Cat. No. 01021161
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DCO # 012139

Installation,
Operation, and
Service Instructions
with Parts Lists

CULLIGAN®
Smart Controller (GBE)
For Commercial and Industrial Softener and Filter Applications

Models from 2011

Firmware Version 2.1.3

Culligan®

Printed in USA

Attention Culligan Customer:

Your local independently operated Culligan dealer employs trained service and maintenance personnel who are experienced in the installation, function and repair of Culligan equipment. This publication is written specifically for these individuals and is intended for their use.

We encourage Culligan users to learn about Culligan products, but we believe that product knowledge is best obtained by consulting with your Culligan dealer. Untrained individuals who use this manual assume the risk of any resulting property damage or personal injury.

WARNING! Electrical shock hazard! Prior to servicing equipment, disconnect power supply to prevent electrical shock.

WARNING! If incorrectly installed, operated, or maintained, this product can cause severe injury. Those who install, operate, or maintain this product should be trained in its proper use, warned of its dangers, and should read the entire manual before attempting to install, operate, or maintain this product. Failure to comply with any warning or caution that results in any damage will void the warranty.

CAUTION! This product is not to be used by children or persons with reduced physical, sensory or mental capabilities, or lack of experience or knowledge, unless they have been given supervision or instruction.

CAUTION! Children should be instructed not to play with this appliance.

CAUTION! If the power cord from the transformer to the unit looks or becomes damaged, the cord and transformer should be replaced by a Culligan Service Agent or similarly qualified person in order to avoid a hazard.

WARNING! This device complies with Part 15 of the FCC rules subject to the two following conditions: 1) This device may not cause harmful interference, and 2) This device must accept all interference received, including interference that may cause undesired operation.

This equipment complies with Part 15 of the FCC rules. Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

CAUTION! To reduce the risk of fire, use only No. 26 AWG or larger telecommunications line cord.

NOTE This system is not intended for use with water that is microbiologically unsafe or of unknown quality.

NOTE Check with your public works department for applicable local plumbing and sanitation codes. Follow local codes if they differ from the standards used in this manual. To ensure proper and efficient operation of the Culligan equipment to your full satisfaction, carefully follow the instructions in this manual.

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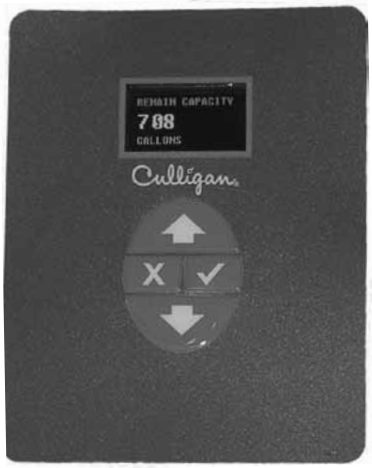

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Contents

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Document Change History

DCO	Chapter	Description	Reason
012139	Programming	Updated menu selections and structure	FWR 2.1.3

Introduction

Read this Manual First

Before you operate the Culligan Smart Controller (GBE), read this manual to become familiar with the device and its capabilities.

About this Manual

This manual:

- Familiarizes the operator with the equipment
- Explains installation and setup procedures
- Provides basic programming information
- Explains the various modes of operation
- Gives specifications and troubleshooting information

Safe Practices

Throughout this manual there are paragraphs set off by special headings.

Notice

Notice is used to emphasize installation, operation or maintenance information which is important, but does not present any hazard. For example,

NOTICE	**The nipple must extend no more than 1 inch above the cover plate.**

Caution

Caution is used when failure to follow directions could result in damage to equipment or property. For example,

CAUTION! Disassembly while under water pressure can result in flooding.

Warning

Warning is used to indicate a hazard which could cause injury or death if ignored. For example,

WARNING! Electrical shock hazard! Unplug the unit before removing the timer mechanism or cover plates!

The CAUTION and WARNING paragraphs are not meant to cover all possible conditions and situations that may occur. It must be understood that common sense, caution, and careful attention are conditions which cannot be built into the equipment. These MUST be supplied by the personnel installing, operating, or maintaining the system.

Be sure to check and follow the applicable plumbing codes and ordinances when installing this equipment. Local codes may prohibit the discharge of sanitizing or descaling solutions to drain.

Use protective clothing and proper face or eye protection equipment when handling chemicals or power tools.

NOTE	**The Culligan Smart Controller (GBE) is not intended for use with water that is microbiologically unsafe or of unknown quality without adequate disinfection either before or after the system.**

NOTE	**Check with your public works department for applicable local plumbing and sanitation codes. Follow local codes if they differ from the standards used in this manual. To ensure proper and efficient operation of the Culligan Smart Controller (GBE) to your full satisfaction, carefully follow the instructions in this manual.**

Smart Controller Features

The primary function of the Culligan Smart Controller (GBE) is to initiate and control the regeneration process via methods that are most convenient and cost effective for the customer while offering many operational features and benefits. The controller is designed to operate a wide range of existing and new softener and filtration valves.

Take Control of Your System and Your Productivity

The Culligan Smart Controller (GBE) is an advanced design engineered to handle regeneration and monitoring of your water treatment equipment. It offers powerful programming options that can be used to operate and monitor any softener or filter system. It also provides sensing capabilities, expanded communications and a multifunction keypad—all in one simple-to-use unit.

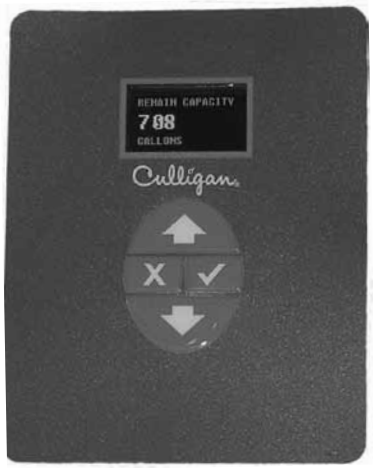


Figure 1. Smart Controller.

Figure 2. Remote display.

Smart Controller Features

Feature	Use/Benefit
Advanced Lighted OLED Display	The user is guided through brightly lit graphical menu screens with clear, multi-line, full text prompts. See Figure 1.
Membrane Keypad	The keypad uses sealed contacts for programming. No buttons to get dirty. See Figure 1.
Program Beeper	Emits an audible beep when keys are depressed to help identify valid (short beep) or invalid (three short beeps) pushes. Can be enabled or disabled.
Power Source	Electrical power required is 24 Volt 50/60 Hz AC current. A UL listed plug-in transformer (120V/24V) is provided.
Time of Day	Displays current time of day in either 12-hour or 24-hour format.
Real Time Clock with a Five-Year Battery Back-up	Keeps accurate time even during a power outage. Updates automatically when the GBE is equipped with optional modem capability.
English or Metric Values	Displays can be set to either English or Metric units.
Regeneration Interval	Provides the ability to initiate a time clock regeneration based on a number of days (1–99) or a specific day of the week.
Regeneration Start Delay	Allows a user determined number of hours (0-9) to be set for the purpose of increasing the amount of time between regenerations in a multi unit installation.
Auxiliary Input	Capable of accepting a remote signal from a dry contact device such as an operator push button for the purpose of initiating a regeneration sequence or external alarm signal.
Auxiliary Output on Alarm	Capable of sending a signal when an alarm/error is recognized.

Feature	Use/Benefit
Expansion Board for Additional Outputs	• Control blocking valves. • Control external solenoids or chemical feeders.
Progressive Flow Trip Point and Unbalanced Progressive Flow	Allows multiple tank systems operating with flow meters to bring tanks on-line or off-line as facility flow demands increase or decrease.
Multiple Unit Communication	A communication cable interconnects multiple units to operate the controller in the Progressive Flow mode and prohibits them from regenerating at the same time.
Diagnostics	The user can check the operation of sensors, progressive flow communication, motor positions, or an optional wireless display.
Transformer is UL and CUL Listed	
RoHS Compliant	

Optional Smart Controller Features

Feature	Use/Benefit
Flow Meter/Sensor Input	Supports various types of Hall effect flow sensors using a programmable K factor to initiate a regeneration sequence.
Aqua-Sensor® Input	Supports the patented digital Culligan Aqua-Sensor® technology used to efficiently initiate and control a regeneration sequence.
Telephone Modem	• Calls in reports on regenerations and alarm conditions. • Automatically updates time and date when calling in.
Wireless Remote Display	Displays the current status of the unit. It can be located up to 200 feet away from the GBE controller (depending on building and interference). The telephone modem can optionally be installed in the remote display. See Figure 2.
Smart Brine Tank Probe	This probe monitors conditions inside the brine tank. • Predicts when more salt is needed. • Detects the presence of a salt bridge. • Detects eductor line plugging. • Signals brine tank overfilling condition.

Basic Principles

What Is Hard Water?

Water is said to be hard when it carries too high a concentration of calcium and magnesium. Acceptable water hardness levels will vary depending on the application.

Why Should Hardness Be Removed?

Hard water causes scaling and etching which greatly impairs the life and efficiency of boilers, air-conditioning systems, cooling towers, water heaters, refrigeration plants and other equipment using water.

How Does It Work?

The components of dissolved minerals are called ions. They carry either a positive or negative charge. Hardness ions of minerals dissolved in water carry a positive charge. These positively charged ions (cations) are attracted to a synthetic softening material called ion exchange resin.

The heart of the softening system, therefore, is a deep bed of resin which draws calcium and magnesium ions, as well as ferrous iron, from the water as it passes through the resin bed.

Can The Resin Draw Out Hardness Ions Indefinitely?

No. During normal operation, the resin becomes saturated with positive ions and functions less efficiently. When hardness leakage occurs, the resin should be regenerated to restore its efficiency.

How Do You Regenerate Resin?

You regenerate a resin bed by removing the mineral ions through a process called ion exchange. This regeneration process occurs in four steps and takes approximately 80 to 90 minutes.

Backwash

During the backwash step, raw water flows rapidly upward (in reverse direction to the service flow) through the resin bed to expand the bed and flush out accumulated dirt, sediment and other sources of turbidity.

Brine Draw

The brine solution consisting of water and salt is drawn from a brine storage tank and allowed to flow slowly down through the resin bed. The brine solution removes the calcium and magnesium ions from the resin. This cycle can also be split into three “sub-cycles” which allow for the cost saving feature of brine reclaim.

Slow Rinse

Brine draw is then followed by a raw water slow rinse. This rinse step will slowly remove most of the remaining brine, exchanged calcium and magnesium ions from the resin. This cycle can also be split into three “sub-titles” which allow for the cost saving feature of brine reclaim.

Fast Rinse

Slow rinse is followed by a raw water flush, a very rapid down flow of raw water which removes the last traces of brine, and settles the resin bed.

How Often Must You Regenerate?

Frequency must be determined for each installation based on the amount of water usage, its degree of hardness and the amount of resin through which it flows. In some cases it is necessary to utilize a resin cleaner when the raw water contains iron. Contact your local Culligan dealer for more information.

How Do You Control The Regeneration Process?

The regeneration process for your commercial water softener is controlled automatically either on a predetermined time, volume, or external signal basis through the use of the Culligan GBE controller with optional flow sensor. See the Installation chapter for further information. The regeneration process can also be initiated manually by the operator as required.

Modes of Operation

Time Clock

The Smart Controller (GBE) will initiate a regeneration based upon a time schedule of intervals of days (such as every three days) or on a specific day of week schedule (such as Mondays, Wednesdays and Saturdays). Because regeneration will occur at the prescribed schedule regardless of water use, this method is usually the most inefficient method of water softener operation.

Flow Meter/Sensor

When a flow meter or sensor is connected to the controller circuit board, the Smart Controller has the ability to measure the amount of water treated and initiate a regeneration sequence based upon the gallon capacity of the water treatment equipment. The controller can delay the regeneration signal until a convenient time of day (known as a delayed regeneration) or act and initiate the regeneration sequence as soon as the signal is received (known as immediate regeneration).

When installing an alternating duplex system (one tank on-line, the other in standby), only one flow measuring device is required to be installed in the common outlet header of the system. Parallel systems (multiple tank systems, all on-line simultaneously) require one flow device for each mineral tank in the system.

This method is a proven, cost-effective means to operate a water softening system.

Aqua-Sensor® (Softener use only)

The Aqua-Sensor® detects when a softener resin bed has reached its point of exhaustion and, as a result, initiate a regeneration sequence. This is the most cost-effective method of operation and may be combined with any of the operational modes previously described.

Progressive Flow

The Progressive Flow mode is used with up to six and as few as two mineral tanks in a system. It allows more than one tank in a system to either be on-line or off-line depending upon the downstream flow demand. If flow demand is greater than the flow capability of the tank on-line, another tank can be brought on-line to help satisfy the excess demand. Once the demand has decreased, the second tank is returned to a standby mode and the system reverts to just one tank on-line providing treated water.

The progressive flow mode of operation relies on a user programmable set point or Trip Point. The Trip Point is a unit of flow (gallons or liters) on a per minute basis. Once attained the trip point will cause the second unit (in multiple resin tank system) to come on-line. Each additional tank in the system will subsequently be brought on-line as multiples of the trip point are attained and remain in that state for ten seconds. (Example: a three-tank system with a trip point of 50 gpm will bring two tanks on-line once the facility flow demands is equal to or greater than the 50 gpm trip point. Should the flow demand reach 100 gpm or more, the third tank shall be brought on-line.)

Additional tanks will be returned to stand-by once the facility flow demand is: less than 95 percent of the trip point for two tank systems; less than 95 percent of two times (2X) the trip point for triplex systems; less than 95 percent of three times (3X) the trip point for quad systems; and remaining in that state for 30 seconds.

Utilizing the progressive flow feature may allow the owner to use smaller units, resulting in the potential for reduced capital and operation costs.

Unbalanced Progressive Flow

Similar to regular Progressive Flow, this mode is used when maximum and minimum flow rates have a wide fluctuation. In this mode you can have one tank that is smaller than the others. This tank has a separate Trip Point set so the Smart Controller knows what flow rate it can run at. The additional larger tanks are brought on-line when the trip point of the smaller tank is exceeded. The small tank is only online during low flow conditions. The small tank must be set up as the master tank.

Differential Pressure (Filters Only)

When combined with an optional differential pressure device, the Culligan Smart Controller has the ability to initiate a backwashing sequence when the pressure differential across the media bed reaches a preset amount (usually 8–10 psi).

Installation

Electrical Installation

CAUTION! Observe the precautions listed below before electrical installation of your Smart Controller (GBE). Failure to do so may cause permanent damage to the controller.

- Follow the local electrical code requirements.
- Be sure electrical power is off and disconnected at the source before completing any wiring/cabling connections.
- Provide a dedicated 120 Volt circuit for the Smart Controller system to ensure maximum electrical protection.
- DO NOT include the Smart Controller wiring cables in any conduit or raceway containing other 120 Volt or higher circuits.
- Maintain a distance of at least 10 feet between the Smart Controller and any electrical distribution panels, raceways carrying 300 Volts or more, and electrical motors of 1 horsepower or more.
- Use the cabling provided. Failure to do so may effect performance of the Smart Controller adversely.

WARNING! One transformer is required for each controller in the system. Do not attempt to operate multiple controllers without a dedicated transformer for each or your system will experience operational difficulties.

Wiring Procedures and Diagrams

Preparation

1. Loosen the screws or latches securing the controller access cover (see Figures 3 or 4) on each controller provided.

Figure 3.

Figure 4.

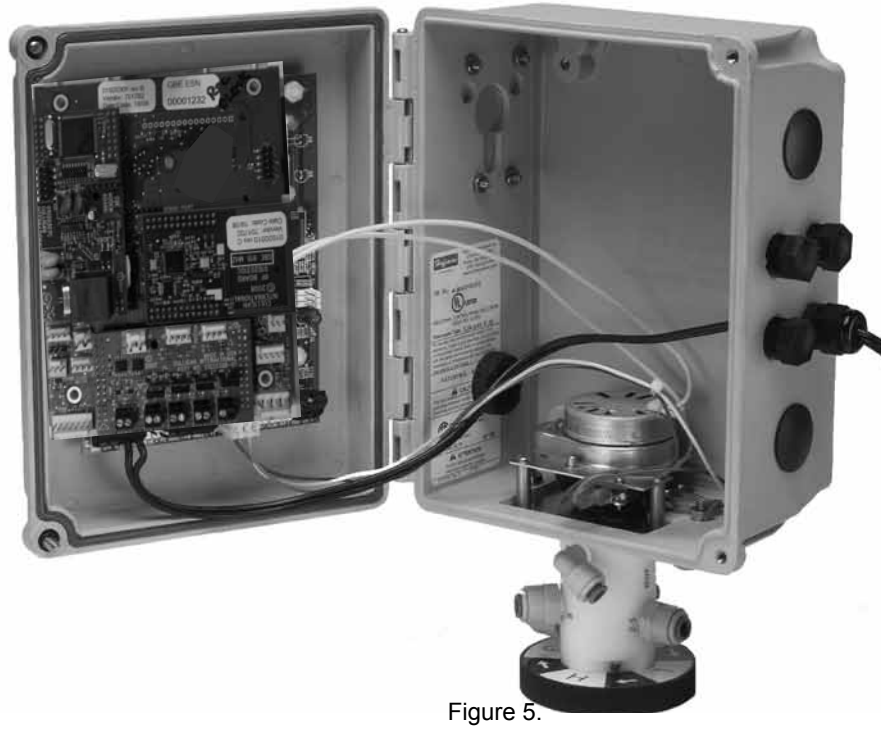


Figure 5.

Cable Routing

All input and output connections to the circuit board are 24 Volt or less.

Although the cables do not have to be run in conduit, it is necessary that long runs of cable be supported or protected by strapping them to the equipment piping. If conduit will be used to route the shielded cables, three factors must be considered:

1. DO NOT share the same conduit or raceway with 120 Volt or higher circuits.
2. Keep cables at least six (6) inches away from 120 Volt or higher electrical circuits.
3. GROUND the conduit (if metallic) to a known “earth ground” location.

A series of holes are located on the sides of the Smart Controller (see Figures 6 and 7). Strain relief fittings are provided with the controller enclosure for interconnecting wiring. Install the plastic fittings as needed. Remove the compression nut and rubber sleeve from each fitting. Prior to connection of the cable wires to the circuit board, slide the compression nut and sleeve over the cable for the wiring connections. When wiring is completed, apply a small amount of silicone to the rubber sleeve and reassemble. This will assure all wiring is secure and assist in making the tightening of the fitting easier. Insert the plugs provided to block any holes not used for wiring or other accessories.

Right Side View

Figure 6.

Left Side View

Figure 7.

Brine Reclaim Solenoid (optional)

Input Connection for Flow Sensor

Output Connection for Remote Accessories

Input Connection for Remote Accessories

24 Volt Power Input Connection

Brine Reclaim Solenoid (optional)

Brine Refill Valve

Blocking Solenoid for Alternating Operation

Smart Controller Overview

To access the inside of the Smart Controller, refer to the instructions below.

CAUTION! Failure to complete the following steps might result in damage to the keypad or circuit board!

1. Loosen the front cover screw.
2. Hinge the front cover upwards. (See Figure 8). Do not remove the front cover yet.
3. Disconnect the keypad from the circuit board.
4. Remove the front cover.

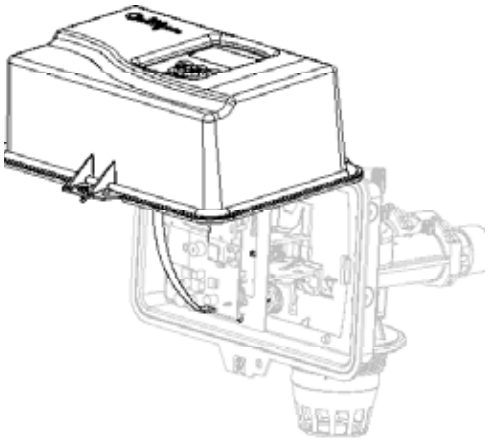


Figure 8.Circuit board.

CAUTION! Grip all connections to the circuit board by connecting terminals for assembly and disassembly. Failure to do so could result in damage to the wire leads or connecting terminals.

CAUTION! Do not touch any surfaces of the circuit board. Electrical static discharges may cause damage to the board. Handle the Smart Controller circuit board by holding only the edges of the circuit board. Keep replacement boards in their special anti-static bags until ready for use. Mishandling the circuit board will void the warranty.

5. The circuit board is held on with plastic posts. Push the locking clip at the end of the posts to allow the circuit board to be removed from the daughter board.

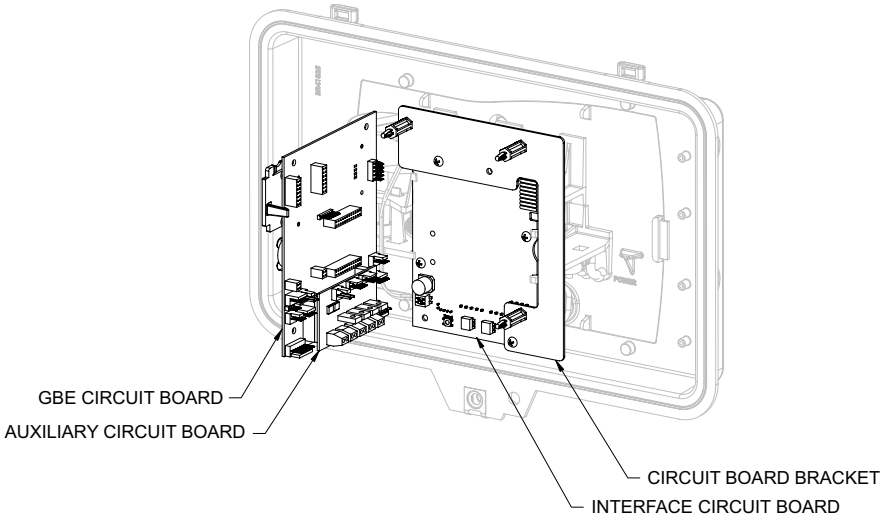


Figure 9.Locking clip.

CAUTION! Properly connect the wire connectors to the circuit board. The wires must exit the plug-in connector opposite of the raised white base of the circuit board connector.

CAUTION! Take extra care when connecting the 2.5 VAC and 24 VAC power. Failure to connect properly will result in damage to the circuit board.

Smart Controller Circuit Board Layout

Smart Controller Circuit Board Layout–Front

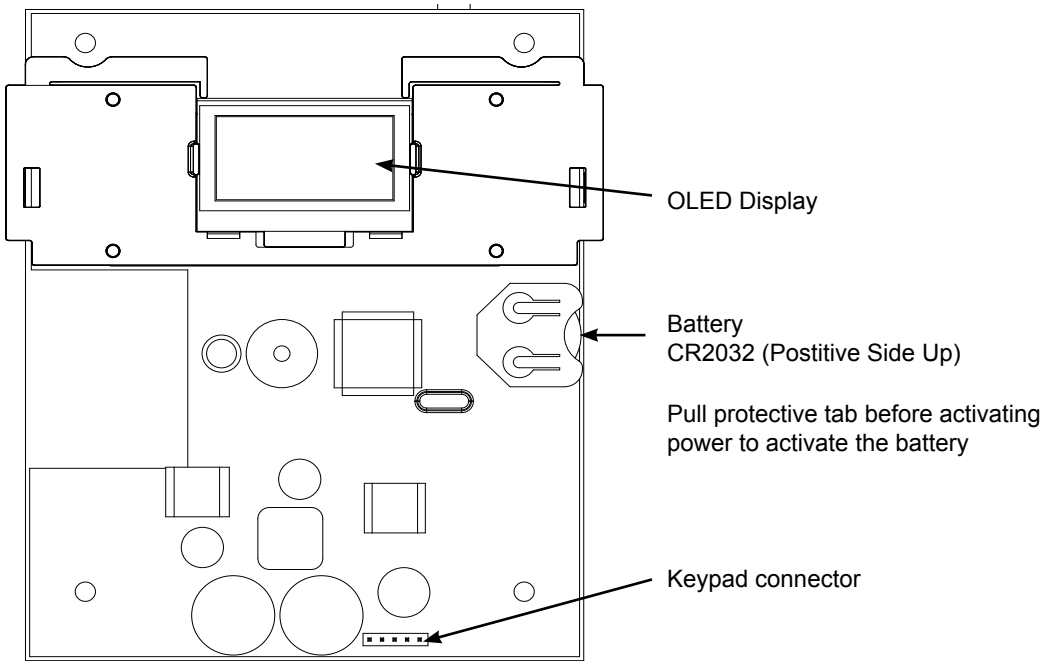


Figure 10. Smart Controller circuit board layout, front view.

Smart Controller Circuit Board Layout–Back

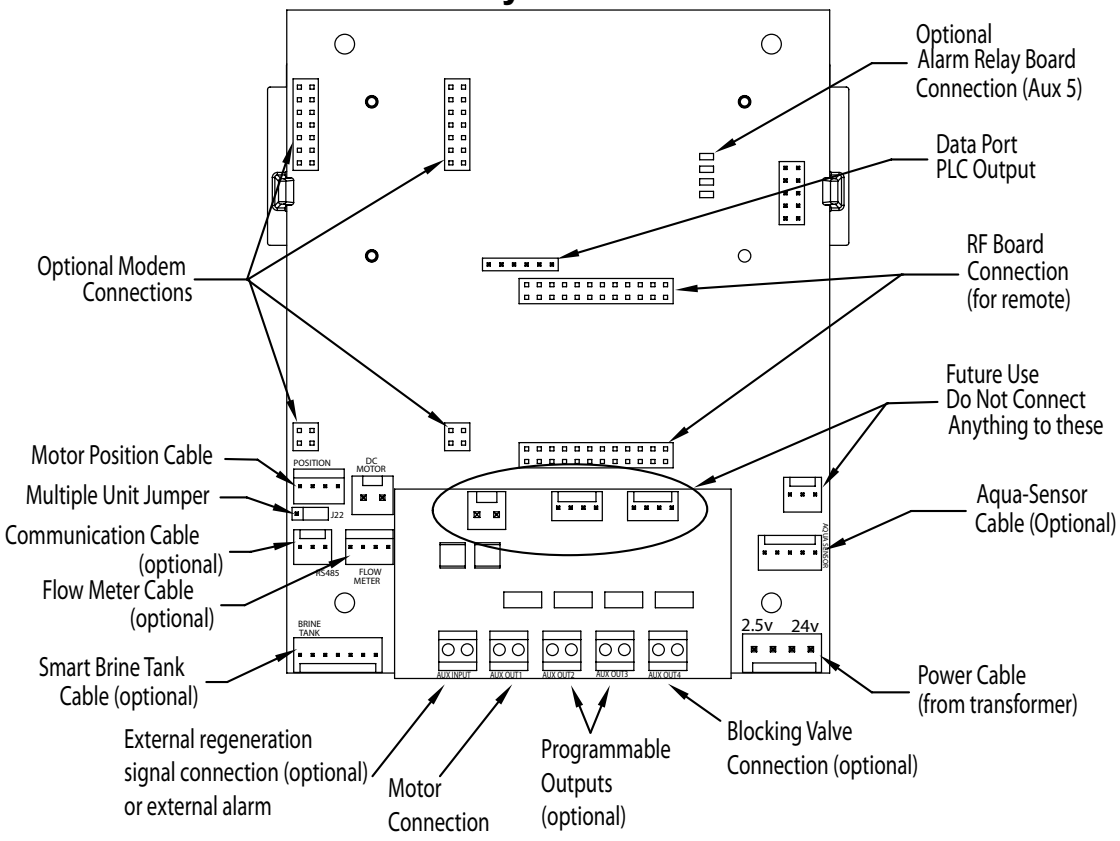


Figure 11. Smart Controller circuit board layout, rear view.

Smart Controller Circuit Board Outputs

The circuit board supports four outputs:

- Motor control (DC Motor)
- Blocking valve (Use Aux Out 4)
- Two programmable auxiliary outputs (Aux Out 2 and Aux Out 3) for commercial four-cycle and five-cycle valves.
- Controller interface (communication between multiple controllers) (RS485).

CAUTION! Connecting 24 V to the 2.5 V connection on the circuit board will damage the circuit board.

NOTE If you are using Aqua-Sensor®, you should run the 2.5 V wiring now as the cable is run through the same cord grip. See page 12 for details.

Wiring the Smart Controller Power Cord

1. Locate the power cord among the controller parts. It has a white connector on one end and two spade connectors on the other.
2. Locate the cord grip among the parts.
3. To assemble the power cord, first run the cord grip nut over the spade terminal end of the power cord.
4. Next, run the spade terminals through a hole in the side of the controller FROM THE INSIDE (see Figure 12).
5. Finally, run the cable through the bottom end of the cord grip, and assemble the grip to the controller wall.
6. Plug the board connector to the board where it is labeled 24 V. The connector has four (4) connections but only two wires are connected. The other end of the power cord (with spade terminals) should be connected to the two 24 VAC terminals on the transformer (see Figure 13).

CAUTION! DO NOT PLUG THE TRANSFORMER INTO THE WALL UNTIL ALL WIRING IS COMPLETED.

7. Repeat the process for any additional units in the system.

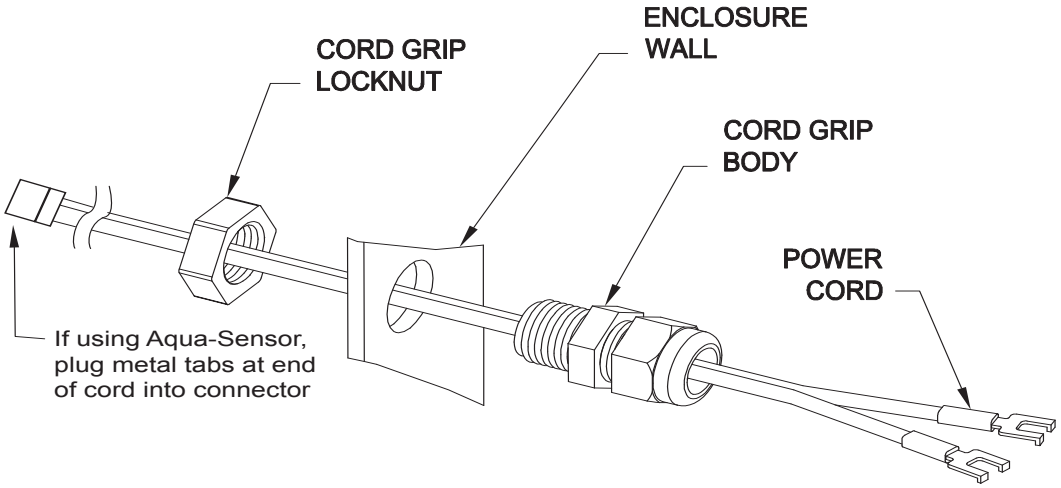


Figure 12. 24 V Power Connection

24 V Transformer

The Smart Controller is powered by a 24 VAC/100 VA transformer. If there are multiple controls in the system being installed, **each controller will require its own transformer**. It is recommended that the transformer be plugged into a dedicated 120V circuit.

CAUTION! Connecting 24 V to the 2.5 V connection on the circuit board will damage the circuit board.

CAUTION! To eliminate the possibility of polarity issues, carefully follow the wiring details shown in Figure 13.

1. Connect one wire from the 24 V cable to the outermost 24 VAC transformer screw terminal (see Figure 13). The other end of the wire should be connected to one of the 24 V terminals on the Smart Controller circuit board (Figure 13) by way of the white connector.
2. Repeat the process for the other 24 V power supply wire attaching the second wire to the opposite terminal on the transformer and next to the other wire connected to the 24V pins on the Smart Controller board.

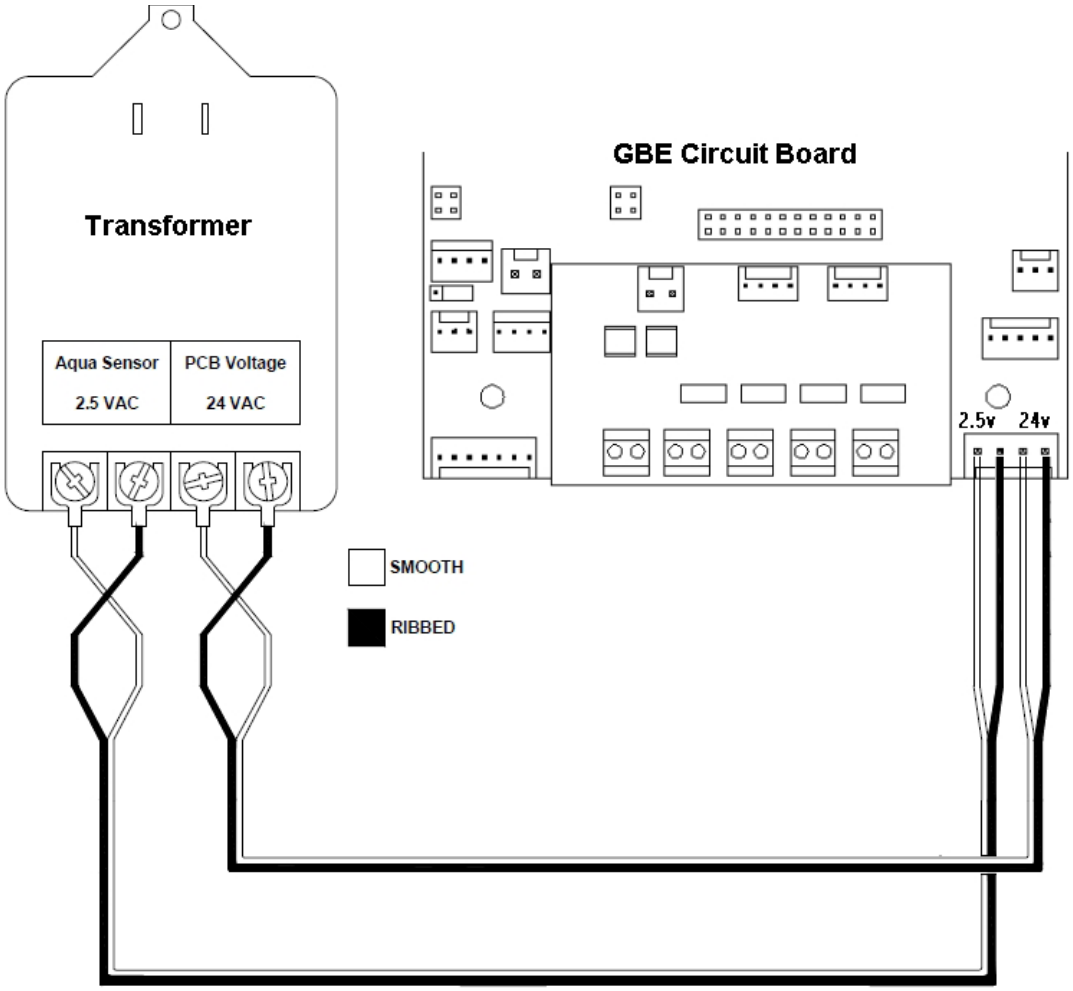


Figure 13. Transformer and Smart Controller circuit board.

Brine Refill Valve Wiring

NOTE This only applies to Culligan CSM Softeners.

Install the Solenoid Coil and Connector

1. Locate the solenoid coil and connector cord.
2. Assemble it to the brine refill valve as shown in Figure 14.

Install the Cord Grip

1. Remove the hole plug from the left side of the Smart Controller enclosure.
2. Locate the cord grip fitting and nut.
3. Assemble them through the open hole and thread the solenoid coil cord through the cord grip fitting as shown in Figure 15.
4. Tighten the cord grip onto the cord.

Wire the Valve

1. Wire the valve to Aux Out 2 as shown in the diagram in Figure 16.
2. Trim the wires to a suitable length.

NOTE Remember to set the brine refill time when using the brine refill valve. It is set using Aux2. See page 47 for programming instructions.

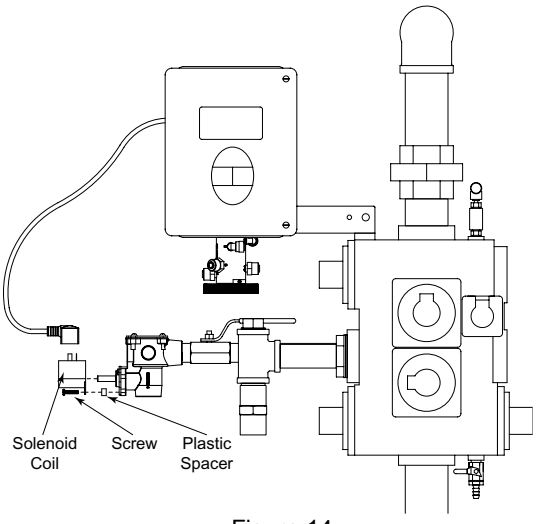


Figure 14.

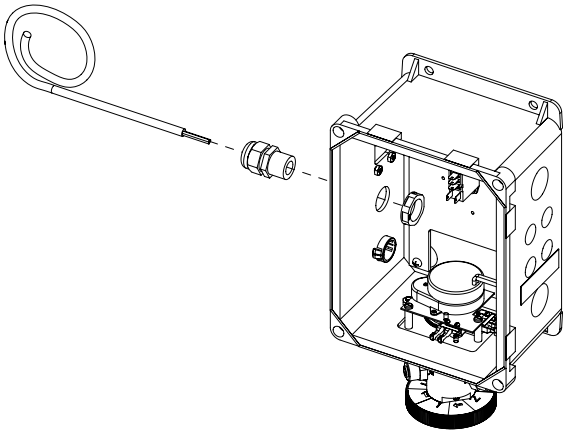


Figure 15.

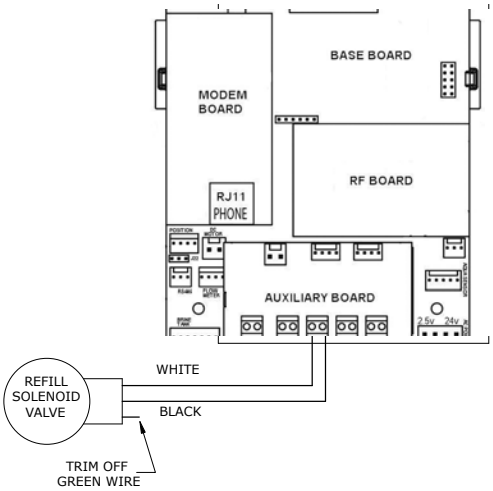


Figure 16.

Smart Controller Programming

Programming

The programming process requires various types of data input. The following information pertains to calculating the softening capacity of the water softening system.

Capacity Settings

The capacity of a water softener is determined by two factors; resin amount and water chemistry.

Single Tank Systems

Normally a single tank system has enough resin capacity to soften water for a minimum period of 24 hours. Time of regeneration is usually set to occur very early in the morning or at a time when no softened water is required. This is because when the softener is regenerating, hard water is typically bypassed through the system and into the facility if a demand for water if present.

If regeneration is desired at a time of day when there is no water usage then the system must have a “reserve” capacity which must last an entire day if the regeneration signal (time clock, Aqua-Sensor® and/or meter) occurs at the beginning of the day. Subtract this reserve capacity from the total capacity to determine capacity to signal.

NOTE	**If the reserve capacity is more than one-third (1/3) of the total capacity, a meter system may not reduce salt consumption relative to a timeclock system.**

Multiple Tank Systems

Multiple tank systems offer the benefit of continuous soft water supply. When using the Aqua-Sensor® to initiate a regeneration sequence, the system capacity may be set for the maximum amount the system is capable of producing. However multiple tank systems using only water meters and or time clock as the basis for regeneration initiation are recommended to be set up with a 10% reserve capacity. The purpose of the reserve capacity in multiple tank systems is to allow for subtle changes in water chemistry. You will be able to get the reserve capacity during programming.

Determining Batch Set Point

To determine the batch set point for programming the Culligan Smart Controller, use the following formula:

$$\frac{\text{Total Capacity} - \text{Reserve Capacity}}{\text{Hardness}} = \text{Gallons}$$

The Smart Controller will calculate this for you automatically. You can use the formula above to verify the setting.

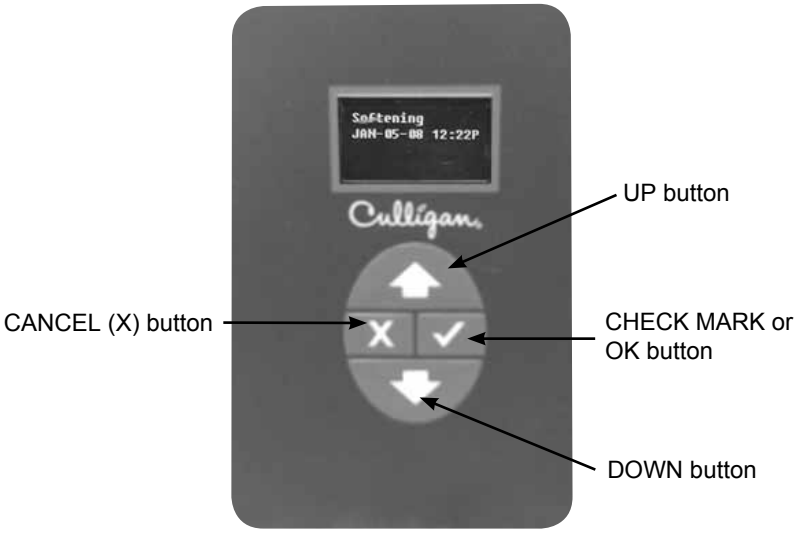
For more information on programming multi-tank systems, see page 39.

Program Data Input

There are a few items to note that can make the programming of the Smart Controller a little easier. They are:

Slew Rates	This term refers to the speed at which the display moves through the input of material. For example, holding down the up arrow key for five (5) seconds when inputting minutes for Time of Day will cause the minutes to pass in ten (10) minute blocks of time. Press the up arrow or down arrow keys for shorter periods (less than 5 seconds) will slow the rate. To move through the programming slowly, do not hold down the up arrow or the down arrow keys.
Beeper	A beeper is available to assist the user by providing an audible tone (about 70 decibels) to signify valid (one beep) and invalid (three beeps) key presses. The beeper can be deactivated in the programming mode. (If error occurs, beep will still be ON even if set to “No” programming.)
Programming Mode Timeout	If there is no keypad activity for a three (3) minute period while in the programming mode, the controller will exit the programming mode and return to the main display. Any setting that was changed prior to the control timing out will revert back the original value. Pressing the check mark key saves the setting.
Program Input Acceptance	For programming information to be accepted, the check mark key must be depressed prior to programming mode timeout.

Navigating the Menus and Keypad

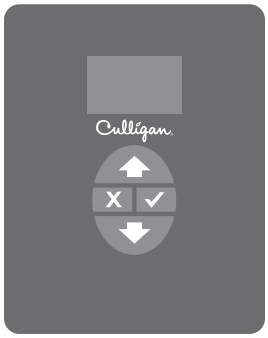


UP ARROW button: scrolls up the menu

DOWN ARROW button: scrolls down the menu

CHECK MARK button: selects the highlighted option, opens a new screen, or accepts a changed setting

CANCEL or EXIT button: returns to the previous screen or cancels a changed setting



Controller

Remote

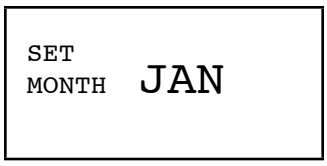
NOTE **Hold down the or button to quickly scroll through the setting without repeatedly pressing the button.**

```
SOFTENING
JAN-01-10 12:01P
```

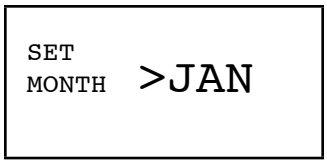
1. This is the home screen. Press any key except X to display the main menu.

```
>1)INFORMATION
 2)MANUAL MODE
 3)SET DATE/TIME
 4)ACCESSORIES
```

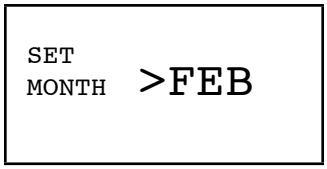
2. This is the main menu. The cursor/pointer (>) shows where you are in the menu. Use or to scroll through the menu. The selection cursor scrolls down to the next line or displays the next screen.
3. Press to select the item next to the cursor. For example, press to select 3)SET DATE/TIME.



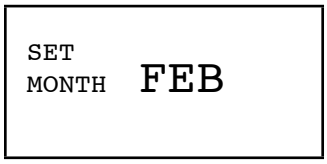
4. The controller screen displays a setting title and value. Here we see the current value for the month setting is January.



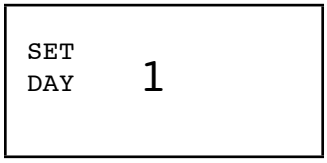
5. Press ✓ to select the item. The screen displays a cursor next to the value. This indicates that the value may be changed by pressing the ↑ or ↓ button.



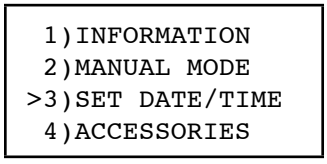
6. Press ↓ to select a new value. The screen displays the new setting value next to the cursor.
7. Press ↓ to select the next available value. You may press ↑ or ↓ to scroll through all available options for this setting.



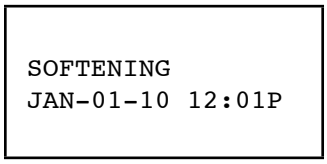
8. Press ✓ to accept the selected screen value. The screen displays the value, no longer preceded by the cursor.



9. Press ↓ to scroll to the next setting.



10. Press ✗ to exit from the setting without saving changes. The screen displays the parent menu (such as the main menu).



11. Press ✗ to display the home screen.

NOTE **Unplugging the Culligan water softener will not affect any of the control settings (the control must be plugged in for at least 15 minutes). Once programmed, the settings will be stored indefinitely.**

Smart Controller Programming

The programming for the Smart Controller is based on a menu structure. There are six top-level menus with additional options in submenus. The top-level menus are:

1. INFORMATION
2. MANUAL MODE
3. SET DATE/TIME
4. ACCESSORIES
5. ADV. SETUP
6. DIAGNOSTICS

Here is a brief explanation of what you will find under each menu.

Menu/Submenu	Description
Information	Scrolls through the operating information for the unit.
Manual Mode	Initiates a manual regeneration.
Set Time and Date	Sets or changes the time and/or date. This is initially done during first time set up. This information is saved in memory even in the event of a power outage.
Accessories	Sets up any installed accessories. This includes Aqua-Sensor®, beeper, Aux In, Aux Outputs, Smart Brine Tank sensor, Wireless Remote, Modem, Chlorinator, flow meter, service phoneline, and external filter.
Advanced Setup	Customizes the unit settings. There are five sub-menus that offer customized settings.
System Setup	Customizes many of the initial setup information. Water Hardness, Iron, Salt Type, Resin Type and Line Pressure are among the settings.
Regeneration Setup	Specifies custom salt dosage, reserve capacity, regeneration time and regeneration mode.
Cycle Times	Specifies custom cycle times for the units.
Regeneration Trigger	Specifies custom regeneration triggers, the regeneration interval, predict mode and days of regeneration.
Diagnostics	Performs diagnostics for sensors, wireless, progressive flow, motor control, data port, phone line (modem), and displays advanced statistics.

Typical Commercial Setup

Setting up the Smart Controller for a commercial installation requires a few additional steps. Follow the outline below to make sure everything is covered.

1. Run the first time setup (see following page).
2. Set up accessories. These include:
    - Aqua-Sensor®
    - Beeper
    - Aux In
    - Aux Outs (needed for multi-tank, brine reclaim and refill on 4-cycle valves)
    - Smart Brine Tank Sensor
    - Wireless Remote
    - Modem
    - Alarm Relay
    - Service Phone
    - External Filter
3. You must configure the controller differently for a multi-tank system. This is explained in the Customizing Setup section.
4. If you are using immediate regeneration, you must change the Reserve Capacity setting under Advanced Setup/ REGEN SETUP and the REGEN MODE.
5. Set/Review Cycle Times—this is under Advanced Setup/Cycle Times. The Brine Draw/Rinse and Refill/Fast Rinse times are now set during First Time Setup. You only need to adjust the settings if required by the application. For CSM and Hi-Flo 50 Softeners, you still need to set up Aux 2 for refill.
6. The Smart Controller has an update feature that will transfer the master programming to all other units in the system. One trick that will make this easier is to program the units in reverse. Then when programming the Master last, you can run the Update menu item immediately.
7. Refer to Appendix A for quick programming charts.

Pre-Programming Information Checklist

Before programming please have the following information available:

- Unit’s cubic feet of resin
- your intended salt dosage
- water hardness
- dealership service phone number

Depending on the accessories installed, you might also need the following:

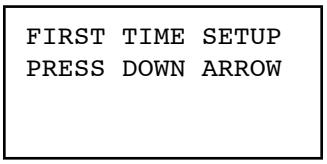
- K-factor (for meter)
- trip flow (for multi-tank progressive flow)
- brine tank size (for smart brine sensor)
- local telemetry data phone number (for modem)
- your dealer account number (used with modem for setting up telemetry)

First Time Setup Procedure

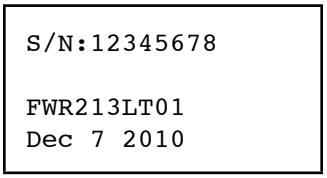
If at any time you need to re-run the First Time Setup, refer to the instructions on page 68.

After completing the plumbing connections to the water softener, turn on and program the Smart Controller.

First Time Setup

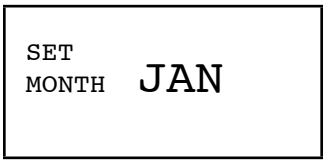


1. When a new controller is first turned on, the screen displays **FIRST TIME SETUP**. Press ↓ to view and change (if necessary) the softener configuration.

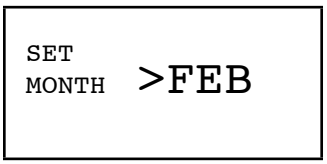


2. The screen displays the serial number and firmware version for the Smart Controller. Press ↓ to view the next setting.

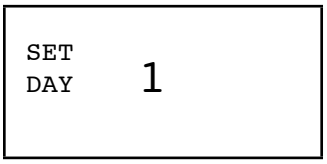
NOTE **If this unit will be installed with a modem, this electronic ID number MUST be reported to Culligan on the Web site www.myculligan.com.**



3. The screen displays the first date setting for the Smart Controller.
4. Press ✓ to change the month setting from the default value. The screen displays a cursor (>) next to the value.



5. Press ↑ to view the next available value (February).
6. Press ✓ to accept the new value.



7. The screen displays the default day setting. Press ✓ ↑ or ↓ and then ✓ to change the value.

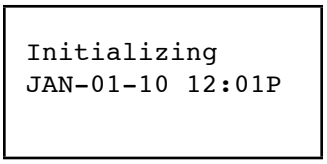
Set Up Other Values

Use the same procedure to change the values of other Smart Controller settings. After changing the setting, press the CHECK MARK button to accept the displayed screen value.

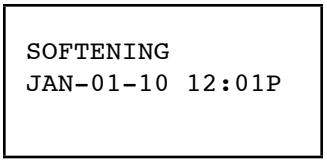
Setting	Screen Display	Range	Changing the Setting
Day	SET DAY 1	1–31	Press ✓ ↑ or ↓ and then ✓ to change the day. The screen displays the new day (in this example, from 1 to 2).
Year	SET YEAR 2010	2008–19	Press ✓ ↑ or ↓ and then ✓ to change the year. The screen displays the selected year (in this example, 2008).
Clock Type	CLOCK TYPE 12 HR	12 or 24	Press ✓ ↑ or ↓ and then ✓ to change the setting. The screen displays either 12 or 24.
Hour	SET HOUR 12PM	12PM–11AM	Press ✓ ↑ or ↓ and then ✓ to change the hour. The screen displays the new hour (in this example, 12) with AM or PM.

<table>
<tr><th>Setting</th><th>Screen Display</th><th>Range</th><th>Changing the Setting</th></tr>
<tr><td>Minute</td><td>SET
MINUTES 11</td><td>0–60</td><td>Press ☑ ⬆ or ⬇ and then ☑ to change the minute. The screen displays the new minute (in this example, 11).</td></tr>
<tr><td>Unit Type</td><td>UNIT TYPE
SOFTENER</td><td>Filter, Softener, Resin + Carbon</td><td>Press ☑ ⬆ or ⬇ and then ☑ to select either softener (default) or filter. The screen displays the selected device (in this example, a water softener).</td></tr>
<tr><td>Valve Type</td><td>VALVE TYPE
4-CYCLE</td><td>HE 1, HE 1.5, HE Twin, 4-cycle, 5-cycle, Plat Plus</td><td>Press ☑ ⬆ or ⬇ and then ☑ to change the valve type setting. The screen displays the new setting (in this example, 4-cycle).<table><tr><th>For Softeners</th><th>For Filters</th></tr><tr><td>CSM, Hi-Flo 42 and Hi-Flo 50: 4-CYCLE</td><td>All are 4-CYCLE</td></tr><tr><td>Hi-Flo 22 and Hi-Flo 3e are 5-CYCLE</td><td>Set HF22 Filter to 5-CYCLE</td></tr></table></td></tr>
<tr><td>Units (U.S. or Metric)</td><td>UNITS
US INCH</td><td>US Inch or METRIC</td><td>Press ☑ ⬆ or ⬇ and then ☑ to select the units of measure (in this example, U.S. inch).</td></tr>
<tr><td>Install Type (softener)</td><td>INSTALL TYPE
Commercial</td><td>Commercial, Residential</td><td>The installation type must be specified for softeners. Press ☑ ⬆ ☑ to change the install type setting to commercial.</td></tr>
<tr><td>Media Life (filter)</td><td>MEDIA LIFE
50000
GALLONS</td><td>0–100000000</td><td>The media life setting specifies the estimated lifetime total flow of the filter media in gallons. Once the total flow reaches the programmed media life, the controller displays the alarm message REPLACE FILTER MEDIA. Press ☑ ⬆ or ⬇ and then ☑ to change the value.</td></tr>
<tr><td>Total Capacity</td><td>TOTAL CAPACITY
1000
GALLONS</td><td>10–999999</td><td>The total capacity setting specifies how often the softener or filter will initiate reconditioning based on total flow, in gallons. For softeners, take the unit capacity (based on salt dosage) in kilograins (Kgr) and then divide by the hardness, in grains. The value for filters is estimated. When the total flow reaches total capacity, the unit initiates a regeneration. A flow meter is required. Press ☑ ⬆ or ⬇ and then ☑ to change the value.</td></tr>
<tr><td>Flow Meter</td><td>FLOW METER
80.00
PULS/GAL</td><td>0–999,900</td><td>Press ☑ ⬆ or ⬇ and then ☑ to specify the flow meter settings for the device connected to the controller.</td></tr>
<tr><td>Brining Type (softener)</td><td>BRINING TYPE
Downflow</td><td>Downflow, Upflow, Proportional</td><td>Press ☑ ⬆ or ⬇ and then ☑ to specify the direction of brine flow. Commercial softeners (except HE 1.5) are not designed for upflow or proportional regeneration. Always use Downflow for commercial softeners.</td></tr>
<tr><td>Brine Draw Rinse (softener)</td><td>BRINE DRAW-RINSE
54
MINUTES</td><td>0–150</td><td>The screen displays the brine draw-rinse setting. For commercial softener applications this value should be 60 minutes. Press ☑ ⬆ or ⬇ and then ☑ to extend the time if the brine is not properly rinsing out within this duration.</td></tr>
<tr><td>Fill Time (softener)</td><td>FILL TIME
6
MINUTES</td><td>1–170</td><td>The screen displays the fill time setting, based on the salt dosage. Press ⬇ to keep the calculated setting.</td></tr>
</table>

Completed First-Time Setup



8. When the setup is complete, the circuit board microprocessor automatically calculates softener capacity. The screen displays the initializing status and the current date and time, and then transitions to the home screen.



9. The screen displays the current state (alternate display is the next programmed regeneration) and the date/time set for the unit. This is the default home screen.

NOTE **For CSM and Hi-Flo 50 softener applications, you must adjust the Aux 2 cycle time for brine refill. Refer to the Brine System charts in the product installation manual for cycle settings.**

Customizing Set Up

The Smart Controller is designed to simplify the setup and installation process by making some default recommendations during the Initial Setup. The default settings are designed to be appropriate for most common installations.

Default Settings

- Downflow Brining[2]
- Time of Regen = 2:00 AM[2]
- Regen Time = Delayed[2]
- Predict Mode OFF[3]
- 30% Reserve Capacity[2]
- Time Clock Backup = OFF[3]
- Day-of-week Regen = OFF[3]
- Pre-Rinse Mode = OFF[1]

[1]These items are changed on the Main Menu / Advanced / System Setup Menu.
[2]These items are changed on the Main Menu / Advanced / Regen Setup Menu.
[3]These items are changed on the Main Menu / Advanced / Regen Trigger Menu.

Depending on the configuration of the system and/or user preferences, you may have to override the default regeneration selections. See Advanced Setup Menu, Regeneration Setup Menu or Regeneration Trigger Menu for information on changing default selections.

Advanced Setup

System Setup

Default values are shown for each selection.

```
SOFTENING
JAN-01-10 12:01P
```

1. From the **HOME** screen, press ↓ to view the main menu.

```
 2)MANUAL MODE
 3)SET DATE/TIME
 4)ACCESSORIES
>5)ADV. SETUP
```

2. The screen displays the main menu. Press ↓ ↓ ↓ ↓ ✓ to select **5)ADV. SETUP**.

```
>1)SYSTEM SETUP
 2)REGEN SETUP
 3)CYCLE TIMES
 4)REGENTRIGGER
```

3. The screen displays the advanced setup menu. The menu includes **SYSTEM SETUP**, **REGEN SETUP**, **CYCLE TIMES**, and **REGENTRIGGER**.
4. Press ✓ to select **1)SYSTEM SETUP**.

```
VALVE TYPE
 4-CYCLE
```

5. The screen displays the valve type setting specified during the first-time setup. This setting cannot be changed. Press ↓ to view the next setting.

Other System Setup Values

Use the same procedure to change the values of other Smart Controller settings. Press the DOWN ARROW button to scroll through the settings, unless otherwise instructed. After changing the setting, press the CHECK MARK button to accept the displayed screen value. The Smart Controller will display the next system setting from the menu.

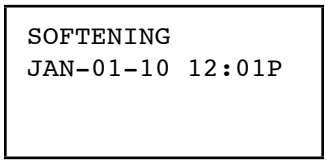
NOTE **All system setup settings are displayed when setting up a water softener. Settings marked with an asterisk (*) below are also displayed when setting up a filter.**

Setting	Screen Display	Range	Changing the Setting
Units (U.S. or Metric)	UNITS US INCH	US Inch or METRIC	Press ✓ ↑ or ↓ and then ✓ to select the units of measure (in this example, U.S. inch).
Multitank System	MULTITANK SYSTEM SINGLE	Single, Progress Flow, Alternating, Unbal Prog FLow	Multitank systems include two or more tanks in the system (up to six). They can each be the same size, or one tank can be smaller (Unbal Prog Flow). Please refer to page 42 for multi-tank system setup. Press ✓ ↑ or ↓ and then ✓ to specify the tank configuration.
Tank ID	PROGRESS FLOW MASTER	Master, Slave1–5	For softeners and filters. This is a multi-tank system setting. Press ✓ ↑ or ↓ and then ✓ to identify the unit. Refer to page <?> for info.
Prog Flow Trip	PROG FLOW TRIP 10 GPM	0–999	For softeners and filters. When a multi-tank (PROGRESS FLOW) system is selected, press ✓ ↑ or ↓ and then ✓ to specify this value. Refer to “Setting up a Multi-Tank System” on page <?>. Set this value on the Master Control only.
Small Tank Trip	SMALL TANK TRIP 5 GPM	0–999	When Unbal Prog Flow is selected, the smaller tank will have a lower trip point. Set this value to the trip point of the smaller tank.
Prerinse Mode	PRERINSE MODE OFF	Off, On	The screen displays the prerinse mode setting, which specifies the unit drain intervals and durations. Press ✓ ↑ or ↓ and then ✓ to change the value from **OFF** to **ON**.
Rinse if No Flow	RINSE IF NO FLOW FOR 24 HOURS	1–240	The screen displays the rinse interval. If prerinse mode is **ON**, the unit will drain if no flow is detected for the duration of this interval. Press ✓ ↑ or ↓ and then ✓ to change the value.
Rinse For	RINSE FOR 5 MINUTES	1–60	The screen displays the rinse duration. If prerinse mode is **ON**, specify the number of minutes the unit should rinse to drain when the **RINSE IF NO FLOW** duration has passed. Press ✓ ↑ or ↓ and then ✓ to change the setting.

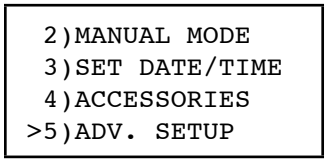
```
 2)MANUAL MODE
 3)SET DATE/TIME
 4)ACCESSORIES
>5)ADV. SETUP
```

6. The customized setup is complete. The screen displays the advanced setup menu. Press ✕ ✕ to display the home screen.

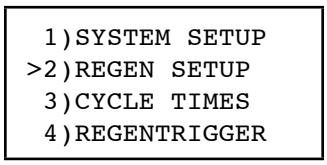
Regeneration Setup



1. From the **HOME** scrren, press ▼ to view the main menu.



2. The screen displays the main menu. Press ▼▼▼▼✓ to select **5)ADV. SETUP**.



3. The screen displays the advanced setup menu. The menu includes **SYSTEM SETUP**, **REGEN SETUP**, **CYCLE TIMES**, and **REGENTRIGGER**.
4. Press ▼✓ to select **2)REGEN SETUP**.

Other Regeneration Setup Values

Use the same procedure to change the values of other regeneration setup settings. Press ▼ to scroll through the settings, unless otherwise instructed. After changing the setting, press ✓ to accept the displayed screen value. The Smart Controller will display the next system setting from the menu.

NOTE **All system setup settings are displayed when setting up a water softener. Settings marked with an asterisk (*) below are also displayed when setting up a filter. Settings marked with two asterisks (**) are displayed only when setting up a filter.**

Setting	Screen Display	Range	Changing the Setting
Total Capacity*	TOTAL CAPACITY 1000 GALLONS	10–999999	The screen displays the total capacity setting, which specifies how often the softener or filter will initiate reconditioning based on total flow, in gallons. For softeners, take the unit capacity (based on salt dosage) in kilograins (Kgr) and divide by the hardness in grains. The value for filters is estimated. When the total flow reaches total capacity, the filter initiates reconditioning at the preset time. Press ✓ ▲ or ▼ and then ✓ to change the value.
Reserve Capacity	RESERVE CAPACITY 30% (300 GAL)	0–99	This setting is generally used for a single-delay system. For a multi-tank system, reserve capacity is not necessary and should be set to a much lower number. Values between 0 and 5 percent are typical. If you do not change this value in a multi-tank system, your unit will regenerate when 30 percent of the capacity remains.
Brining Type	BRINING TYPE Downflow	Downflow, Upflow, Proportional	Press ✓ ▲ or ▼ and then ✓ to specify the direction of brine flow. **Commercial softeners (except HE 1.5) are not designed for upflow or proportional regeneration. Always use Downflow for commercial softeners.**
Time of Regen	TIME OF REGEN 2:00AM	12:00AM–11:59PM	Press ✓ ▲ or ▼ and then ✓ to specify the time of day that the unit will regenerate when needed.
Regen Mode*	REGEN MODE DELAYED	Delayed or Immediate	For softeners and filters. For multi-tank systems, this is normally set to IMMEDIATE. If immediate is selected, be sure to change the Reserve Capacity setting.

Setting	Screen Display	Range	Changing the Setting
Power Up Regen	POWER UP REGEN 3 PLUS HOURS	3 Plus Hours or No	By default if a power loss is for more than three hours, the unit will regenerate when it regains power. Setting this value to No disables this function, preventing a regeneration after a power outage of any length.
Media Life**	MEDIA LIFE 1000 GALLONS	100–1,000,000	For filters only. This setting is used to trigger the media end of life message/condition. Requires a flow meter.
Regen Lockout	REGEN LOCKOUT FOR 0 HOURS	0–12	This setting prevents back-to-back regenerations on multi-tank systems, if necessary. When one unit is done regenerating, the next regeneration cannot begin until the set amount of time has passed. Press ✓ ▲ or ▼ then ✓ to specify the duration.

```
 2)MANUAL MODE
 3)SET DATE/TIME
 4)ACCESSORIES
>5)ADV. SETUP
```

5. The regen setup is complete. The screen displays the advanced setup menu. Press ✕ ✕ to display the home screen.

Cycle Times Setup

```
SOFTENING
JAN-01-10 12:01P
```

1. From the **HOME** screen, press ▼ to view the main menu.

```
 2)MANUAL MODE
 3)SET DATE/TIME
 4)ACCESSORIES
>5)ADV. SETUP
```

2. The screen displays the main menu. Press ▼ ▼ ▼ ▼ ✓ to select **5)ADV. SETUP**.

```
 1)SYSTEM SETUP
 2)REGEN SETUP
>3)CYCLE TIMES
 4)REGENTRIGGER
```

3. The screen displays the advanced setup menu. The menu includes **SYSTEM SETUP**, **REGEN SETUP**, **CYCLE TIMES**, and **REGENTRIGGER**.
4. Press ▼ ▼ ✓ to select **3)CYCLE TIMES**.

Cycle Times Settings

Use the same procedure to change the values of other cycle times settings. Press ▼ to scroll through the settings, unless otherwise instructed. After changing the setting, press ✓ to accept the displayed screen value. The Smart Controller will display the next system setting from the menu.

Setting	Screen Display	Range	Changing the Setting
Cycle Times	CYCLE TIMES USE DEFAULTS	Defaults or Custom	When USE DEFAULTS is selected, the program calculates the cycle times based on hardness and resin volume. When CUSTOM is selected, you can set custom cycle times. For commercial applications, Press ✓ ▲ or ▼ and then ✓ to select CUSTOM and verify the settings.

Setting	Screen Display	Range	Changing the Setting
Backwash Time	BACKWASH TIME 10 MINUTES	0–150	Use this setting to adjust the number of minutes for backwash. The default setting is 10 minutes. You generally will not need to change this setting. Press ↓ to view the next setting.
Brine Draw-Rinse	BRINE DRAW-RINSE 60 MINUTES	0–150	The screen displays the brine draw-rinse setting. For commercial softener applications this value should be 60 minutes. Press ✓ ↑ or ↓ and then ✓ to extend the time if the brine is not properly rinsing out within this duration.
Fast Rinse-Time	FAST RINSE-TIME 10 MINUTES	0–150	This value is displayed as Fast Rinse-Time for five-cycle valves and Fill Time for four-cycle valves. The value is calculated for household units based on input parameters. For commercial units, press ↓ to keep the default setting of 10 minutes.
Fill Time	FILL TIME 377 SECONDS	0–9000	The screen displays the fill time setting if a 5-cycle valve is selected, based on the salt dosage. Find this value in the unit's installation manual. For example, if you have a Hi-Flo 22 WS-90 water softener (3 ft³) and you want to set a capacity of 60,000 grains, the chart in Appendix A of the Hi-Flo 22 manual shows a time setting of 12 minutes. For a 4-cycle valve, the refill is controlled by AUX OUTPUT 2; set the refill time there. See page 48. For filters, Press ↓ to keep the default setting, one (1) minute. **NOTE** **This time is displayed in seconds. For example, If you entered 12 minutes during FTS, then this will display 720 seconds.**

```
 2)MANUAL MODE
 3)SET DATE/TIME
 4)ACCESSORIES
>5)ADV. SETUP
```

5. The cycle times setup is complete. The screen displays the advanced setup menu. Press X X to display the home screen.

Regeneration Triggers Setup

Default values are shown for each selection.

```
SOFTENING
JAN-01-10 12:01P
```

1. From the **HOME** scrren, press ↓ to view the main menu.

```
 2)MANUAL MODE
 3)SET DATE/TIME
 4)ACCESSORIES
>5)ADV. SETUP
```

2. The screen displays the main menu. Press ↓ ↓ ↓ ↓ ✓ to select **5)ADV. SETUP**.

```
 1)SYSTEM SETUP
 2)REGEN SETUP
>3)CYCLE TIMES
 4)REGENTRIGGER
```

3. The screen displays the advanced setup menu. The menu includes **SYSTEM SETUP**, **REGEN SETUP**, **CYCLE TIMES**, and **REGENTRIGGER**.
4. Press ↓ ↓ ↓ ✓ to select **4)REGENTRIGGER**.

Regeneration Triggers Settings

Use the same procedure to change the values of other regeneration trigger settings. Press ⬇ to scroll through the settings, unless otherwise instructed. After changing the setting, press ✔ to accept the displayed screen value. The Smart Controller will display the next system setting from the menu.

NOTE **All system setup settings are displayed when setting up a water softener. Settings marked with an asterisk (*) below are also displayed when setting up a filter.**

Setting	Screen Display	Range	Changing the Setting
Flow Meter*	FLOW METER CAN TRIGGER	Can or Cannot	This setting requires an optional flow meter (except Hi-Flo 22). Use this setting to tell the controller whether the optional flow meter is used to trigger a regeneration. If set to CAN TRIGGER, the flow meter is used to count the gallons of soft water until the batch value is reached, at which time a regeneration is triggered. You can install water meter and use it just to monitor flow rate and total usage, and not use it to trigger the regeneration. You can have both the water meter and Aqua-Sensor®/ differential pressure installed and able to trigger regeneration. Either one can trigger the regeneration and everything is reset when regeneration is complete.
Aqua Sensor	AQUASENSOR CAN TRIGGER	Can or Cannot	This setting requires an optional Aqua-Sensor®. Use this setting to tell the controller whether the Aqua-Sensor® is used to trigger a regeneration. If set to CAN TRIGGER, the Aqua-Sensor® is used to monitor the hardness front across the resin bed. The probe will sense when the front has reched its sensors, at which time a regeneration is triggered. You can have both the water meter and Aqua-Sensor® installed and able to trigger regeneration. Either one can trigger the regeneration and everything is reset when regeneration is complete.
Regen Interval*	REGEN INTERVAL NUMBER OF DAYS: 0	0–99	Use this setting if using time clock regeneration only or if you would like to have a time clock backup for the installed trigger device. It is common to set this at three days, although not necessary.
Predict Mode	PREDICT MODE OFF	Off or On	The Predict Mode is used in the flow meter mode to determine the optimum regeneration point. Before the regeneration starts, the control will compare the remaining capacity value with the average daily water use. Although the Smart Controller can use Predict Mode with Immediate regeneration, it works better on single delayed systems. When using predict mode, reduce the reserve capacity of the system to about 2 percent. If the system reaches zero percent remaining capacity and the Smart Controller is set to IMMEDIATE, the system will regenerate immediately. If the Smart Controller is NOT set to IMMEDIATE, then each night at time of regeneration (TOR), if the remaining capacity is less than the average daily usage, then the Smart Controller initiates regeneration; if the remaming capacity is greater than the average daily usage the Smart Controller will NOT initate regeneration.

Setting	Screen Display	Range	Changing the Setting
Regeneration On*	REGENERATION ON MONDAY OFF	Sunday–Saturday On or Off	Use this setting to select the days of the week to regenerate. This is most useful when running the system as time clock only. For commercial multi-tank systems, leave all days to OFF. The program will go through the rest of the days of the week to set regeneration on or off. This can also be used to create a Time-Clock backup for the water meter or Aqua-Sensor. When set as a backup, the clock will trigger a regeneration at that day and time even if the unit is in Stand-by and/or has been the whole time.

```
 2)MANUAL MODE
 3)SET DATE/TIME
 4)ACCESSORIES
>5)ADV. SETUP
```

5. The regeneration trigger setup is complete. The screen displays the advanced setup menu. Press X X to display the home screen.

Softener and Filter Program Log

Use this log to record the program settings for any Smart Controller (GBE) controlled softener or filter. Circle or enter the observed value. Make additional copies to keep on file near the installation and with your local Culligan dealer.

Program Date: _____ Installer: _____ Site Location: _____

Smart Controller ESN: _____ Firmware Version: _____ ☐Softener ☐Filter

Regeneration Initiation (check all that apply): ☐Time Clock ☐Meter ☐Aqua-Sensor ☐Other

First Time Setup

Month		
Day		
Year		
Clock Type	12 Hr/24 Hr	
Hour		
Minutes		
Unit Type	Softener/Filter/R+C	
Valve Type	HE 1, HE 1.5, HE 1 Twin, 4-Cycle, 5-Cycle, Plat Plus	
Units	US Inch/Metric	
Install Type	Residential, Commercial	S Only
Brining Type	Downflow, Upflow, Proportional	S Only
Tank Diameter		S Only
Hardness		S Only
Media Life		F Only
Total Capacity		F Only

Advanced Setup

Valve Type	HE 1, HE 1.5, HE 1 Twin, 4-Cycle, 5-Cycle, Plat Plus	
Units	US Inch/Metric	
Multitank System	Single Twin Progress Flow Alternating Unbal Prog Flow	
Prog Flow Trip		
Progress Flow	Master/Slave (_____)	
Small Tank Trip		
Prerinse Mode	OFF/ON	
Rinse If No Flow		
Rinse For		

Regeneration Setup

Total Capacity		
Reserve Capacity		S Only
Brining Type		S Only
Time of Regen		
Regen Mode	Delayed/Immediate	
Power Up Regen		
Regen Lockout		S Only
Media Life		F Only

Cycle Times

Backwash		
Brine Draw-Rinse		
Fast Rinse Time		
Fill Time		

Regeneration Triggers

Flow Meter	Can/Cannot	
Aqua-Sensor	Can/Cannot	S Only
Regen Interval		
Predict Mode	OFF/ON	S Only
Regen On		

On Remote Display

Remote Display	Installed/Not Installed	
Channel #		
Radio Frequency	915	

Accessories

Aqua-Sensor	Installed/Not Installed	S Only
Debug	ON/OFF	S Only
Beeper Mode	Always On Always Off 12 Hr. Warnings 24 Hr. Warnings	
Aux Input	Normal/Alarm	
Aux2 Output Type	Normally On Normally Off Repeat Cycle	
Aux2 Valv Pos		
Aux2 Out Delay		
Aux2 Out Active		
Aux2 Out Off		Repeat Cycle
Aux3 Output Type	Normally On Normally Off Repeat Cycle	
Aux3 Valv Pos		
Aux3 Out Delay		
Aux3 Out Active		
Aux3 Out Off		Repeat Cycle
SBT Sensor	Installed/Not Installed	S Only
Tank Diameter		S Only
Salt Geometry	Pellet/Rock/ Brick/Special	S Only
Remote Display	Installed/Not Installed	
Channel #		
Radio Frequency	915	
Modem	Installed/Not Installed	
Modem Location	Main Control/ In Remote	
Call Frequency		
Time Zone GMT		
Dealer ID		
Date Phone #		
Chlorinator	Installed/Not Installed	
Power Level		
On Time		
Meter	Installed/Not Installed	
Puls/Gal		
Low Flow Limit		
High Flow Limit		
Service Phone #		
Ext Filter	Installed/Not Installed	S Only
Filter Capacity		S Only
Reset Capacity	Yes/No	S Only

Warning! If incorrectly installed, operated or maintained, this product can cause severe injury. Those who install, operate, or maintain this product should be trained in its proper use and warned of its dangers before attempting to install, operate or maintain this product.

Installing Accessories

Flow Sensor Meter Connections (Optional)

The Smart Controller is capable of detecting the signal from a Hall effect sensor device to provide flow rate information, totalization and volume based regeneration initiation.

There are several different types of flow measuring devices and differences in the wiring of the devices to the Smart Controller circuit board do exist. See Figure 17 below.

For all but duplex alternating, a meter needs to be connected to each circuit board at the location shown below in the drawing. For duplex alternating meter connection, please refer to page 41, Duplex Alternating with Meter Option.

See “Programming the External Flow Meter” on page 31 and “Appendix Flow Device K-Factor Data” on page 95 for K factors.

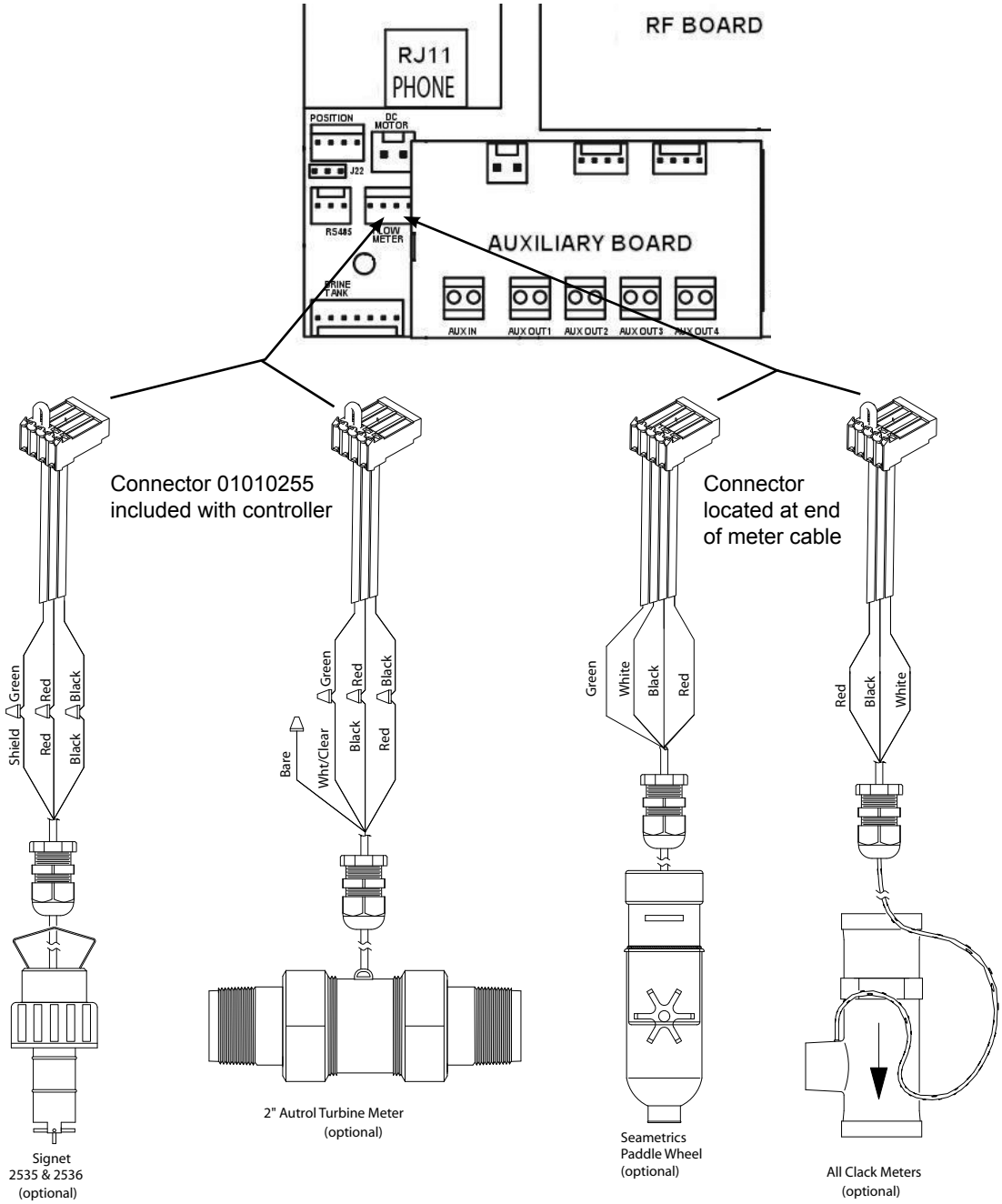
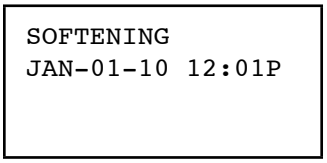


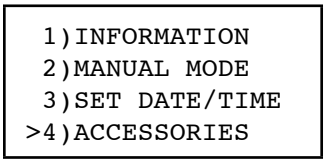
Figure 17. Flow measuring devices.

Programming the External Flow Meter

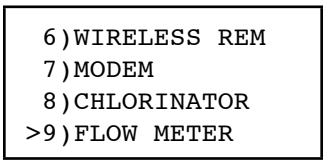
Most metered commercial units require an external flow meter device. this requires an entry in the programming for the meter chosen. The entry is the pulses per gallon, or K Factor. Refer to the table in Appendix C for meter K Factors.



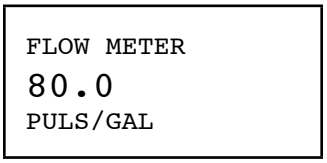
1. From the **HOME** screen, press ↓ to view the main menu.



2. The screen displays the main menu. Press ↓ ↓ ↓ ✓ to select **4)ACCESSORIES**.

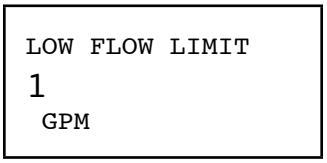


3. From the Accessories menu, press ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ✓ to **9)FLOW METER**.

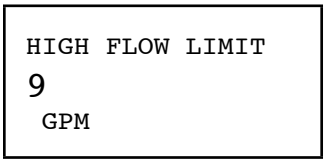


4. Press ✓ ↑ or ↓ and then ✓ to change the value. Refer to Appendix C for possible settings. This value is also referred to as the K-Factor.

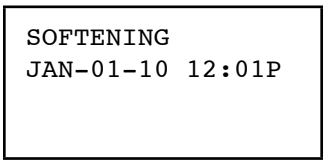
NOTE Hi-Flo 22 is to be set at 78.0 Puls/Gal.



5. Press ✓ ↑ or ↓ and then ✓ to change the value. For information on how to set this value, see Flow Profiles.



6. Press ✓ ↑ or ↓ and then ✓ to change the value. For information on how to set this value, see Flow Profiles.



7. Press ✗ ✗ to display the home screen.

Flow Profiles

This feature allows you to monitor the amount of time that softener or filter spends within different flow ranges. Select flow ranges by setting the Low Flow Limit and High Flow Limit when programming the controller. To best explain this, refer to the following example.

Programming Flow Profiles for a Hi-Flo 22 WS-90

The low flow limit can be set to any low value. Consider setting it at the minimum flow rate shown in the manual. This is usually calculated using 2 gpm per square foot of bed area. The WS-90 has a 16" diameter tank, so its cross section is 1.4 square feet (area = PI * r²). 1.4 sf * 2 gpm is 2.8, rounded up to 3. Next you can set the high flow limit at the unit's rated peak flow, in this case 38 gpm. Here is what the controller is going to do.

First it will take the high flow limit and subtract the low flow limit: 38 – 3 = 35. It then divides this into four equal divisions: 35 ÷ 4 = 8.75, and then tracks six separate values or flow profiles. The flow profile values are displayed in minutes.

- Profile 1 is any flow below the low flow limit.
- Profile 2 is any flow from 3 to 11.75 gpm
- Profile 3 is any flow from 11.76 to 20.51 gpm
- Profile 4 is any flow from 20.52 to 29.26 gpm
- Profile 5 is any flow from 29.27 to 38 gpm (the high flow limit)
- Profile 6 is any flow above the high flow limit.

View flow profiles through the Diagnostics menu. Go to ADVANCED STATS then FLOW STATS and scroll down to FLOW PROFILE R1 through R6. The values displayed are the number of minutes the flow rate has been in that range.

Aqua-Sensor® Schematic (Optional)

The Aqua-Sensor® device requires a 2.5 VAC power source. This source is provided via two of the posts on the 24 VAC/2.5 VAC transformer (see figure 19). The two leads from the transformer are run through the same cable grip as the 24 VAC and then must be pushed into the white power connector for connection to the 2.5 V power pins on the GBE circuit board.

The wire connector from the Aqua-Sensor® probe is then routed through the included cable grip and plugged into the Aqua-Sensor terminal on the Smart Controller circuit board. See below.

For information and detailed instructions for installing the Aqua-Sensor in the tank, refer to the specific product manual.

Aqua-Sensor®

If you are going to install an Aqua-Sensor®, you can set up the 2.5 VAC power now.

1. Locate the power cord packed with the Aqua-Sensor®. It has two spade terminals on one end of the cable and two metal "slip in" tabs on the other.
2. Locate the cord grip.
3. The cable can be run through the cable grip and wall from either end of the cable. Make sure the end with the metal tabs goes INSIDE the controller. The spade terminals should be coming out the top end of the grip.
4. Locate the connector at the end of the power cord. You may have already plugged it into the board.
5. Press the two metal tabs on the end of the power cord into the open slots on the connector. They will connect to the pins labeled 2.5 V on the Base Board.The other end of the power cord with the spade terminals should be connected to the two 2.5 VAC terminals on the transformer (see Figure 18).

CAUTION! Verify wiring from terminals to circuit board are correct before applying power to control. 24 VAC power must not be applied to the 2.5 VAC terminals of the circuit board or the circuit board will be damaged.

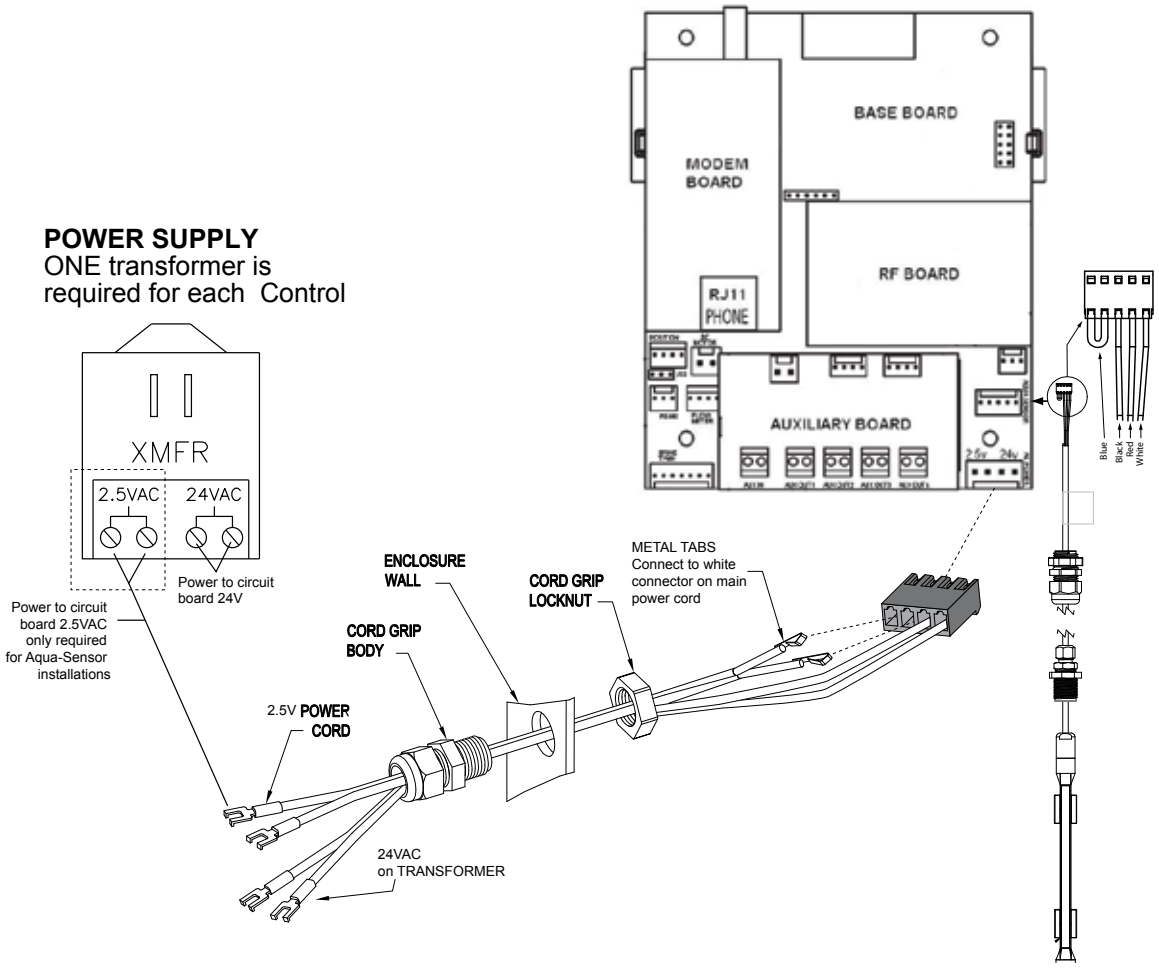


Figure 18. 2.5 VAC Aqua-Sensor® power connection (CSM and Hi-Flo 50).

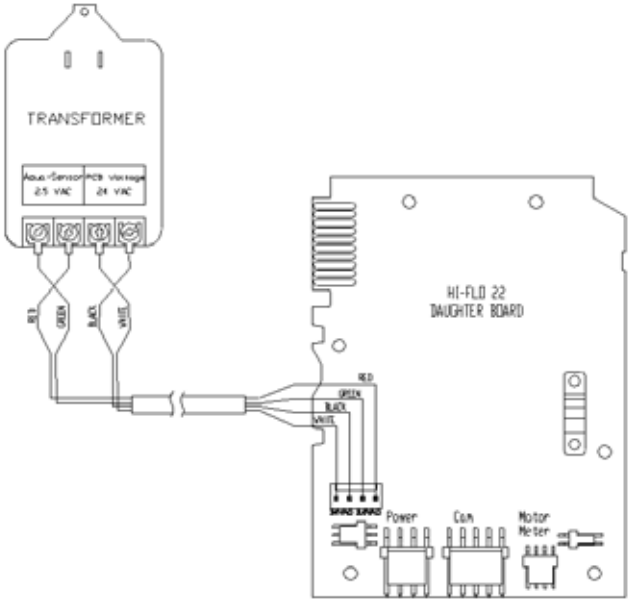


Figure 19. 2.5 VAC Aqua-Sensor® power connection (Hi-Flo 22).

Programming the Aqua-Sensor® Probe

After installing the Aqua-Sensor® kit 01008779–CSM, Hi-Flo 50, or 01018959–Hi-Flo 22, you must configure the settings.

The Aqua-Sensor® probe should be installed prior to loading the resin in the tank.

1. Run the probe lead through the opening in the top of the tank. Systems with fiberglass tanks will have a tank plug on the cord. Systems with steel tanks require a 3/4" x 1/2" reducing bushing (included in kit) for the cord grip.
2. Run the probe through the bushing prior to inserting into tank.
3. Use a supplied strain relief to run the connector into the controller.
4. Plug the connector into the circuit board at the position labeled Aqua-Sensor®. See Figure 20.

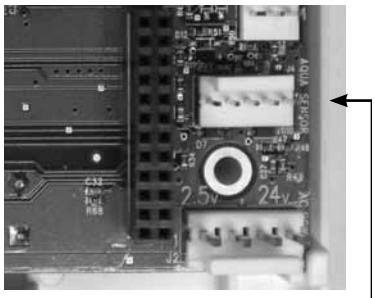


Figure 20.

Configuring the Aqua Sensor® Probe Settings

```
SOFTENING
JAN-01-10 12:01P
```

1. From the **HOME** screen, press ↓ to view the main menu.

```
 1)INFORMATION
 2)MANUAL MODE
 3)SET DATE/TIME
>4)ACCESSORIES
```

2. The screen displays the main menu. Press ↓ ↓ ↓ ✓ to select **4)ACCESSORIES**.

```
>1)AQUASENSOR
 2)BEEPER
 3)AUX IN
 4)AUX OUTPUTS
```

3. The cursor is already pointing at the 1)AQUASENSOR so press ✓ to display the Aqua-Sensor® settings.

```
AQUASENSOR
NOT INSTALLED
```

4. Press ✓ ↑ or ↓ and then ✓ to change the setting from NOT INSTALLED to INSTALLED. Press the CHECK MARK button to accept the setting.

```
AQUASENSOR DEBUG
OFF
```

5. If the Aqua-Sensor setting state is INSTALLED, this screen displays the Aqua-Sensor® debugging mode. Press ↓ to toggle between on and off.
6. Press ✓ when the correct Aqua-Sensor® debugging mode is displayed.

```
SOFTENING
JAN-01-10 12:01P
```

7. Press X X to display the home screen.

Installing the Smart Brine Tank (SBT Probe) in to the Brine Tank

CAUTION! Do not use the SBT probe if you are using Brine Reclaim.

NOTE For a multi-tank system using one brine tank, connect the probe to the Master controller.

NOTE IMPORTANT! In order for proper probe functioning, you must physically install the probe into the brine tank and fill the brine tank with a minimum of 16" depth of salt prior to selecting INSTALLED on the SBT Sensor settings. Failure to take these steps will result in an error message. If these steps were not followed, go to the SBT settings, select NOT INSTALLED, and then press the X/CANCEL button. When the probe is installed correctly and salt is added to the brine tank, change the SBT setting to INSTALLED.

1. Place the smart brine probe on top of the brine plate as shown in Figure 21.
2. Loop the two zip ties thru the holes in the probe housing and loop the zip ties around the outside of the brine well as shown in Figure 22.

NOTE IMPORTANT! Tighten zip ties securely to prevent movement.

3. Use zip tie to snug the top of the brine tank probe against the top of the brine well.
4. Route the smart brine tank probe cable to an appropriate opening in the valve control housing. Use the strain-relief plug provided with the SBT probe for installation.
5. Plug the SBT probe connector into the circuit board at the position labeled Brine Tank. See Figure 23.

Configuring the Smart Brine Tank (SBT) Probe Settings

Figure 21.

Figure 22.

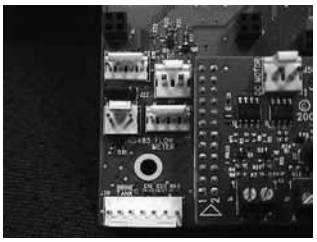


Figure 23.

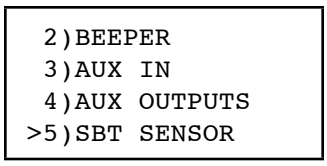
After the Smart Brine Tank Probe is installed, it is necessary to configure some settings.

```
SOFTENING
JAN-01-10 12:01P
```

1. From the **HOME** screen, press ▼ to view the main menu.

```
 1)INFORMATION
 2)MANUAL MODE
 3)SET DATE/TIME
>4)ACCESSORIES
```

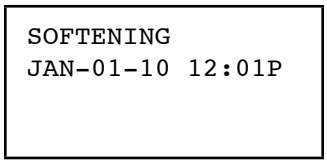
2. The screen displays the main menu. Press ▼ ▼ ▼ ✓ to select **4)ACCESSORIES**.



3. From the Accessories menu, press ↓ ↓ ↓ ↓ ✓ to **5)SBT SENSOR**.
4. Press the CHECK MARK button. The screen displays the SBT Sensor settings.

Use the same procedure to change the values of other cycle times setup settings. Press the DOWN ARROW button to change the setting, unless otherwise instructed. After changing the setting, press the CHECK MARK button to accept the displayed screen value. The Smart Controller will display the next system setting from the menu.

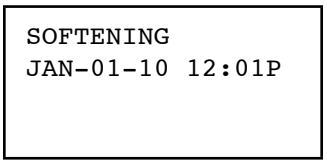
Setting	Screen Display	Range	Changing the Setting
SBT Sensor	SBT SENSOR NOT INSTALLED	Installed, Not Installed	Press ✓ ↑ or ↓ and then ✓ to change the setting from NOT INSTALLED to INSTALLED if a salt brine tank probe is installed.
Tank Diameter	TANK DIAMETER 9 INCHES	0–150	Press ✓ ↑ or ↓ and then ✓ to increase or decrease the tank diameter, which is used to estimate the number of days the brine tank has salt.
Salt Geometry	SALT GEOMETRY Pellet/cube	Pellet/Cube Rock/Solar Special Block/Brick	Use this setting to select the salt geometry (the shape of the softening salts). Press ✓ ↑ or ↓ and then ✓ to change the setting.



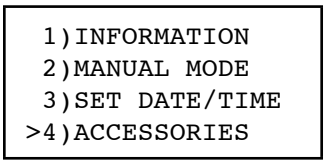
5. Press ✗ ✗ to display the home screen.

Brine Reclaim

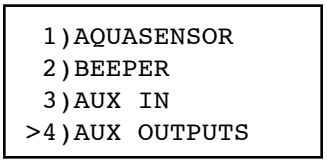
For brine reclaim, AUX OUT 2 and AUX OUT 3 must be set to open and close the valves to direct the brine. There are four things to set for each aux output. See page 48 for a complete description of auxiliary output settings. Refer to the Brine Reclaim Installation Manual (01018946) for information required to determine appropriate auxiliary settings.



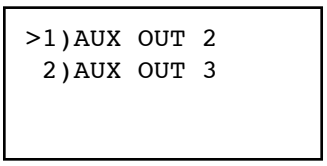
1. From the **HOME** screen, press ↓ to view the main menu.



2. The screen displays the main menu. Press ↓ ↓ ↓ ✓ to select **4)ACCESSORIES**.



3. From the Accessories menu, press ↓ ↓ ↓ ✓ to select **4)AUX OUTPUTS**.



4. Press ✓ to select **1) AUX OUT 2**. The screen displays the settings for the selected auxiliary output.

Setting	Screen Display	Range	Changing the Setting
Aux2 Output Type	AUX2 OUTPUT TYPE Normally Off	Normally Off, Normally On, Repeat Cycle	5. Press ↓ to leave the AUX 2 OUTPUT TYPE setting to **NORMALLY OFF**. The screen displays the AUX 2 VALV POS setting.
Aux 2 Valve Position	AUX 2 VALV POS Brine/SRinse	Service, Backwash, Brine/ SRinse	6. Press ✓ ↑ ↑ to change the AUX 2 VALV POS setting to **Brine/SRinse**. The screen displays the AUX OUT 2 setting.
Aux2 Out Delay	AUX2 OUT DELAY 0 Mins	0–25	7. Press ↓ to leave the AUX 2 OUT DELAY setting at zero.
Aux2 Out Active	AUX2 OUT ACTIVE 0 Secs	0–9999	8. Press ✓ ↑ or ↓ and then ✓ to specify the number of seconds needed for the selected auxiliary output to be activated. Refer to the brine reclaim manual, 01018946, for recommended settings.

```
 1)AUX OUT 2
>2)AUX OUT 3
```

9. Press the DOWN ARROW button to select 2) AUX OUT 3. Press the CHECK MARK button. The screen displays the settings for the selected auxiliary output.

Setting	Screen Display	Range	Changing the Setting
Aux3 Output Type	AUX3 OUTPUT TYPE Normally Off	Normally Off, Normally On, Repeat Cycle	10. Press ↓ to leave the AUX 3 OUTPUT TYPE setting at **NORMALLY OFF**.
Aux 3 Valve Position	AUX 2 VALV POS Brine/SRinse	Service, Backwash, Brine/ SRinse	11. Press ✓ ↑ ↑ to change the AUX 2 VALV POS setting to **Brine/SRinse**. The screen displays the AUX OUT 2 setting.
Aux3 Out Delay	AUX3 OUT DELAY 0 Mins	0–25	12. Press ↓ to leave the AUX 3 OUT DELAY setting at zero. This sets up AUX3 to turn on immediately after AUX2 turns off.
Aux3 Out Active	AUX3 OUT ACTIVE 0 Secs	0–9999	13. This is the number of minutes needed for AUX3 to be activated. Press ✓ ↑ or ↓ and then ✓ to change the setting. Refer to the brine reclaim manual, 01018946, for recommended settings.

```
SOFTENING
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```

14. Press X X X to save the settings and return to the home screen.

NOTE **For testing purposes, use the Aux2 and Aux3 control options available on the Diagnostics and Aux Out Test settings.**

Multi-Tank Systems

Communication Cable—Multiple Units

Multiple units require a communication cable between each unit. Refer to the table below for the cable type, part number and quantity required. Cables are attached to the RS485 terminal of the circuit board.

Table 1. Communication cable requirements

System Configuration	Cable Part Number	Qty of Cables Required	Kit Part Number	Qty of blocking solenoids used
Duplex Alternating	01016342	1	01016369	2
Duplex Parallel	01016327	1	N/A	0
Triplex Parallel	01016327	2	N/A	0
Duplex Progressive	01016327	1	01016333	2
Triplex Progressive	01016327	2	01016334	3

Multiple units can be set up as progressive flow, alternating or parallel operation. Refer to the instructions and schematics below and on the following pages for connection to the circuit board.

Most multiple tank configurations will also require blocking valves (with the exception of the Hi-Flo 3e softener). These are used to hold tanks offline until needed. Based on the chart above, you can determine how many blocking solenoids are used. These solenoids are included in the alternating and progressive flow kits.

Blocking Solenoid Connection (used on Alternating and Progressive Flow Systems)

The solenoid valve wiring attaches to the Aux Out 4 output connection on the auxiliary circuit board. See Figure 24.

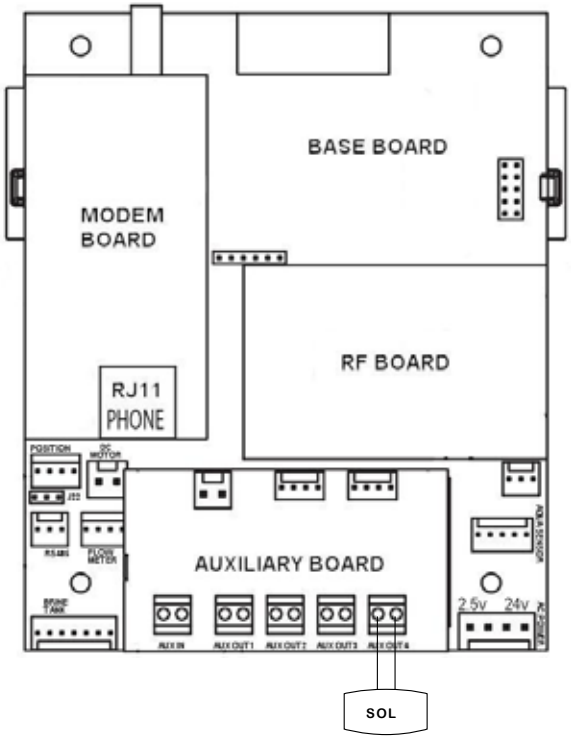
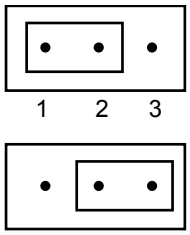


Figure 24. Auxiliary circuit board.

Progressive Flow or Parallel Flow

IMPORTANT—Setting the Jumpers for Progressive Flow

For progressive flow to operate properly, the first and last units must have the jumpers set to pins 1 and 2 on terminal J22 (see Figure 25 at right). All middle units should have the jumpers on pins 2 and 3 (see Figure 25). The diagram below (Figure 26) shows duplex connections. Repeat the connections on any additional systems.



Jumper location for first and last units (end units).

Jumper location for middle units.

Figure 25.

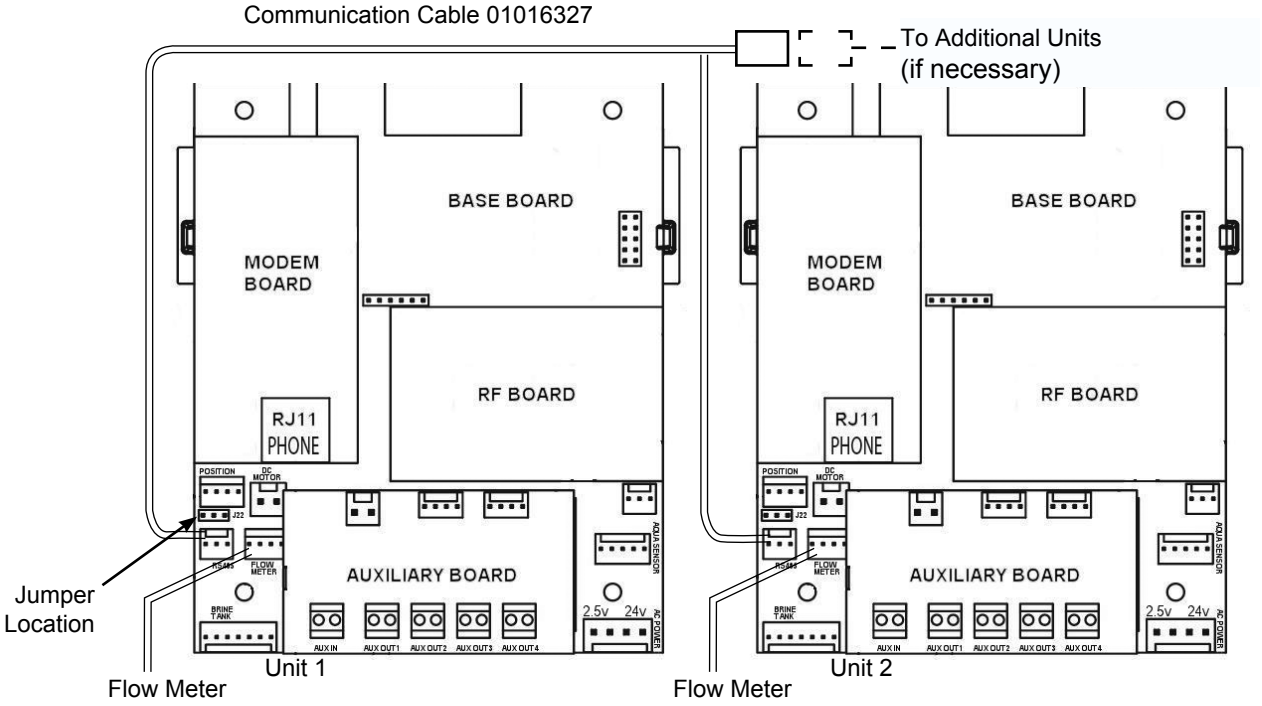


Figure 26. Duplex connections.

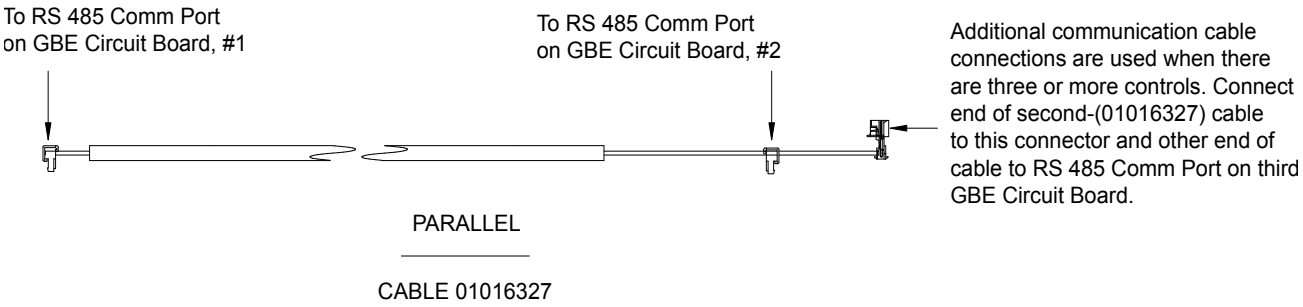


Figure 27. Parallel cable for Smart Controller.

Duplex Alternating with Meter (Optional)

For triplex, quad, and other alternating connections, you must use a meter on each unit and connect the same way as progressive flow. See Figure 28.

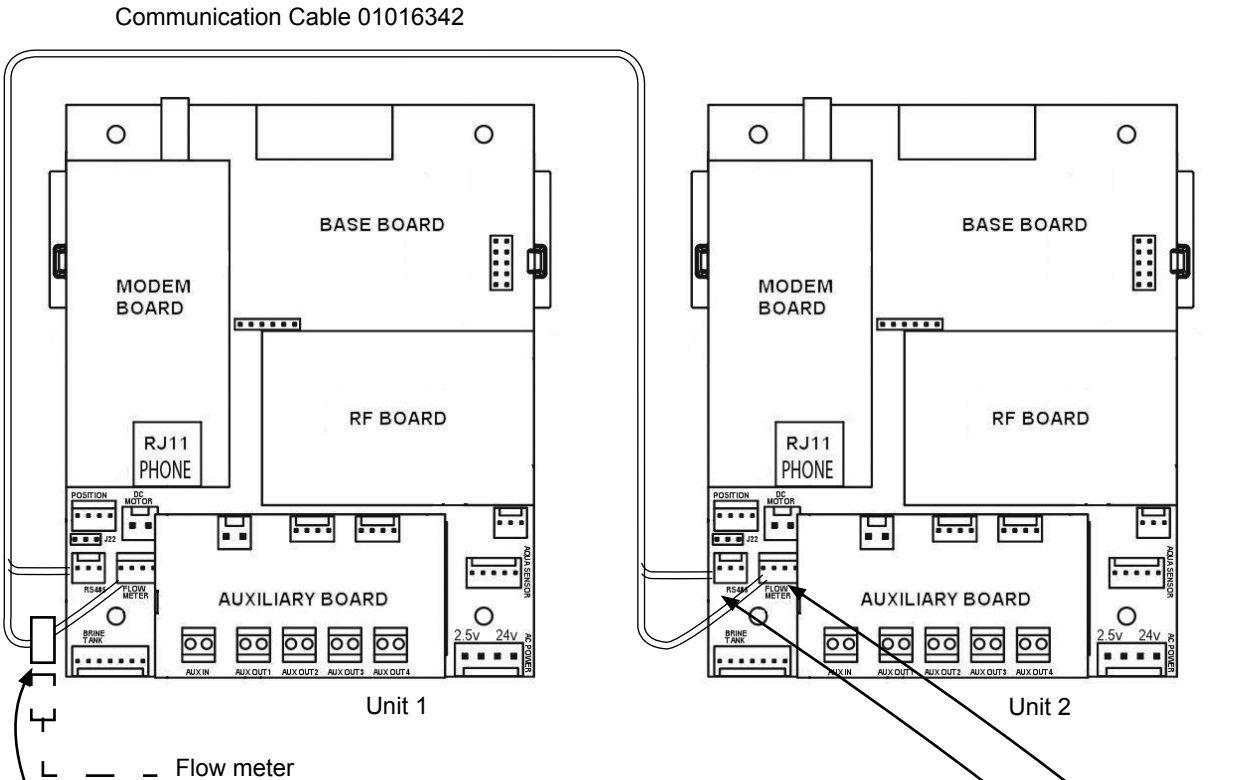


Figure 28. Alternate duplex connection.

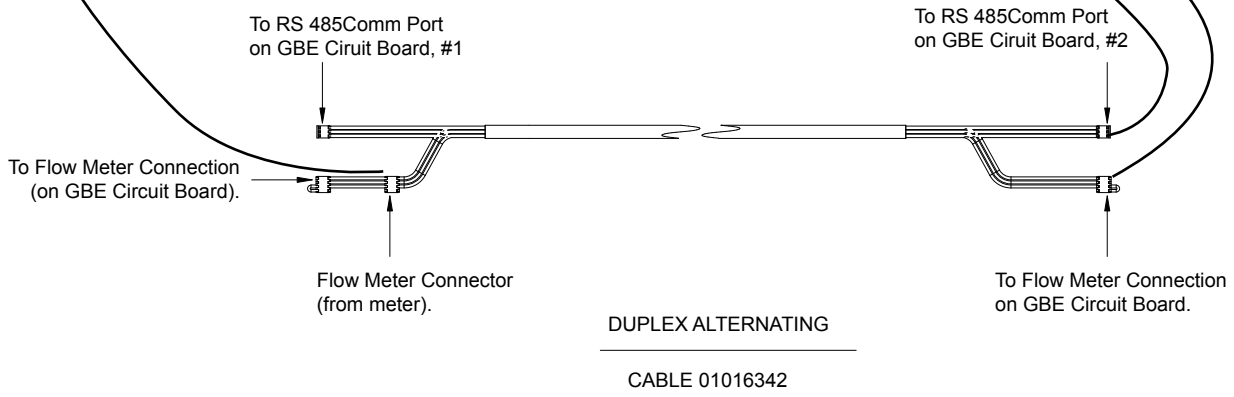
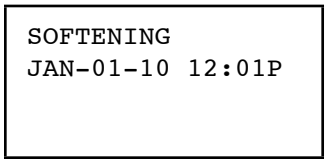


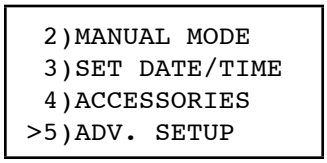
Figure 29. Duplex alternating cable.

Setting up a Multi-Tank System

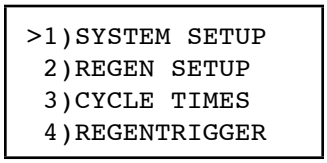
A Multi-tank system requires additional programming.



1. From the **HOME** scrren, press ▼ to view the main menu.



2. The screen displays the main menu. Press ▼ ▼ ▼ ▼ ✓ to select **5)ADV. SETUP**.



3. The screen displays the advanced setup menu. The menu includes **SYSTEM SET-UP**, **REGEN SETUP**, **CYCLE TIMES**, and **REGENTRIGGER**.
4. Press ✓ to select **1)SYSTEM SETUP**.

Multi-Tank System Settings

Setting	Screen Display	Range	Changing the Setting
Units (U.S. or Metric)	UNITS US INCH	US Inch or METRIC	Press ✓ ▲ or ▼ and then ✓ to select the units of measure (in this example, U.S. inch).
Multitank System	MULTITANK SYSTEM SINGLE	Single, Progress Flow, Alternating, Unbal Prog FLow	Press ✓ ▲ or ▼ and then ✓ to specify the tank configuration. SINGLE: used only with single tank system. TWIN: used only with High Efficiency (HE) systems. PROGRESS FLOW: Used for progressive flow and parallel operation. See Prog Flow Trip below. ALTERNATING: In an alternating system, one tank is always held back, either in regeneration or standby, no matter how many tanks are in the system. UNBAL PROG FLOW: Used when the tanks in the system are different sizes. See Small Tank Trip below.
Tank ID	PROGRESS FLOW MASTER	Master, Slave1–5	In a multi-tank system, one unit must be specified as master. All other units are slaves. For example, in a triplex system, select one unit to be the master and set this setting to MASTER. Set the second unit to SLAVE 1. Set the third unit to SLAVE 2. A multi-tank system may have up to five slaves connected to a master.

Setting	Screen Display	Range	Changing the Setting
Prog Flow Trip	PROG FLOW TRIP 10 GPM	0–999	This setting establishes a flow rate which, when attained, will cause another unit to come online until the total flow rate is less than the established trip point for 30 seconds. Should the flow demand exceed the trip point by a rate equal to or greater than two times the trip point, another unit shall be brought on-line (when Progress Flow or Unbal Prog Flow is selected). Each subsequent equivalent increase in flow demand shall continue to bring additional units on line (up to six total units if the flow demand is six times the TRIP amount). Units shall be returned to a stand-by mode in the reverse order as the system flow decreases by a rate equal to or greater than the trip point. Generally, the trip point is the rated continuous flow rate of one unit. These values can be found in the unit's instruction manual. Prog Flow Trip is set only on the master.
			NOTE **PARALLEL OPERATION: To set up the Smart Controller for parallel operation (all online), set the trip point to zero (0). As long as the flow is above zero, all units will stay online. The trip point is set only on the master unit. You must also set the jumpers as explained on page 40 for progressive flow.**
Small Tank Trip	SMALL TANK TRIP 5 GPM	0–999	When UNBAL PROG FLOW is selected, you need to set the trip point for the smaller tank. This specifies the flow rate for the smaller tank. This is generally set to the continuous flow rating of the smaller tank. The small tank MUST be set up as the MASTER.
Prerinse Mode	PRERINSE MODE OFF	Off, On	Press ⬇ to keep this setting at its current value.
Rinse if No Flow	RINSE IF NO FLOW FOR 24 HOURS	1–240	Press ⬇ to keep this setting at its current value.
Rinse For	RINSE FOR 5 MINUTES	1–60	Press ⬇ to keep this setting at its current value.

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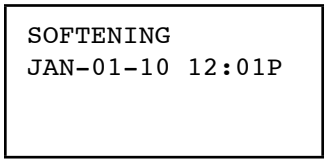
5. Press X X X to save the settings and return to the home screen.

Flow meters are required for progressive flow—one for each unit. See "Programming the External Flow Meter" on page 31 to set up the meters.

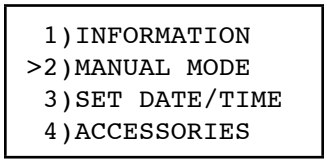
Progressive Flow Update

With Firmware version 2.0.9 and later, the Smart Controller can now update all units in the system. After the master is programmed, Follow these instructions:

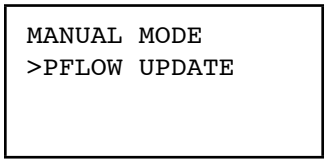
1. Run the First Time Setup on all remaining units. You can skip through until you get to multi-tank. Select PROGRESS FLOW and set the SLAVE ID. Skip through the rest of FTS.



1. From the **HOME** scrren, press ↓ to view the main menu.



2. The screen displays the main menu. Press ↓ ✓ to select **2)MANUAL MODE**.



3. Press ✓ ↓ ↓ ✓ to select PFLOW UPDATE. This will transfer the programming to all other systems.

The additional settings needed on the slave units will be for accessories such as Aqua-Sensor and Smart Brine Tank Probe. Service phone number, wireless remote, and modem settings are not transferred because in a multi-tank system they are installed on the Master only.

Blocking Solenoid Valve For Multi-tank Alternating Operation

NOTE **Proceed to page 47 if your system is a single tank configuration. The solenoid valve is only required for multiple unit alternating or progressive flow systems.**

The purpose of the solenoid valve is to assist the controller in providing automatic alternation of multiple tank systems. Each Brunermatic multiport valve in the system will require its own solenoid valve. These solenoids are tubed as follows:

- From solenoid valve port number 1 to Brunermatic multiport valve port number 4.
- From solenoid valve port number 2, tee into the tubing that attaches to the “IN” port on the pilot valve body.
- From solenoid valve port number 3 to port number 2 on the pilot valve body. The detailed tubing schematic is shown below (Figure 30).

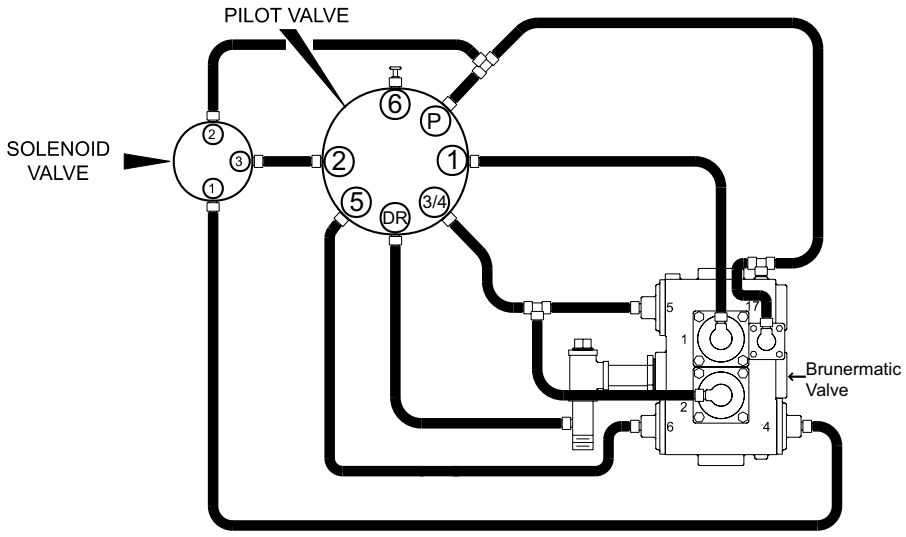


Figure 30. Alternating/progressive flow parallel system with plugged bypass.

Figure 31. Solenoid Valve.

Sequence of Operation

When a softener is in standby or a regeneration cycle, the Smart Controller sends a signal to the P7 Sol-Vlv terminal of the primary circuit board, activating the solenoid valve. The orange LED will be on at this time. When the solenoid valve is electrically activated, ports #1 and #2 of the solenoid (Figure 32) become common. This will direct pressure from a constant IN pressure supply to the blocking diaphragm valve, which prohibits the flow of water to service.

Once the Smart Controller signals the unit to return to a Service status, the signal from P7 Sol-Vlv is removed and the solenoid valve is deactivated. When the solenoid valve is electrically deactivated, ports #1 and #3 of the solenoid become common. The orange LED will not be on at this time. This will vent pressure, from the diaphragm valve to drain. The diaphragm valve opens to allow softened water to flow to service.

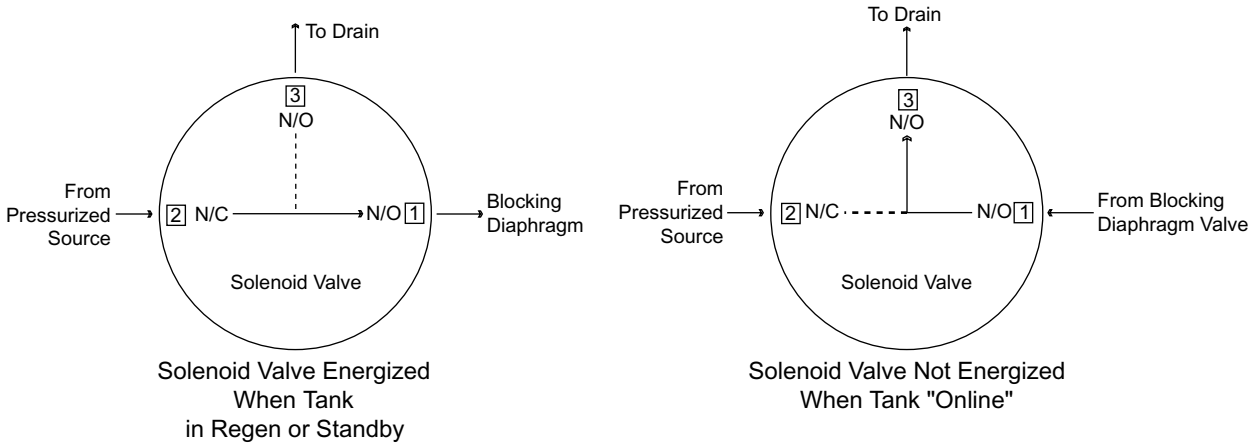


Figure 32.

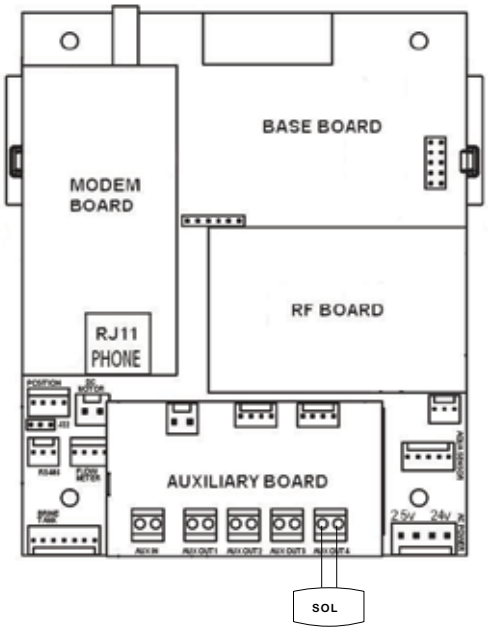


Figure 33. Smart Controller board with solenoid connection.

Auxiliary Board

The auxiliary board (Figure 34) comes installed in all commercial softeners and filters. It can control up to four 24 VAC outputs for energizing a relay coil only (max current 2.1 Amps output). The Auxiliary Outputs (see Figure 35) are output triacs that can be programmed to provide power to a normally open (normally no power to auxiliary output until power required) or a normally closed contact (user choice).

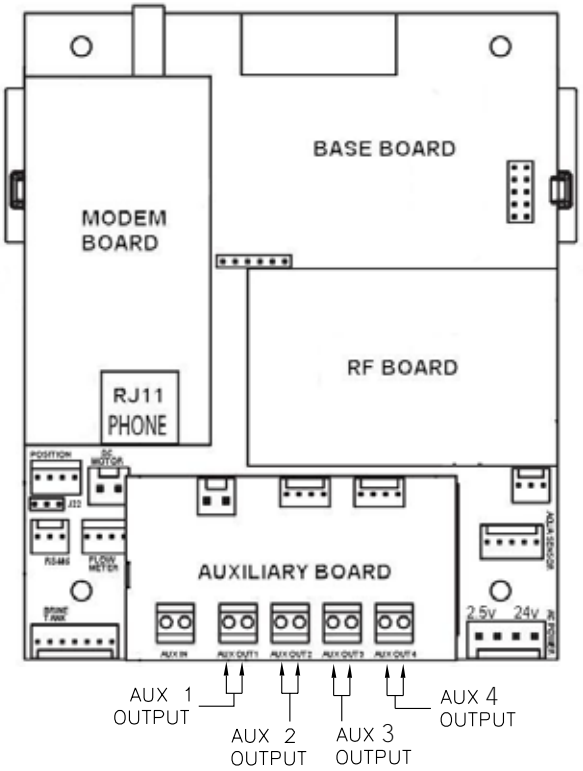


Figure 34. Auxiliary outputs.

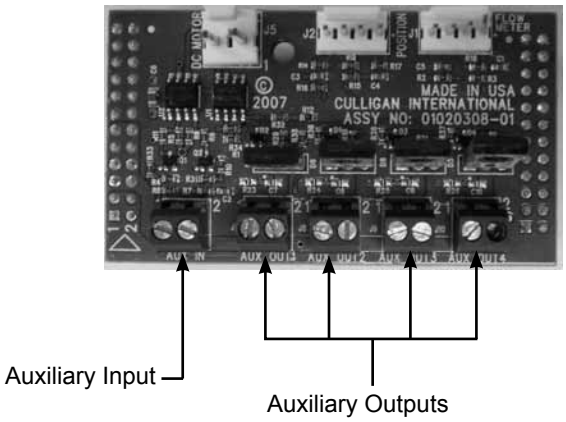


Figure 35. Auxiliary board input and outputs.

Aux Output 1 is used to power the 24 VAC drive motor found on all valves. When Aux Output 1 is used for this, then Aux Output 4 is automatically configured to operate a solenoid which can be used for a standby or blocking. Aux Output 4 is powered during all cycles except service, and unpowered during service.

For CSM and Hi-Flo 50 softeners, Aux Output 2 is used to power the refill solenoid. The Aux Output 2 Active time needs to be set based on the desired salt dosage/capacity as found in the appendix of the unit's installation manual.

For example, Figure 36 shows how the timing would work if the CYCLE TYPE was set to NORMALLY OFF, the CYCLE POSITION was set to BACKWASH, the DELAY minutes greater than zero, and ON minutes greater than zero.

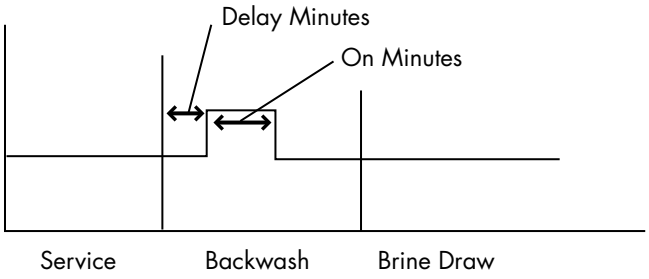
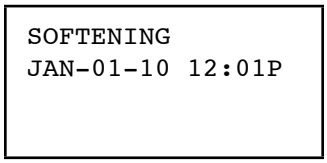


Figure 36. Auxiliary board activation timing.

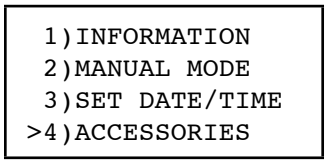
An additional Aux Output 5 is available by using the optional Alarm Relay board. See page 58.

AUX OUTPUTS Settings

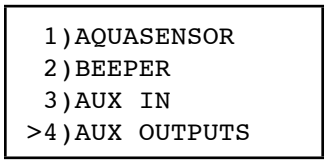
The output settings for AUX2 and AUX3 are the same.



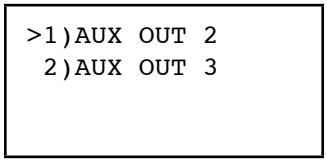
1. From the **HOME** screen, press ↓ to view the main menu.



2. The screen displays the main menu. Press ↓ ↓ ↓ ✓ to select **4)ACCESSORIES**.



3. From the Accessories menu, press ↓ ↓ ↓ ✓ to select **4)AUX OUTPUTS**.



4. Press ✓ to select **1) AUX OUT 2**. The screen displays the settings for the selected auxiliary output.

Setting	Screen Display	Range	Changing the Setting
Aux2 Output Type	AUX2 OUTPUT TYPE Repeat Cycle	Normally Off, Normally On, Repeat Cycle	Press ✓ ↓ ↓ to change the AUX 2 OUTPUT TYPE setting. The screen displays the AUX 2 VALV POS setting. Normally On—For this option, select a cycle, a delay time and a duration time. In this mode, the relay is energized through all cycles EXCEPT the cycle you designate. Further, it will delay de-energizing the relay for the duration designated. It will de-energize during that cycle for the amount of time you set after the delay. Normally Off—For this option, select a cycle, a delay time and the duration time. In this mode, the relay is NOT energized through all cycles EXCEPT the cycle you designate. Further, it will delay energizing the relay for the duration designated. It will be energized during the selected cycle for the amount of time you set after the delay. Repeat Cycle—For this option, select a cycle, a delay time, an “on” time, and an “off” time. Once the relay energizes in the selected cycle, it will repeat the “on” time and “off” time settings until the cycle ends.
Aux 2 Valve Position	AUX 2 VALV POS Brine/SRinse	Service, Backwash, Brine/ SRinse	Press ✓ ↑ ↑ to change the AUX 2 VALV POS setting to **Brine/SRinse**. The screen displays the AUX OUT 2 setting. For repeat cycle auxiliary output type, keep the setting at **SERVICE**.

Setting	Screen Display	Range	Changing the Setting
Aux Out 2	AUX OUT 2 6 Gals	0–4342	Press ✓ ↑ or ↓ and then ✓ to change the capacity, in gallons, of the selected auxiliary output.
Aux2 Out Delay	AUX2 OUT DELAY 0 Mins	0–25	Press ↓ to leave the AUX 2 OUT DELAY setting at zero. Set the AUX3 OUT delay to the same value as the AUX2 OUT (the last setting on AUX2).This allows AUX3 to turn on immediately after AUX2 turns off.
Aux2 Out Active	AUX2 OUT ACTIVE 0 Secs	0–9999	Press ✓ ↑ or ↓ and then ✓ to specify the number of seconds needed for the selected auxiliary output to be activated. If the AUX OUT minutes are set longer than the cycle time selected, the AUX OUT will continue running beyond the end of the cycle.
Aux2 Out Off	AUX2 OUT OFF 0 Mins	0–9999	Press ✓ ↑ or ↓ and then ✓ to specify the duration, in minutes, for the selected auxiliary output to be inactive. This selection is available only for repeat cycle auxiliary output type.

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5. Press X X X to save the settings and return to the home screen.

Auxiliary Output 2 Example

For CSM and Hi-Flo 50 softeners, this output is used for the refill solenoid. As an example, let's say we have a CSM-300-2 and we need to set this up for refill minutes. We are looking for a capacity around 250,000 grains (10 lbs/ft³).

According to the chart on page 92 of the CSM installation manual (01016370), we are looking at a salt dosage of 10.2 lbs/ft³ and need to set the ON minutes of AUX2 to 17.

```
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```

1. From the **HOME** screen, press ↓ to view the main menu.

```
 1)INFORMATION
 2)MANUAL MODE
 3)SET DATE/TIME
>4)ACCESSORIES
```

2. The screen displays the main menu. Press ↓ ↓ ↓ ✓ to select **4)ACCESSORIES**.

```
 1)AQUASENSOR
 2)BEEPER
 3)AUX IN
>4)AUX OUTPUTS
```

3. From the Accessories menu, press ↓ ↓ ↓ ✓ to select **4)AUX OUTPUTS**.

```
>1)AUX OUT 2
 2)AUX OUT 3
```

4. Press ✓ to select **1) AUX OUT 2**. The screen displays the settings for the selected auxiliary output.

```
AUX2 OUTPUT TYPE
Normally Off
```

5. Press ↓ to leave the AUX 2 OUTPUT TYPE setting to **NORMALLY OFF**. The output should energize (turn on) the refill solenoid. The screen displays the AUX 2 VALV POS setting.

```
AUX 2 VALV POS
Service
```

6. Press ↓ to leave the setting at SERVICE and view the next setting.

```
AUX2 OUT DELAY
0
Mins
```

7. This is the activation delay. No delay is necessary; leave this set to zero (0). Press ↓ to accept this setting and view the next setting.

```
AUX2 OUT ACTIVE
0
Secs
```

8. This is the number of minutes needed for AUX2 to be activated. Press ↑ to set this to 17 minutes. Press ✓ to accept this setting. The screen displays the Auxiliary Output menu.

```
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```

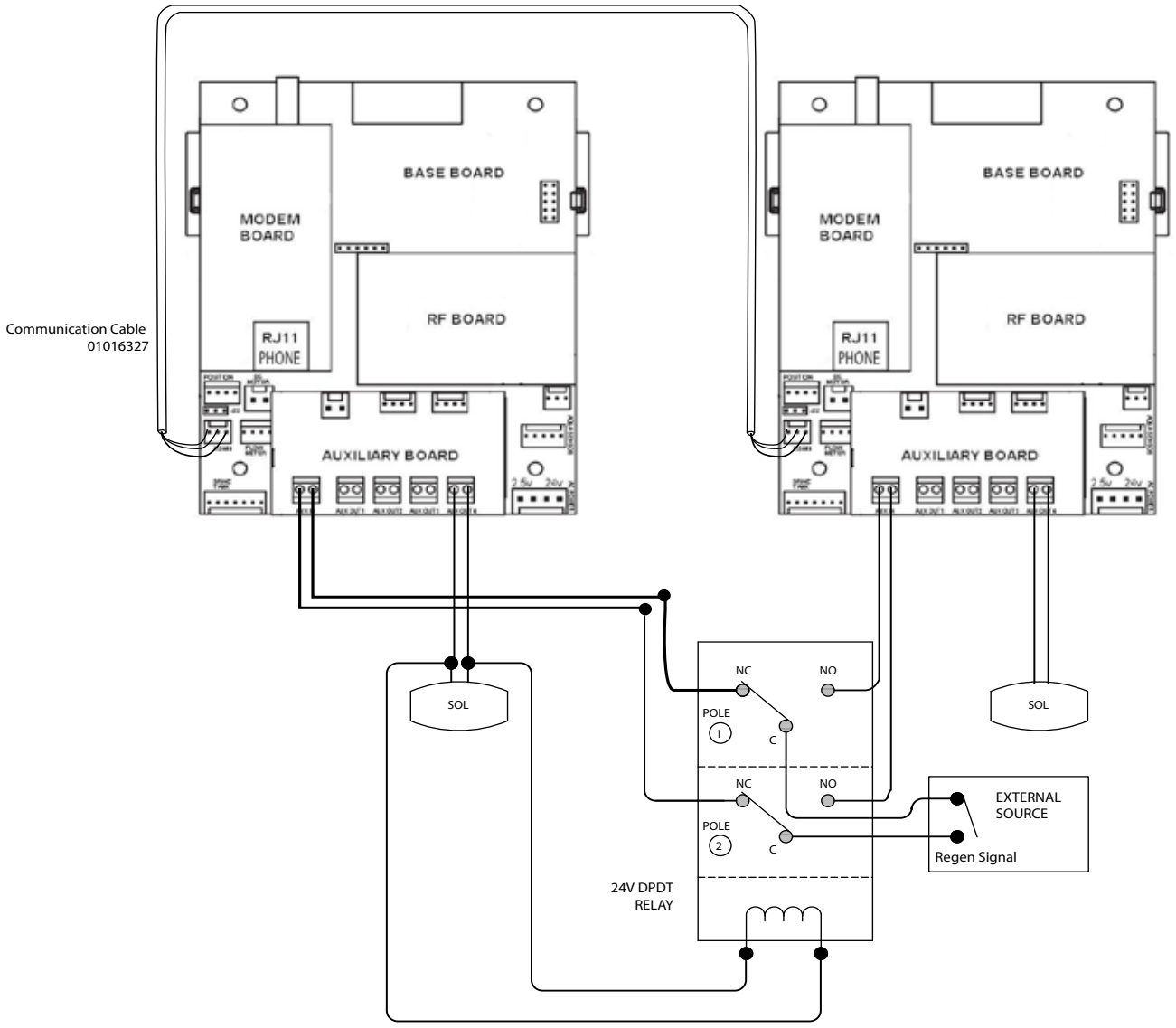
9. Press ✗ ✗ ✗ to save the settings and return to the home screen.

Auxiliary Input (Optional)

One auxiliary input is provided for optional signal devices such as remote push buttons, differential pressure switches, hardness monitors, turbid meters, etc. for the purpose of receiving a regeneration signal. The Aux Input can also be configured as an external alarm trigger.

To provide a regeneration signal, select an UNPOWERED contact within the remote device that will close when regeneration is desired. The duration of the switch closure can be as low as 0 seconds; 6 seconds is the recommended minimum and default but can be as long as 999 seconds. The contact must automatically open following the start of a regeneration sequence. Connect this contact to the Aux In terminal shown in Figure 37. The illustration below is an example of how to use an external source (with duplex alternating current) to initiate regeneration.

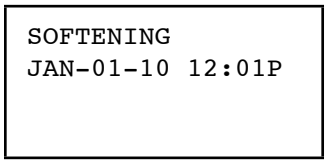
To use as external alarm trigger, select an UNPOWERED contact within the remote device that will close when the alarm condition exists. The duration of the switch closure can be as low as 0 seconds; 6 seconds is the recommended minimum and default but can be as long as 999 seconds.



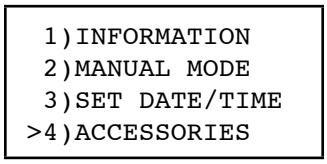
DUPLEX ALTERNATING WITH EXTERNAL SOURCE

Figure 37. Auxiliary input.

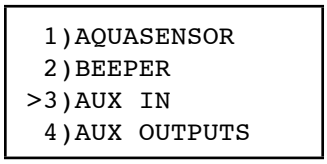
AUX Input Setup



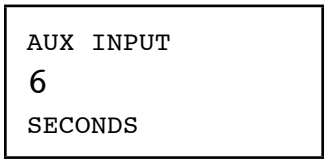
1. From the **HOME** screen, press ↓ to view the main menu.



2. The screen displays the main menu. Press ↓ ↓ ↓ ✓ to select **4)ACCESSORIES**.



3. From the Accessories menu, press ↓ ↓ ✓ to select **3)AUX IN**.

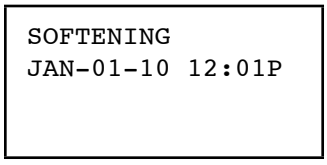


4. Press the DOWN ARROW button to accept a six (6)-second auxliary input.
5. Press the X button to return to the Accessories menu.

AUX Input Settings

AUX2 values are shown for each selection unless otherwise noted.

Setting	Screen Display	Range	Changing the Setting
Aux Input	AUX INPUT 6 SECONDS	1–999	Press ↓ to to accept a six (6)-second auxliary input.
Aux Input Type	AUX INPUT REGEN TRIGGER	Regen Trigger External Alarm	Press ✓ ↑ or ↓ and then ✓ to change the setting from REGEN TRIGGER to EXTERNAL ALARM. When set to REGEN TRIGGER (default), the GBE will initiate regeneration when it receives a signal. When set to EXTERNAL ALARM, the GBE will enter an alarm condition when it receives a signal. The screen displays the error message AUX INPUT ALARM.



6. Press X X X to save the settings and return to the home screen.

Installing the Modem (Optional)

NOTE **The modem can be installed into either the back of the main controller or the back of the remote control board. The functionality of the modem is the same in either installation.**

NOTE **Use of the modem kit requires a one-year subscription to either a Level 1 or Level 2 Telecom package. Self-service registration is available at www.myculligan.com.**

1. Before installing the modem into the back of the Smart Controller board or the back of the remote, the Smart Controller circuit board or the remote must first be powered off.
2. When handling all circuit boards, take care to only touch the edges of the circuit boards—not the metal pins. The electronics on all circuit boards can be damaged by static electricity.
3. Make sure all of the pins at all four connectors are aligned between the modem board and the main controller board. Make sure that the modem board is fully seated into all four sockets.
4. When all connections have been made restore power.

Installing on the Smart Controller Board

Open the controller cover and locate the modem connection on the back of the board (see Figure 38). Insert line modem board (part number 01020307) into the socket on the back of the board. Make sure that all of the pins in all four connectors are aligned and make sure the modem is fully seated into all of the sockets.

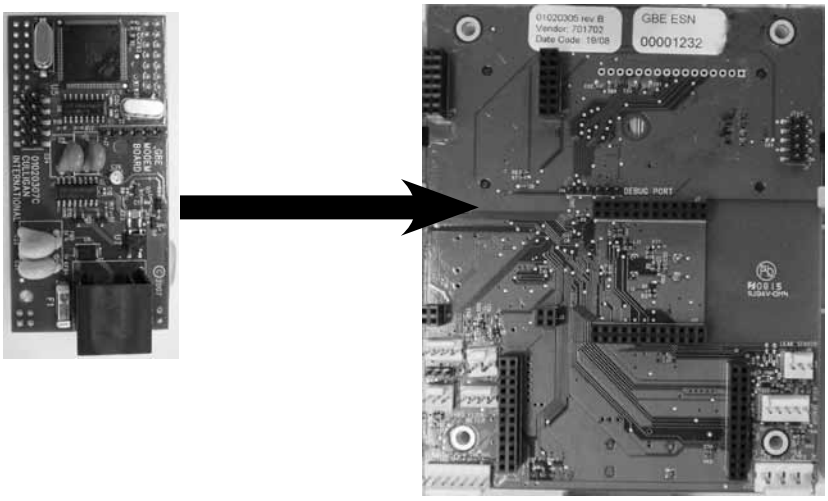
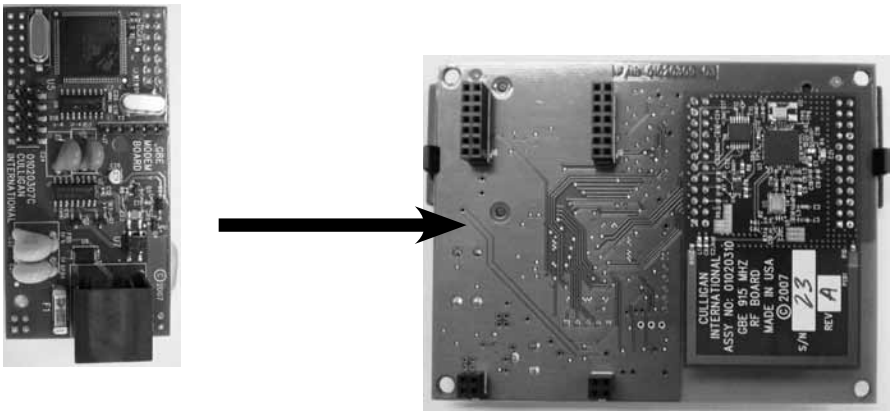


Figure 38. Back of Smart Controller board.

Installing In the Remote

Open the remote monitor housing by removing the two screws and squeezing the sides of the monitor housing slightly. Insert the modem board (P/N 01020307) into the socket on the back of the remote board (see Figure 39). Make sure that all of the pins in all four connectors are aligned and make sure the modem is fully seated into all of the sockets. Snap the two halves of the remote housing back together using light finger pressure and insert the two screws.



Modem Board

Figure 39. Back of remote board.

GBE Modem Setup

```
SOFTENING
JAN-01-10 12:01P
```

1. From the **HOME** screen, press ↓ to view the main menu.

```
 1)INFORMATION
 2)MANUAL MODE
 3)SET DATE/TIME
>4)ACCESSORIES
```

2. The screen displays the main menu. Press ↓ ↓ ↓ ✓ to select **4)ACCESSORIES**.

```
 4)AUX OUTPUTS
 5)SBT SENSOR
 6)WIRELESS REM
>7)MODEM
```

3. From the Accessories menu, press ↓ ↓ ↓ ↓ ↓ ↓ ✓ to select **7)MODEM**.

GBE Modem Settings

Setting	Screen Display	Range	Changing the Setting
Telephone Modem	TELEPHONE MODEM INSTALLED	Installed, Not Installed	Press ✓ ↑ or ↓ and then ✓ to select INSTALLED if a telephone modem is installed inside the Smart Controller.
Modem Location	MODEM LOCATION IN MAIN CONTROL	In Main Control or In Remote	Press ✓ ↑ or ↓ and then ✓ to change the Modem Location setting. Change this setting only if a modem is installed.

Setting	Screen Display	Range	Changing the Setting
Call Frequency	CALL FREQUENCY EVERY 10 REGENS	0–25	Press ✓ ↑ or ↓ and then ✓ to specify Call frequency. The default value of Every 10 regens can be changed from 1 to 25 successful regenerations. If set to 1, the unit will call in the following morning after each regeneration. The interval can also be set to 0, meaning the unit would NEVER call in unless there was a problem detected. It is recommended for a typical installation the default value of EVERY 10 REGENS is used.
Time Zone GMT	TIME ZONE GMT +00:00	0 to +12 or -12	Press ✓ ↑ or ↓ and then ✓ to specify the time zone of the Smart Controller location with respect to Greenwich Mean Time (GMT). When using a modem, the controller will occasionally access the internet to synchronize the date and time. In order to do this correctly, the control must be told which time zone it is installed in. The time zone is specified as so many hours ahead or behind GMT time. The GMT offset for some common cities is listed below:
Dealer ID	DEALER ID 00000000	8 digits	Press ✓ to change the Dealer ID setting. Press ✓ ↑ or ↓ and then ✓ to increase or decrease each digit of the Dealer ID and select the next digit. Press ✓ when the correct Dealer ID is displayed. The Dealer ID is your dealership's account number.
Data Phone #	DATA PHONE # >18884137028	15 digits	Press ✓ to change the Data Phone Number setting. Press ✓ ↑ or ↓ and then ✓ to increase or decrease each digit of the Data phone number and move to the next digit. Press ✓ when the correct Data phone # is displayed. It is necessary to provide a telephone number to be called by the unit. Typically, it is desired that the unit call a local access number. These local access numbers, for nearly every area code around the globe, can be found from the My Culligan website at http://www.myculligan.com/technical/tech_ref-gbe-boards.asp. The unit can also be programmed with the default toll-free access number. Use a local number whenever possible.

GMT Offset	
New York	-5:00 (and anywhere in EST)
Chicago	-6:00 (CST)
Denver	-7:00 (MST)
Los Angeles	-8:00 (PST)
London	0:00
Paris	0:00
Rome	+1:00

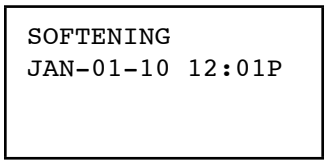
SOFTENING
JAN-01-10 12:01P

4. Press X X X to save the settings and return to the home screen.

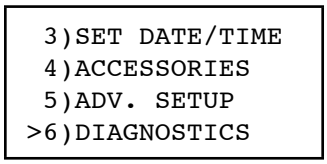
Test Modem

This menu attempts to send a test message. The screen indicates whether or not this process is successful. Sending a test message will also update the time and date on the Smart Controller to the correct time. If the modem is installed on the main controller (as opposed to installed in the remote control) then this testing process will also check to see if there is an updated version of firmware available on the Culligan servers.

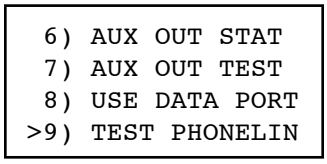
After conducting a phone line test, it is important to verify that the new time and date settings on the controller are correct. If the new time setting has the incorrect value for the hours it is likely that the time zone setting on the control is incorrect. The time zone setting found under the Main Menu / Accessories / Modem screen is displayed in the format of GMT +/- X hours. See “Installing the Modem” on page 50.



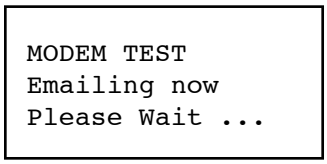
1. From the **HOME** screen, press ⬇ to view the main menu.



2. The screen displays the main menu. Press ⬇⬇⬇⬇⬇✔ to select **6)DIAGNOSTICS**.

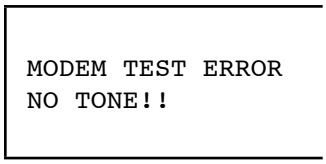


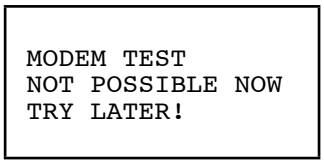
3. The screen displays the main menu. Press ⬇⬇⬇⬇⬇⬇⬇⬇✔ to select **9)TEST PHONELIN**. The screen displays the modem phone line test screen.

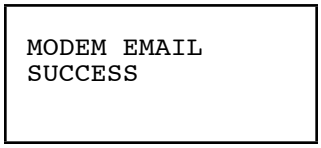


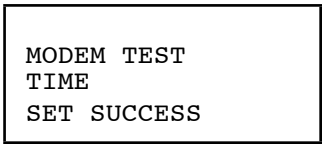
4. Press the CHECK MARK button to begin testing the modem telephone line. The screen displays the status of the test before displaying the results. Do not press any buttons before the test is complete or the controller will return to the Diagnostics menu.

Possible Results









Installing the Wireless Remote

1. Select a location for the wireless remote monitor (Figure 40). The location must be near an electrical outlet. If a modem is used in the remote, then the location should also be near a standard RJ-11 type telephone wall jack.

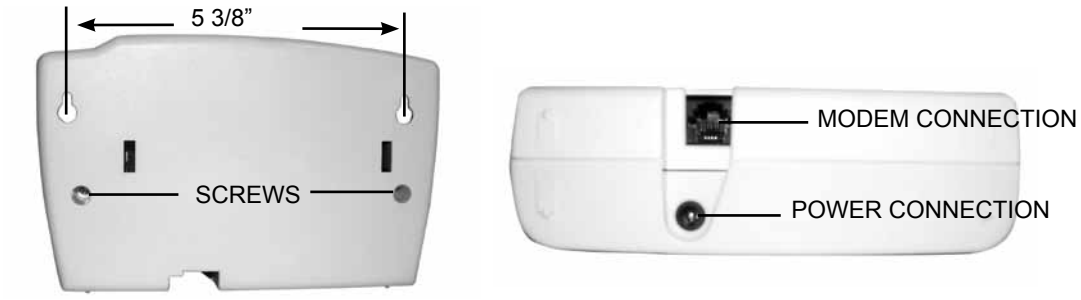


Figure 40. Wireless remote monitor.

⚠	**CAUTION! Do not touch any surfaces of the circuit board. Electrical static discharges may cause damage to the board. Handle the circuit board by holding only the edges of the circuit board. Keep replacement boards in their special anti-static bags until ready for use. Mishandling of the circuit board will void the warranty.**

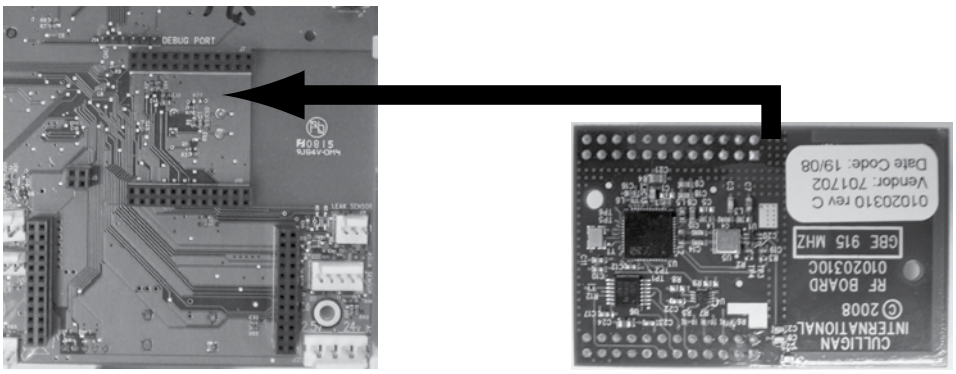
2. Use the Hole Drilling Template as a guide to drilling two holes to mount the remote monitor. If drilling into wall board, drill two 5/16” diameter holes and insert the plastic drywall anchors into the holes securing them with the two #10 screws provided. If drilling into a solid surface, drill two 7/32” holes into the surface and screw the two #10 screws into the holes. In either case, leave a gap of approximately 3/32” between the head of the screw and the wall.

3. (Optional) If a modem is to be installed into the remote monitor, refer to page 53 for installation and setup.

4. Connect the power cord to the bottom of the remote monitor. If a modem is to be used in the remote, plug a standard telephone extension cord into the bottom of the remote monitor.

5. Hang the remote monitor on the two screws.

6. Disconnect power to the softener. Open the control and connect the RF board into the controller circuit board. Make sure the RF board is fully seated into all of the sockets (see Figure 41). Reconnect power.



Back of GBE Board RF Board (note orientation)

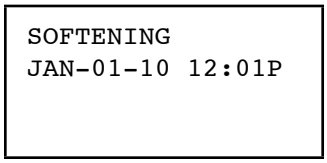
Figure 41. RF board location on Smart Controller board.

7. Install RF board into unit controller. Line up pins in RF board and press firmly into black connectors. Note orientation of RF board (see Figure 41).

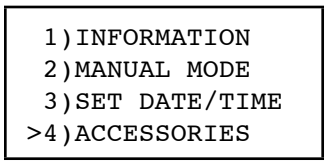
8. Follow the directions on the next page to program BOTH the main and remote monitor units to communicate with each other. If modem has been installed in the remote, it is also necessary to follow the directions in the next section of this manual to configure the main controller to use the modem in the remote.

Control Valve Setup

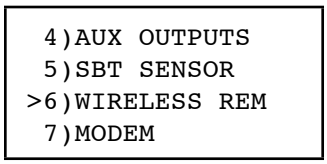
The control valve setup prompts the Smart Controller to communicate with a wireless remote.



1. From the **HOME** screen, press ↓ to view the main menu.



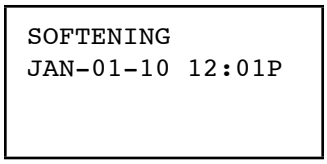
2. The screen displays the main menu. Press ↓ ↓ ↓ ✓ to select **4)ACCESSORIES**.



3. From the Accessories menu, press ↓ ↓ ↓ ↓ ↓ ✓ to select **6)WIRELESS REM**. The screen displays the wireless remote settings. Use these to set up the communication between the control valve and the wireless remote.

Control Valve Settings

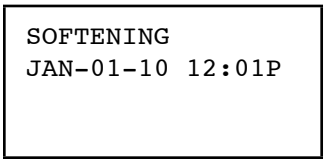
Setting	Screen Display	Range	Changing the Setting
Remote Display	REMOTE DISPLAY INSTALLED	Installed, Not Installed	Press ✓ ↑ or ↓ and then ✓ to select INSTALLED if the Smart Controller can communicate with a remote display.
Channel #	CHANNEL # >1	1–254	Press ✓ ↑ or ↓ and then ✓ to select the channel number of the control valve. The CHANNEL # for the control valve must be the same as the CHANNEL # for the Remote Display.
RF Frequency	RF FREQUENCY 915 Mhz	433, 869, or 915	Use this setting to select the correct radio frequency. Do not change the RF frequency for North America installations.



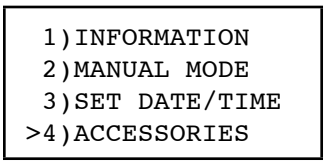
4. Press X X X to save the settings and return to the home screen.

Wireless Remote Setup

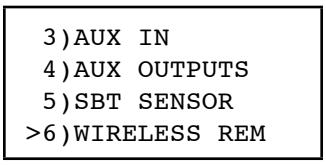
This setup is completed using the wireless remote device.



1. From the **HOME** screen, press ↓ to view the main menu.



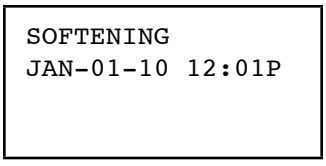
2. The screen displays the main menu. Press ↓ ↓ ↓ ✓ to select **4)ACCESSORIES**.



3. From the Accessories menu, press ↓ ↓ ↓ ↓ ↓ ✓ to select **6)WIRELESS REM**. The screen displays the wireless remote settings. Use these to set up the communication between the control valve and the wireless remote.

Wireless Remote Settings

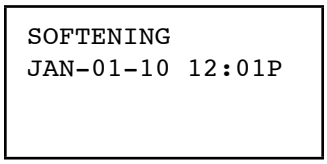
Setting	Screen Display	Range	Changing the Setting
Remote Display	REMOTE DISPLAY INSTALLED	Installed, Not Installed	Press ✓ ↑ or ↓ and then ✓ to select INSTALLED if the Smart Controller can communicate with a remote display.
Channel #	CHANNEL # >1	1–254	Press ✓ ↑ or ↓ and then ✓ to select the channel number of the control valve. The CHANNEL # for the control valve must be the same as the CHANNEL # for the Remote Display.
RF Frequency	RF FREQUENCY 915 Mhz	433, 869, or 915	Use this setting to select the correct radio frequency. Do not change the RF frequency for North America installations.



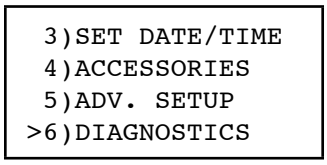
4. Press X X X to save the settings and return to the home screen.

Check Signal Strength

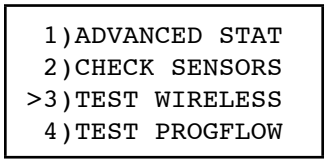
Check the signal strength once the control valve and wireless remote are setup. On the Softener Controller, go to the Main Menu/Advanced setup/Diagnostics/Test Wireless to check signal strength. The signal strength indicator (SSI) will show a value of between 0 and 8. If the SSI is at least 4, then the installation is complete. It the SSI drops below 4, then it may be necessary to select an alternate location for the wireless remote.



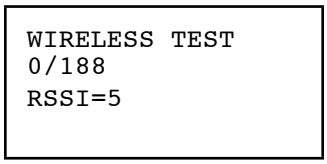
1. From the **HOME** screen, press ↓ to view the main menu.



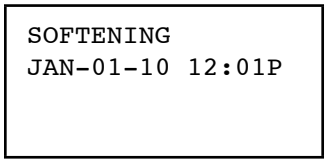
2. The screen displays the main menu. Press ↓ ↓ ↓ ↓ ↓ ✓ to select **6)DIAGNOSTICS**.



3. The screen displays the main menu. Press ↓ ↓ ✓ to select **3)TEST WIRELES**S. The screen displays the wireless test screen.



4. Press ✓ to test the signal strength. The screen displays the test number and total number of attempts and the received signal strength indicator (RSSI). The system will test the signal strength again and repeat until you press ✓ again.



5. Press X X X to save the settings and return to the home screen.

Chlorinator/Relay Board/Aux5 Setup

The GBE board offers support for the Culligan Chlorinator/Relay board (PN 01021961). See Figure 43.

To use the chlorinator/relay board, install it onto the back of the GBE board. See Figure 42.

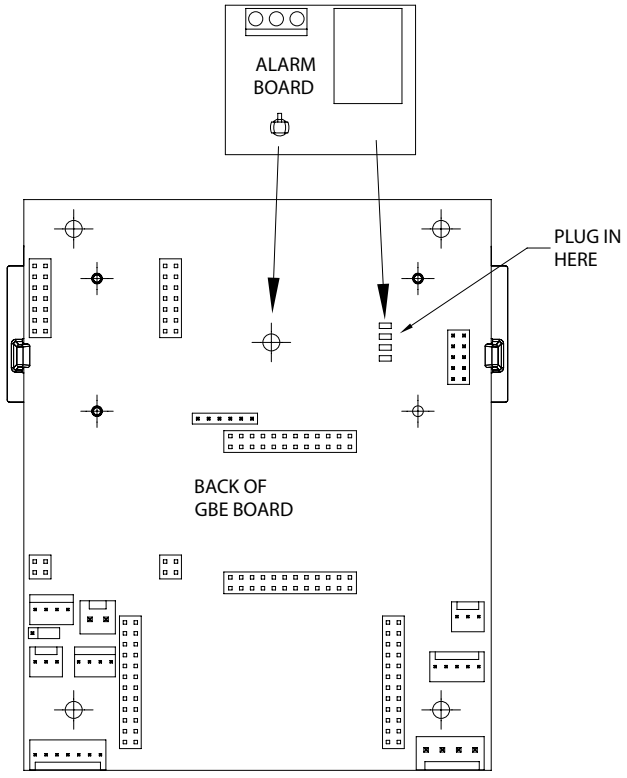


Figure 42. Alarm Relay Board—>Smart Controller.

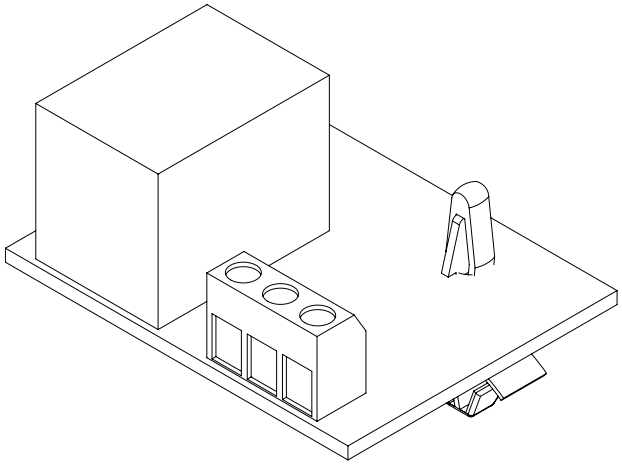


Figure 43. Alarm Relay board.

Install the Chlorinator under the Main Menu /Accessories menu. From the Chlorinator Accessory menu select Chlorinator for standard chlorinator behavior.

```
SOFTENING
JAN-01-10 12:01P
```

1. From the **HOME** screen, press ↓ to view the main menu.

```
 1)INFORMATION
 2)MANUAL MODE
 3)SET DATE/TIME
>4)ACCESSORIES
```

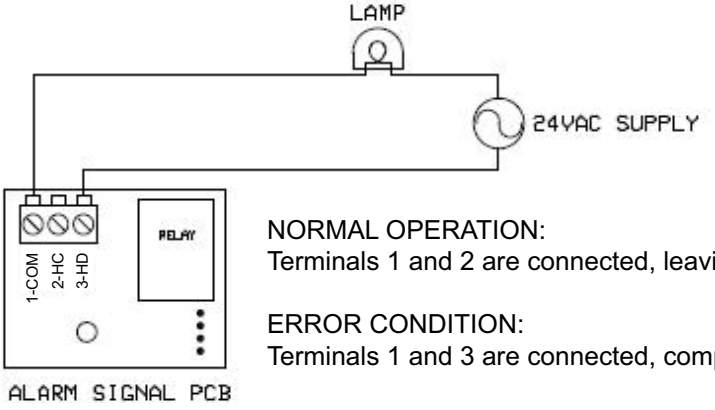
2. The screen displays the main menu. Press ↓ ↓ ↓ ✓ to select **4)ACCESSORIES**.

```
 5)SBT SENSOR
 6)WIRELESS REM
 7)MODEM
>8)CHLORINATOR
```

3. From the Accessories menu, press ↓ ↓ ↓ ↓ ↓ ↓ ↓ ✓ to select **8)CHLORINATOR**. The screen displays the Chlorinator settings. Use these to set up the Chlorinator board.

Alarm Relay Board/Chlorinator Settings

Setting	Screen Display	Range	Changing the Setting
Chlorinator	CHLORINATOR CHLORINATOR	Chlorinator Error Status Network Normally On Normally Off Repeat Cycle	Chlorinator—Used to control a chlorinator. Not used in commercial/industrial applications. Error Status—This mode of operation occurs when the relay board is plugged into the GBE board chlorinator socket. When Error Status is selected, this relay is in the Normally Open position when the GBE board has power AND there are no errors present (“Problem Found” is not showing on the Home screen). The relay is in the Normally Closed Position when the GBE is either powered OFF or when there is an error present on the GBE board. Network – currently not used. Normally On—Sets up relay to be Aux5. For this option, select cycle, delay time and duration. In this mode, the relay is energized through all cycles EXCEPT the cycle you designate. Further, it will delay de-energizing the relay for the duration designated. It will de-energize during that cycle for the amount of time you set after the delay. Normally Off— Sets up relay to be Aux5. For this option, select cycle, delay time, and duration. In this mode, the relay is NOT energized through all cycles EXCEPT the cycle you designate. Further, it will delay energizing the relay for the duration designated. It will be energized during the selected cycle for the amount of time you set after the delay. Repeat Cycle— Sets up relay to be Aux5. For this option, select cycle, delay time, “on” time, and “off” time. Once the relay energizes in the selected cycle, it will repeat the “on” time and “off” time settings until the cycle ends.
Chlorinator	CHLORINATOR INSTALLED	Installed, Not Installed	Press ✔ ⬆ or ⬇ and then ✔ to select INSTALLED if a Chlorinator board is installed inside the Smart Controller.
Power Level	POWER LEVEL HIGH	Low Medium High	Press ✔ ⬆ or ⬇ and then ✔ to change the Chlorinator power level setting. Change this setting only if a Chlorinator is installed.
On Time	ON TIME 5 MINUTES	1–20	Press ✔ ⬆ or ⬇ and then ✔ to specify the number of minutes the chlorinator will operate during the brine draw phase.



NORMAL OPERATION:
Terminals 1 and 2 are connected, leaving the lamp circuit open (lamp off)

ERROR CONDITION:
Terminals 1 and 3 are connected, completing the lamp circuit (lamp on)

Figure 44. Example of customer wiring to the GBE Alarm Signal Output

Smart Controller Alarm Signal Output

The Smart Controller Alarm Signal Output is provided thru three screw terminals located on the Plug-in Circuit board. These terminals provide a pair of dry contacts rated at 10 A at 240 VAC. One dry contact is open and one is closed at all times as defined in the table below.

When Smart Controller is…	Contact A (screw terminals 1 & 2)	Contact B (screw terminals 1 & 3)
Operating Normally	Continuity	Open circuit
In “Error Condition”, or when the Smart Controller is not powered on	Open circuit	Continuity

A simple error alarm can be constructed by routing a customer supplied power source thru the Alarm Signal Output contact terminals 1 & 3 as shown in figure 44. The indicating light will be ON any time that the Smart Controller is either not powered on, or if it is in an “error condition.” Alternatively, the Alarm Signal Output contact terminals can be wired to a customer supplied PLC or SCADA system to provide an indication to the customer of the status of the Smart Controller equipment.

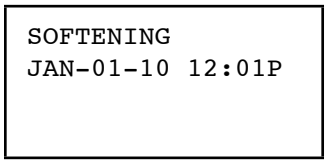
Error	Add Sensors	Meaning
Motor Pos Err	No	Control valve drive motor or motor position sensors have failed
Motor Home Err	No	Control valve drive motor or motor position sensors have failed
GBE is unpowered (or board has failed)	No	
Ext Filter Alarm	No	Smart Controller has a programmable count-down gallonage alarm. This error indicates that the countdown has reached zero. Typically this alarm is used as a reminder to replace filter media in an external canister filter
Aqua Salt Error	Aqua-Sensor	The most recent regeneration was unsuccessful because the strength of the brine was too low.
Low Salt Level	SBT Probe	This alarm is a prediction that the solid salt remaining in the brine tank will need to be replenished within the next 14 or fewer days. (The predicted days-salt-remaining an be viewed on the Smart Controller display screen.)
Brine Overfill	SBT Probe	There is too much water in the brine tank.
Brine Blocked	SBT Probe	The rate of brine draw during the most recent eduction was too slow. The eduction system is either partially clogged or a vacuum leak has formed in the eduction system. -or- There was not enough water in the brine tank at the end of fill (which could also be due to a blocked brine line)
Salt Bridging	SBT Probe	There appears to be a salt bridge in the brine tank
No RF Remote Signal	RF wireless remote	The controller has lost RF communication with the Smart Controller wireless remote.

Table 2. Error Conditions on the Smart Controller which will trigger the Alarm Signal Output.

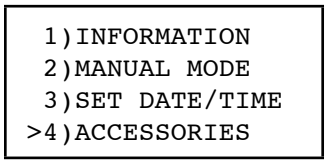
On a multiple-tank softener system, such as a twin-alternating, or progressive flow network, the Alarm Signal Output Relay board must be installed on each Smart Controller that the user wants monitored for errors.

When the Smart Controller senses any of the error conditions listed in the table above, the alarm output signal will be triggered. In order to determine the actual individual error(s) which triggered the alarm output signal to be triggered, you would either need to refer to the Smart Controller display screen itself, or to use the PLC communication process described in this installation manual.

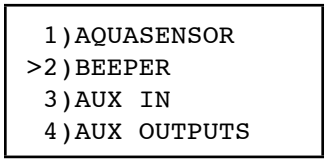
Setting the Beeper Mode



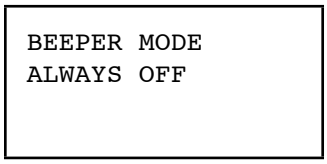
1. From the **HOME** screen, press ↓ to view the main menu.



2. The screen displays the main menu. Press ↓ ↓ ↓ ✓ to select **4)ACCESSORIES**.



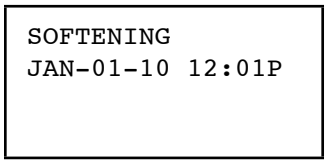
3. From the Accessories menu, press ↓ ✓ to select **2)BEEPER**. The screen displays the beeper settings.



4. Press ✓ ↑ or ↓ and then ✓ to change the beeper mode setting: ALWAYS OFF, ALWAYS ON, 12 HR WARNINGS, or 24 HR WARNINGS.

Beeper Mode Settings

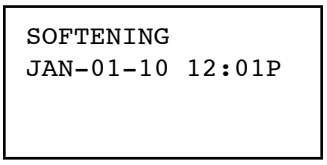
Beeper Mode Display	Beeps When Key is Pressed	Alarm Beeps
Always on	Always	Always
Always off	Never	Never
12 hour warnings	Never	Between 8 AM–8 PM
24 hour warnings	Never	Always



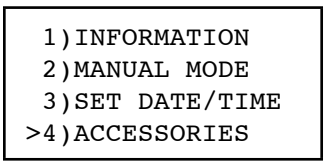
5. Press X X to save the settings and return to the home screen.

Service Phone Number

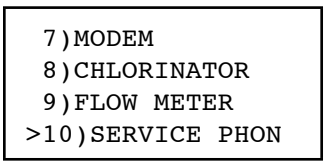
If the Modem is not installed it is possible, in addition to displaying the error message, to display a message that reads "Call Culligan at: XXXXXXXXXX" where the telephone number XXXXXXXXXX can be programmed by the dealership (typically programmed to be the telephone number of the dealership).



1. From the **HOME** screen, press ↓ to view the main menu.

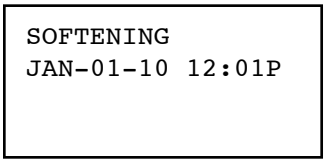


2. The screen displays the main menu. Press ↓ ↓ ↓ ✓ to select **4)ACCESSORIES**.



3. From the Accessories menu, press ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ✓ to select **10)SERVICE PHON**.

4. Press ✓ to change the Service Phone Number setting. Press ✓ ↑ or ↓ and then ✓ to increase or decrease each digit of the service phone number and move to the next digit. Press ✓ when the correct 14-digit Service phone # is displayed.

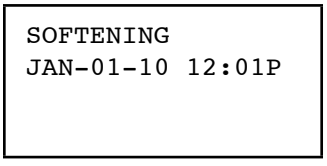


5. Press X X to save the settings and return to the home screen.

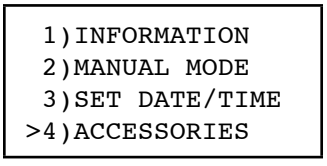
External Filter

The unit can provide alarm feedback for a sediment or carbon filter installed upstream of the unit. The Auxiliary flow alarm can be used to monitor the flow through this filter.

To use this feature it is necessary to specify either the total lifetime totalized flow of the auxiliary filter in either gallons or liters or the total life in days at Main Menu/Accessories/Ext. Filter. Once set, it will begin to track the total gallons through the system flow meter or days in operation. Once the total flow reaches the specified lifetime totalized flow or the set number of days, the system will display the error message "Change Auxiliary Filter" on the main display as well as the remote display and via the telephone modem if these secondary devices are used.



1. From the **HOME** screen, press ↓ to view the main menu.



2. The screen displays the main menu. Press ↓ ↓ ↓ ✓ to select **4)ACCESSORIES**.

```
 8)CHLORINATOR
 9)FLOW METER
10)SERVICE PHON
>11)EXT. FILTER
```

3. From the Accessories menu, press ↓↓↓↓↓↓↓↓↓↓✓ to select **11)EXT. FILTER**.

External Filter Settings

Setting	Screen Display	Range	Changing the Setting
External Filter Alarm	EXT FILTER ALRM NOT INSTALLED	Installed, Not Installed	Press ✓ ↑ or ↓ and then ✓ to change the setting from INSTALLED to NOT INSTALLED.
Filter Capacity	FILTER CAPACITY TIME BASED	Time Based Flow Based	This alarm setting may be set based on how many gallons have flowed through the unit (requires meter) or may be set based on time.
Filter Capacity	FILTER CAPACITY 100000 GALLONS	0–100000	Press ✓ ↑ or ↓ and then ✓ to change the filter capacity setting.
Filter Capacity	FILTER CAPACITY 365 DAYS	1–999	Press ✓ ↑ or ↓ and then ✓ to increase or decrease filter capacity.
Reset Capacity	RESET CAPACITY NO	Yes or No	The screen displays a confirmation query. Press ✓ ↑ or ↓ and then ✓ to change the setting from NO to YES. The screen displays the Accessories menu.
Change Auxiliary Filter	CHANGE AUXILIARY FILTER	Yes or No	When the screen displays “Change Auxiliary Filter,” press ↓. The screen displays the main menu.

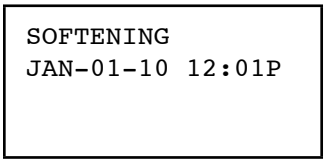
NOTE **Once the auxiliary filter has been replaced, the auxiliary filter alarm must be reset by returning to the same menu: Main Menu / Accessories.**

```
SOFTENING
JAN-01-10 12:01P
```

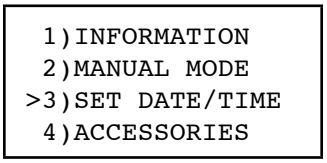
4. Press X X to save the settings and return to the home screen.

Set Date/Time

If the unit loses time for some reason, you can use this setting to reset the correct date and time. Please note that if you have a modem installed and connected to the phone line, the unit will check for the correct time each time it calls in.



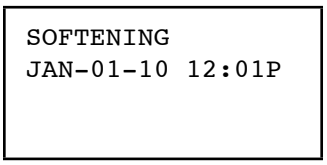
1. From the **HOME** screen, press ↓ to view the main menu.



2. The screen displays the main menu. Press ↓ ↓ ✓ to select **3)SET DATE/TIME**.

Date/Time Settings

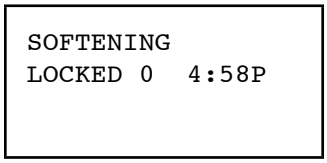
Setting	Screen Display	Range	Changing the Setting
Month	SET MONTH JAN	January –December	Press ✓ ↑ and then ✓ to change the month.
Day	SET DAY 1	1–31	Press ✓ ↑ or ↓ and then ✓ to change the day. The screen displays the new day (in this example, from 1 to 2).
Year	SET YEAR 2010	2008–19	Press ✓ ↑ or ↓ and then ✓ to change the year. The screen displays the selected year (in this example, 2008).
Clock Type	CLOCK TYPE 12 HR	12 or 24	Press ✓ ↑ or ↓ and then ✓ to change the setting. The screen displays either 12 or 24.
Hour	SET HOUR 12PM	12PM–11AM	Press ✓ ↑ or ↓ and then ✓ to select either 24-hour clock (00:00 to 23:59) or 12-hour clock (AM/PM).. The screen displays the new hour (in this example, 12) with AM or PM.
Minute	SET MINUTES 11	0–60	Press ✓ ↑ or ↓ and then ✓ to change the minute. The screen displays the new minute (in this example, 11).
Daylight Saving	DAYLIGHT SAVING YES	Yes or No	Press ✓ ↑ or ↓ and then ✓ to select either YES or NO. If you observe daylight savings time in your area, select YES.



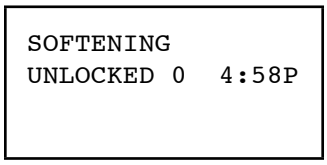
3. Press ✗ ✗ to save the settings and return to the home screen.

Menu Lockout

It is possible to lock the keypad of the Smart Controller so that users will only have access to the INFORMATION, MANUAL MODE, and SET DATE/TIME menu screens.



The system can be locked from the home screen. Press ▲ and ▼ simultaneously and holding them down for 10 seconds until you see the word LOCKED.



Repeating this process will unlock the keypad.

NOTE Menu lockout may only be completed from the home screen.

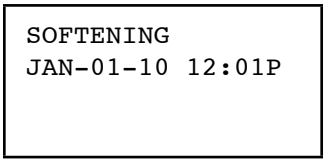
Menu Default—Rerun First Time Setup

Below is the procedure to default the board to factory settings and begin the first time setup.

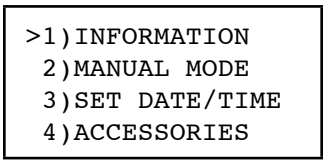
1. Power down the control.
2. Power up the control while pressing ▲ and X for at least ten (10) seconds.
3. Release ▲ and X. The display should be blank—if not go back to step 1.
4. After a brief 10-20 second delay, the screen lights up for two seconds and then displays FIRST TIME SETUP.
5. Follow the first time setup process.

Control Valve Information

The following information can be displayed at the control valve or remote display.



1. From the **HOME** screen, press ▼ to view the main menu.



2. The screen displays the main menu. Press ✓ to select **1)INFORMATION**.

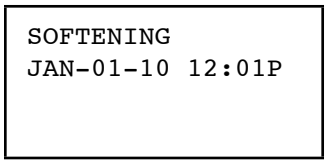
Control Valve Information Settings

These settings are read-only. Press ▼ or ✓ to scroll through the settings. Press ▲ to view the previous setting.

NOTE **All system setup settings are displayed when setting up a water softener. Settings marked with an asterisk (*) below are also displayed when setting up a filter. Settings marked with two asterisks (**) are displayed only when setting up a filter.**

Setting	Screen Display	Range	Setting Description
Media Life Left**	MEDIA LIFE LEFT 1000 GALLONS	0–max. media life	If the Media Life setting is specified during first time setup, this screen displays the remaining media life based on usage in gallons.
Media Life Left**	MEDIA LIFE LEFT 3 DAYS	0–max. media life	If the Media Life setting is specified during first time setup, this screen displays the remaining media life based on usage per day.
Salt Tank Level	SALT TANK LEVEL OK	OK Low	If a Smart Brine Tank sensor is installed, the screen displays the status of the salt. If the salt tank level is below a specificed lower limit, the screen displays **Low.**
Remain Capacity	REMAIN CAPACITY 80%	0–99%	The softening capacity remaining, displayed as a percentage of the total capacity. During manually initiated regeneration, assume zero (0) percent remaining capacity.
Remain Capacity*	REMAIN CAPACITY 16692 GALLONS	0–no limit	The softening or filtering capacity remaining, measured in gallons (liters).
Current Flowrate*	CURRENT FLOWRATE 10.8 GPM	0–no limit	The current flow rate, measured in gallons (liters) per minute.
Today's Usage*	TODAY'S USAGE 107 GALLONS	0–no limit	Today's water usage, measured in gallons (liters).

Setting	Screen Display	Range	Setting Description
Average Daily*	AVERAGE DAILY 6750 GALLONS	0–no limit	Average water usage for this configuration.
Total System Flowrate*	TOTAL SYSTEM 52.2 GPM FLOWRATE	0.0–no limit	Shown only on Master unit when Progressive Flow system is selected. This is the flow rate through the total system.
Next Regen On*	NEXT REGEN ON JAN–07	JAN-01 –DEC-31	Displays the date of the next regeneration, based on average daily water usage.
Total Water Used*	TOTAL WATER USED 107 GALLONS	0.0–no limit	Displays the total water used for this configuration. Whole numbers are displayed above 100 gallons.
External Filter Capacity Remain-ing*	EXT FILT CAP REM 98896 GALLONS	0–external filter capacity	Displays the remaining capacity of the external filter. When the remaining capacity reaches zero, the system triggers the External Filter Alarm. This information is displayed only if the External Filter Alarm is installed.



3. Press X X to save the settings and return to the home screen.

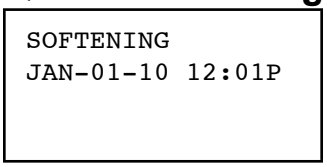
Manual Regeneration

Follow either procedure to bypass the softener or to initiate a manual regeneration at the control valve or the remote display.

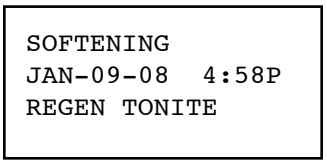
NOTE **In multi-tank systems, the regeneration request is sent to the master control. It will allow the unit to regenerate at the next available time.**

NOTE **Once regeneration is initiated the status can be changed only after the process is complete or by re-setting the motor control in the Diagnostics menu.**

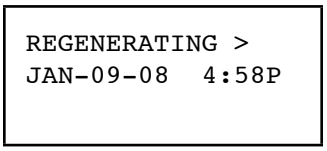
Quick Manual Regeneration



1. From the **HOME** screen, press and hold ↓ to view the home screen plus a regeneration status line.

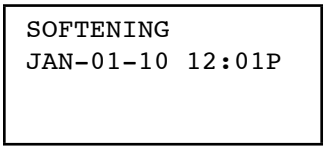


2. Press and hold ✓ for three (3) seconds. Regeneration will be delayed until a specified later time. The screen displays **REGEN TONITE** on the home screen for about one second.
3. To cancel a delayed regeneration, press and hold the ✓ for three (3) seconds. The screen displays **REGEN OFF** on the home screen.
4. Continue to hold down ✓ for six (6) seconds. The screen displays **REGEN NOW** and the softener will initiate an immediate regeneration.

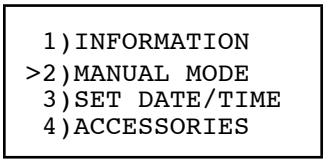


5. If REGEN NOW or REGEN TONITE is selected, the home screen displays Regenerating.

Standard Manual Regeneration



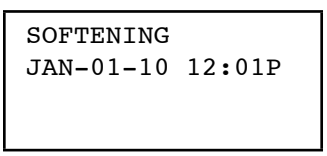
1. From the home screen, press ↓ to display the main menu.



2. From the main menu screen, press ↓ to view **2) MANUAL MODE**.
3. Press ✓. The screen displays the Manual Mode settings.

Standard Regeneration Manual Mode Settings

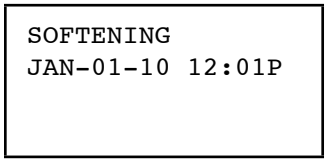
Setting	Screen Display	Range	Changing the Setting
Manual Mode	MANUAL MODE REGEN NOW	Regen Off Regen Now Regen Tonite	REGEN NOW is the default. Press ✓ to select this option to begin regeneration immediately. REGEN OFF will cancel a pending regeneration by canceling the regeneration trigger. REGEN TONITE specifies that the softener will regenerate that night at 2:00 a.m. (or at the preset regeneration time). The screen displays two status messages: Softening >> and Regen Tonite >>.



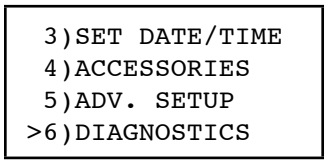
4. Press ✗ ✗ to return to the home screen.

Manual Cycling

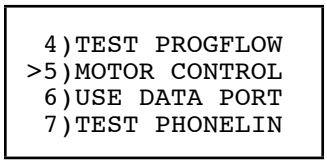
Manual cycling can be performed when the unit is starting either in SERVICE or while it is already within any portion of the REGENERATION process. If the unit is currently regenerating, the name of the current cycle position and the number of minutes remaining in the current cycle position will be displayed.



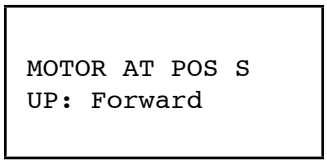
1. From the **HOME** screen, press ↓ to view the main menu.



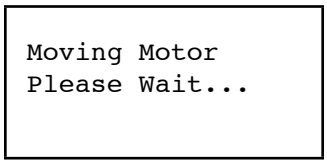
2. The screen displays the main menu. Press ↓ ↓ ↓ ↓ ↓ ✓ to select **6)DIAGNOSTICS**.



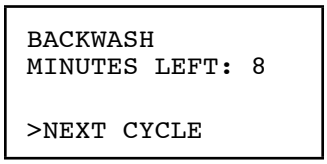
3. Press ↓ ↓ ↓ ↓ ✓ to select **5) MOTOR CONTROL**. If control is not in regeneration, the screen displays the motor control status.



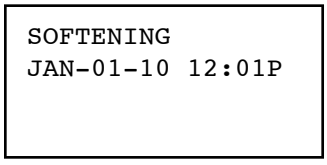
4. The displayed motor control status may be S, B, E, or F.
   S = Service
   B = Backwash
   E = Brine Draw/Slow Rinse
   F = Fast Rinse
5. Press ✓ to cycle the control valve all the way around without stopping the motor.



6. Press ✓ to move the motor to another position (such as from S to B).



7. If cycling the control during regeneration, the screen displays the remaining time left for the regeneration setting. Press ✓ ↑ or ↓ and then ✓ to select either NEXT CYCLE, END REGEN NOW, or END/CANCEL TRIG.
   a. Next Cycle will cause the control to move the valve to the next cycle
   b. End Regen Now will terminate the regeneration in process and return the control to service.
   c. End/Cancel Trig will end the regeneration process and cancel the regeneration trigger (such as from the meter or Aqua-Sensor). The unit will return to service.
8. Press ✓ to accept the new regeneration setting.



9. Press ✗ ✗ to return to the home screen.

Error and Alert Codes

When the Smart Controller identifies that an error has occurred, it is programmed to take steps to attempt to correct the error on its own. If it is unable to correct the problem, the controller will display the message “PROBLEM FOUND.” When an error message is displayed (on either the GBE Controller or the remote display), pressing the CHECK MARK button on the keypad will display the detected error condition(s). Some of these messages will also provide additional information to help correct the error.

The following error messages may display on both the Smart Controller display as well as the Remote Display (if one is connected).

If the main screen displays “PROBLEM FOUND” it indicates that there are one or more errors detected. Push the CHECK MARK button to display the first error present. Press the DOWN ARROW button to show any additional errors present. At the bottom of this list the user can press the CHECK MARK button to clear the error or press the X button to exit. Pressing the CHECK MARK button on the “CLEAR THE ERROR” message causes the controller to re-check to see if the error condition still exists, if it still exists, the error will remain displayed on the main screen. If the error no longer exists the main menu will display SYSTEM OK.

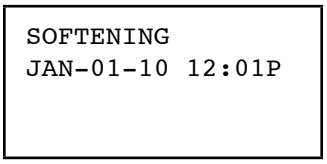
Error	Reason for Error	Comment/ Clearing Error Message
Position Sensor Error	The motor is turning, but the position sensor appears to be incorrect.	Check the motor using manual motor control and the position sensors using Main Menu / Advanced / Diagnostics Sensors.
Motor Position Error	Motor did not move when it should. No feedback from switches.	Use manual motor control to see if motor is actually working and not jammed. Use Diagnostics/ Sensor menu to verify that the optical or mechanical position switches are working.
Brine blocked	The flow rate of brine or water to or from the brine tank is fully or partially blocked.	Check brine line for blockages or air leaks. Check eductor and eductor screen for blockages.
Replace Ext Filt	Total gallons thru the unit has exceeded the specified capacity of the media.	Replace the media. Reset the media filter life at Main Menu/ Advanced Setup/Regen Settings/ Media Life.
Replace Aux Filter Media	Total gallons thru the secondary filter (i.e. “Big Blue” filter) has exceeded the specified capacity of the big blue.	Replace optional filter cartridge. Reset the aux. Filter media life at Main Menu/ Accessories/ Aux Filter menu.
Call Culligan at xxx-xxx-xxxx	This message is displayed if an error has been detected that requires servicing and no modem installed in the system.	Call the number shown. If possible, place this call using a phone that will allow you to see and enter changes to the main controller if required by the service technician during the call.
Salt Bridging	Brine tank has low concentration of brine.	Use a tool to break up any salt bridge inside the brine tank.
xx days salt remaining	This is a prediction of the number of days until it will be necessary to add salt to the brine tank.	Salt can be added to the brine tank at any time. It is recommended that the brine tank be filled to approximately 2/3 full.
Aqua-Sensor® Salt Error	Aqua-Sensor did not detect brine during the regeneration cycle.	Check brine tank. Add salt if necessary. Check Z ratio of the Aqua-Sensor® at Main Menu/ Advanced / Diagnostics/ Sensors.
No Remote RF Signal	Main board is not receiving a signal from the remote.	Remote is off, out of range or on a different channel from the main board. If interference is suspected, try moving the remote closer or switching to a different channel on both the main and remote units.
Low Salt level	Salt level is low; less than 15 days of salt remaining.	Contact Culligan dealer for salt deviery or fill brine tank with salt.
Low battery	Battery needs replacement.	Replace with Panasonic Model# CR 2032 3V battery.

Error	Reason for Error	Comment/ Clearing Error Message
Brine overfill	Too much water in brine tank. Plugged drain line flow control (Unit will not draw brine). Slow leak to brine line. Faulty eductor piston. Power outage while control was in refill position.	Check eductor; check for brine draw. Clean drain line flow control. Clean eductor screen and nozzle. Replace eductor piston.
No Refill	Failure to refill brine tank. Refill restrictor plugged. Air in brine line causes float to slam shut.	Clean or replace refill restrictor. Verify all tubing connections are properly assembled.
Motor Home Error	Incorrect valve type selected.	Change the valve type using the Advanced Setup/ Valve Type menu then return to the home screen. The screen will blank while the unit reinitializes.

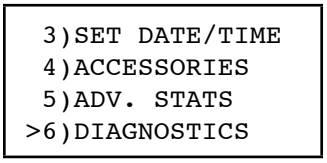
Diagnostic Screens

There are a large number of diagnostic menu screens to aid in setup and troubleshooting of the Smart Controller. Below is an overview of the menus.

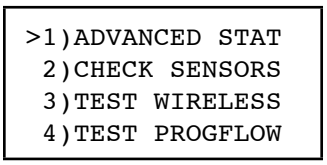
Advanced Statistics



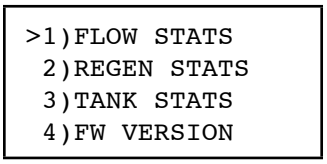
1. From the **HOME** screen, press ↓ to view the main menu.



2. The screen displays the main menu. Press ↓ ↓ ↓ ↓ ↓ ✓ to select **6)DIAGNOSTICS**.



3. The screen displays the diagnostics menu. Press ✓ to select **1)ADVANCED STAT**.

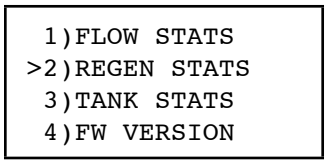


4. The screen displays the advanced statistics menu. Press ✓ to select **1)FLOW STATS**. The screen displays the first flow statistics information about the softener.

Flow Statistics

Setting	Screen Display	Range	Description
Totalized Flow	TOTALIZED FLOW 100 GALLONS	0–9999999	The screen displays the Totalized Flow, the total number of gallons of soft water since the unit was installed. Press ↓ to view the next statistic.
Current Flowrate	CURRENT FLOWRATE 10.0 GPM	0.0–999999	The screen displays the current flow rate of the unit. Press ↓ to view the next statistic.
Flow Profile R1–R6	FLOW PROFILE R1 10 MINUTES	R1–R6 0–9999999	The screen displays the Flow Profile, the amount of time that the unit spends within different flow ranges. Press ✗ to return to the Advanced Stats menu.

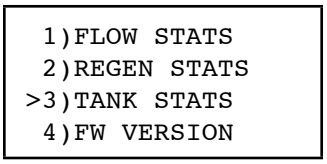
Regeneration Statistics



5. The screen displays the advanced statistics. Press ▼ ✓ to select **2)REGEN STATS**. The screen displays the first regeneration statistics information about the softener.

Setting	Screen Display	Range	Description
Total Regens	TOTAL REGENS 15	0–9999999	The screen displays the total number of regenerations since the unit was installed. Press ▼ to view the next statistic.
Regens in Last 14 Days	REGENS IN LAST 14 DAYS: 0	0–999999	The screen displays the number of regenerations in the past 14 days. Press ▼ to view the next statistic.
Days Since Last Regen	DAYS SINCE LAST REGEN:1	R1–R6 0–9999999	The screen displays the number of days since the last regeneration. Press ▼ to view the next statistic.
Last Regen On	LAST REGEN ON JAN-01	Jan–Dec, 01–31	The screen displays the the date of the last regeneration of the unit (in this example, January 1, 2010). Press ▼ to view the next statistic.
Last Regen Trig	LAST REGEN TRIG Manual	Manual, Meter, Aqua-Sensor, (Day), Aux Input, Power Outage	The screen displays the device that triggered the last regeneration. Press ▼ to view the next statistic.
Last BD/ SR Time	LAST BD/SR TIME 10 MINUTES	0–999999	The screen displays the number of minutes recorded for the last brine draw/slow rinse cycle. When using Aqua-Sensor, this value should be shorter than the programmed value as the Aqua-Sensor will detect when the rinse is complete. Press ▼ to view the next statistic.
Last Fill Time	LAST FILL TIME 10 SECONDS	0–9999999	The screen displays the number of minutes recorded for the last brine tank refill. You can use this value to check if the proper amount of water is being used to fill the tank. Press ✗ to return to the Advanced Stats menu.

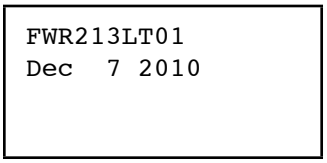
Tank Statistics



6. The screen displays the advanced statistics. Press ↓ ↓ ✓ to select **3)TANK STATS**. The screen displays the tank statistics information for the softener.

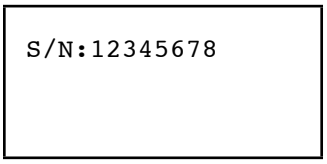
Setting	Screen Display	Range	Description
Remain Capacity	REMAIN CAPACITY 700 GALLONS	0–9999999	The screen displays the the remaining capacity of the unit, in gallons. This value can be displayed as a negative number if the unit exceeds the system capacity. The controller will continue to count the number of gallons through the softener when the capacity reaches zero. Press ↓ to view the next statistic.
Total Capacity	TOTAL CAPACITY 1000 GALLONS	0–9999999	The screen displays the total capacity of the unit, in gallons. Press ↓ to view the next statistic.
Flow Profile R1–R6	TOTAL WATER USED 50 GALLONS	0–9999999	The screen displays the total amount of water that has flowed through the unit. Press ✕ to return to the Advanced Stats menu.

Firmware Version



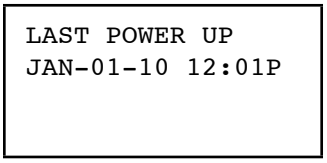
7. From the Advanced Statistics menu, press ↓ ↓ ↓ ✓ to select 4) FIRMWARE VERSION. The screen displays the latest version number and date of the firmware on the unit controller circuit board.

Serial Number

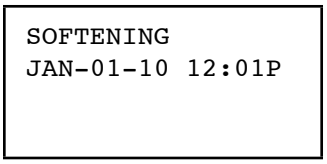


8. From the Advanced Statistics menu, press ↓ ↓ ↓ ↓ ✓ to select 5) SERIAL NUMBER. The screen displays the serial number of the circuit board.

Last Power Up



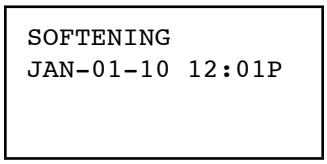
9. From the Advanced Statistics menu, press ↓ ↓ ↓ ↓ ↓ ✓ to select 6) LAST POWER UP. The screen displays the date and time when the unit was last powered on. This can be helpful if there was a power outage to see how long the unit has been powered on.



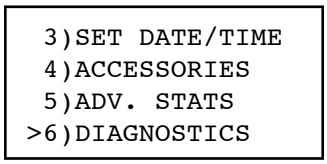
10. Press ✕ ✕ to save the settings and return to the home screen.

Check Sensors

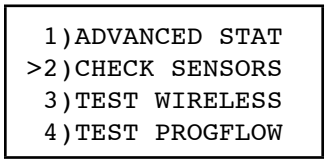
The Smart Controller Check Sensors screen displays statistics for the Main Board, Flow Meter, Aqua-Sensor®, and SBT Sensor.



1. From the **HOME** screen, press ↓ to view the main menu.



2. The screen displays the main menu. Press ↓ ↓ ↓ ↓ ↓ ✓ to select **6)DIAGNOSTICS**.



3. The screen displays the diagnostics menu. Press ↓ ✓ to select **2)CHECK SENSORS**. The screen displays information about the sensors connected to the main board, flow meter, and Aqua-Sensor®.

Check Sensors Settings

Setting	Screen Display	Range	Description
Main Board	MAIN BOARD POSITION SENSOR HOME:OFF POS:OFF	On or Off	The main board position of Home and Program switches. Service: Home Switch Off, Program Switch Off Backwash: Home Switch On, Program Switch On Brine Draw/Slow Rinse: Home Switch On, Program Switch Off Fast Rinse/Refill: Home Switch On, Program Switch On
Flow Meter	FLOW METER 10 PULS/SEC	N/A	This is what the flow meter is recording in pulses per second. This number divided by the K-Factor (pulses per gallon) then multiplied by 60 (60 seconds in a minute) gives you the flow rate in gpm.
Aqua-Sensor Supply Voltage	AQUASENSOR SUPPLY VOLTAGE 2.5VAC: PASS SIM TEST: FAIL	Pass or Fail	The supply voltage for the Aqua-Sensor®. Refer to page 31 to verify the correct reading. If the Aqua-Sensor® is not installed, the screen displays NOT INSTALLED instead of the supply voltage.
Aqua-Sensor Stats	AQUASENSOR Zratio 429496 Zminimum 0.000 00.0% Increase	N/A	ZRATIO, Impedance ratio: Number calculated by microprocessor on measured Voltage values that are converted to a digital representation. This is the value that the controller monitors in order to determine need for regeneration and salt rinse-out. ZMINIMUM, Minimum impedance ratio: reference point that the Z-ratio is compared to, in order to initiate a regeneration. This number is reset after every successful regeneration. INCREASE: During service, this number represents the percent increase of z-ratio over z-minimum. Regeneration is initiated when it reaches 7.5% or more for at least six minutes. This screen is displayed only if the Aqua-Sensor® is installed.

<table>
<tr><th>Setting</th><th>Screen Display</th><th>Range</th><th>Description</th></tr>
<tr><td>SBT Sensor</td><td>SBT SENSOR
Salometer=OP
Salt Level=OP
FR1=OP FR2=OP</td><td>BL
OP</td><td>Expected Readings on the Sensor/Diagnostic screen when the SBT probe is installed inside the brine tank. See below for settings.</td></tr>
<tr><td></td><td colspan="3">
<table>
<tr><th></th><th>Displays BL (= Blocked)</th><th>Displays OP (= Open)</th></tr>
<tr><td>Salometer</td><td>Brine at least 1" above the salt plate.</td><td></td></tr>
<tr><td>Salt Level</td><td>Normal Operation. Salt level greater than 8" above the salt plate</td><td>Salt level less than 8" above the salt plate</td></tr>
<tr><td>Flow Rate #1</td><td>Water level in brine tank is below salt plate</td><td>Water level is brine tank is more than 1" above salt plate</td></tr>
<tr><td>Flow Rate #2</td><td>Water level is brine tank is more than 1" above salt plate</td><td>Water level in brine tank is below salt plate</td></tr>
</table>
Expected Readings from the SBT probe when the probe is not installed in the brine tank.
<table>
<tr><th></th><th>Normally</th><th>Probe Inverted</th></tr>
<tr><td>Salometer</td><td>OP</td><td>BL</td></tr>
<tr><td>Salt Level</td><td>OP</td><td>OP</td></tr>
<tr><td>Flow Rate #1</td><td>BL</td><td>OP</td></tr>
<tr><td>Flow Rate #2</td><td>OP</td><td>BL</td></tr>
</table>
</td></tr>
<tr><td>SBT Average T3</td><td>SBT AVG T3
10
SECONDS</td><td></td><td>The screen displays the Smart Brine Tank T3 measurement.

In addition to these four sensors, the SBT probe takes a measurement during each regeneration cycle called T3. This measurement varies from system to system, but is typically between 10 and 60 seconds for a system. When the SBT is turned from UNINSTALLED to INSTALLED on the Accessories menu, the average value of T3 is erased and the system will use the next three regeneration cycles to compute a new T3 average number. During each subsequent regeneration, the new T3 is compared to the average T3 number. If the new T3 exceeds the average T3 by more than 50 percent then the system will display a “Brine Line Blockage—Check Brine Line” error message. The average T3 value is displayed on the diagnostic screen after the SBT sensor screen.</td></tr>
<tr><td>SBT Last T3</td><td>SBT Last T3
10
SECONDS</td><td></td><td>The screen displays the last Smart Brine Tank T3 valve recorded by the probe.</td></tr>
</table>

Test Wireless, Progressive Flow, and Motor Control

```
 1)ADVANCED STAT
 2)CHECK SENSORS
>3)CHECK WIRELESS
 4)TEST PROGFLOW
```

4. From the diagnostics menu, press ↓ ↓ ✓ to select **3)TEST WIRELESS**. The screen displays the wireless test diagnostic.

```
WIRELESS TEST
537/541
RSSI=5
```

5. Press ✓ to test the signal strength. The screen displays the number of connection attempts and the radio signal strength index. If the screen displays RSSI = 0, there is no wireless signal.
6. Press any button to return to the Diagnostics menu.

Test Progressive Flow

```
 1)ADVANCED STAT
 2)CHECK SENSORS
 3)CHECK WIRELESS
>4)TEST PROGFLOW
```

1. From the diagnostics menu, press ↓ ↓ ↓ ✓ to select **4)TEST PROGFLOW**. The screen displays the progressive flow test diagnostic.

```
PROGRESSIVE TEST
1:0000, 2:0000
3:0000, 4:0000
5:0000, Tx:1252
```

2. The progressive test screen will show the data packet transmissions from the master (Tx) and which slaves are receiving (1, 2, 3, 4, and/or 5). For example, in a triplex system, if the transmission from the master (Tx) is 0085, then you should see 1:0085 and 2:0085. 3, 4, and 5 will remain all zeros because no other slaves are connected.
3. Press any key to return to the Diagnostics menu.

Motor Control Diagnostic

```
 2)CHECK SENSORS
 3)CHECK WIRELESS
 4)TEST PROGFLOW
>5)MOTOR CONTROL
```

1. From the diagnostics menu, press ↓ ↓ ↓ ↓ ✓ to select **5)MOTOR CONTROL**. The screen displays the motor control diagnostic.

```
MOTOR AT POS S
UP:Forward
```

2. The screen displays the position of the motor. Press ↑ to change the motor position and then return to the Diagnostics menu. See “Manual Cycling” on page 72 for more information.

Aux Out Status

```
 3)CHECK WIRELESS
 4)TEST PROGFLOW
 5)MOTOR CONTROL
>6)AUX OUT STAT
```

1. From the Diagnostics menu, press ↓ ↓ ↓ ↓ ↓ ✓ to select **6)AUX OUT STAT**. The screen displays the AUX OUT STATUS settings.

```
AUX OUT STATUS
1:ON  2:OFF
3:OFF 4:OFF
5:OFF
```

2. The screen displays the status of each of the controller’s AUX Outputs. Press any key to return to the Diagnostics menu.

Aux Out Test

```
 4)TEST PROGFLOW
 5)MOTOR CONTROL
 6)AUX OUT STAT
>7)AUX OUT TEST
```

1. From the Diagnostics menu, press ↓ ↓ ↓ ↓ ↓ ↓ ✓ to select **7)AUX OUT TEST**.

```
AUX OUT TEST
AUX 3 ON

Press Enter...
```

2. The AUX OUT TEST allows you to turn the Aux Out switches on or off for testing purposes. For example, the screen displays AUX 1 ON then PRESS ENTER. This indicates that AUX 1 is currently off and if you press enter (☑) the state changes to AUX 1 ON. Press ☑ to turn cycle through all available outputs.

```
AUX OUT TEST
COMPLETE

Press Enter...
```

3. After the last output, the screen displays COMPLETE. Press ☑ to return the outputs to their previous status; the screen displays the Diagnostics menu.

Use Data Port

```
 5)MOTOR CONTROL
 6)AUX OUT STAT
 7)AUX OUT TEST
>8)USE DATA PORT
```

1. From the diagnostics menu, press ↓↓↓↓↓↓↓☑ to select **8)USE DATA PORT**. The controller will attempt to send a mini-report to the data port.

```
Mini Report:
Sending...
```

2. The controller is preparing and sending the mini-report.

```
Mini Report:
Sent...
```

3. The screen indicates when the report has been sent to the data port.
4. Press ☒ ☒ to return to the diagnostics menu.

```
Mini Report:
Busy!
```

5. If nothing is attached to the data port, the screen displays a busy message. See page 89 for data port output information.

Test Phone Line

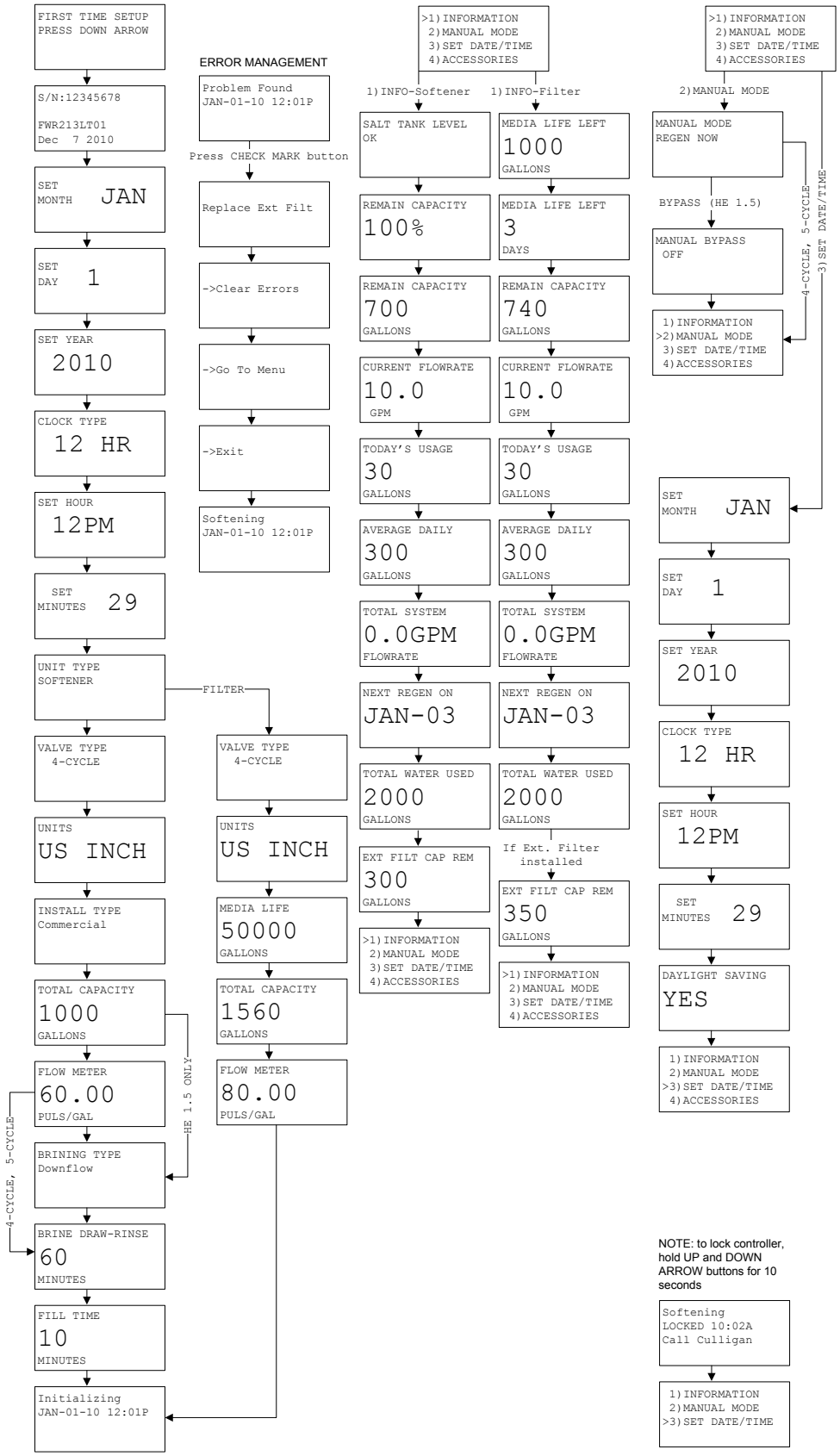
```
 6)AUX OUT STAT
 7)AUX OUT TEST
 8)USE DATA PORT
>9)TEST PHONELIN
```

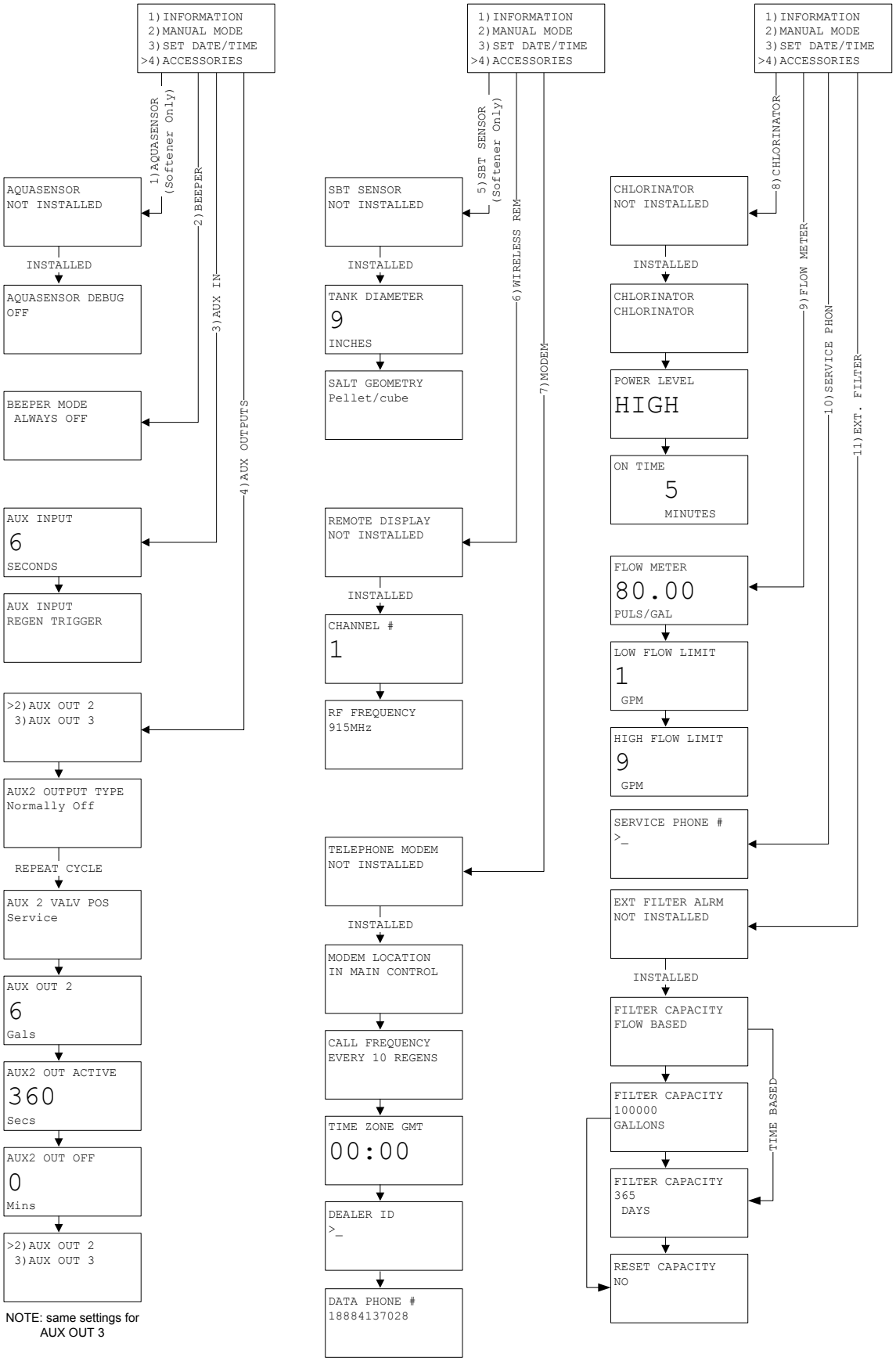
1. From the diagnostics menu, press ↓↓↓↓↓↓↓↓☑ to select **9)TEST PHONELIN**. The screen displays the modem test.

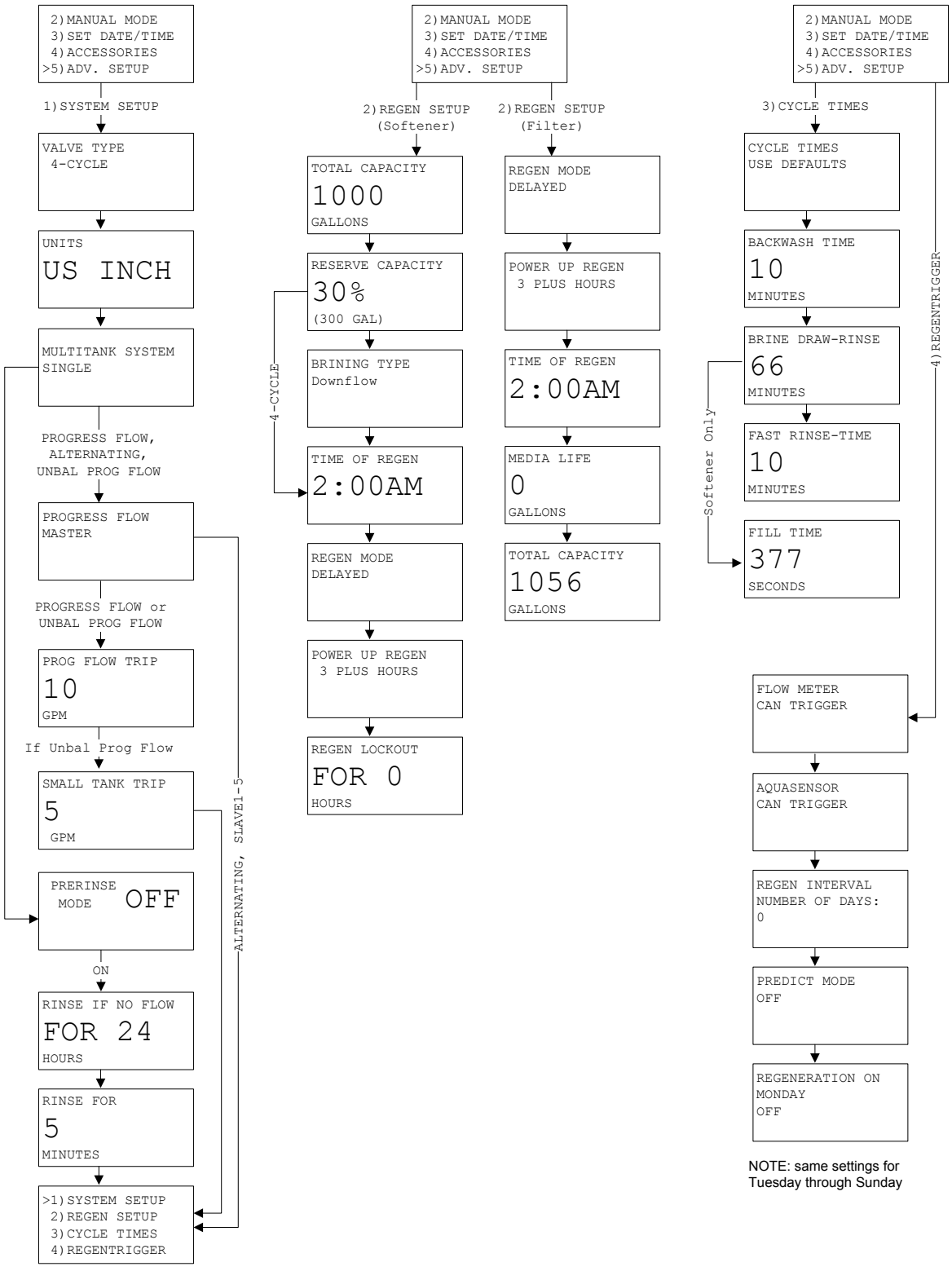
```
MODEM TEST
Emailing now
Please Wait...
```

2. The unit sends a test message through the telemetry system and reports a reason code, displayed as “REASON CODE: 1.” See Appendix B, Data Port Output on page 90 for phone line test information.

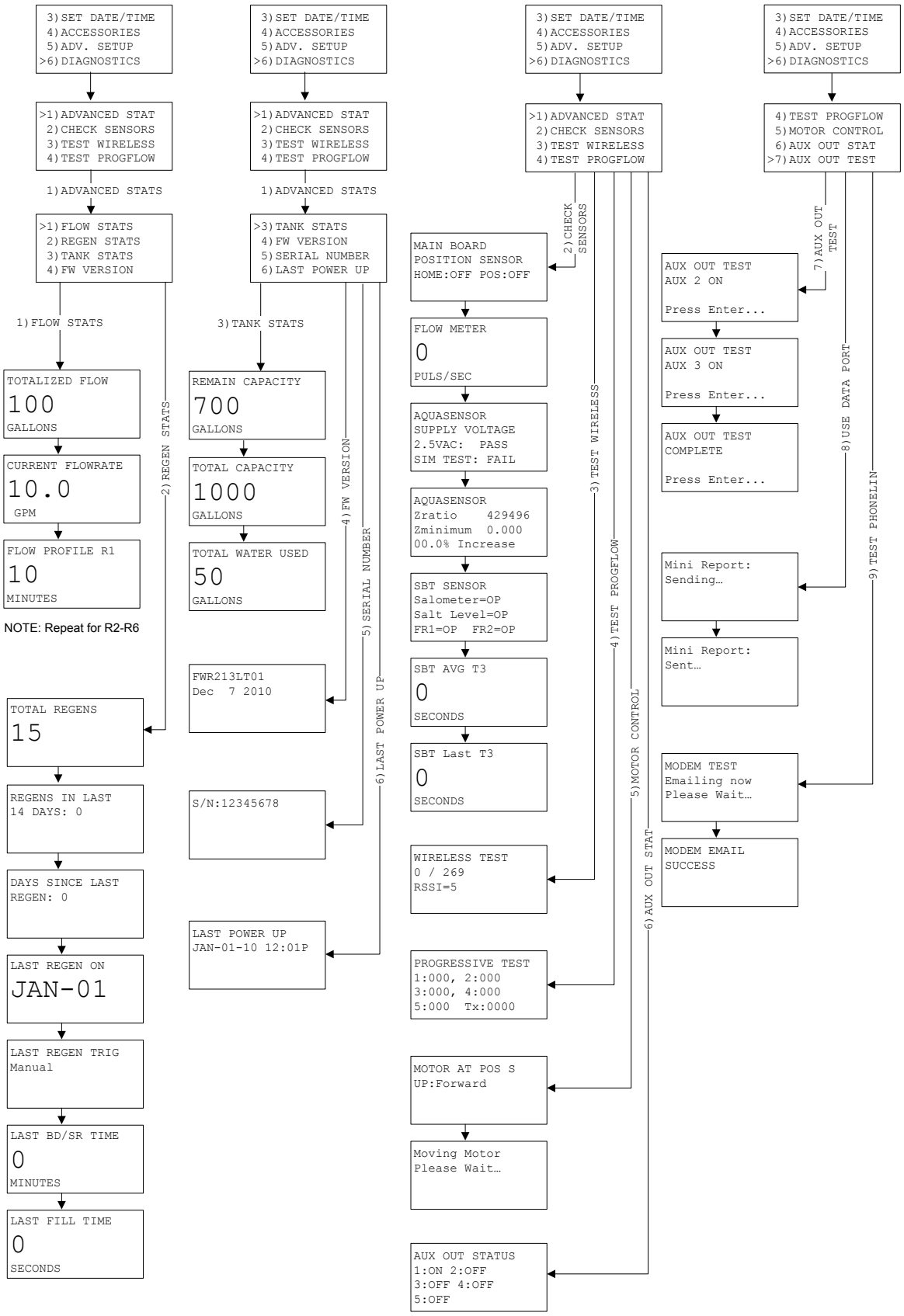
Menu Overview




1) INFORMATION
2) MANUAL MODE
3) SET DATE/TIME
>4) ACCESSORIES
1) AQUASENSOR (Softener Only)
2) BEEPER
3) AUX IN
4) AUX OUTPUTS
AQUASENSOR NOT INSTALLED
INSTALLED
AQUASENSOR DEBUG OFF
BEEPER MODE ALWAYS OFF
AUX INPUT 6 SECONDS
AUX INPUT REGEN TRIGGER
>2) AUX OUT 2 3) AUX OUT 3
AUX2 OUTPUT TYPE Normally Off
REPEAT CYCLE
AUX 2 VALV POS Service
AUX OUT 2 6 Gals
AUX2 OUT ACTIVE 360 Secs
AUX2 OUT OFF 0 Mins
>2) AUX OUT 2 3) AUX OUT 3
NOTE: same settings for AUX OUT 3
1) INFORMATION
2) MANUAL MODE
3) SET DATE/TIME
>4) ACCESSORIES
5) SBT SENSOR (Softener Only)
6) WIRELESS REM
7) MODEM
SBT SENSOR NOT INSTALLED
INSTALLED
TANK DIAMETER 9 INCHES
SALT GEOMETRY Pellet/cube
REMOTE DISPLAY NOT INSTALLED
INSTALLED
CHANNEL # 1
RF FREQUENCY 915MHz
TELEPHONE MODEM NOT INSTALLED
INSTALLED
MODEM LOCATION IN MAIN CONTROL
CALL FREQUENCY EVERY 10 REGENS
TIME ZONE GMT 00:00
DEALER ID >_
DATA PHONE # 18884137028
1) INFORMATION
2) MANUAL MODE
3) SET DATE/TIME
>4) ACCESSORIES
8) CHLORINATOR
9) FLOW METER
10) SERVICE PHON
11) EXT. FILTER
CHLORINATOR NOT INSTALLED
INSTALLED
CHLORINATOR CHLORINATOR
POWER LEVEL HIGH
ON TIME 5 MINUTES
FLOW METER 80.00 PULS/GAL
LOW FLOW LIMIT 1 GPM
HIGH FLOW LIMIT 9 GPM
SERVICE PHONE # >_
EXT FILTER ALRM NOT INSTALLED
INSTALLED
FILTER CAPACITY FLOW BASED
FILTER CAPACITY 100000 GALLONS
FILTER CAPACITY 365 DAYS
TIME BASED
RESET CAPACITY NO



NOTE: same settings for Tuesday through Sunday


3)SET DATE/TIME
4)ACCESSORIES
5)ADV. SETUP
>6)DIAGNOSTICS
>1)ADVANCED STAT
2)CHECK SENSORS
3)TEST WIRELESS
4)TEST PROGFLOW
1)ADVANCED STATS
>1)FLOW STATS
2)REGEN STATS
3)TANK STATS
4)FW VERSION
1)FLOW STATS
TOTALIZED FLOW
100
GALLONS
CURRENT FLOWRATE
10.0
GPM
FLOW PROFILE R1
10
MINUTES
NOTE: Repeat for R2-R6
2)REGEN STATS
TOTAL REGENS
15
REGENS IN LAST
14 DAYS: 0
DAYS SINCE LAST
REGEN: 0
LAST REGEN ON
JAN-01
LAST REGEN TRIG
Manual
LAST BD/SR TIME
0
MINUTES
LAST FILL TIME
0
SECONDS
>3)TANK STATS
4)FW VERSION
5)SERIAL NUMBER
6)LAST POWER UP
3)TANK STATS
REMAIN CAPACITY
700
GALLONS
TOTAL CAPACITY
1000
GALLONS
TOTAL WATER USED
50
GALLONS
4)FW VERSION
FWR213LT01
Dec 7 2010
5)SERIAL NUMBER
S/N:12345678
6)LAST POWER UP
LAST POWER UP
JAN-01-10 12:01P
2)CHECK SENSORS
MAIN BOARD
POSITION SENSOR
HOME:OFF POS:OFF
FLOW METER
0
PULS/SEC
AQUASENSOR
SUPPLY VOLTAGE
2.5VAC: PASS
SIM TEST: FAIL
AQUASENSOR
Zratio 429496
Zminimum 0.000
00.0% Increase
SBT SENSOR
Salometer=OP
Salt Level=OP
FR1=OP FR2=OP
SBT AVG T3
0
SECONDS
SBT Last T3
0
SECONDS
3)TEST WIRELESS
WIRELESS TEST
0 / 269
RSSI=5
4)TEST PROGFLOW
PROGRESSIVE TEST
1:000, 2:000
3:000, 4:000
5:000 Tx:0000
5)MOTOR CONTROL
MOTOR AT POS S
UP:Forward
Moving Motor
Please Wait…
6)AUX OUT STAT
AUX OUT STATUS
1:ON 2:OFF
3:OFF 4:OFF
5:OFF
4)TEST PROGFLOW
5)MOTOR CONTROL
6)AUX OUT STAT
>7)AUX OUT TEST
7)AUX OUT TEST
AUX OUT TEST
AUX 2 ON
Press Enter...
AUX OUT TEST
AUX 3 ON
Press Enter...
AUX OUT TEST
COMPLETE
Press Enter...
8)USE DATA PORT
Mini Report:
Sending…
Mini Report:
Sent…
9)TEST PHONELIN
MODEM TEST
Emailing now
Please Wait…
MODEM EMAIL
SUCCESS

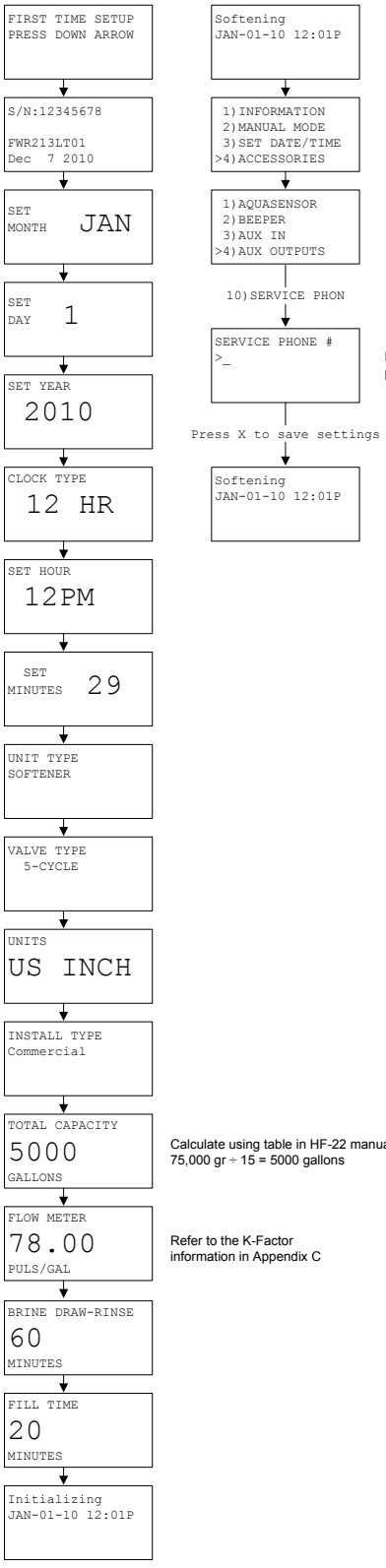
Smart Controller (GBE) Parts and Accessories

Part Number	Item
Complete Controls	
01020677	Smart Controller Complete for CSM
01020676	Smart Controller Complete for Hi-Flo 42, Hi-Flo 50
01021766	Smart Controller Complete for Hi-Flo 3e, 3"
01021596	Hi-Flo 22 Softener Control Valve with Smart Controller
01021597	Hi-Flo 22 Filter Control Valve with Smart Controller
01021123	Hi-Flo 3e Softener Valve with Smart Controller, HWB, 2" (16–24" tank)
01021124	Hi-Flo 3e Softener Valve with Smart Controller, HWB, 2” (30” tank)
01021125	Hi-Flo 3e Softener Valve with Smart Controller, NHWB, 2” (16–24” tank)
01021126	Hi-Flo 3e Softener Valve with Smart Controller, NHWB, 2” (30” tank)
01021765	Hi-Flo 3e Softener Valve with Smart Controller HWB, 3”
01021764	Hi-Flo 3e Softener Valve with Smart Controller NHWB, 3”
Accessories and Replacement Parts	
01020745	Replacement Smart Controller Board
01020498	Replacement Key pad
01020493	Face Plate, Smart Controller
01020748	Auxiliary Board
01020747	Modem Board
01020750	RF Board
01022238	Chlorinator/Alarm Relay Board
01020553	Remote Display—Complete for Softener/Filter ONLY
01014897	Transformer
01020447	Smart Brine Tank Accessory
01008779	Aqua-Sensor—Steel Tank
01018959	Aqua-Sensor—Fiberglass Tank
CR 2032	Battery (available at local electronics and retail stores)
Cables and Kits	
01016327	Communication Cable
01016342	Communication Cable – Duplex Alternating
01016333	Duplex Progressive Kit
01016334	Triplex Progressive Kit
01016369	Duplex Alternating Kit
01021402	SBT Extension Cable, 20ft
01021507	PLC-USB Communication Cable
01021509	PLC-RS485 Communication Cable
01021508	PLC-RS232 Communication Cable
01023103	PLC-Modbus Communication Cable
01023227	Cable, Disc Meter
Conversion Kits	
01022166	Hi-Flo 22 MVP to Hi-Flo 22 Smart Controller
01022162	Hi-Flo 3/2900/MVP to Hi-Flo 3e/Smart Controller
01022164	3900 3" to Smart Controller
01022165	Universal Conversion, works on Hi-Flo 2/2e, 2850, 3150
01018209	Fleck 2" Meter Conversion Kit, Mechanical to Electronic, 8 ft. Cable
01023062	Fleck 3" Meter Conversion Kit, Mechanical to Electronic

Appendix A Programming Examples

Quick Programming—First Time Setup with Delayed Regeneration

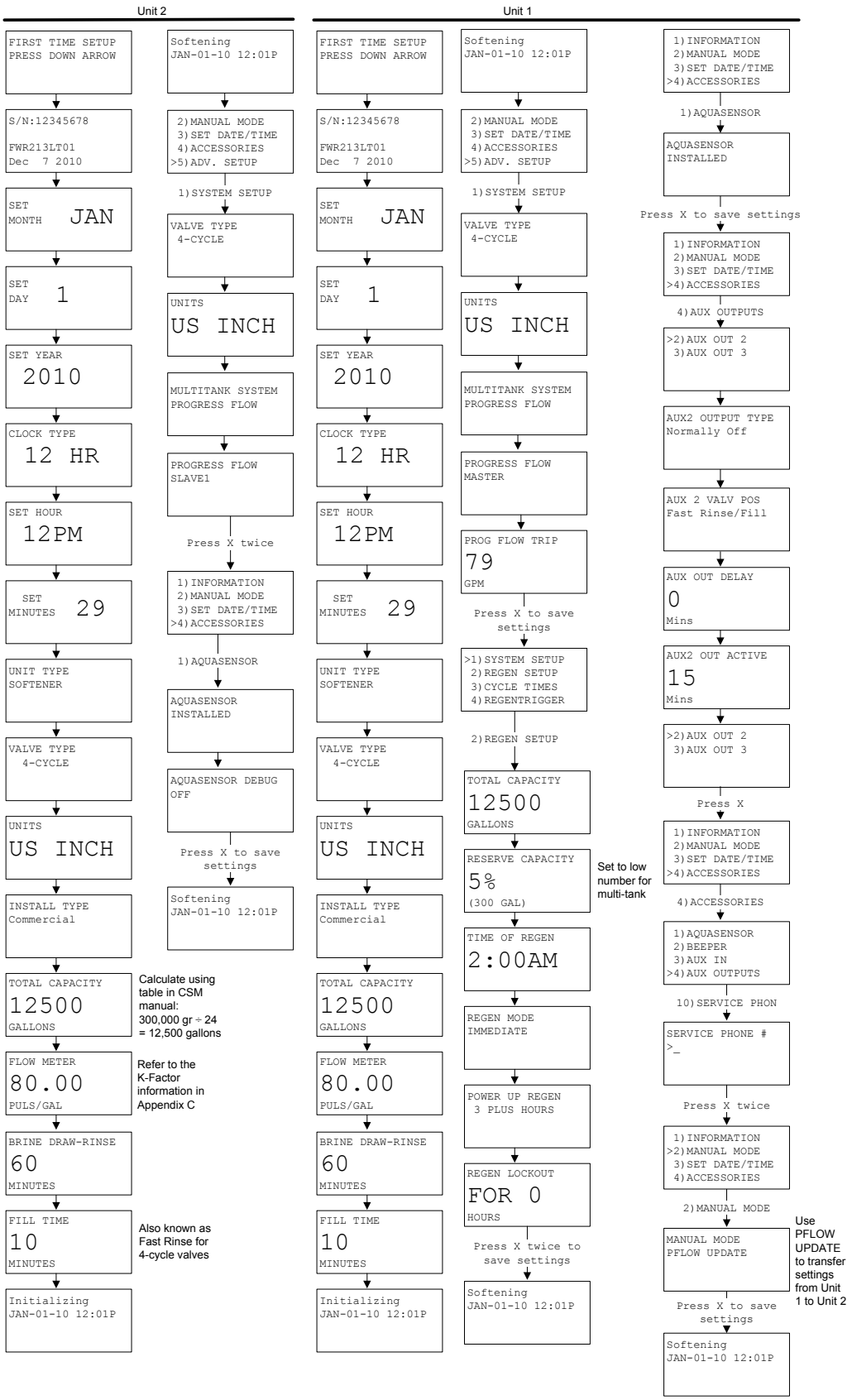
Hi-Flo 22 Softener (WS-090, 5-Cycle) with Single Meter: salt dosage=30, hardness=15 gpg



Quick Programming—Duplex Progressive Flow with Aqua-Sensor®

CSM 450-2: salt dosage=90 lbs, hardness=24 gpg

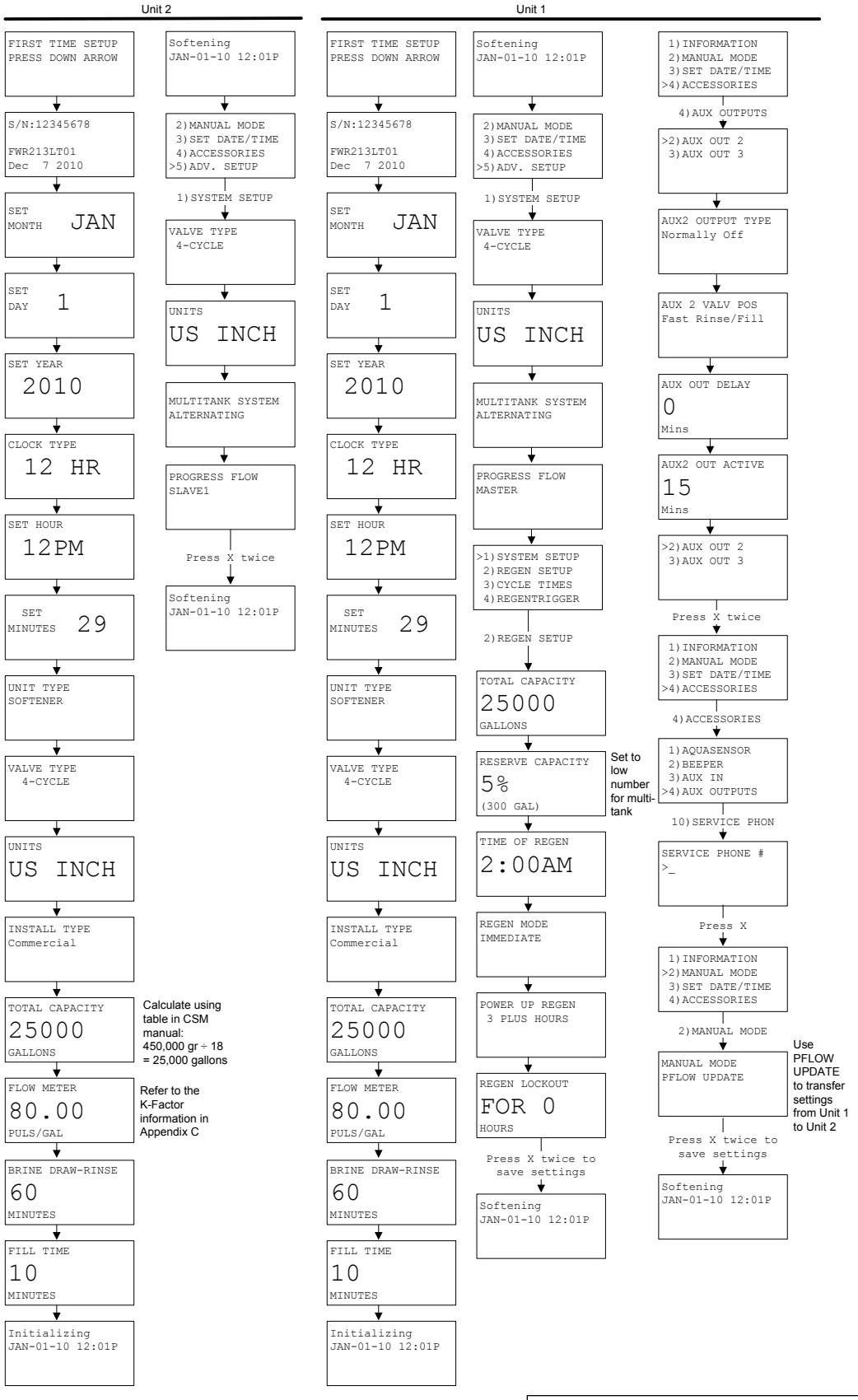
NOTE Perform first-time setup and programming for Unit 2 and then for Unit 1.



Quick Programming Chart—Duplex Alternating Flow

CSM 300-2: salt dosage=150 lbs, hardness=18 gpg

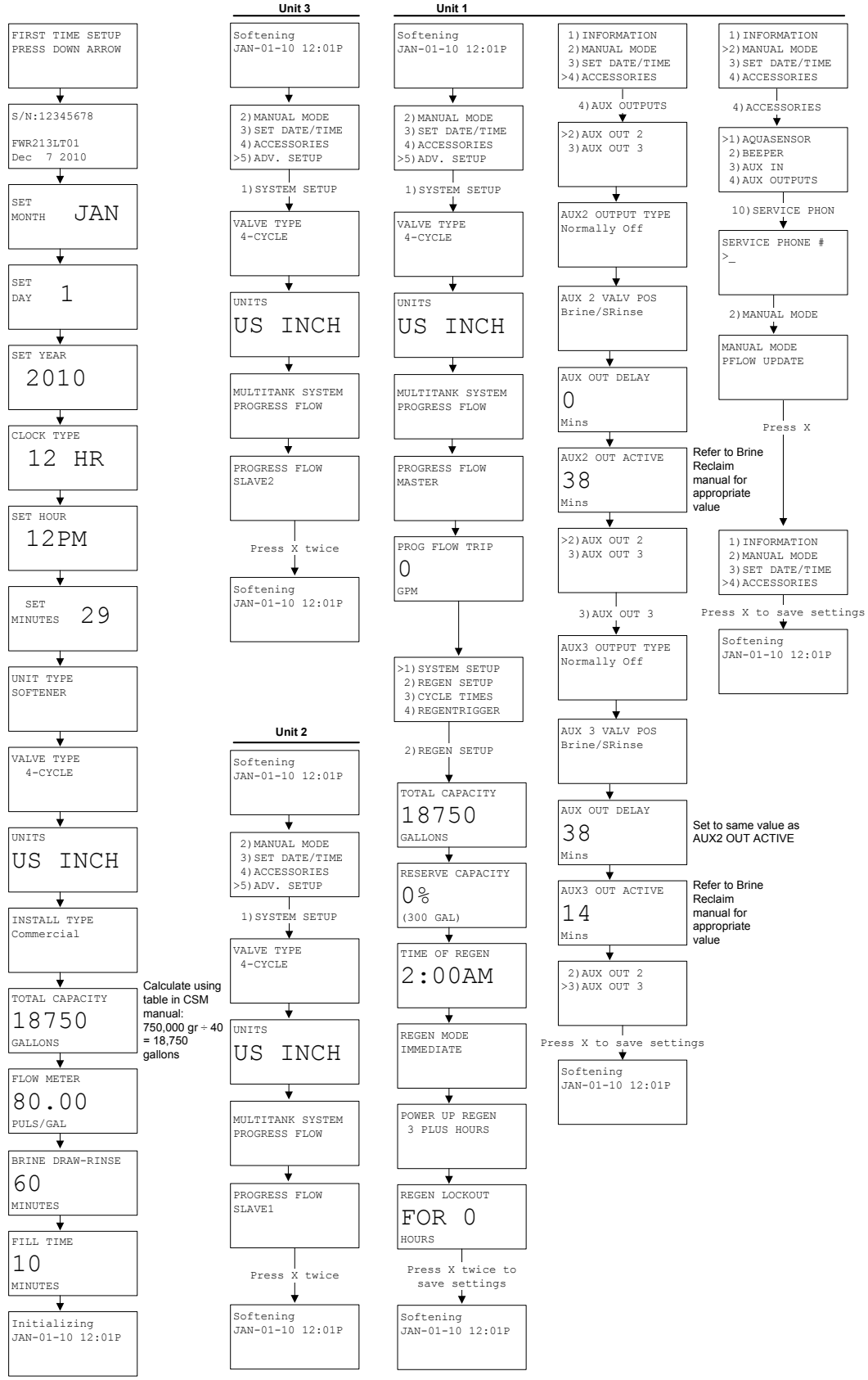
NOTE Perform first-time setup and programming for Unit 2 and then for Unit 1.



Quick Programming Chart—Triplex with Parallel Flow/Brine Reclaim

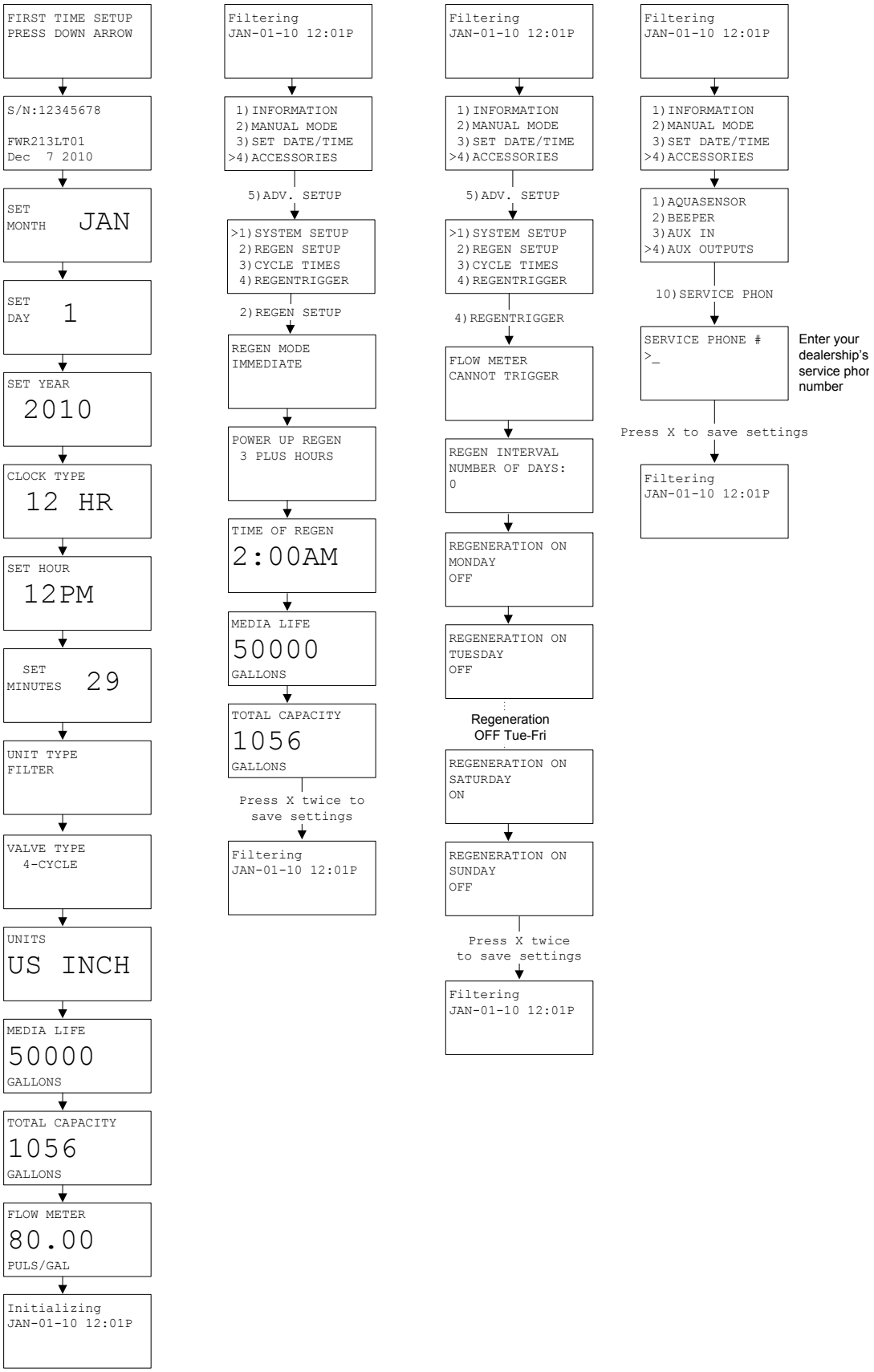
CSM 750-3: salt dosage=375 lbs, hardness=40 gpg

NOTE Perform first-time setup and programming for Unit 3, then Unit 2, and then for Unit 1.



Quick Programming Chart—CSM Filter (Single Time Clock Regeneration)

NOTE Set up Total Capacity only if the system configuration uses a meter to trigger regeneration.



Appendix B Data Port Output

Culligan Smart Controller—Data Port Output

The Smart Controller (GBE) is used to control water softeners, filters and commercial RO systems. This controller has the ability to provide status messages to a customer's equipment using RS-232 and RS-485 communication protocols. These protocols are commonly used to send information from the Smart Controller to either a customer's PC or to a building management system or programmable logic controller (PLC). The information is one way in that the Smart Controller can send this information out, but the Smart Controller cannot receive or respond to any commands sent into the communication port. The Smart Controller sends a status message every 60 seconds. The information is send as a short text (ASCII), comma separated string of letters and numbers.

The information contained in the status message depends upon what type of equipment is being controlled by the GBE.

Single Water Softener or Filter controlled by the Smart Controller

The format of the status message is: CULL,A,B,C,D,E,F,G

Example: CULL,00016524,000051.5,1,00000000,0x0000,1,0329101314

Where the values for the fields A thru F are as follows:

A = total gallons since new

B = current flow rate in gallons per minute (57.2 means 57.2 gallons per minute)

C = Current Status Indicator (0 = initialization, 1=service, 2=prerinse, 3=regen, 4= standby)

D = capacity remaining in gallons

E = Error Flag (see below)

F = 1

G = A ten-digit number representing the date and time (24-hour format)

Error Bit	Meaning
0	Internal Valve Leak
1	Salt Bridging Detected
2	Brine Line Blocked
3	Brine Tank Overfill Error
4	Replace Media Filter
5	No RF Remote Signal
6	AquaSensor Salt Error (possibly low salt or failed eduction)
7	Motor Homing Error
8	Motor Position Sensor Error
9	Low Salt Level in Brine Tank
10	(not used)
11	AquaSensor Probe Fault (probe has failed, not plugged in or AquaSensor transformer failed)
12	Less than 14 Days Salt

The error flag is sent as a hexadecimal number in the format 0xWXYZ as follows:

W				X				Y				Z			
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Each error bit is either 0, meaning that this error is NOT present, or 1, meaning that this error IS present. Each of the four-bit sections (W, X, Y and Z) are then combined into a four digit binary word which is converted to a hexadecimal digit.

As an example, if there are no errors present, then the value would be 0x0000.

If there were a ‘Replace Media Filter’, ‘Aquasensor Salt Err’ and ‘Motor Position Sensor Error’ present then bits 4, 6 and 8 would be set to 1 and all other bits would be 0, respectively.

	W				X				Y				Z			
Error Bits	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Binary	0	0	0	0	0	0	0	1	0	1	0	1	0	0	0	0
hexadecimal	0				1				5**				0			
Error Flag	0x0150															

*Note that the first two characters of the error flag are always “0x” to signify that this is a hexadecimal number

** In hexadecimal, the number 4 bit equals 1, the number 5 bit equals 2, the number 6 bit equals 4, and the number 7 bit equals 8. Therefore, when you add the #4 bit value to the #1 bit value, you get 5.

So the value of the error flag would be 0x0150 if these three errors were present.

NOTE If the GBE is controlling a filter (instead of a water softener) then the above message definitions are identical, but that error flags 1,2,3,6,9 and 11 will always be zero for a filter.

Progressive Flow System of Smart Controller-Controlled Water Softeners

The format of the status message for a progressive flow network consists of a series of individual lines of information, one line for each of the Smart Controller-controlled softeners. For example, in a triplex progressive flow network, every 60 seconds, the data port on the master unit will send out the following three lines of information:

CULL,A1,B1,C1,D1,E1,1,G1

CULL,A2,B2,C2,D2,E2,2,G2

CULL,A3,B3,C3,D3,E3,3,G3

example:

CULL,00052754,000003.7,1,00009110,0x0000,1,0329101314

CULL,00042674,000003.5,1,00004321,0x0000,2,0329101314

CULL,00010204,000000.0,4,00005444,0x0000,3,0329101314

The 1 at the end of the first line indicates that this line is the status for the Master unit in the progressive flow network. The 2 and 3 on the subsequent lines indicate that this data is for slave unit #1 and slave unit #2, respectively. The information contained on each line is of the same format as described in the Single softener section above.

Electrical Connections

The Culligan Data Cable Connector is terminated with a D-sub9 style female termination. The customer must provide the following pin connections:

Pin	Function
3 (Input)	TD (data coming FROM the GBE board
2 (Output)	RD (this line is required even though no data is sent TO the GBE board)
7 (Input)	RTS
8 (Output)	CTS
5 (Signal gnd)	GND

The data coming from the Smart Controller board is at the following conditions:

Bits Per Second: 9600
Data Bits: 8
Parity: None
Stop Bits: 1
Flow Control: None

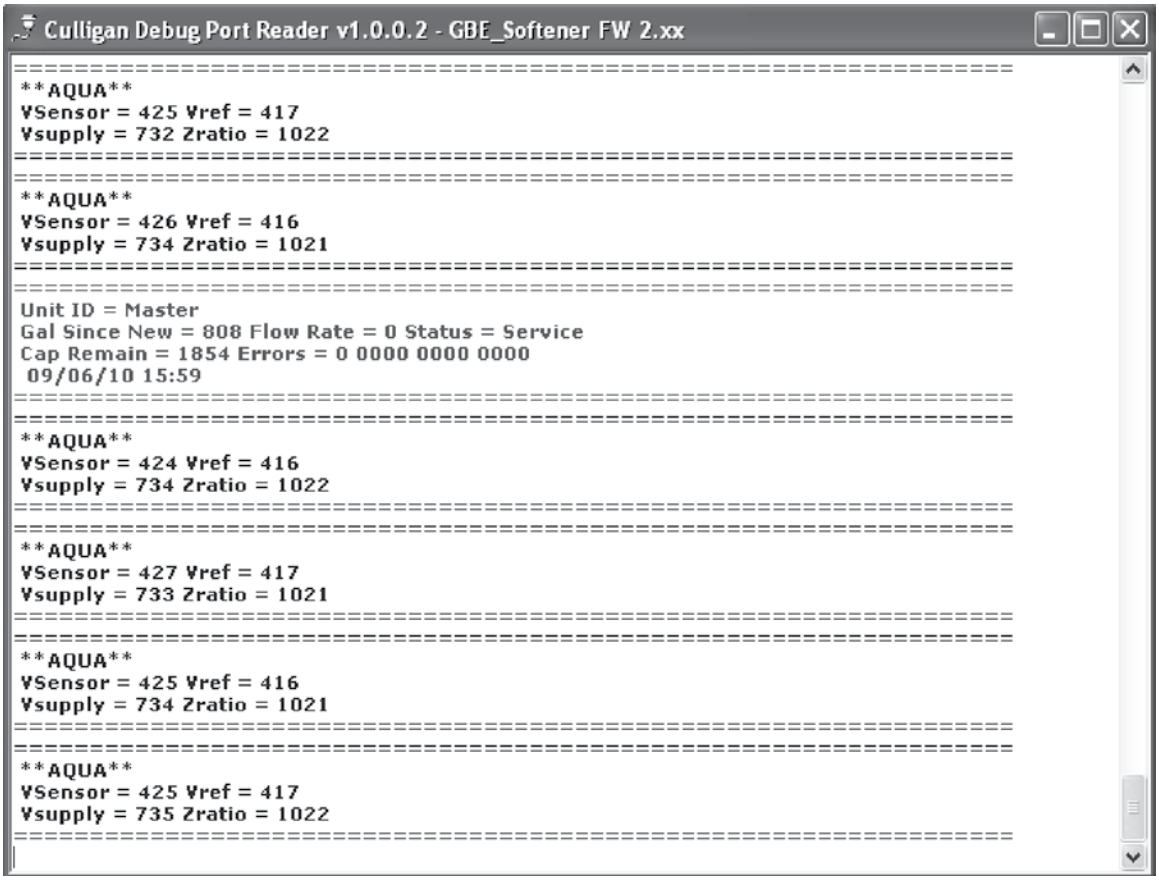
Refer to “Accessories Parts List” on page 124 for a list of cables currently available.

Test the Data Port

The Culligan Smart controller is capable of communicating with many different types of equipment including laptop and desktop computers running Microsoft Windows® operating systems. In order to connect the Smart Controller to a computer you will need a USB-to-GBE cable, Culligan P/N 01021507. You will also need to download a installation file from the myCulligan Web site on the GBE downloads page. The file is called “Setup_Culligan_GBE.EXE”. Once you copy the file to your PC, you can double-click on the file to install the USB drivers and the Data Port Output Viewer to your local hard drive. You will be asked which directory you want to copy these files to. You may select any directory. Note: Previous instructions showed how to view the output in Windows’ Hyperterminal. Although this is still possible, this program makes the process much more simple.

The instructions for using the program are included with the download. The program is a simple viewer window that shows the decoded messages sent to the debug port. See figure below.

The following pages describe how to send a mini report to the viewer.



Send a Test Message from the Smart Controller

```
SOFTENING
JAN-01-10 12:01P
```

1. From the **HOME** screen, press ↓ to view the main menu.

```
 3)SET DATE/TIME
 4)ACCESSORIES
 5)ADV. STATS
>6)DIAGNOSTICS
```

2. The screen displays the main menu. Press ↓ ↓ ↓ ↓ ↓ ✓ to select **6)DIAGNOSTICS**.

```
 5)MOTOR CONTROL
 6)AUX OUT STAT
 7)AUX OUT TEST
>8)USE DATA PORT
```

1. From the diagnostics menu, press ↓ ↓ ↓ ↓ ↓ ↓ ↓ ✓ to select **8)USE DATA PORT**. The controller will attempt to send a mini-report to the data port.

```
Mini Report:
Sending...
```

2. The Smart Controller sends a test message to the hyperterminal screen that generates a Mini Report. See Figure 44.

```
Mini Report:
Sent...
```

3. The screen indicates when the report has been sent to the data port.
4. Press X X to return to the diagnostics menu.

*** MINI REPORT ***

SN = 00000041
FW Version = FWR210LT01
Valve Type = 4-CYCLE
Date = 4/30/10
Time = 11:00
Total = 0 GAL
regen 14d = 0
trigger = Manual
type = softener
hardness units = US
Hardness = 26 grains
Resin = 1.00 cu/ft
avg mon = 300 GAL
avg tue = 300 GAL
avg wed = 300 GAL
avg thr = 198 GAL
avg fri = 300 GAL
avg sat = 300 GAL
avg sun gal = 300 GAL
bw time = 1 min
BD rinse = 1 min
F rinse = 10 min
Fill = 60 sec
Dosage = 9.0 LBS
DAS = SOFTEST
Iron = 0 PPM

Pressure = HIGH
Salt type = NaCl
Resin type = std
BF Flow control = 0.45 GPM
Eductor Flow control = 32.0
Reserve capacity = 10 %
flow meter trig = yes
aquasensor trig = no
regen interval = 0
predict mode = no
day of week mode = none
brine type = Downflow
pre-rinse mode = no
prerinse after 24 hours
prerinse for 5 mins
units = US
A/S = not installed*
SBT = not installed*
Flow Profile R1 = 0
Flow Profile R2 = 0
Flow Profile R3 = 0
Flow Profile R4 = 0
Flow Profile R5 = 0
Flow Profile R6 = 0

* Softener only.

Figure 45. Mini Report from data port.

C Flow Device K-Factor Data

Meter Type	Installation Fitting Type/Material	Pipe Size NPT	Flow Range (GPM)	K-Factor Gallons	K-Factor Liters	Culligan Part No.	Shaded = Obsolete
Culligan	Turbine, PVC, NPT	0.5"		80	21.1	01021033	
	Tubine, PVC, NPT	0.75"		80	21.1	01021259	
	Turbine, Noryl, NPT	1.5"	1-60	72 on valve 67 away from	19 on valve, 17.7 off valve	01009910	
	Turbine, Noryl, Union Ends, NPT	2.0"	3-200	10.5	2.8	010150646	
Clack	Tee, Stainless Steel, NPT	1.5"	0.75-75	37	9.8	01020408	
	Tee, Stainless Steel, NPT	2.0"	1.5-150	20	5.3	01020409	
	Tee, Stainless Steel, NPT	3.0"	3.5-350	8	2.1	01021978	
GE/ Autotrol	Turbine, Noryl, Union, NPT Turbine, Noryl, Union, PVC Soc	1.0"	0.25-40	62	16.4	01018887 01018888	
	Turbine, Noryl, Union, SS, NPT	1.5"	5-250	15	4	01018954	
	Turbine, Noryl/SS, Union, NPT Turbine, Noryl/PVC, Union, Soc	2.0"	5-250	15	4	01018891 01018892	
Fleck	Hi-Flo 22 integral plastic	1.5"	0.5-60	78	20.6	01019670	
	Tee, Brass, NPT	1.5"	1.5-75	4	1.1	-	
	Tee, Brass, NPT	2.0"	3-150	2	0.5	-	
	Tee, Brass, NPT	3.0"	7-300	0.67	0.2	-	
SeaMetrics 	Tee, Brass, NPT	2.0"	3.1-195.8	18	4.8	01008782	
	Saddle Clamp, Brass Tee, Brass, NPT Sweat, Copper	3.0"	6.6-440.6	11	2.9	01009751 01009752 01009753	
	Saddle Clamp, Brass Tee, Brass, NPT Sweat, Copper	4.0"	11.74-783.2	6.5	1.7	01009754 01009755 01009756	
GF/Signet Paddle-wheel  **Blue Nut**	Tee, Sch. 80, PVC, NPT	1.0"	0.6-42	352.4	93.1	OBS	
		1.25"	1.2-77	177.2	46.8	D1018838	
		1.5"	1.6-106	117.9	31.1	D1018839	
		2.0"	2.7-179	66.7	17.6	D1018840	
		2.5"	3.8-256	43	11.4	D1018841	
		3.0"	6.0-401	26.7	7.1	D1018842	
		4.0"	10.5-701	15	4	D1018843	
	Saddle, Sch. 80, PVC	2.5"	3.9-256	43	11.4	D1018834	
		3.0"	6.0-401	36.7	9.7	D1018835	
		4.0"	10.5-701	15	4	D1018836	
		6.0"	16.7-1595	8.3	2.2	D1018837	
	Tee, Copper Sweat	1.0"	0.7-48	256.4	67.7	D1018822	
		1.25"	1.1-75	176.4	46.6	D1018823	
		1.5"	1.6-107	115.7	30.6	D1018824	
		2.0"	2.8-187	63.4	16.8	D1018825	
	Tee, Galvanized Steel, Sch. 40, NPT	1.0"	0.7-44	213	56.3	D1018826	
		1.25"	1.2-80	127.7	33.7	D1018827	
		1.5"	1.7-110	94.4	24.9	D1018828	
		2.0"	2.8-184	58.4	15.4	D1018829	
	Saddle, Sch. 40, Iron	2.5"	4.5-298	37.6	9.9	D1018830	
		3.0"	6.9-460	23.2	6.1	D1018831	
		4.0"	11.9-793	13.3	3.5	D1018832	
		6.0"	27-1800	7.2	1.9	D1018833	
	Brazolet, Brass	2.5"	4.0-264	37.6	9.9	D1018814	
		3.0"	6.2-411	24.3	6.4	D1018815	
		4.0"	10.8-716	13.9	3.7	D1018816	
		6.0"	25-1624	7.52	2	D1018817	
	Weldolet, Carbon Steel	2.5"	4.0-264	37.6	9.9	D1018818	
		3.0"	6.2-411	24.3	6.4	D1018819	
		4.0"	10.8-716	13.9	3.7	D1018820	
		6.0"	25-1624	7.52	2	D1018821	

Culligan® Softener and Filter Program Log

Cat. No. 01022883
Rev. B 01/10/10
DCO # 000000

Use this log to record the program settings for any Smart Controller (GBE) controlled softener or filter. Circle or enter the observed value. Make additional copies to keep on file near the installation and with your local Culligan dealer.

Program Date: _____ Installer: _____ Site Location: _____

Smart Controller ESN: _____ Firmware Version: _____ ☐Softener ☐Filter

Regeneration Initiation (check all that apply): ☐Time Clock ☐Meter ☐Aqua-Sensor ☐Other

First Time Setup

Month		
Day		
Year		
Clock Type	12 Hr/24 Hr	
Hour		
Minutes		
Unit Type	Softener/Filter/R+C	
Valve Type	HE 1, HE 1.5, HE 1 Twin, 4-Cycle, 5-Cycle, Plat Plus	
Units	US Inch/Metric	
Install Type	Residential, Commercial	S Only
Brining Type	Downflow, Upflow, Proportional	S Only
Tank Diameter		S Only
Hardness		S Only
Media Life		F Only
Total Capacity		F Only

Advanced Setup

Valve Type	HE 1, HE 1.5, HE 1 Twin, 4-Cycle, 5-Cycle, Plat Plus	
Units	US Inch/Metric	
Multitank System	Single Twin Progress Flow Alternating Unbal Prog Flow	
Prog Flow Trip		
Progress Flow	Master/Slave (_____)	
Small Tank Trip		
Prerinse Mode	OFF/ON	
Rinse If No Flow		
Rinse For		

Regeneration Setup

Total Capacity		
Reserve Capacity		S Only
Brining Type		S Only
Time of Regen		
Regen Mode	Delayed/Immediate	
Power Up Regen		
Regen Lockout		S Only
Media Life		F Only

Cycle Times

Backwash		
Brine Draw-Rinse		
Fast Rinse Time		
Fill Time		

Regeneration Triggers

Flow Meter	Can/Cannot	
Aqua-Sensor	Can/Cannot	S Only
Regen Interval		
Predict Mode	OFF/ON	S Only
Regen On		

On Remote Display

Remote Display	Installed/Not Installed	
Channel #		
Radio Frequency	915	

Accessories

Aqua-Sensor	Installed/Not Installed	S Only
Debug	ON/OFF	S Only
Beeper Mode	Always On Always Off 12 Hr. Warnings 24 Hr. Warnings	
Aux Input	Normal/Alarm	
Aux2 Output Type	Normally On Normally Off Repeat Cycle	
Aux2 Valv Pos		
Aux2 Out Delay		
Aux2 Out Active		
Aux2 Out Off		Repeat Cycle
Aux3 Output Type	Normally On Normally Off Repeat Cycle	
Aux3 Valv Pos		
Aux3 Out Delay		
Aux3 Out Active		
Aux3 Out Off		Repeat Cycle
SBT Sensor	Installed/Not Installed	S Only
Tank Diameter		S Only
Salt Geometry	Pellet/Rock/ Brick/Special	S Only
Remote Display	Installed/Not Installed	
Channel #		
Radio Frequency	915	
Modem	Installed/Not Installed	
Modem Location	Main Control/ In Remote	
Call Frequency		
Time Zone GMT		
Dealer ID		
Date Phone #		
Chlorinator	Installed/Not Installed	
Power Level		
On Time		
Meter	Installed/Not Installed	
Puls/Gal		
Low Flow Limit		
High Flow Limit		
Service Phone #		
Ext Filter	Installed/Not Installed	S Only
Filter Capacity		S Only
Reset Capacity	Yes/No	S Only

Warning! If incorrectly installed, operated or maintained, this product can cause severe injury. Those who install, operate, or maintain this product should be trained in its proper use and warned of its dangers before attempting to install, operate or maintain this product.

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