- “AUTO” automatically estimates reserve capacity and automatically calculates gallons capacity from grains capacity and water hardness;
- “oFF” bases regeneration on Day Override in Step 3-NA (page 11); or
- number of gallons (20 to 50,000 gallons).

See Table 8 (page 9) for more detail.³ Press NEXT to go to Step 7-SS. Press REGEN to return to the previous step.

STEP 7-SS – *Refill*: Set refill option using or buttons:

- “PoST” to refill the brine tank after the final rinse; or
 - “PrE” to refill the brine tank two hours before the regeneration time set.
- Press NEXT to go to Step 8-SS. Press REGEN to return to the previous step.

STEP 8-SS – *Flow*: Set regenerant downflow or upflow using or buttons:

- “dn” if the regenerant is to flow downward through the media; or
- “UP” if the regenerant is to flow upward through the media.

Prior to selecting a regenerant flow direction, verify the correct valve body, main piston, regenerant piston, and stack are being used, and that the injector or injector plug(s) are in the correct locations. See Compliance Table (page 17) in *Tech Control Valves Service Manual*. Press NEXT to go to Step 9-SS. Press REGEN to return to the previous step.

STEP 9-SS – *Regen Time*: Set regeneration time option using or buttons:

- “NORMAL” means regeneration will occur at the preset time;
- “on 0” means regeneration will occur immediately when the gallons capacity reaches 0 (zero); or
- “NORMAL + on 0” means regeneration will occur at one of the following:
 - the preset time when the gallons capacity falls below the reserve, or when the specified number of days between regenerations is reached, whichever comes first; or
 - after 10 minutes of no water usage when the gallon capacity reaches 0 (zero).

See Table 8 (page 9) for more detail. Press NEXT to exit Softener Setup. Press REGEN to return to the previous step.

3. If “oFF” or a number is used, hardness display will not be allowed to be set in Installer Display Settings (Step 2-NA, page 11). It is suggested that “AUTO” be used in order to insure a proper reserve capacity.

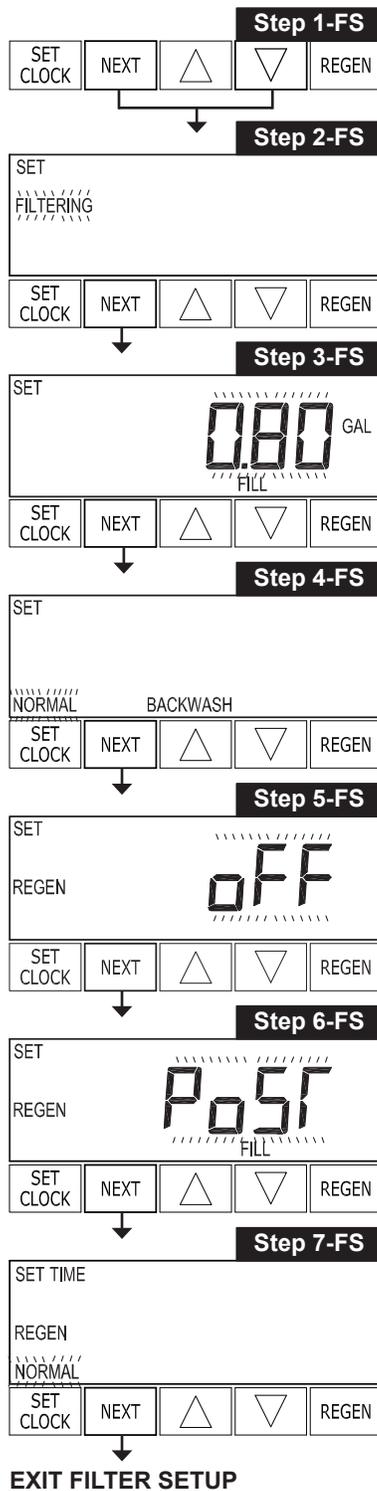
Table 8
Softener and Filter Setting Options

NOTE: Filters should only use the shaded options.

Gallons Capacity	Regeneration Time Option	Day Override	Result *
AUTO	NORMAL	oFF	Reserve capacity automatically estimated. Regeneration occurs when gallons capacity falls below the reserve capacity at the next Regen Set Time.
AUTO	NORMAL	Any number	Reserve capacity automatically estimated. Regeneration occurs at the next Regen Set Time when gallons capacity falls below the reserve capacity or the specified number of days between regenerations is reached.
Any number	NORMAL	oFF	Reserve capacity not automatically estimated. Regeneration occurs at the next Regen Set Time when gallons capacity reaches 0.
oFF	NORMAL	Any number	Reserve capacity not automatically estimated. Regeneration occurs at the next Regen Set Time when the specified number of days between regenerations is reached.
Any number	NORMAL	Any number	Reserve capacity not automatically estimated. Regeneration occurs at the next Regen Set Time when gallons capacity reaches 0 or the specified number of days between regenerations is reached.
AUTO	on 0	oFF	Reserve capacity not automatically estimated. Regeneration occurs immediately when gallons capacity reaches 0. Time of regeneration will not be allowed to be set because regeneration will always occur when gallons capacity reaches 0.
Any number	on 0	oFF	Reserve capacity not automatically estimated. Regeneration occurs immediately when gallons capacity reaches 0. Time of regeneration will not be allowed to be set because regeneration will always occur on 0.
AUTO	NORMAL + on 0	oFF	Reserve capacity automatically estimated. Regeneration occurs when gallons capacity falls below the reserve capacity at the next Regen Set Time or regeneration occurs after 10 minutes of no water usage when gallon capacity reaches 0.
AUTO	NORMAL + on 0	Any number	Reserve capacity automatically estimated. Regeneration occurs at the next Regen Set Time when gallons 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 gallon capacity reaches 0.
Any number	NORMAL + on 0	Any number	Reserve capacity not 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 gallon capacity reaches 0.

* Reserve Capacity estimate is based on history of water usage.

Filter Setup



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

STEP 2-FS – *Mode*: Choose “FILTERING” using ▼ or ▲ buttons. Press NEXT to go to Step 3-FS. Press REGEN to exit Filter Setup.

STEP 3-FS – *Regenerant Fill Volume*: Set fill volume using ▼ or ▲ buttons:
 — “oFF” if regenerant is not used (i.e. backwash only); or
 — regenerant fill volume (0.1 to 100 gallons—default is 0.8).

Prior to selecting “oFF” or regenerant fill volume, verify the correct valve body, main piston, regenerant piston, and stack are being used, and that the injector or injector plug(s) are in the correct locations. See Compliance Table (page 17) and WS1 & WS1.25 Identification (page 46) in *Tech Control Valves Service Manual*. Press NEXT to go to Step 4-FS. Press REGEN to return to the previous step.

STEP 4-FS – *Backwash*: Set backwash using ▼ or ▲ buttons:

- “NORMAL” for one normal backwash (14 minutes);
- “NORMAL 2” for two normal backwashes (8 minutes each);
- “LONGER” for one longer backwash (16 minutes); or
- “LONGER 2” for two longer backwashes (12 minutes each).

See Tables 5 and 6 (page 5) for additional details. Press NEXT to go to Step 5-FS. Press REGEN to return to the previous step.

STEP 5-FS – *Gallons Capacity*: Set gallons capacity using ▼ or ▲ buttons:

- “oFF” bases regeneration on Day Override in Step 3N (page 11); or
- number of gallons (20 to 50,100 gallons).

See Table 8 (page 9) for more detail.⁴ Press NEXT to go to Step 6-FS. Press REGEN to return to the previous step.

STEP 6-FS – *Refill*: Set refill option using ▼ or ▲ buttons:

- “PoST” to refill the brine tank after the final rinse; or
- “PrE” to refill the brine tank two hours before the regeneration time set.

If “oFF” is selected in Step 3-FS (above), the display can be left on “PoST” or “PrE” because no refill occurs. Press NEXT to go to Step 7-FS. Press REGEN to return to the previous step.

STEP 7-FS – *Regen Time*: Set regeneration time option using ▼ or ▲ buttons:

- “NORMAL” means regeneration will occur at the preset time;
- “on 0” means regeneration will occur immediately when the gallons capacity reaches 0 (zero); or
- “NORMAL + on 0” means regeneration will occur at one of the following:
 - the preset time when the specified number of days between regenerations is reached; or
 - after 10 minutes of no water usage when the gallon capacity reaches 0 (zero).

See Table 8 (page 9) for more detail. Press NEXT to exit Filter System Setup. Press REGEN to return to the previous step. To lock settings press ▼, NEXT, ▲, and SET CLOCK in sequence.

4. Hardness display will not be allowed to be set in Installer Display Settings (Step 2-NA, page 11).

Installer Display Settings



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

STEP 2-NA – *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 show “–nA–” if “FILTER” is selected in Step 2-FS (page 10) or if “AUTO” is not selected in Step 6-SS (page 8). Press NEXT to go to step 3-NA. Press REGEN to exit Installer Display Settings.

STEP 3-NA – *Day Override*: When Gallon Capacity is set to “oFF” in Step 6-SS (page 8) or Step 5-FS (page 10), Day Override sets the number of days between regenerations. When Gallon Capacity is set to “AUTO” or to a number, Day Override sets the maximum number of days between regenerations. Set Day Override using ▼ or ▲ buttons:

- number of days between regeneration (1 to 28) – a regeneration initiation will be called for on that day even if a sufficient number of gallons were not used to call for a regeneration; or
- “oFF” – regeneration initiation is based solely on gallons used.

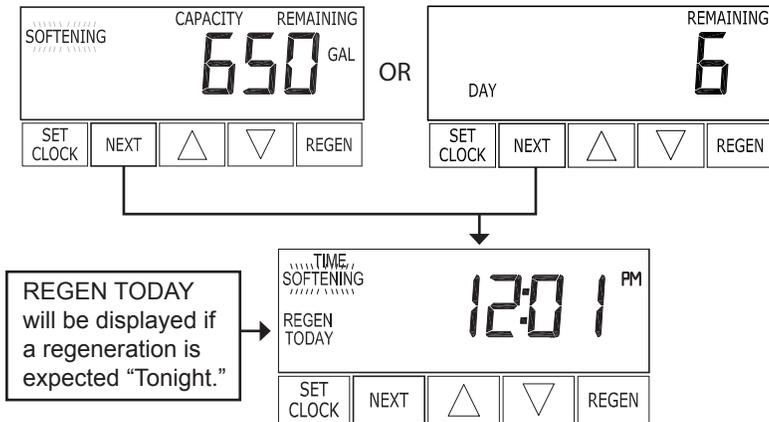
Press NEXT to go to step 4-NA. Press REGEN to return to the previous step.

STEP 4-NA – *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 a.m. This display will show “REGEN on 0 GAL” if “on 0” is selected in Step 9-SS (page 8) or Step 7-FS (page 10). Press NEXT to go to step 5-NA. Press REGEN to return to the previous step.

STEP 5-NA – *Next Regeneration Time (minutes)*: Set the minutes of day for regeneration using ▼ or ▲ buttons. This display will not be shown if “on 0” is selected in Step 9-SS (page 8) or Step 7-FS (page 10). Press NEXT to exit Installer Display Settings. Press REGEN to return to the previous step.

To initiate a manual regeneration immediately, press and hold the REGEN button for 3 seconds. The system will begin to regenerate immediately. The control valve may be stepped through the various regeneration cycles by pressing the REGEN button.

User Display Settings



General Operation

When the system is operating, one of two displays will be shown. Pressing the NEXT button 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 capacity remaining. Days remaining is the number of days left before the system goes through a regeneration cycle. Capacity remaining is the number of gallons that will be treated before the system goes through a regeneration cycle. The user can scroll between the displays as desired.

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

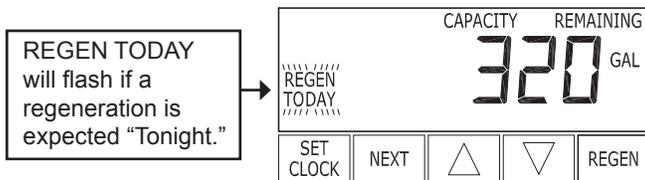
When water is being treated (i.e. water is flowing through the system) the word "SOFTENING" or "FILTERING" flashes on the display if a water meter is installed.

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

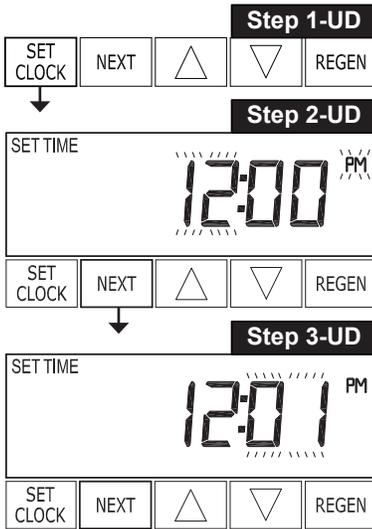
Sometimes there is a need to regenerate the system sooner than when the system calls for it, usually referred to as manual regeneration. There may be a period of heavy water usage because of guests or a heavy laundry day.

When the regeneration time option is set to "NORMAL" or "NORMAL + on 0," press and release the REGEN button to initiate a manual regeneration at the preset delayed regeneration time. The words "REGEN TODAY" will flash on the display to indicate that the system will regenerate at the preset delayed regeneration time. If the REGEN button is pressed in error, pressing the button again will cancel the request.

NOTE: If the regeneration time option is set to "on 0" there is no set delayed regeneration time so "REGEN TODAY" will not activate if the REGEN button is pressed.

To initiate a manual regeneration immediately, press and hold the REGEN button for 3 seconds. The system will begin to regenerate immediately. The request cannot be cancelled.

NOTE: For softeners, if the brine tank does not contain salt, fill with salt and wait at least 2 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 after power outages lasting more than 8 hours, if the battery has been depleted and a power outage occurs, or when daylight saving time begins or ends. 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.

STEP 1-UD – Press SET CLOCK.

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

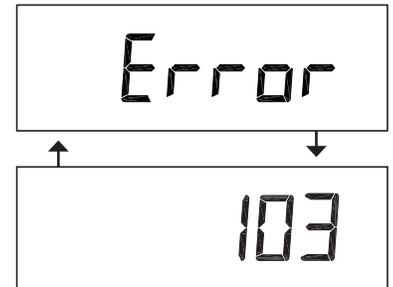
STEP 3-UD – *Current Time (minutes)*: Set the minutes of the day using ▼ or ▲ buttons. Press NEXT to exit Set Clock. Press REGEN to return to previous step.

Power Loss

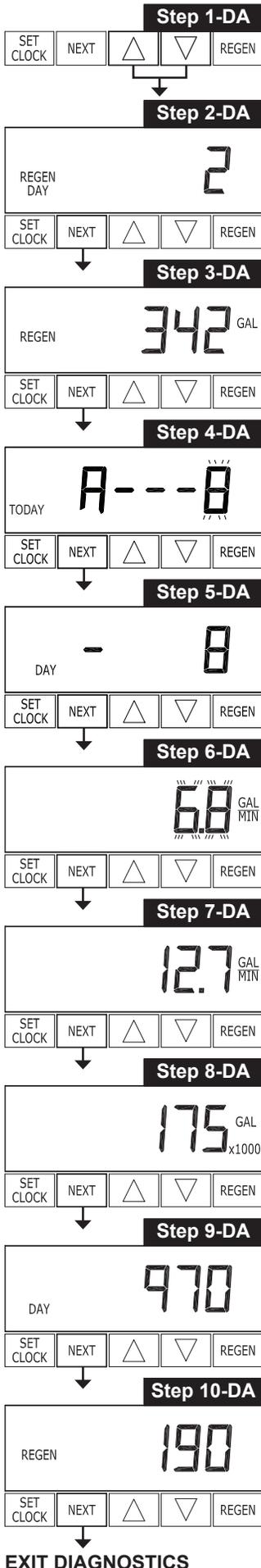
If the power goes out, the system will keep time for up to 8 hours or until the battery is depleted. If a power outage of more than 8 hours occurs, the time of day will flash on and off which indicates the time of day should be reset. The system will remember the rest. If a power outage lasts less than 8 hours and the time of day flashes on and off, the non-rechargeable battery should be replaced.

Error Message

If the word “ERROR” and a number are alternately flashing on the display, this indicates that the valve was not able to function properly. See *Troubleshooting & Error Code Guide for Tech Control Valves* for help diagnosing error codes or contact manufacturer for help.



Diagnostics⁵



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

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

STEP 3-DA – *Gallons, since last regeneration:* This display shows the number of gallons that have been treated since the last regeneration. This display will equal 0 (zero) if a water meter is not installed. Press the NEXT to go to Step 4-DA. Press REGEN to return to the previous step.

STEP 4-DA – *Gallons, reserve capacity used for last 7 days:* If the valve is set up as a softener, a meter is installed, and Set Gallons Capacity is set to “AUTO,” this display shows 0 day (for today) and flashes the reserve capacity. Pressing the ▲ button will show day 1 (which would be yesterday) and flashes 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 gallons for days 3, 4, 5, and 6. The ▼ button can be pressed to move backwards in the day series. Press NEXT at any time to go to Step 5-DA. Press REGEN to return to the previous step.

STEP 5-DA – *Gallons, 63 day usage history:* This display shows day 1 (for yesterday) and flashes the number of gallons treated yesterday. Pressing the ▲ button will show day 2 (which would be the day before yesterday) and flashes the number of gallons treated on that day. Continue to press the ▲ button to show the maximum number of gallons treated for the last 63 days. This display will show dashes if a water meter is not installed. Press NEXT at any time to go to Step 6-DA. Press REGEN to return to the previous step.

STEP 6-DA – *Flow Rate, current:* Turn the water on at one or more taps in the building. The flow rate in gallons per minute will be displayed. If flow stops, the value will fall to 0 (zero) in a few seconds. This display will equal 0 (zero) if a water meter is not installed. Press NEXT to go to Step 7-DA. Press REGEN to return to the previous step.

STEP 7-DA – *Flow Rate, maximum last seven days:* The maximum flow rate in gallons per minute that occurred in the last seven days will be displayed. This display will equal 0 (zero) if a water meter is not installed. Press NEXT to go to Step 8-DA. Press REGEN to return to the previous step.

STEP 8-DA – *Gallons, total used since last reset:* The total number of gallons used since last reset will be displayed. This display will equal 0 (zero) if a water meter is not installed. Press NEXT to go to Step 9-DA. Press REGEN to return to the previous step.

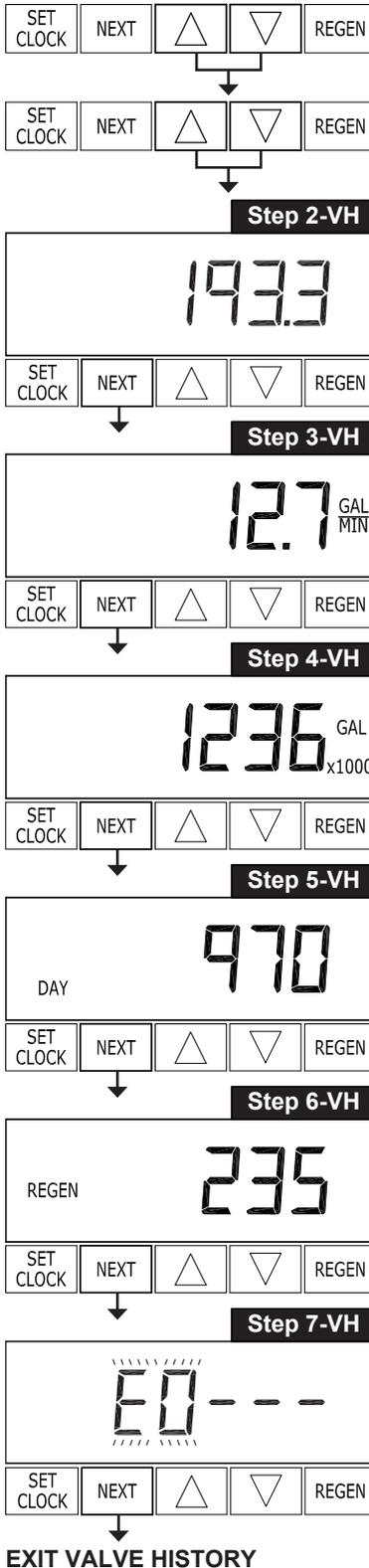
STEP 9-DA – *Days, total number since last reset:* The total number of days the control valve has been in service since last reset will be displayed. Press NEXT to go to Step 10-DA. Press REGEN to return to the previous step.

STEP 10-DA – *Regenerations, total number since last reset:* The total number of regenerations that have occurred since last reset will be displayed. Press NEXT to exit Diagnostics. Press REGEN to return to the previous step.

EXIT DIAGNOSTICS

5. All Diagnostic values can be reset to 0 (zero). See bold type on page 7 for procedure.

Valve History



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

STEP 2-VH – *Software Version*: This display shows the software version of the valve. Press NEXT to go to Step 3-VH. Press REGEN to exit Valve History.

STEP 3-VH⁶ – *Flow Rate, maximum since start-up*: This display shows the maximum flow rate in gallons per minute that has occurred since start-up. This display will equal 0 (zero) if a water meter is not installed. Press NEXT to go to Step 4-VH. Press REGEN to return to the previous step.

STEP 4-VH – *Gallons, total used since start-up*: This display shows the total gallons treated since start-up. This display will equal 0 (zero) if a water meter is not installed. Press NEXT to go to Step 5-VH. Press REGEN to return to the previous step.

STEP 5-VH – *Days, total since start-up*: This display shows the total days since start-up. Press NEXT to go to Step 6-VH. Press REGEN to return to the previous step.

STEP 6-VH – *Regenerations, total number since start-up*: This display shows the total number of regenerations that have occurred since start-up. Press NEXT to go to Step 7-VH. Press REGEN to return to the previous step.

STEP 7-VH – *Error Log*: This display shows a history of the last 10 errors generated by the control during operation. Press the ▲ or ▼ buttons to review each error recorded. Press NEXT to exit Valve History. Press REGEN to return to the previous step.

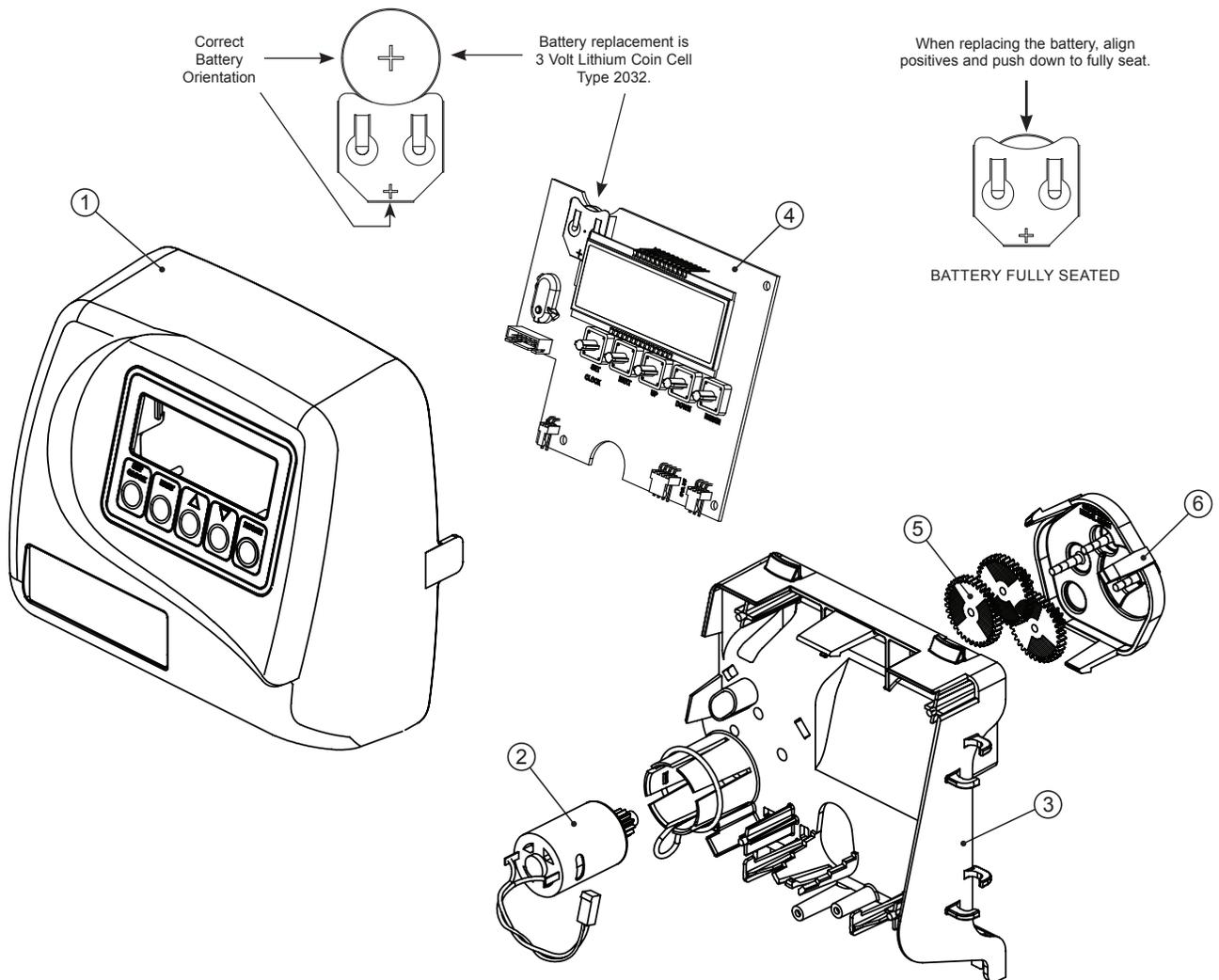
6. Values in Steps 3-VH through 7-VH cannot be reset.

Front Cover and Drive Assembly

Drawing No.	Part No.	Description	Quantity
1	LC-V3175-01	WS1 Front Cover Assembly	1
*	LC-V3002 *	WS1 Drive Assembly	1
2	LC-V3107-01	WS1 Motor	1
3	LC-V3106-01	WS1 Drive Bracket and Spring Clip	1
4	LC-V3108-10BOARD	WS1 PC Board XMEGA Replace	1
5	LC-V3110	WS1 Drive Reducing Gear 12 x 36	3
6	LC-V3109	WS1 Drive Gear Cover	1
Not Shown	LC-V3186	WS1 AC Adapter 120V-12V	1
	LC-V3186EU	WS1 AC Adapter 220-240V-12V EU	1
	LC-V3186UK	WS1 AC Adapter 220-240V-12V UK	1
	LC-V3186-01	WS1 AC Adapter Cord Only	1

* Drawing Number Parts 2 through 6 may be purchased as a complete assembly: Part No. LC-V3002, WS1 Drive Assembly.

AC Adapter	US	International
Supply Voltage	120 VAC	230 VAC
Supply Frequency	60 Hz	50 Hz
Output Voltage	12 VAC	12 VAC
Output Current	500 mA	500 mA

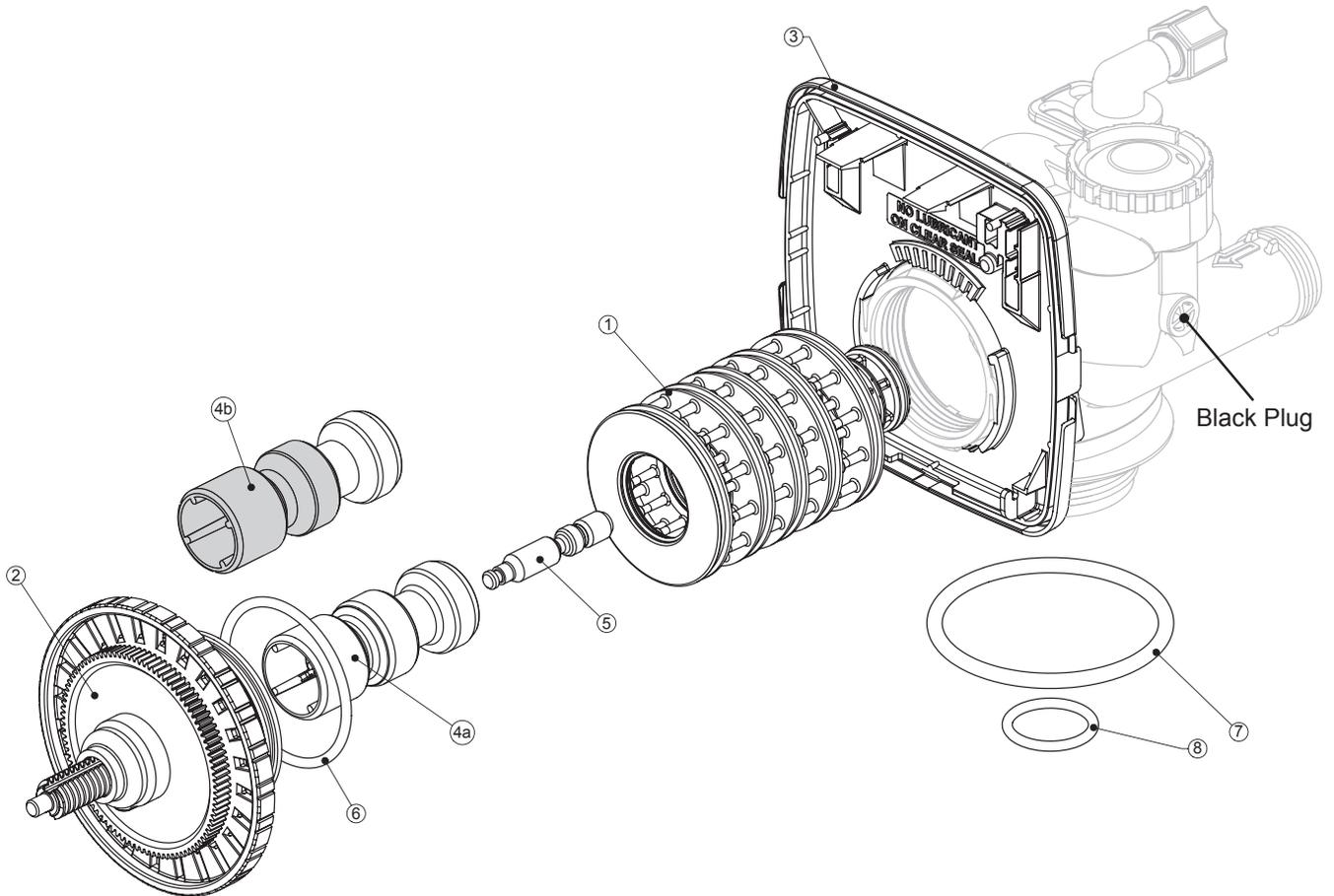


WS1 Drive Cap Assembly, Downflow Piston, Upflow Piston, Regenerant Piston, and Spacer Stack Assembly

Drawing No.	Part No.	Description	Quantity
1	LC-V3005-02	WS1 Spacer Stack Assembly	1
2	LC-V3004	Drive Cap Assembly	1
3	LC-V3178	WS1 Drive Backplate	1
4a	LC-V3011 *	WS1 Piston Downflow Assembly	1
4b	LC-V3011-01 *	WS1 Piston Upflow Assembly	1
5	LC-V3174	WS1 Regenerant Piston	1
6	LC-V3135	O-ring 228	1
7	LC-V3180	O-ring 337	1
8	LC-V3105	O-ring 215 (Distributor Tube)	1
Not Shown	LC-V3001	WS1 Body Downflow Assembly	1
	LC-V3001-02	WS1 Mixing Valve Body Downflow Assembly	1
	LC-V3001UP	WS1 Body Upflow Assembly	1
	LC-V3001-02UP	WS1 Mixing Valve Body Upflow Assembly	1

* P/N: LC-V3011 is labeled with "DN" and P/N: LC-V3011-01 is labeled with "UP."

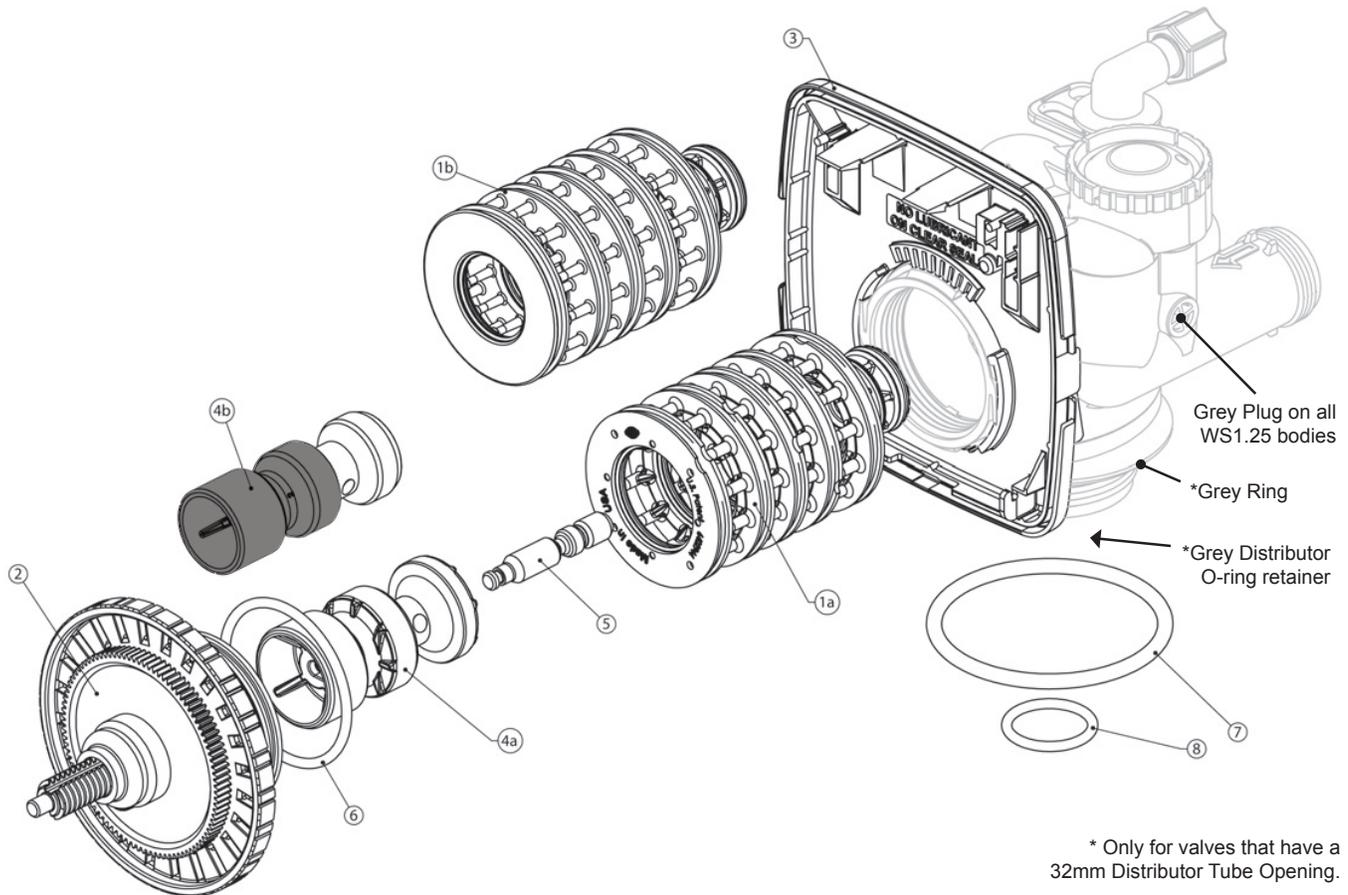
NOTE: The regenerant piston is not used in backwash only applications.



WS1.25 Drive Cap Assembly, Downflow Piston, Upflow Piston, Regenerant Piston, & Spacer Stack Assembly

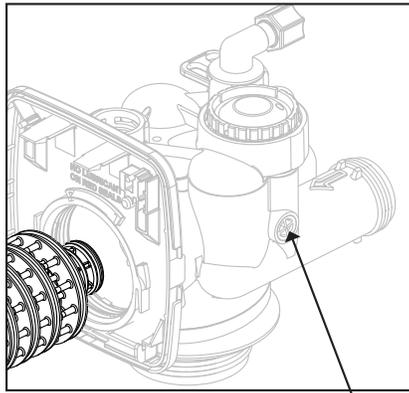
Drawing No.	Part No.	Description	Quantity
1a	LC-V3430-01	WS1.5 Spacer Stack Assembly	1
1b	LC-V3005-02	WS1 Spacer Stack Assembly	1
2	LC-V3004	Drive Cap Assembly	1
3	LC-V3178	WS1 Drive Backplate	1
4a	LC-V3407	WS1.5 Piston Downflow Assembly	1
4b	LC-V3011-01	WS1 Piston Upflow Assembly	1
5	LC-V3174	WS1 Regenerant Piston	1
6	LC-V3135	O-ring 228	1
7	LC-V3180	O-ring 337	1
8	LC-V3358	O-ring 219 (Distributor Tube Opening 1.32 inch)	1
	LC-V3357	O-ring 218 (Distributor Tube Opening 32mm)	1
Not Shown	LC-V3020	WS1.25 Body Downflow Assembly (Distributor Tube Opening 1.32 inch)	1
	LC-V3020-01	WS1.25 Mixing Valve Body Downflow Assembly (Distributor Tube Opening 1.32 inch)	1
	LC-V3020-02	WS1.25 Body Downflow Assembly (Distributor Tube Opening 32mm)	1
	LC-V3020-03	WS1.25 Mixing Valve Body Downflow Assembly (Distributor Tube Opening 32mm)	1
	LC-V3020UP	WS1.25 Body Upflow Assembly (Distributor Tube Opening 1.32 inch)	1
	LC-V3020-02UP	WS1.25 Body Upflow Assembly (Distributor Tube Opening 32mm)	1

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

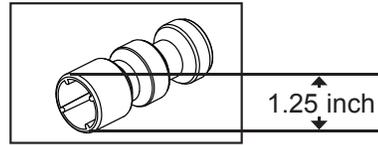
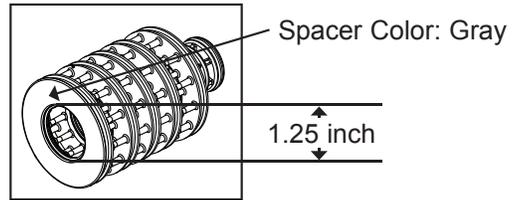


WS1 & WS1.25 Identification

WS1 with 1.050 inch Distributor Tube Opening Identification

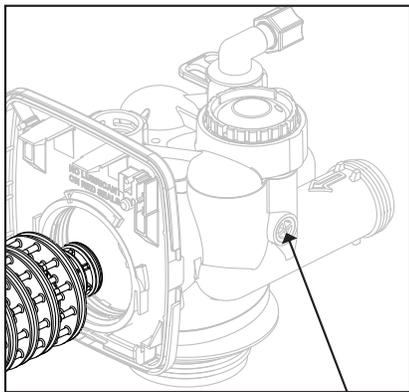


Black Plug



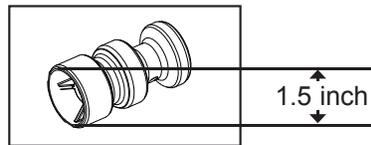
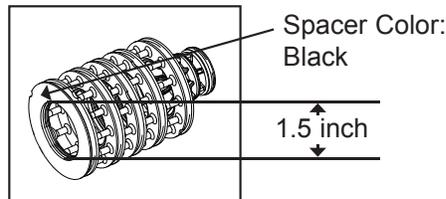
NOTE: The WS1 downflow piston is a solid amber color.
The WS1 upflow piston is black and amber.

WS1.25 with 1.32 inch Distributor Tube Opening Identification

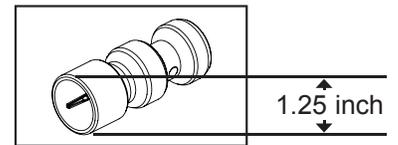
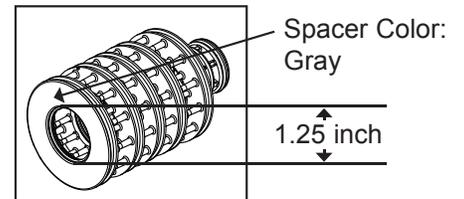


Gray Plug

DOWNFLOW & BACKWASH

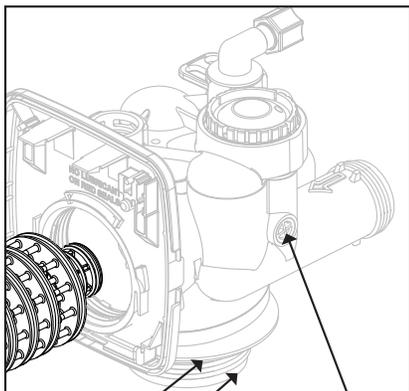


UPFLOW



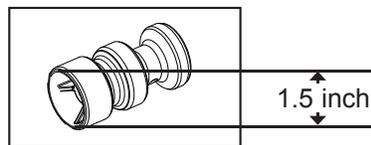
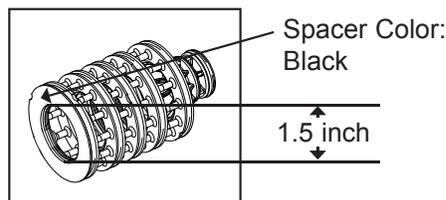
NOTE: The WS1 downflow piston is a solid amber color.
The WS1 upflow piston is black and amber.

WS1.25 with 32mm Distributor Tube Opening Identification

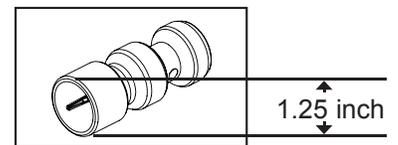
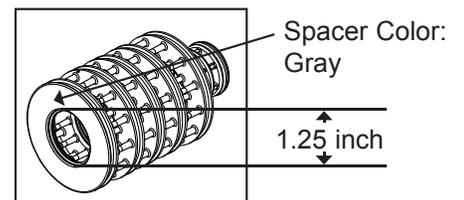


Gray Ring
Gray Distributor O-ring Retainer
Gray Plug

DOWNFLOW & BACKWASH



UPFLOW



NOTE: The WS1 downflow piston is a solid amber color.
The WS1 upflow piston is black and amber.

