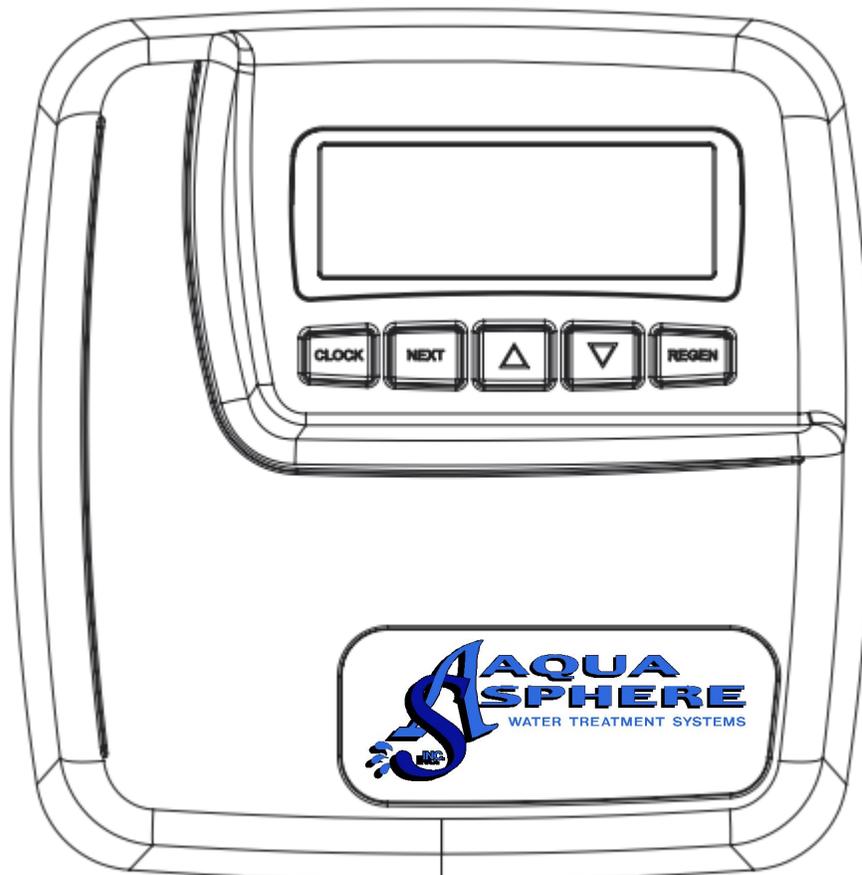




## 1" & 1.25" Control Valve

With Fully Adjustable Cycles

Owners Manual



## Introduction

This manual is about a control valve to be used on water softeners or water filters. Information in this manual is different than what is needed for installation and servicing of a particular water treatment system. This manual is not intended to be used as a manual for a complete water softener or filter. The control valve, fittings and/or bypass are designed to accommodate minor plumbing misalignments but are not designed to support the weight of a system or the plumbing. Do not use Vaseline, oils, other hydrocarbon lubricants or spray silicone anywhere. A silicone lubricant may be used on black o-rings but is not necessary. Avoid any type of lubricants, including silicone, on the clear lip seals. The nuts and caps are designed to be unscrewed or tightened by hand or with the special plastic wrench. If necessary pliers can be used to unscrew the nut or cap but may result in damage to the fitting. Do not use a pipe wrench to tighten or loosen nuts or caps. Do not place a screwdriver in the slots on caps and/or tap with a hammer. Do not use pipe dope or other sealants on threads. Use Teflon tape on the threaded inlet, outlet and drain fittings. Teflon tape is not necessary on the nut connection or caps because of o-ring seals. After completing any valve maintenance involving the drive assembly or the drive cap assembly and pistons, press and hold NEXT and REGEN buttons for 3 seconds or unplug power source jack from the printed circuit board (black wire) and plug back in. This resets the electronics and establishes the service piston position. The display should flash all wording, then flash the software version and then reset the valve to the service position. All plumbing should be done in accordance with local plumbing codes. The pipe size for the drain line should be a minimum of ½". Backwash flow rates in excess of 7 gpm or length in excess of 20' require ¾" drain line. Solder joints near the drain must be done prior to connecting the drain line flow control fitting. Leave at least 6" between the drain line control fitting and solder joints when soldering pipes that are connected on the drain line control fitting. Failure to do this could cause interior damage to the drain line flow control fitting. When assembling the installation fitting package (inlet and outlet), connect the fitting to the plumbing system first and then attach the nut, split ring and o-ring. Heat from soldering or solvent cements may damage the nut, split ring or o-ring. Solder joints should be cool and solvent cements should be set before installing the nut, split ring and o-ring. Avoid getting primer and solvent cement on any part of the o-rings, split rings, bypass valve or control valve. Plug into an electrical outlet. Note: All electrical connections must be connected according to local codes. (Be certain the outlet is uninterrupted.) Install grounding strap on metal pipes.

**Table 1**  
**Specifications which must be included in OEM's Manual**

|   |                                     |                      |
|---|-------------------------------------|----------------------|
| Minimum/Maximum Operating Pressures   | 20 psi (138 kPa) -125 psi (862 kPa) |                      |
| Minimum/Maximum Operating Temperatures  | 40°F (4°C) - 110°F (43°C)           |                      |
| AC Adapter:   | <u>U.S.</u>                         | <u>International</u> |
| Supply Voltage  | 120 V AC                            | 230 V AC             |
| Supply Frequency  | 60 Hz                               | 50 Hz                |
| Output Voltage  | 12 V AC                             | 12 V AC              |
| Output Current  | 500 mA                              | 500 mA               |
| No user serviceable parts are on the PC board, the motor, or the AC adapter. The means of disconnection from the main power supply is by unplugging the AC adapter from the wall. |                                     |                      |

**Table 2 contains a summary of specifications for the control valve and bypass valve.**

**Table 2**  
**Quick Reference Specifications**

|   |   |                      |
|---|---|----------------------|
| Service flow rate 1" (includes bypass and meter)    | 27 gpm (102.2 lpm) @15 psig (103 kPa) drop  |                      |
| Backwash flow rate 1" (includes bypass)             | 27 gpm (102.2 lpm) @25 psig (172 kPa) drop  |                      |
| Service flow rate 1.25" (includes meter)            | 34 gpm (128.7 lpm) @15 psig (103 kPa) drop  |                      |
| Service flow rate 1.25" (includes bypass and meter) | 32 gpm (121.1 lpm) @15 psig (103 kPa) drop  |                      |
| Backwash flow rate 1.25"                            | 32 gpm (121.1 lpm) @25 psig (172 kPa) drop  |                      |
| Backwash flow rate 1.25" (includes bypass)          | 30 gpm (113.5 lpm) @25 psig (172 kPa) drop  |                      |
| Minimum/Maximum Operating Pressures                 | 20 psi (138 kPa) -125 psi (862 kPa)   |                      |
| Minimum/Maximum Operating Temperatures              | 40°F (4°C) - 110°F (43°C)   |                      |
| AC Adapter:   | <u>U.S.</u>   | <u>International</u> |
| 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               |
| Regenerant Refill Rate                              | 0.5 gpm (1.9 lpm)   |                      |
| Injectors   | See Injector Graphs   |                      |
| Drain Line Flow Controls                            | See Table 7   |                      |
| Inlet / Outlet Fitting Options                      | - 1" NPT elbow which has a unique drill out feature to allow a ¼" NPT connection to the inlet and/or outlet<br>- ¾" & 1" PVC solvent weld fitting<br>- ¾" or 1" straight brass sweat fittings<br>- 1" or 1 ¼" plastic male NPT fittings<br>- 1" or 1 ¼" plastic male BSPT fittings<br>- 1¼" & 1½" brass sweat fitting<br>- 1¼" & 1½" PVC solvent fitting<br>- ¾" or 1" PEX fittings |                      |
| Distributor Tube Opening WS1ER Valve                | 1.05" outside diameter (¾" NPS)   |                      |
| Distributor Tube Opening WS1.25ER Valve             | 1.32" outside diameter (1" NPS)<br>32 mm outside diameter   |                      |
| Tank Thread   | 2½" - 8 NPSM  |                      |
| Control Valve Weight                                | 4.5 lbs.          2.0 kg  |                      |
| PC Board Memory                                     | Nonvolatile EEPROM<br>(electrically erasable programmable read only memory)   |                      |
| Compatible with regenerants/chemicals               | Sodium chloride, potassium chloride, potassium permanganate, sodium bisulfite, chlorine and chloramines   |                      |

## 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. The control valve can perform downflow or upflow regeneration. The 1.25" control valve is only available in downflow regeneration. When the 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. 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. 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 until the battery power is depleted if the power goes out. After the battery power is depleted, the only item that needs to be reset is the time of day; other values are permanently stored in the nonvolatile memory. The control valve battery is not rechargeable but is replaceable. The control valve's unique design and electronics allow the flexibility shown in Tables 3 and 4.

**Table 3  
Regeneration Cycles Softening**

| WS1CH & WS1.25CH<br>Downflow Regenerant<br>Refill After Rinse | WS1CH & WS1.25CH<br>Downflow Regenerant<br>Prefill | WS1CH only<br>Upflow Regenerant<br>Refill After Rinse | WS1CH only<br>Upflow Regenerant<br>Prefill |
|---|--|---|--|
| 1 <sup>st</sup> Cycle: Backwash                               | 1 <sup>st</sup> Cycle: Fill                        | 1 <sup>st</sup> Cycle: UP Brine                       | 1 <sup>st</sup> Cycle: Fill                |
| 2 <sup>nd</sup> Cycle: dn Brine                               | 2 <sup>nd</sup> Cycle: Softening                   | 2 <sup>nd</sup> Cycle: Backwash                       | 2 <sup>nd</sup> Cycle: Softening           |
| 3 <sup>rd</sup> Cycle: Backwash                               | 3 <sup>rd</sup> Cycle: Backwash                    | 3 <sup>rd</sup> Cycle: Rinse                          | 3 <sup>rd</sup> Cycle: UP Brine            |
| 4 <sup>th</sup> Cycle: Rinse                                  | 4 <sup>th</sup> Cycle: dn Brine                    | 4 <sup>th</sup> Cycle: Fill                           | 4 <sup>th</sup> Cycle: Backwash            |
| 5 <sup>th</sup> Cycle: Fill                                   | 5 <sup>th</sup> Cycle: Backwash                    | 5 <sup>th</sup> Cycle: Service                        | 5 <sup>th</sup> Cycle: Rinse               |
| 6 <sup>th</sup> Cycle: Service                                | 6 <sup>th</sup> Cycle: Rinse                       |   | 6 <sup>th</sup> Cycle: Service             |
|   | 7 <sup>th</sup> Cycle: Service                     |   |  |

**Table 4  
Regeneration Cycles Filtering**

| WS1CH & WS1.25CH Downflow<br>Regenerant Refill After Rinse | WS1CH & WS1.25CH<br>No Regeneration |
|--|-------------------------------------|
| 1 <sup>st</sup> Cycle: Backwash                            | 1 <sup>st</sup> Cycle: Backwash     |
| 2 <sup>nd</sup> Cycle: Regenerate                          | 2 <sup>nd</sup> Cycle: Rinse        |
| 3 <sup>rd</sup> Cycle: Backwash                            | 3 <sup>rd</sup> Cycle: Service      |
| 4 <sup>th</sup> Cycle: Rinse                               |                                     |
| 5 <sup>th</sup> Cycle: Fill                                |                                     |
| 6 <sup>th</sup> Cycle: Service                             |                                     |

## Installer Display Settings

### STEP 11

Step 11 - Press NEXT and  simultaneously for 3 seconds.



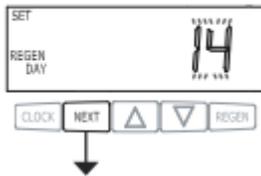
### STEP 21

Step 21 – 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 2F or if ‘AUTO’ is not selected in Set Volume Capacity in OEM Softener System Setup. Press NEXT to go to step 31. Press REGEN to exit Installer Display Settings.



### STEP 31

Step 31 – 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 Table 8 for more detail on softener setup and Table 9 for more detail on filter setup. Press NEXT to go to step 41. Press REGEN to return to previous step.



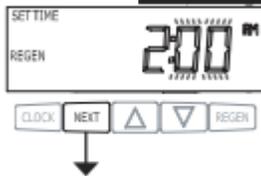
### STEP 41

Step 41 – 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 “on 0” if “on 0” is selected in Set Regeneration Time Option in OEM Softener System Setup or OEM Filter System Setup. Press NEXT to go to step 51. Press REGEN to return to previous step.



### STEP 51

Step 51 – 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 Set Regeneration Time Option in OEM Softener System Setup or OEM Filter System Setup. Press NEXT to exit Installer Display Settings. Press REGEN to return to previous step.

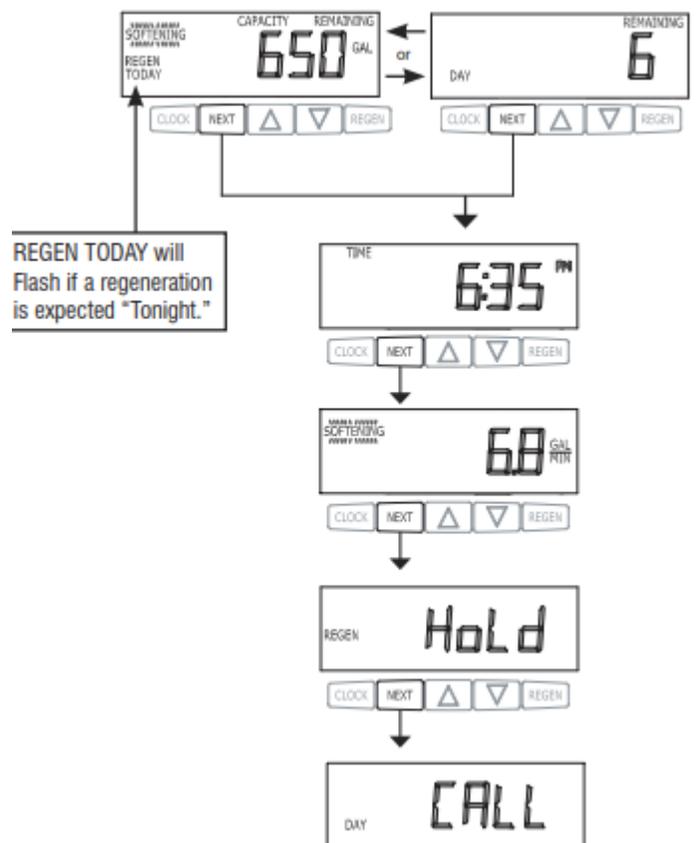


RETURN TO  
NORMAL MODE

To initiate a manual regeneration immediately, press and hold the “REGEN” button for three 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 five displays may be shown. 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 remaining 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 show either dP or hold if the dP switch is closed. The fifth display indicates the user should call for service. The fifth display will not appear if OFF is selected in Step 14S of OEM Softener System Setup or Step 13F of OEM Filter System Setup. To clear the Service Call reminder, press the  and  buttons simultaneously while CALL is displayed. 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. If a water meter is installed, the word "Softening" or "Filtering" flashes on the display when water is being treated (i.e. water is flowing through the system).



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.

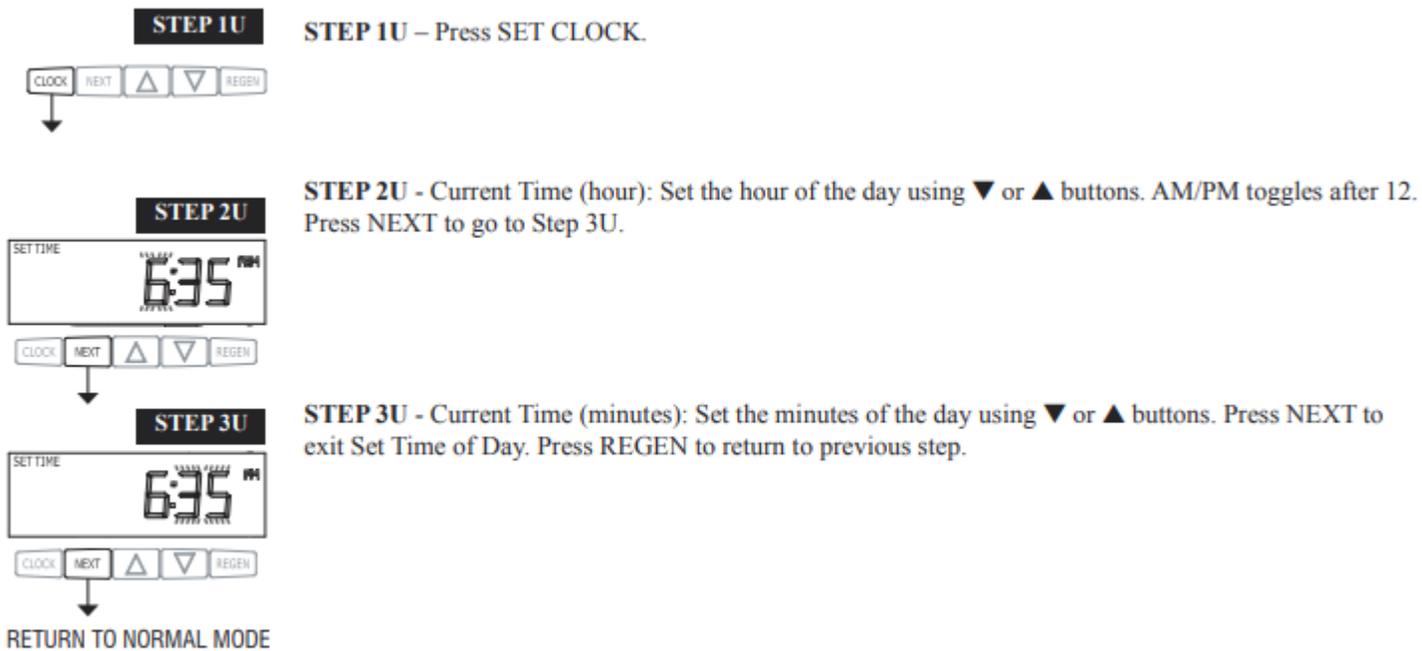


Manual Regeneration Sometimes there is a need to regenerate the system sooner than when the system calls for it, usually referred to as manual regeneration. There may be a period of heavy water usage because of guests or a heavy laundry day.



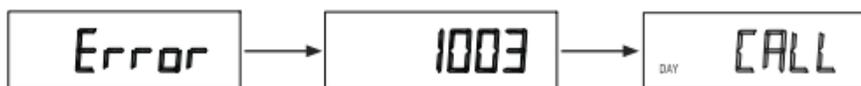
To initiate a manual regeneration at the preset delayed regeneration time, when the regeneration time option is set to “Normal” or “NORMAL + on 0”, press and release “REGEN”. The words “REGEN TODAY” will flash on the display to indicate that the system will regenerate at the preset delayed regeneration 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 “on 0” 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 the brine tank does not contain salt, fill with salt and wait at least two hours before regenerating.

Set Time of Day The user can also set the time of day. Time of day should only need to be set if the battery has been depleted because of extended power outages or when daylight saving time begins or ends. If an extended power outage occurs, the time of day will flash on and off which indicates the time of day should be reset. The non rechargeable battery should also be replaced.



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

Error Message If the word “ERROR,” a number and the word “CALL” are alternately flashing on the display contact the OEM for help. A number indicates that the valve was not able to function properly.



**Table 10**  
**Troubleshooting Procedures**

| Problem  | Possible Cause  | Solution   |
|--|---|--|
| 1. Timer does not display time of day  | a. AC Adapter unplugged   | a. Connect power   |
|  | b. No electric power at outlet  | b. Repair outlet or use working outlet   |
|  | c. Defective AC Adapter   | c. Replace AC Adapter  |
|  | d. Defective PC board   | d. Replace PC board  |
| 2. Timer does not display correct time of day  | a. Switched outlet  | a. Use uninterrupted outlet  |
|  | b. Power outage   | b. Reset time of day and replace battery   |
|  | c. Defective PC board   | c. Replace PC board  |
| 3. No softening/filtering display when water is flowing  | a. Bypass valve in bypass position  | a. Put bypass valve in service position  |
|  | b. Meter connection disconnected  | b. Connect meter to PC board   |
|  | c. Restricted/stalled meter turbine   | c. Remove meter and check for rotation or foreign material   |
|  | d. Defective meter  | d. Replace meter   |
|  | e. Defective PC board   | e. Replace PC board  |
| 4. Control valve regenerates at wrong time of day  | a. Power outages  | a. Reset control valve to correct time of day and replace battery  |
|  | b. Time of day not set correctly  | b. Reset to correct time of day  |
|  | c. Time of regeneration incorrect   | c. Reset regeneration time   |
|  | d. Control valve set at "on 0" (immediate regeneration)   | d. Check control valve set-up procedure regeneration time option   |
|  | e. Control valve set at NORMAL + on 0   | e. Check control valve set-up procedure regeneration time option   |
| 5. ERROR followed by code number<br><br>Error Code 1001 -Unable to recognize start of regeneration<br>Error Code 1002 – Unexpected stall<br>Error Code 1003 – Motor ran to long, timed out trying to reach next cycle position<br>Error Code 1004 - Motor ran to long, timed out trying to reach home position<br><br>If other Error Codes followed by a number display contact the factory. | a. Control valve has just been serviced   | a. Press NEXT and REGEN for 3 seconds or unplug power source jack (black wire) and plug back in to reset control valve |
|  | b. Foreign matter is lodged in control valve  | b. Check piston and spacer stack assembly for foreign matter   |
|  | c. High drive forces on piston  | c. Replace piston(s) and spacer stack assembly   |
|  | d. Control valve piston not in home position  | d. Press NEXT and REGEN for 3 seconds or unplug power source jack (black wire) and plug back in to reset control valve |
|  | e. Motor not inserted fully to engage pinion, motor wires broken or disconnected, motor failure | e. Check motor and wiring. Replace motor if necessary  |
|  | f. Drive gear label dirty or damaged, missing or broken gear                                    | f. Replace or clean drive gear   |
|  | g. Drive bracket incorrectly aligned to back plate  | g. Reseat drive bracket properly   |
|  | h. PC board is damaged or defective   | h. Replace PC board  |
|  | i. PC board incorrectly aligned to drive bracket  | i. Ensure PC board is correctly snapped on to drive bracket  |

| Problem  | Possible Cause                             | Solution   |
|--|--|--|
| 6. Control valve stalled in regeneration   | a. Motor not operating                     | a. Replace motor   |
|  | b. No electric power at outlet             | b. Repair outlet or use working outlet                   |
|  | c. Defective AC Adapter                    | c. Replace AC Adapter                                    |
|  | d. Defective PC board                      | d. Replace PC board                                      |
|  | e. Broken drive gear or drive cap assembly | e. Replace drive gear or drive cap assembly              |
|  | f. Broken piston retainer                  | f. Replace drive cap assembly                            |
|  | g. Broken main or regenerant piston        | g. Replace main or regenerant piston                     |
| 7. Control valve does not regenerate automatically when REGEN button is depressed and held | a. AC Adapter unplugged                    | a. Connect AC Adapter                                    |
|  | b. No electric power at outlet             | b. Repair outlet or use working outlet                   |
|  | c. Broken drive gear or drive cap assembly | c. Replace drive gear or drive cap assembly              |
|  | d. Defective PC board                      | d. Replace PC board                                      |
| 8. Control valve does not regenerate automatically but does when REGEN button is depressed | a. By-pass valve in bypass position        | a. Put bypass valve in normal operation position         |
|  | b. Meter connection disconnected           | b. Connect meter to PC board                             |
|  | c. Restricted/stalled meter turbine        | c. Remove meter and check for rotation or foreign matter |
|  | d. Defective meter                         | d. Replace meter   |
|  | e. Defective PC board                      | e. Replace PC board                                      |
|  | f. Set-up error                            | f. Check control valve set-up procedure                  |
| 9. Time of day flashes on and off  | a. Power outage                            | a. Reset the time of day and replace battery             |

### **AQUA SPHERE INC. FIVE-YEAR SOFTENER AND FILTER CONTROLS LIMITED WARRANTY**

Aqua Sphere Inc. warrants that its Softener and Filter Control Valves will be free from defects in material and workmanship under normal use and service for a period of five years from the date of installation of such Valves when installed and operated within recommended parameters by ASI certified personnel. No warranty is made with respect to defects not reported to ASI within the warranty period and/or defects or damages due to neglect, misuse, alterations, accident, misapplication, physical damage, or damage caused by fire, acts of God, freezing or hot water or similar causes. For outdoor installations where the Softener and Filter Control Valves are not under cover, the weather cover must be utilized for the warranty to be valid.

ASI's obligation under this Limited Warranty shall be limited, at its option, to replacement or repair of any Softener and Filter Control valve covered by this Limited Warranty.

ASI GIVES THIS WARRANTY TO ORIGINAL PURCHASER IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE AND HEREBY EXPRESSLY DISCLAIMS ALL OTHER SUCH WARRANTIES. ASI'S LIABILITY HERE UNDER SHALL NOT EXCEED THE COST OF THE PRODUCT. UNDER NO CIRCUMSTANCES WILL ASI BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES OR FOR ANY OTHER LOSS, DAMAGE OR EXPENSE OF ANY KIND.

