BECSys5

Operation and Maintenance Manual

NSF

Certified to NSF/ANSI Standard 50

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BECS TECHNOLOGY

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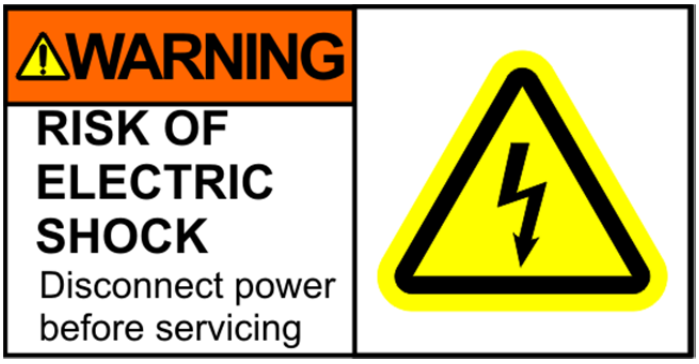
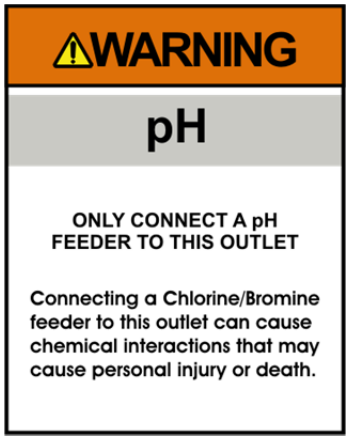
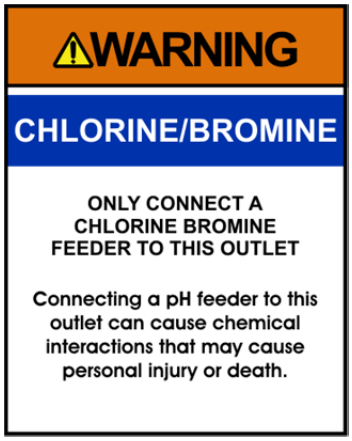
Warnings

Pay particular attention to the following warnings encountered while utilizing your BECSys5 Water Chemistry Controller:







Warning: Various other warning boxes may be found throughout the manual text.

Caution: Various caution boxes may be found throughout the manual text.

General Guidelines

Proper installation and use of the BECSys controller depends on the specific needs of the application. Read the manual completely before starting the installation and ensure all guidelines and recommendations are followed. All components should be mounted and the flow cell plumbing installed and pressure tested before wiring the controller. Ensure compliance with all applicable plumbing and electrical codes during the installation as well.

⚠ Caution: The BECSys controller should not be installed where it is accessible to the public.

⚠ Caution: The BECSys controller should be sealed while under operation. All IO, power cables, and unused ports must be sealed using hardware rated NEMA4 or better. Damage to the controller caused by improper sealing of the enclosure is not covered under warranty.

Firmware Version

This manual was written for firmware v1.54. If you received newer firmware but did not receive a copy of the manual covering that version of firmware, please contact your distributor.

Environmental Conditions

The BECSys5 is housed in a NEMA 4X (IP65) enclosure. It should not be used in explosive environments. The BECSys5 should be mounted so that adequate ventilation is provided around the enclosure, preventing general environmental specifications from being exceeded (see table below).

Environmental Specifications	
Specification	**Rating**
Storage Temperature	-40 to 85 Deg C
Ambient Operating Temperature	-18 to 50 Deg C
Ambient Humidity	95% non condensing maximum humidity

Electrical Specifications

The BECSys5 may be ordered in either an 115VAC model or a 230VAC model. Following are the electrical specifications for each model:

Controller Ratings		
	115VAC Model	**230VAC Model**
Voltage:	115VAC 60Hz	230VAC 50Hz
Phase:	Single	Single
Current:	12.25 Amps Full Load	12.125 Amps Full Load
	(¼ Amp – Controller)	(⅛ Amp – Controller)
	(12 Amps – Relay Outputs: 3A X 4)	(12 Amps – Relay Outputs: 3A X 4)

Relay Output Ratings		
	115VAC Model	**230VAC Model**
Relay 1 (K1)	250VAC (max) – 3 Amps	250VAC (max) – 3 Amps
Relay 2 (K2)	250VAC (max) – 3 Amps	250VAC (max) – 3 Amps
Relay 3 (K3)	250VAC (max) – 3 Amps	250VAC (max) – 3 Amps
Relay 4 (K4)	250VAC (max) – 3 Amps	250VAC (max) – 3 Amps

NSF Suggested Operation Ranges

ORP	650mV to 850mV
pH	6.8 to 8.2
Free Available Chlorine	0 to 10 ppm

Applicable Sensor Operation Ranges

Standard Sensors	
pH	0.0 to 14.0 pH
ORP	-1500mV to 1500mV
Temperature	32°F to 212°F (0°C to 100°C)
Reed Flow Switch	Switch Point (On): 2.0 gpm
Rotary Flow Switch	Switch Point (On): 1.5 gpm
Optional Sensors	
Amperometric ppm	0 ppm to 20 ppm
Total Chlorine	0 ppm to 20 ppm
Pressure Transducer	0 to 100 PSI
Vacuum Transducer	-14.7 to 85 PSI
Vacuum Swichgage	0 – 30 in. HG
Pressure Swichgage	0 – 50 PSI
Differential Swichgage	0 – 50 PSI
Conductivity Sensor	0 – 20,000 micromho
Turbidimeter	0 – 20.0 NTU
Flowmeter	0 – 655.35 Kgpm

Section A: Programming the Controller

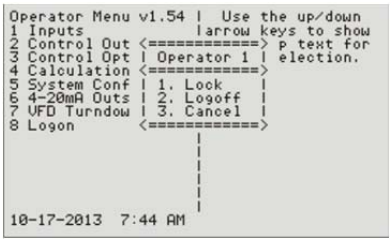
A – 1: Adjusting the Display Contrast

You can adjust the display contrast by holding down either the up or down arrow keys for two seconds, then after the controller beeps three times, use the up and down keys to adjust the contrast.

A – 2: Security Settings

A – 2.1: Access Codes and levels

To view what access level you were given, press the lock screen button while in any menu.



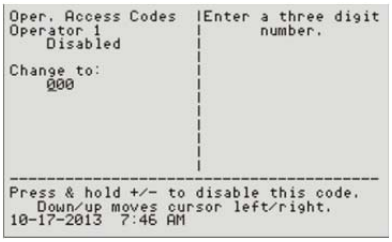
The Main Menu will also display who is logged on along with the version of firmware.

You do not need to set all the access codes for each level if you do not wish to. Also, a disabled access code is not equivalent to 000, so entering 000 when it prompts for an access code will only work if you have specifically assigned an access code to be 000.

A – 2.2: Setting Access Codes

To set an access code, press the menu button, then:

- Select System Config
- Choose User Setup
- Then select the access level you want to set an access code for.
  To set Operator 1's access code, you would select Oper. Access Codes, then select Operator 1.



Pressing and holding the +/- button disables the access code, while pressing enter will enable and set the access code to the value on the screen.

Operators may only change their own access code. Managers may change their access code and any of the Operators.

A – 2.3: Controller Options

Depending on how a particular controller is configured, not all of the options listed in this manual may be available.

A – 3: Navigating the menus

The controller's menus incorporate built in help text to aid in understanding the function of each parameter, item, and option.

A – 3.1: Common status messages

The very bottom line of the display contains the time and date on the left while the right is reserved for a number of status messages; the most common are as follows:

- "Busy..." - Indicates the controller is busy doing something critical and it cannot stop until it finishes. Until this message disappears, the controller will not respond to your key presses (although it does record them any will process them when done). Normally this message is only seen briefly after changing a setting, but it is also used for lengthier operations such as factory defaults and in the extremely rare case where the internal diagnostics detect a memory problem and attempts to correct it.

⚠ Warning: Interrupting the controller by turning the power off while it displays the busy message could result in the complete loss of all of its settings.

- "(1 of 2) (More →)" - and the like indicate there are more options for you to choose from than the controller could show at one time. Press the right arrow key (Next) to view them. The left number indicates the current page, while the right number indicates the total number of pages.
- "Bad Value, Retry..." - Accompanied by an error beep, this indicates the value you just entered was not within the allowable range of values and was not stored.

A – 3.2: The Menu Screens

Most of the features of the controller are configured via the Menu button's menus. The menu screens can be broken up into two types: entry screens and lists.

A – 3.2.1: Entry Screens

An entry screen is used to enter a value using the keypad.

The current value is usually displayed at the top while the cursor will be positioned under the current digit or character of the value you are entering in. The up and down arrows allow you to move the cursor right or left so you do not have to retype the existing digits if you only wish to change one.

Most numerical values will display the minimum and maximum values you can enter in at the bottom of the display in the format "< ### to ###>". These ranges many times will be dependant on other values you have set, such as alarm points or set points, while others are simply fixed to stay within a reasonable range.

Entering a value that is not within the acceptable range will result in an error beep and the message "Bad Value, Retry..." being displayed in the status area.

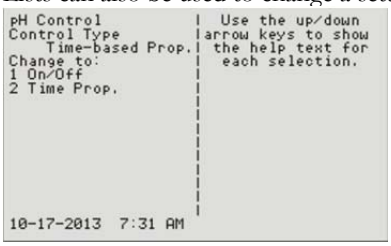
For some values, certain keys may take on special functions that are explained in the lower lines of the screen. The Down/up message in the example above is one of them.

A – 3.2.2: List Screens

The list screens are mainly composed of lists of menu items that you can choose from by either pressing an item's number or by using the up and down arrow keys to select it (indicated by the arrow) and then pressing enter to choose it.

Using the up and down arrow keys also allows you to view each item's help text. And if the item leads to an entry screen or a list screen that sets a setting (see below), the current value is displayed in the lower right side.

Lists can also be used to change a setting:



When a list is used this way, it will display the current setting followed by the words "Change to:". Because it is a list, you can select an item with the up/down buttons to see help information about that particular selection.

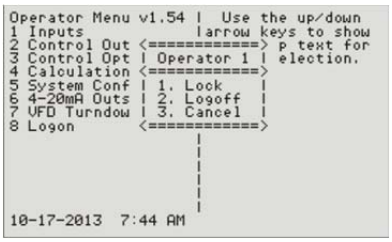
There are a few list screens that use the entire width of the display for displaying values associated with each item and therefore do not have help. See Section C: Using the Quick Set Face Panel Keys for examples of these types of screens.

A – 3.3: The Lock Screen Key

When not in a menu (i.e. viewing the normal display), pressing the lock screen key will prevent the controller from paging the screen to show more inputs, alarms, and other status information. See Section B: The Normal Display for more info about using the lock screen key in the normal display.

While within any menu, if the user does not press a key within sixty seconds of the last key press, the current user is logged out and the screen is returned to the normal display. To prevent the controller from timing out, you may lock the screen.

While within a menu, pressing the Lock Screen key will bring up a popup menu:



The first option on the popup will be either to lock or unlock the screen depending on the current lock state. While the screen is locked, key presses normally are ignored. However, in some instances certain keys are given special functions while the screen is locked, such as using the up and down arrows to scroll the help text if all of the help text cannot be displayed at once.

You can also lock/unlock the screen without bringing up the popup menu by holding down the lock button for one second. The controller will acknowledge this action with a triple beep and the yellow Lock Screen light will turn on.

The Lock button popup menu also identifies who is currently logged on, and provides an option for the user to log off. You can also select cancel if you pressed the lock button in error.

A – 4: Inputs

To enter the program menu, press the Menu button on the front face panel of your controller. This will allow the viewing of the Main Menu where the programming options are displayed.

The Cl inputs, Cl Inventory Input, Chlorine Control, and Chlorine booster control are all displayed as either Chlorine and Cl or Bromine and Br depending on the chemical selected in the Cl feed menu. This manual is written using the Chlorine setting. If you select Bromine as the sanitizing chemical, the controller will display Bromine and Br instead of Chlorine and Cl, but the menus and functions are otherwise exactly the same as shown.

A – 4.1: pH Setup

If your controller is configured to monitor pH, you will have the following options:

- **High Alarm (Op):** The high alarm will activate when the pH reaches or rises above this setting. You may disable this alarm by holding down the +/- key for 1 second.
- **Low Alarm (Op):** The low alarm will activate when the pH reaches or falls below this setting. You may disable this alarm by holding down the +/- key for 1 second.
- **Alarm Hysteresis (Mgr):** This value sets the amount that the pH reading has to rise above the high alarm or fall below the low alarm before the alarm will shut off.

A – 4.2: ORP Setup

If your controller is configured to monitor ORP, you will have the following options:

- **High Alarm (Op):** The high alarm will activate when the ORP reaches or rises above this setting. You may disable this alarm by holding down the +/- key for 1 second.
- **Low Alarm (Op):** The low alarm will activate when the ORP reaches or falls below this setting. You may disable this alarm by holding down the +/- key for 1 second.
- **Alarm Hysteresis (Mgr):** This value sets the amount that the ORP reading has to rise above the high alarm or fall below the low alarm before the alarm will shut off.

A – 4.3: Cl Inputs Setup

A – 4.3.1: Free Cl Setup

If your controller is configured to monitor Free Cl, it may be either calculated or a probe may be attached.

⚠ Caution: Amperometric chlorine sensors require the use of a temperature sensor and a properly calibrated pH sensor. Refer to the instruction pamphlet included with the sensor at the time of installation.

A – 4.3.1.1: Input Source: Calculated

- **High Alarm (Op):** The high alarm will activate when the free Cl reaches or rises above this setting. You may disable this alarm by holding down the +/- key for 1 second.
- **Low Alarm (Op):** The low alarm will activate when the free Cl reaches or falls below this setting. You may disable this alarm by holding down the +/- key for 1 second.
- **Alarm Hysteresis (Mgr):** This value sets the amount that the Cl input readings have to rise above their high alarm or fall below their low alarm before the alarm will shut off.

A – 4.3.1.2: Input Source: Probe

- **High Alarm (Op):** The high alarm will activate when the free Cl reaches or rises above this setting. You may disable this alarm by holding down the +/- key for 1 second.
- **Low Alarm (Op):** The low alarm will activate when the free Cl reaches or falls below this setting. You may disable this alarm by holding down the +/- key for 1 second.
- **Alarm Hysteresis (Mgr):** This value sets the amount that the Cl input readings have to rise above their high alarm or fall below their low alarm before the alarm will shut off. Note this value is used for free, total, and combined Cl alarms.
- **Calibrate (Op):** This selection allows you to do a single point calibration of free Cl, enter the reading from you test kit, and press enter. The value entered must be 0.5 ppm or greater.
- **Reset Calibration (Op):** Resets the calibration to the original factory setting.

A – 4.3.2: Total Cl Setup

If your controller is configured to monitor Total Cl, you will have the following options:

- **High Alarm (Op):** The high alarm will activate when the total Cl reaches or rises above this setting. You may disable this alarm by holding down the +/- key for 1 second.
- **Low Alarm (Op):** The low alarm will activate when the total Cl reaches or falls below this setting. You may disable this alarm by holding down the +/- key for 1 second.
- **Alarm Hysteresis (Mgr):** This value sets the amount that the Cl input readings have to rise above their high alarm or fall below their low alarm before the alarm will shut off. Note this value is used for free, total, and combined Cl alarms.

A – 4.3.3: Combined Cl

If your controller is configured to monitor Combined Cl, you will have the following options:

- **High Alarm (Op):** The high alarm will activate when the combined Cl reaches or rises above this setting. You may disable this alarm by holding down the +/- key for 1 second.
- **Alarm Hysteresis (Mgr):** This value sets the amount that the Cl input readings have to rise above their high alarm or fall below their low alarm before the alarm will shut off. Note this value is used for free, total, and combined Cl alarms.

A – 4.4: Temperature Setup

If your controller is configured to monitor temperature, you will have the following options:

- **High Alarm (Op):** The high alarm will activate when the temperature reaches or rises above this setting. You may disable this alarm by holding down the +/- key for 1 second.
- **Low Alarm (Op):** The low alarm will activate when the temperature reaches or falls below this setting. You may disable this alarm by holding down the +/- key for 1 second.
- **Alarm Hysteresis (Mgr):** This value sets the amount that the temperature reading has to rise above the high alarm or fall below the low alarm before the alarm will shut off.

A – 4.5: Conductivity/TDS Setup

If your controller is configured to monitor Conductivity/TDS, you will have the following options:

- **High Alarm (Op):** The high alarm will activate when the input reaches or rises above this setting. You may disable this alarm by holding down the +/- key for 1 second.
- **Low Alarm (Op):** The low alarm will activate when the input reaches or falls below this setting. You may disable this alarm by holding down the +/- key for 1 second.
- **Alarm Hysteresis (Mgr):** This value sets the amount that the Conductivity/TDS reading has to rise above the high alarm or fall below the low alarm before the alarm will shut off.

A – 4.6: Flow Rate Setup

If your controller is configured to monitor Flow Rate, you will have the following options:

- **Low Alarm (Op):** The low alarm will activate when the flow rate reaches or falls below this setting. You may disable this alarm by holding down the +/- key for 1 second.
- **Alarm Hysteresis (Mgr):** This value sets the reading that the flow rate must rise above the low alarm before the alarm will shut off.

A – 4.7: pH & Chlorine Inventory Setups

If your controller is configured to monitor chemical inventories, a sensor may be used or a contact switch. If a sensor is used, you will have the following options:

- **Low Alarm (Op):** This value sets at what level or weight the inventory low alarm will be activated. You may disable this alarm by holding down the +/- key for 1 second.
- **Alarm Hysteresis (Mgr):** This value sets at what level the inventory level or weight has to rise above the low level or weight alarm setting before the alarm will shut off.

A – 4.8: Turbidity

If your controller is configured to monitor Turbidity, you will have the following options:

- **High Alarm (Op):** The high alarm will activate when the input reaches or rises above this setting. You may disable this alarm by holding down the +/- key for 1 second.
- **Alarm Hysteresis (Mgr):** This value sets the level that the turbidity reading has to rise above the high alarm setting before the alarm will shut off.

A – 4.9: Surge Pit Level

If your controller is configured to monitor the Surge Pit Level, a sensor may be used or a contact switch. If a sensor is used, you will have the following options:

- **High Alarm (Op):** The high alarm will activate when the input reaches or rises above this setting. You may disable this alarm by holding down the +/- key for 1 second.
- **Low Alarm (Op):** The low alarm will activate when the input reaches or falls below this setting. You may disable this alarm by holding down the +/- key for 1 second.
- **Alarm Hysteresis (Mgr):** This value sets the amount that the surge pit level has to rise above the high alarm or fall below the low alarm before the alarm will shut off.

A – 4.10: Pressure & Vacuum Setup

A – 4.10.1: Filter Influent Pressure

If your controller is configured to monitor the Filter Influent Pressure, either a PSI transducer, Vacuum transducer, or a gauge may be used. If a transducer is used, you will have the following options:

- **High Alarm (Op):** The high alarm will activate when the pressure reaches or rises above this setting. You may disable this alarm by holding down the +/- key for 1 second.
- **Low Alarm (Op):** The low alarm will activate when the pressure falls below this setting. You may disable this alarm by holding down the +/- key for 1 second.
- **Alarm Hysteresis: (Mgr)** This value sets the amount that the pressure reading has to rise above the high alarm or fall below the low alarm before the alarm will shut off.
- **Display Input (Op):** This option enables/disables displaying the influent pressure on the normal display.

A – 4.10.2: Filter Effluent Pressure

If your controller is configured to monitor the Filter Effluent Pressure, either a PSI transducer, or a pressure gauge may be used. If a transducer is used, you will have the following options:

- **High Alarm (Op):** The high alarm will activate when the pressure reaches or rises above this setting. You may disable this alarm by holding down the +/- key for 1 second.
- **Low Alarm (Op):** The low alarm will activate when the pressure reaches or falls below this setting. You may disable this alarm by holding down the +/- key for 1 second.

- **Alarm Hysteresis (Mgr):** This value sets the amount that the pressure reading has to rise above the high alarm or fall below the low alarm before the alarm will shut off.
- **Display Input (Op):** This option enables/disables displaying the Filter Effluent pressure on the normal display.

A – 4.10.3: Filter Differential Pressure

If your controller is configured to monitor the Filter Differential Pressure, you will have the following options:

- **High Alarm (Op):** The high alarm will activate when the pressure reaches or rises above this setting. You may disable this alarm by holding down the +/- key for 1 second.
- **Alarm Hysteresis (Mgr):** This value sets the amount that the pressure reading has to rise above the high alarm before the alarm will shut off.

A – 4.10.4: Pump Effluent Pressure

If your controller is configured to monitor the Pump Effluent Pressure, you will have the following options:

- **High Alarm (Op):** The high alarm will activate when the pressure reaches or rises above this setting. You may disable this alarm by holding down the +/- key for 1 second.
- **Low Alarm (Op):** The low alarm will activate when the pressure reaches or falls below this setting. You may disable this alarm by holding down the +/- key for 1 second.
- **Alarm Hysteresis (Mgr):** This value sets the amount that the pressure reading has to rise above the high alarm or fall below the low alarm before the alarm will shut off.
- **Display Input (Op):** This option enables/disables displaying the Pump Effluent pressure on the normal display.

A – 4.10.5: Strainer Vacuum

If your controller is configured to monitor the Strainer Vacuum, either a transducer or a gauge may be used. If a transducer is used, you will have the following options:

- **High Vac Alarm (Op):** The high vacuum alarm will activate when the pressure reaches or falls below this setting. This is actually a low pressure alarm that operates in the negative pressure range, which is a vacuum. You may disable this alarm by holding down the +/- key for 1 second.

  If the recirc pump is assigned a relay, the high strainer vacuum alarm will trigger an **emergency off** of the system.

- **High Vac Warning (Op):** The high vacuum warning will activate when the pressure reaches or falls below this setting. This is actually a low pressure alarm that operates in the negative pressure range, which is a vacuum. You may disable this alarm by holding down the +/- key for 1 second.

  The high strainer vacuum warning is generally used to indicate to the operators that the strainer needs cleaned. While this warning does flash the alarm LED, it does not shut down any pumps or feeds.

- **Alarm Hysteresis (Mgr):** This value sets the level that the pressure reading must rise above the alarm settings before the alarm will shut off.

A – 4.10.6: Total Dynamic Head

If your controller is configured to monitor the Total Dynamic Head, you will have the following options:

- **Display TDH (Op):** Enables displaying total dynamic head on the normal display.
- **High Alarm (Op):** The high alarm will activate when the total dynamic head across the pump reaches or rises above this setting. You may disable this alarm by holding down the +/- key for 1 second.
- **Low Alarm (Op):** The low alarm will activate when the total dynamic head across the pump reaches or falls below this setting. You may disable this alarm by holding down the +/- key for 1 second.
- **Alarm Hysteresis (Mgr):** This value sets the amount that the total dynamic head has to rise above the high alarm or fall below the low alarm before the alarm will shut off.

A – 5: Control Outputs

Press the Menu button on the front of the Controller and select Control Outputs. Depending on the controller configuration, some control outputs may or may not be installed.

A – 5.1: pH Control

If your controller is configured to control pH, you will have the following options:

- **Control Type (Op):** Choose from On/Off or Time Base Proportional control.
  - In general, if you are using a motor driven chemical feeder then you should choose the On/Off option. If you are using a solenoid driven or pulsed diaphragm chemical feeder (such as Pulsatron, most LMI models or most Prominent Models), you should choose the TBP option. This feature helps to hold a set point and to minimize over-shoot by making a standard feeder mimic the action of more sophisticated modulating feeders.
  - If you choose the On/Off option and are feeding up, then the controller will activate the chemical feeder whenever the pH falls below the set point and continue to feed until the pH rises above the set point plus hysteresis at which point it will stop.
  - If you choose the TBP option and are feeding up then the controller will activate the chemical feeder whenever the pH falls below the set point and will feed for a percentage of the Time Base (default one minute) proportional to the offset from set point. For the remainder of the Time Base the feeder will be paused. The feeder will continue this feed and pause cycle until the controller achieves the set point plus hysteresis. The closer to set point, the less time the feeder is ON.
- **Set Point (Op):** This value sets the desired level to maintain the pH at. Input the desired pH set point.
- **Span/Prop. Bnd (Op):** *This option is only shown if the Control Type is Time Base Proportional.* This value sets the distance (or span) from the set point that the output will be proportionally controlled.

Warning: Increasing or decreasing the *Span/Prop. band* or *Time Base* may cause the feed to severely overshoot or never achieve set point. Adjust this option only when recommended to do so by a factory representative.

- **Time Base (Op):** *This option is only shown if the Control Type is Time Base Proportional.* This sets the total time that control is based on. During this time, the feeder will turn on for a percentage of the Time Base and turn off for the remainder.
- **Failsafe Timer (Op):** This value sets the time that the relay is allowed to stay continuously on.
  - The most common failures of automated chemical feed systems are depletion of the chemical supply and/or chemical feeder failure. Both problems result in the controller being unable to reach set point in a reasonable period of time. The failsafe timer sets the maximum length of time the feeder can run. If the feeder has been trying to achieve set point without success for the selected time, the controller will cut power to the feeder, flash the Reset Fail/Safe LED on the face panel and display a message to alert the operator. If in TBP Pause mode, the controller will reset the timer.
  - An operator must reset the failsafe through the Reset Fail/Safe button to re-enable normal control.

Warning: Disabling the failsafe timers is highly discouraged. They are an important safety feature to protect against dangerous chemical overfeeds and will protect the equipment from running continuously if it runs out of chemical.

- **Dead Band (Mgr):** *This option is only shown under dual pH control.* This value sets the amount the input must exceed the set point by before the feed of the opposite direction will trigger. (The range is from twice the feeds' hysteresis to 2.8 pH)

A – 5.2: Chlorine Control

After entering the Control Outputs option, select the Cl Control from the menu. This will allow the programming of the following:

- **Sanitizer Chemical (Op):** Sets the sanitizer chemical name (Chlorine or Bromine).
  - This option controls what chemical name the controller displays for the Cl inputs and the primary sanitization/oxidizing chemical.
- **Control Input Src (Op):** *This option is only available if the free Cl Input source is set to Calculated or Probe.* Choose between ORP and free Cl to use as the primary control input for the sanitizer feed.
  - If the free Cl Input is selected and the free Cl Input source is set to probe, ORP is still used for control while the free Cl interlock timer is running.
  - If the free Cl Input is selected and the free Cl Input source is set to calculated, the controller still controls off of ORP, but the ORP set point is calculated by the controller based on the free Cl set point, the pH set point, and the free Cl calibration. Modification of any one of those three values will result in a new ORP set point.
- **Control Type (Op):** Choose from On/Off or Time Base Proportional control.
  - In general, if you are using a motor driven chemical feeder then you should choose the On/Off option. If you are using a solenoid driven or pulsed diaphragm chemical feeder (such as Pulsatron, most LMI models or most Prominent Models), you should choose the TBP option. This feature helps to hold a set point and to minimize over-shoot by making a standard feeder mimic the action of more sophisticated modulating feeders.
  - If you choose the On/Off option, then the controller will activate the chemical feeder whenever the ORP falls below the set point and continue to feed until the ORP rises above the set point plus hysteresis at which point it will stop.
  - If you choose the TBP option, then the controller will activate the chemical feeder whenever the ORP falls below the set point and will feed for a percentage of the Time Base (default one minute) proportional to the offset from set point. For the remainder of the Time Base the feeder will be paused. The feeder will continue this feed and pause cycle until the controller achieves the set point plus hysteresis. The closer to set point, the less time the feeder is ON.
- **ORP Set Point (Op):** *This option is NOT shown if the Control Source is set to free Cl and the free Cl Input source is set to Calculated.* This value sets the desired level to maintain the ORP at.
- **ORP Span/Prop. Bnd (Op):** *This option is only shown if the Control Type is Time Base Proportional and the ORP Set Point is shown above.* This value sets the distance (or span) from the set point that the output will be proportionally controlled.

⚠ Warning: Increasing or decreasing the proportional band may cause the feed to severely overshoot or never achieve set point. Adjust this option only when recommended to do so by a factory representative.

- **Free Cl Span/Prop Bnd (Op):** *This option is only shown if the Control Type is Time Base Proportional, the Control Source is set to free Cl, and the free Cl Input source is set to probe.* This value sets the distance (or span) from the set point that the output will be proportionally controlled.
- **Free Cl Set Point (Op):** *This option is only shown if the Control Source is set to free Cl.* This value sets the desired level to maintain the free Cl at.
- **Free Cl Ctrl Hyst (Rep):** *This option is only shown if the Control Source is set to free Cl and the free Cl Input source is set to probe.* This value sets the amount the input must rise above set point before the feed will shut off.
- **Time Base (Op):** *This option is only shown if the Control Type is Time Base Proportional.* This sets the total time that control is based on. During this time, the feeder will turn on for a percentage of the Time Base and turn off for the remainder.

⚠ Warning: Increasing or decreasing the time base may cause the feed to severely overshoot or never achieve set point. Adjust this option only when recommended to do so by a factory representative.

A – 5.2: Chlorine Control (continued)

- **Failsafe Timer (Op):** This value sets the time that the relay is allowed to stay continuously on.
  - The most common failures of automated chemical feed systems are depletion of the chemical supply and/or chemical feeder failure. Both problems result in the controller being unable to reach set point in a reasonable period of time. The failsafe timer sets the maximum length of time the feeder can run. If the feeder has been trying to achieve set point without success for the selected time, the controller will cut power to the feeder, flash the Reset Fail/Safe LED on the face panel and display a message to alert the operator. If in TBP Pause mode, the controller will reset the timer.
  - An operator must reset the failsafe through the Reset Fail/safe button to re-enable normal control.

Warning: Disabling the failsafe timers is highly discouraged. They are an important safety feature to protect against dangerous chemical overfeeds and will protect the equipment from running continuously if it runs out of chemical.

- **Alt Set Point (Op):** The 4 Event 28 Day Timer allows you to program a schedule to define when to use alternate set point.
  - **Alt Set Point 4 Event 28 Day Timer:** To program the 4 Event 28 Day Timer, perform the following:
    - Select the Alt. Set point from the Cl (Br) Control menu.
    - Now select the 4Event 28Day Timer from the Alt. Set Point menu.
    - Selecting Event1 will allow you to select the weekly interval to use the alternate set point.

      If the 1st, 2nd, 3rd, or 4th week is selected, the timer will only trigger on that week in the four-week cycle. The Odd Weeks selection will trigger on the 1st and 3rd weeks, the Even Weeks selection will trigger on the 2nd and 4th weeks, and the Every Week selection triggers every week.

      - The week number and day of week for the current date is displayed on the bottom right side of these screens.
      - The first week is fixed to be the week of Sunday, January 2nd, 2000 and every four weeks afterwards.

      The next set of screens will allow you to choose the actual day(s).

    - Select what day of the week, or every day, the alternate set point should be used.
    - Once you make your selection you will be returned to the 4Event 28Day Timer menu where you will have a new menu item: Event 1 Times.
    - Select the Event1 Times from the 4Event 28Day Timer menu.

      This screen allows you to set both the start time and the end time for the event's programmed weeks/days. To toggle AM/PM, press the +/- key while the cursor is on the time you wish to change.
      - If your start time is before midnight (12:00 AM) and the end time is after midnight, the alternate set point will continue to be used the following day up to the end time even if that day did not fall within the week/day selection for that event.

      Example:

Event1 Week/Day:	Odd weeks/ Tuesday
Event1 Times:	11:00 PM to 3:00 AM
Event2 Week/Day:	Even weeks/ Monday
Event2 Times:	11:00 PM to 6:00 AM
Current Week/Day:	2nd/Tuesday
Current Time:	4:00 PM

      The alternate set point last ran from 11:00 PM last night to 6:00AM this morning.

      The next time the alternate set point will run will be from 11:00 PM next Tuesday to 3:00AM next Wednesday.

  - **ORP Set Point (Op):** This value sets the desired level to maintain the ORP at during any of the programmed alternate set point events.
  - **Free Cl Set Point (Op):** *This option is only available if the free Cl probe is installed and the Control Source is set to free Cl.* This value sets the desired level to maintain the free Cl at during any of the programmed alternate set point events.
- **Bracketed Free Cl (Op):** *This option is only available if the free Cl probe is installed and the Control Source is set to ORP.* If enabled, the controller will override the ORP control so that the free Cl will not drop out of a programmed range.
- **Bracketed ORP (Op):** *This option is only available if the free Cl probe is installed and the Control Source is set to free Cl.* If enabled, the controller will override the free Cl control so that the ORP will not drop out of a programmed range.

A – 5.3: Chlorine Booster Control

If your controller is configured to control a Chlorine Booster pump, you will have the following options:

- **Control Input (Op):** *This option is only available if the free Cl Input is enabled.* Choose between ORP, free Cl or, if the free Cl probe is used, both to control the chlorine booster.
- **ORP Trigger Point (Op):** *This option is only shown if the Control Input is ORP or Both.* This value sets the ORP level that the input must drop below to activate the chlorine booster control. (the range is –1000 mV to the Cl Booster's ORP Set Point)
- **Free Cl Trigger Point (Op):** *This option is only shown if the Control Input is free Cl or Both.* This value sets the free Cl level that the input must drop below to activate the chlorine booster control. (the range is from 0.0 free Cl to the Cl Booster's free Cl Set Point)
- **ORP Set Point (Op):** *This option is only shown if the Control Input is ORP or Both.* This value sets the ORP level that once it is reached the chlorine booster control will shut off. (the range is from Cl Booster's ORP Trigger Point to the ORP high alarm point)
- **Free Cl Set Point (Op):** *This option is only shown if the Control Input is free Cl or Both.* This value sets the free Cl level that once it is reached the chlorine booster control will shut off. (the range is from the Cl Booster's free Cl Trigger Point to the free Cl high alarm point)
- **Failsafe Timer (Op):** This value sets the time that the relay is allowed to stay continuously on.

⚠ Warning: Disabling the failsafe timers is highly discouraged. They are an important safety feature to protect against dangerous chemical overfeeds and will protect the equipment from running continuously if it runs out of chemical.

The most common failures of automated chemical feed systems are depletion of the chemical supply and/or chemical feeder failure. Both problems result in the controller being unable to reach set point in a reasonable period of time. The failsafe timer sets the maximum length of time the feeder can run. If the feeder has been trying to achieve set point without success for the selected time, the controller will cut power to the feeder, flash the Reset Fail/Safe LED on the face panel and display a message to alert the operator. If in TBP Pause mode, the controller will reset the timer.

An operator must reset the failsafe through the Reset Fail/Safe button to re-enable normal control.

A – 5.4: Super Chlorination

If your controller is configured for Super Chlorination, you will have the following options:

- **Control Input (Op):** *This option is only available if the free Cl probe is installed.* Choose between free Cl and ORP to use to control the Super Chlorination feed.
- **4 Event 28 Day Timer (Op):** To program when the super chlorination should trigger, select 4Event 28Day Timer from the Super Chlorination menu:
  - Selecting Event1 will allow you to select the weekly interval to trigger the Super Chlorination. If the 1st, 2nd, 3rd, or 4th week is selected, the timer will only trigger on that week in the four-week cycle. The Odd Weeks selection will trigger on the 1st and 3rd weeks, the Even Weeks selection will trigger on the 2nd and 4th weeks, and the Every Week selection triggers every week.
    - The week number and day of week for the current date is displayed on the bottom right side of these screens.
    - The first week is fixed to be the week of Sunday, January 2nd, 2000 and every four weeks afterwards.
  - Next you can select the day of the week (or every day) the event should be triggered on.

Once you make your selection, you will be returned to the 4Event 28Day Timer menu where you will have a new menu item: Event 1 Start Time.

- Select the Event1 Start Time from the 4Event 28Day Timer menu.

This screen allows you to set the time to trigger the event on the programmed weeks/days. The event will trigger at the start time if the controller is running at that time. To toggle AM/PM, press the +/- key. Enter the desired time and press enter.

After setting the time, press the left arrow to return to Super Chlorination's main menu. Here you will notice the next scheduled super chlorination is displayed for you. The controller will also list the last super chlorination here once one has been completed.

A – 5.4: Super Chlorination (continued)

- **Maximum Time On (Op):** This value sets the maximum time you want the Super Chlorination on to reach the set point. If the time expires before set point is reached, the controller will trigger the SuperChlor failsafe alarm and end the SuperChlor feeds. (the range is from 0:00 to 18:00 hours)

  An operator can reset the failsafe through the Reset Fail/Safe button; however the failsafe alarm will automatically clear itself when the regular Cl feed begins feeding.

- **ORP Set Point (Op):** *This option is only shown if the Control Input is set to ORP.* This value sets the desired ORP level to shock the pool.
- **Free Cl Set Point (Op):** *This option is only shown if the Control Input is set to free Cl.* This value sets the desired free Cl level to shock the pool.

A – 5.5: Dechlorination

If your controller is configured for Dechlorination, you will have the following options:

- **Control Input (Op):** *This option is only available if the free Cl probe is installed.* Choose between free Cl and ORP to use to control the dechlor feed.
- **Follow Super Chlorination (Op):** Choose whether or not you want your dechlorination to automatically follow your super chlorination.
- **4 Event 28 Day Timer (Op):** The 4 Event 28 Day Timer allows you to program the dechlorination on a schedule. See the section on Super Chlorination's 4 Event 28 Day Timer for details on how to set this.
- **Maximum Time On (Op):** This value sets the maximum time you want the dechlorination on to reach the set point. (the range is from 0:00 to 18:00 hours)
- **ORP Set Point (Op):** *This option is only shown if the Control Input is set to ORP.* This value sets the desired final ORP level.
- **Free Cl Set Point (Op):** *This option is only shown if the Control Input is set to free Cl.* This value sets the desired final free Cl level.

A – 5.6: Ozone Control

If your controller is configured for Ozone Control, you will have the following options:

- **Control Input (Op):** *This option is only available if the free Cl probe is installed.* Choose between free Cl, ORP, or both to use to control the Ozone feed.
- **ORP Set Point (Op):** *This option is only shown if the Control Input is ORP or Both.* This value sets the ORP level that the input must drop below to activate the Ozone.
- **Free Cl Set Point (Op):** *This option is only shown if the Control Input is free Cl or Both.* This value sets the free Cl level that the input must drop below to activate the Ozone.
- **Fireman Switch (Op):** *This option is only shown if a relay is assigned to the recirculation pump or backwash.* This value sets the minimum amount of time to leave the recirculation pump on or delay the start of backwash after the Ozone relay shuts off.
- **Failsafe Timer (Op):** This value sets the time that the relay is allowed to stay continuously on.

A – 5.7: Heater

If your controller is configured for Heater Control, you will have the following options:

- **Temp. Ctrl Enable (Op):** Enables or disables controlling the Heater using the Temperature Input.
- **Set Point (Op):** *Only shown if Temp. Ctrl is enabled.* This value sets the desired temperature. (the range is from the temperature low alarm to the temperature high alarm)
- **Failsafe Timer (Op):** *Only shown if Temp. Ctrl is enabled.* This value sets the time that the relay is allowed to stay on without reaching set point before the relay is locked out. If the heater has been trying to achieve set point without success for the selected time, the controller will cut power to the heater, flash the Reset Fail/Safe LED on the face panel and display a message to alert the operator.

  An operator must reset the failsafe through the Reset Fail/safe button to re-enable normal control.

- **Fireman Switch (Op):** *This option is only shown if a relay is assigned to the recirculation pump or backwash.* This value sets the minimum amount of time to leave the recirculation pump on or delay the start of backwash after the heater relay shuts off.
- **Alternate Temperature (Op):** *Only shown if Temp. Ctrl is enabled.* The 4 Event 28 Day Timer allows you to program an alternate set point on a schedule. See the Chlorine (Bromine) Control's Alt Set Point for details on how to set this.

  After the schedule is set, you may choose the alternate temperature set point option and enter the desired setting.

A – 5.8: Autofill

If your controller is set up to control an Autofill valve, it can be triggered by the Surge Pit Level (if monitored) or a proximity switch.

- **Set Point (Op):** *Only shown if Autofill sensor type is set to Surge Pit Level.* This value sets the surge pit level that the controller will fill to.
- **Alternate Set Point (Op):** *Only shown if Autofill sensor type is set to Surge Pit Level.* To program when to use the alternate set point, see the section on Chlorine (Bromine) Control's Alternate Set point Timer Settings. After the schedule is set, you may choose the alternate set point option and enter the desired setting.
- **Start Delay (Op):** Sets the time required for the water level to stay below the trigger point before fill begins.
- **End Delay (Op):** Sets the time required for the water level to remain above shutoff point before ending the fill.
- **Failsafe Timer (Op):** This value sets the time that the relay is allowed to stay on without reaching set point before the relay is locked out. If Autofill has been trying to achieve set point without success for the selected time, the controller will cut power to the relay, flash the Reset Fail/Safe LED on the face panel and display a message to alert the operator.

  An operator must reset the failsafe through the Reset Fail/safe button to re-enable normal control.

A – 5.9: TDS Control

If your controller is set up to monitor the TDS of the water, you will have the following options:

- **Makeup water TDS (Op):** Enter the test kit TDS reading for the water controlled by your Autofill. This is used to determine the appropriate TDS set point.
- **Pool TDS cycle (Op):** Enter the pools' cycle multiplier of the incoming makeup water. The resulting TDS set point is the incoming makeup water's TDS times this value.
- **Failsafe Timer (Op):** This value sets the time that the relay is allowed to stay on without reaching set point before the relay is locked out. If the TDS control has been trying to achieve set point without success for the selected time, the controller will cut power to the relay, flash the Reset Fail/Safe LED on the face panel and display a message to alert the operator.

  An operator must reset the failsafe through the Reset Fail/safe button to re-enable normal control.

A – 5.10: Sensor Wash

If your controller is set up to do a Sensor Wash you will have the following options:

- **4 Event 28 Day Timer (Op):** Once you have entered Sensor Wash, select 4Event 28Day Timer from the menu. The 4 Event 28 Day Timer allows you to program the sensor wash on a schedule. See the section on Super Chlorination's 4 Event 28 Day Timer for details on how to set this.
  - **Start/End Time (Op):** Allows you to set what times the feed may be triggered during a day.
  - **# Of Cycles (Op):** *Only shown if Duration is not zero.* Sets how many times the relay will trigger between the Start and End times.
- **Duration (Op):** Sets how long the feed will run for each cycle. If set to zero, there are no cycles and the relay will simply be on when current time is between the active event's start and end times.

A – 5.11: Enzyme

If your controller is configured to control an Enzyme feed, you will have the following options:

- **Start/End Time (Op):** Allows you to set what times the feed may be triggered during a day.
- **# Of Cycles (Op):** *Only shown if Duration is not zero.* Sets how many times the relay will trigger between the Start and End times.
- **Duration (Op):** Sets how long the feed will run for each cycle. If set to zero, there are no cycles and the relay will simply be on when current time is between the start and end times.

A – 5.12: UV Turndown

If your controller is configured to control a UV unit, you will have the following options:

- **Combined Cl Set Point (Op):** *This option is only shown if both the free Cl and total Cl probes are installed.* This value sets the Combined Cl level that the input must be equal to or drop below to activate the turndown.
- **Start Delay (Op):** *This option is only shown if both the free Cl and total Cl probes are installed.* Time the combined free Cl must remain at or below set point before activating turndown.
- **Fireman Switch (Op):** *This option is only shown if a relay is assigned to the recirculation pump or backwash.* This value sets the minimum amount of time to leave the recirculation pump on or delay the start of backwash after the UV turndown relay turns on.

A – 5.13: Polymer

If your controller is configured to control a Polymer feed, you will have the following options:

- **High Set Point (Op):** *Only shown if control type is set to Turbidity Control.* When the turbidity reading rises above this value for the Trigger Delay Time, the controller will trigger the polymer control cycle.
- **Low Set Point (Op):** *Only shown if control type is set to Turbidity Control.* At the end of each control cycle, the controller checks to see if the turbidity reading is below this value. If it is, the control cycle ends, otherwise the controller starts a new control cycle.
- **Cycle Time (Op):** *Only shown if control type is set to Turbidity Control.* This value sets the control cycle duration. At the beginning of each cycle, the relay turns on, stays on for the programmed On Time, then shuts off for the remainder of the cycle time.
- **On Time (Op):** *Only shown if control type is set to Turbidity Control.* This value sets how long the controller will feed polymer during each control cycle.
- **Trigger Delay Time (Op):** *Only shown if control type is set to Turbidity Control.* This value sets how long the turbidity reading must remain above the high set point before triggering the polymer control cycle.
- **Start/End Time (Op):** *Only shown if control type is set to Cycle Timer.* Allows you to set what times the feed may be triggered during a day.
- **# Of Cycles (Op):** *Only shown if control type is set to Cycle Timer.* Sets how many times the feed will be triggered between the Start and End times.
- **Duration (Op):** *Only shown if control type is set to Cycle Timer.* Sets how long the feed will run for each cycle.

A – 5.14: Recirculation Pump

If your controller is configured to control the Recirculation Pump, you will have the following options:

- **Pres. Alarm Delay (Op):** Delay pressure and vacuum alarms from triggering for this amount of time whenever the recirc pump starts up.
- **Heater Fireman Switch (Op):** *This option is only shown if a relay is assigned to the Heater control.* This value sets the minimum amount of time to leave the recirculation pump on or delay the start of backwash after the heater shuts off.
- **Ozone Fireman Switch (Op):** *This option is only shown if a relay is assigned to the Ozone control.* This value sets the minimum amount of time to leave the recirculation pump on or delay the start of backwash after the Ozone relay shuts off.
- **UV Turndown Fireman Switch (Op):** *This option is only shown if a relay is assigned to the UV Turndown.* This value sets the minimum amount of time to leave the recirculation pump on or delay the start of backwash after the UV turndown relay turns on.

A – 5.9.1: VFD Control:

Allows you to configure the VFD control settings for the Recirculation Pump. Once you have selected VFD Control you will have the following items to choose from:

- **OOR alarm delay (Op):** *This option is only shown if the Control Input is set to Flow Meter.* If the output required to meet the set point exceeds 100%, the triggering of the Out Of Range (OOR) alarm will be delayed by this amount of time. Set to 0 to disable the alarm.
- **Set Point (Op):** Allows you to set the value to control to. (in % or flow rate depending on what the control input is set to).
- **Dead Band (View Only):** *This option is only shown if the Control Input is set to Flow Rate.* The VFD output will not change until the input is this far away from the set point.
- **Backwash Output (View Only):** *This option is only shown if the backwash control is configured.* Sets the VFD percent output to use when backwashing.
- **Minimum Output (View Only):** The controller will always keep the VFD output above this % except when the relay is off.

A – 5.15: Alarm Relay

There are no programmable options for the Alarm Relay. Whenever there is an alarm or Emergency Off is active, this relay will turn on.

A – 6: Control Options

A – 6.1: Flow Restored Feed Delay

- **Enable / Disable (Op):** Once you have entered the Flow Restored Feed Delay option, select Enable / Disable from the menu. Here you will be able to select whether you want to delay the chemical feeders after flow is restored to the system.
- **Delay Duration (Op):** *This option is only available if flow restored feed delay is enabled.* Enter the desired time that the chemical feeders must wait to operate after flow is restored.

A – 6.2: Power Saver

Power Saver is a timer triggered function that saves energy by shutting down the recirculation pump for programmable periods of time while the pool is not in use.

When active, power saver has the following states:

- CONTROLLING: At least one control function is currently feeding. Once all feeds have finished, the system will enter the GOING TO SLEEP state.
- GOING TO SLEEP: All control functions must be satisfied (they don't turn their feeds on) for the Enter Sleep Delay duration before allowing system to enter the SLEEPING state.
- SLEEPING: Timed period (Sleep Duration) where the shutdown of recirculation pump is triggered and all feeds are disabled. After entering SLEEPING state, the recirculation pump will continue to run until the heater and ozone fireman switch timers run out. The sleep timer starts when all conditions have been met, not when controller shuts down the recirculation pump. Only a timer triggered backwash, the sleep timer expiring, or the Power Saver timer expiring will put the system into the WAKING UP state. No feeds or input alarms will operate while the system is asleep or waking up.
- WAKING UP: Timed period (Exit Sleep Delay) where the recirculation pump is ran before allowing feeds to operate. Once the wake up time expires, if the Power Saver timer expired, the system will remain awake even if all feeds are satisfied. Otherwise the system enters the CONTROLLING state, performing a backwash if triggered, and will reenter GOING TO SLEEP again once all feeds have been satisfied again.

While Power Saver is active, the system automatically uses the Alternate Temperature set point for the Heater and the Alternate ORP and/or Alternate ppm set points for the Cl feed.

- **Enable (Op):** Enable or disable the Power Saver feature.
- **4 Event 28 Day Timer (Op):** The 4 Event 28 Day Timer allows you to program power saver's schedule. See the section on the Chlorine (Bromine) Control's Alt Set Point for details on how to set this.
- **Sleep Duration (Op):** Sets how long the controller will sleep.
- **Enter Sleep Delay (Op):** Sets how long to wait after all of the feeds have been satisfied before entering SLEEP (i.e. the GOING TO SLEEP duration). If any feed starts feeding during this time, the controller goes back to the CONTROLLING state.
- **Exit Sleep Delay (Op):** Sets how long to wait after coming out of sleep before allowing any feeds to run. (i.e. the WAKING UP duration).
- **Alternate ORP (Op):** Sets the alternate ORP value used during power saver and the Cl feed's alternate set point event timer.
- **Alternate free Cl (Op):** Sets the alternate free Cl value used during power saver and the Cl feed's alternate set point event timer.
- **Alternate temp (Op):** Sets the alternate temperature value used during power saver and the heater's alternate set point event timer.

A – 6.3: pH Lockout

pH lockout (Manager) disables the sanitizer feed when a pH high and/or low alarm is activated:

Full lockout:	The Cl (Br) feed is disabled when either a pH high or low alarm occurs.
Feed direction:	For pH feed up, the Cl (Br) feed is disabled on a pH low alarm. For pH feed down, the Cl (Br) feed is disabled on a pH high alarm.
Disable:	pH alarms do not disable the Cl (Br) feed. (**Not Recommended**)

⚠Warning: Disabling the pH lockout will allow for chemical overfeeds which may damage equipment or harm patrons.

A – 7: Calculations

A – 7.1: Enter Parameters

By selecting this, the controller will step you through entering the values for Pool Volume, whether it should use TDS for calculations, Calcium Hardness, and Alkalinity. Once the values have been entered, the calculated LSI & Ryzner reading will appear in the menu and on the display.

A – 7.2: LSI Setup

- **Use TDS? (Op):** Selects if the controller should use TDS for the LSI/RSI calculations.
- **Pool Volume (Op):** Allows you to enter the volume of the pool.
- **Display RSI/LSI (Op):** Allows you to select if the RSI/LSI information is displayed on the routine display.

A – 8: System Configuration

Press Menu on the controller's face panel and select System Configuration from the menu. This will allow you to configure the following for the system:

A – 8.1: System Info

This information menu displays the controller's system type, serial number, firmware version information. If a BECSys Ethernet card is installed, the card's firmware version and the current IP address information is also displayed.

A – 8.2: Communication

Once you have entered System Configuration, select Communication from the menu. Under communication, you can select from the following.

A – 8.2.1: Direct Baud Rate

(Op) *This option is only shown if a BECSys Ethernet card is NOT installed.* Here you can choose the desired direct connect baud rate for the system.

A – 8.2.2: Ethernet Setup

This option is only shown if a BECSys Ethernet card is installed. These parameters should be set to values provided by the network's administrators.

- **Enable DHCP (Mgr):** Enables/disables using DHCP. If DHCP is enabled, the controller will retrieve its IP address information from a DHCP server on the network. If DHCP is disabled, the IP address information must be set manually via the remaining items listed here.
- **IP Address (Mgr):** *This option is only shown if DHCP is disabled.* Sets the controllers IP address.
- **IP Netmask (Mgr):** *This option is only shown if DHCP is disabled.* Sets the controllers IP netmask.
- **IP Default Route (Mgr):** *This option is only shown if DHCP is disabled.* Sets the controllers IP default route/gateway.
- **TCP Port (Mgr):** Sets the TCP port to listen for connections on. Acceptable values are 1024-1089 and 1091-65535.
- **SMTP Server Addr (Mgr):** Sets the email SMTP server address used by alarm call-out to send email and text messages.
- **SMTP Server Port (Mgr):** Sets the email SMTP TCP port. This value should be set to 25 unless otherwise instructed by a network administrator.
- **DNS Server 1 (Mgr):** Sets the IP address for the primary DNS server. Required for email call-outs.
- **DNS Server 2 (Mgr):** (Optional) Sets the IP address for the secondary DNS server which is only used if DNS server 1 cannot be contacted.

C – 8.2.3: Call Out Setup

This option is only shown if a BECSys Ethernet card or modem is installed. Here you can set the parameters for the alarm call-out functions.

- **Call Out Enable (Op):** Choose to enable or disable call outs.
- **Call Start Time (Op):** Sets the time the controller will start allowing call outs.
- **Call End Time (Op):** Set the time the controller will stop allowing call outs. Set this and Call Start Time to same value for 24 hour callouts.
- **Ack. Page outs (Op):** Allows the controller to determine if somebody is responding to the page. If somebody receives the page and calls the controller this stops the controller from calling the remaining page phone numbers.
- **Pre-Delay (Op):** Sets the amount of time the controller will delay to allow for alarm to reset before calling out.

- **Recipients Setup (Op):** Allows configuration of eight recipients which can individually be configured for fax, pager, email, or text message call-out.
  - **Call-Out Type:**
    - **Pager:** *Requires a BECSys Ethernet Modem card or a standard modem.* Calls a numeric pager and leaves a callback number. After dialing the pager's number, the controller will wait for five seconds of silence before sending the callback number.
    - **Fax:** *Requires a BECSys Ethernet Modem card.* Calls a fax machine and sends a fax containing all active alarms, the times they were triggered, and a summary of inputs and set points.
    - **Email:** *Requires a BECSys Ethernet card with functioning DNS and SMTP server settings.* Sends an email to the recipient's email address containing all active alarms, the times they were triggered, and a summary of inputs and set points.
    - **Text Message:** *Requires BECSys Ethernet card with functioning DNS and SMTP server settings.* Sends a text message with a list of active alarms to a text pager or cell phone using email.
    - **Disabled:** Disables the call-out recipient.
  - **Pager Service # (pager):** *This option is only shown if the call-out type is set to pager.* Enter the recipient's pager phone number to dial. You may use commas to add two second delays in the dialing of the number. Example 9,1234567 will dial 9, wait two seconds, then dial 1234567.
  - **Callback # (pager)**: *This option is only shown if the call-out type is set to pager.* Enter a number to leave as the callback number displayed on the pager.
  - **Fax Number (fax):** *This option is only shown if the call-out type is set to fax.* Enter the phone number of the recipient's fax machine. You may use commas to add two second delays in the dialing of the number. Example 9,1234567 will dial 9, wait two seconds, then dial 1234567.
  - **Email address (Email):** *This option is only shown if the call-out type is set to email.* Enter the recipients email address. Enter the local part of the email address (the part before the @) into the first screen, then enter the domain part of the email address (the part after the @) into the second screen.
  - **Email address (text message):** *This option is only shown if the call-out type is set to text message.* The recipients email address for text messaging is usually in the form of the pager's or cell's ten-digit-number@domain.com or the like. (2223334444@txt.att.net). Enter the phone number into the first screen, then enter the domain part of the email address (the part after the @) into the second screen. Check with the recipient's wireless carrier for the correct email address to use.
  - **Post-Delay**: *This option is used only if the call-out type is pager or fax. The post delay is ignored if the call-out type is email or text message.* The time to delay starting the next recipient call-out after this recipient call-out is triggered.
  - **Test:** Triggers a test call-out of the current recipient only. You may only test one recipient at a time. **NOTE: if the callout type is Text Message, an alarm must be active for the test message to be sent.**
  - **Current State:** Shows the current state of the recipient's call-out when a call-out is in progress.
  - **Last Status**: Shows the status of the previous call-out for the selected recipient. This is only updated when a call-out has been completed. Some of the possible results are: success, no dial tone, busy, no answer, and no carrier.

Common North American text message email domains	
AT&T	@txt.att.net
Rogers	@pcs.rogers.com
Sprint PCS	@messaging.sprintpcs.com
T-Mobile	@tmomail.net
US Cellular	@smtp.uscc.net
Verizon PCS	@vtext.com

A – 8.2.4: Installed Options

This screen lists the currently supported notification hardware (modem and email), their current status, and some diagnostic information.

A – 8.3: Datalog Frequency

Once you have entered System Configuration, select Datalog Frequency (Operator) from the menu. Here you can choose how often the controller collects data. By setting the Datalog Frequency longer, the more information the controller can store, but the less detailed the information is.

A – 8.4: Date, Time & Units

Once you have entered System Configuration, select Date, Time & Units from the menu. Here you can enter the values for the following:

- **Units (Op):** Here you can choose from U.S. or Metric measurements.
- **Date Format (Op):** Here you can choose the format for the date.
- **Current Date (Op):** Here you can set the current date.
- **Current Time (Op):** Here you can set the current time. Use the + / - key to toggle between AM and PM.

A – 8.5: User Setup

Once you have entered System Configuration, select User Setup from the menu. Here you can enter the access codes for Operators and Managers. You can enter 6 codes for Operators and 2 codes for Managers.

See the section on Access Codes for more information.

A – 8.6: Display Options

Once you have entered System Configuration, select Display Options from the menu.

- **Page Delay (Op):** Here you can set the delay for scrolling to the next page in the normal display. These screens will only scroll when not in a menu screen.
- **Backlight Delay (Op):** *Only shown if the LCD display with the white backlight display is installed and one of the two-state backlight modes is used.* When a key is pressed, delay this amount of time before dimming or shutting off the backlight.
- **Toggle LCD Mode (Op):** Toggles the LCD display between negative and positive modes.

A – 9: VFD Turndowns

VFD Turndowns allow you to trigger or cancel manual turndowns (must have a manual turndown enabled for this menu to appear). This will also display the next scheduled turndown.

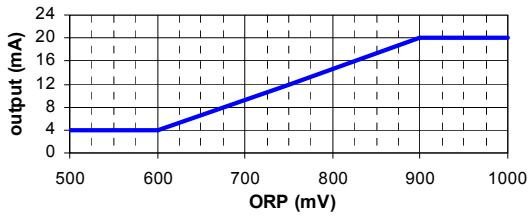
A – 10: 4-20mA Outs

The 4-20mA output board allows you to connect to either a building management system or to control a VFD.

If you have a 4-20 mA board installed in your system you may choose 4-20mA outputs from the main menu. By selecting one of the 4-20mA output channels you will be able to select the following:

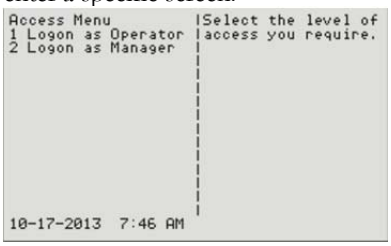
- **Usage (Mgr):** Selects what to use the selected 4-20mA output channel for.
  - **Recorder Out:** Output a 4-20mA signal based on one of the controller's inputs, feed set points, or alarm set points. Once you have selected Recorder Out, you will need to then select the Source (see below).
  - **VFD Control Out:** Use this channel to control a VFD unit connected to the recirculation pump.
  - **Disable:** Disables the 4-20mA output.
- **Source (Mgr):** *Only shown if the usage is set to Recorder Out.* Configures the recorder out's signal source. This is broken up into four different categories to make selection of the source easier. Select the Recorder Out's source from one of the following lists:
  - **Inputs:** Lists all enabled inputs compatible for outputting on the selected 4-20mA output channel.
  - **Feed Set Points:** Lists all enabled controls using feed set points. Note that some feeds have more than one set point to control to. If a control's feed point is selected, the output signal will be whatever value that feed is controlling to.
  - **High Alarm Set Points:** Lists all available high alarm set points for use as the source.
  - **Low Alarm Setpoints:** Lists all available low alarm set points for use as the source.
  - **Disable:** Disables the recorder out.
- **20 ma value (Mgr):** *Only shown if usage is set to Recorder Out.* Enter the value which the recorder will output 20 mA for.
- **4 ma value (Mgr):** *Only shown if usage is set to Recorder Out.* Enter the value which the recorder will output 4 mA for.

Example: Source: ORP input, 4 mA value = 600 mV, 20 mA value = 900 mV. ORP values between 600 and 900 mV are lineally scaled between 4 and 20 mA as shown below.



A – 11: Access Menu

The controller will require users to enter their access code before allowing them to enter the menus or set any values under the quick set keys. The controller automatically displays the access screen whenever a user does not have a high enough access level to enter a specific screen.



To enter an Operator access code, press 1.
To enter a Manager access code, press 2.
If at anytime you wish to logon as another access level, you may do so by pressing the Menu key and selecting Logon from the main menu.

Section B: The Normal Display

The normal display refers to the screens that display all of your inputs, current alarms, and status messages. These are read only and do not offer any selections to chose from.

B – 1: Inputs and Feeds

When no alarms or status messages are present, the entire screen will be used to display all of the enabled inputs. If a particular input is used by a control output and the control output is feeding based off of that input, the controller will display a message next to that input indicating so.

Other information such as LSI/RSI calculated values and Customer/Location/Rep information may also be displayed.

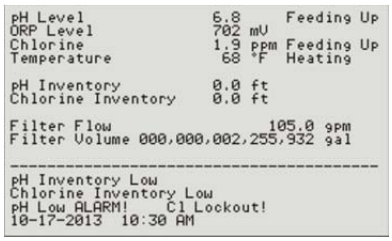
If there are more items to show than there is room for, the controller the controller will page through them until they all have been displayed, then start over.

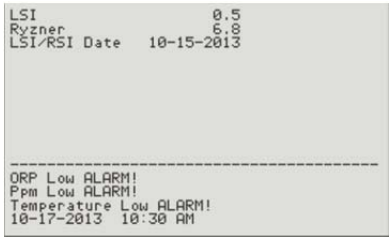
- Pressing the right arrow key (Next) will display the next page.
- Pressing the Lock Screen button will prevent the controller from paging the screen to show more inputs, alarms, and other status information.
- You can adjust the rate at which the controller pages by pressing the up and/or down arrow keys.

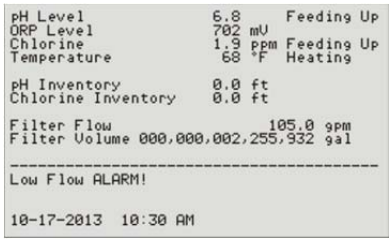
B – 2: Alarms & Status messages

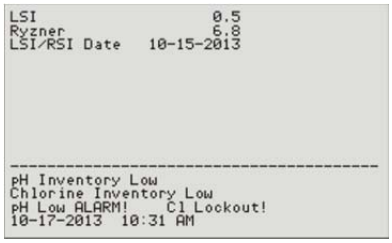
When one or more alarms are active, the bottom three lines are used to list them. If more than three alarms are active, the controller will page through them three at a time until they all have been displayed, then start over.

Super chlorination, dechlorination, sensor wash, and power saver all display status information in this area as well. If there are any active alarms while one or more of these control functions' are active, the alarms will be shown every other page while the control functions will alternate with each other.





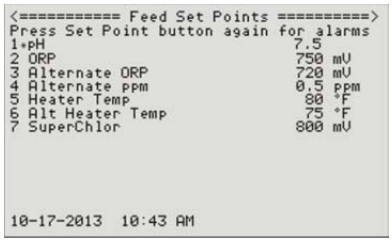




Section C: Using the Face Panel Quick Keys

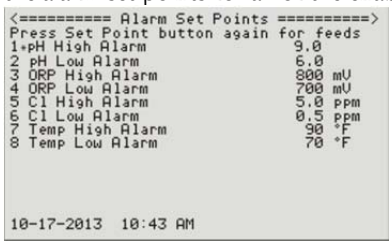
C – 1: The Set Points Key

The Set Points Key on the front face panel, when pressed, allows you to quickly change desired feed set points for the various control outputs that are enabled.



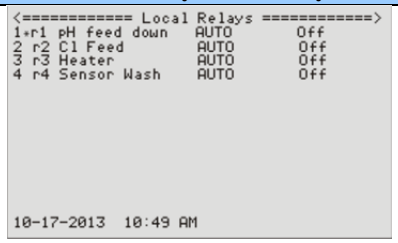
To change the existing feed set point, first select the desired option, input the new value, and then press enter.

Pressing the Set Points key a second time will display the alarm set points for all of the enabled inputs.



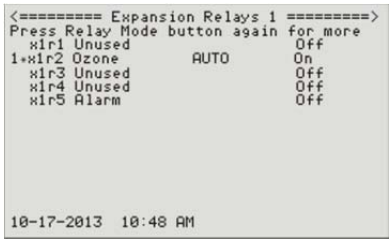
To change the existing alarm set point, first select the desired option, input the new value, and then press enter.

C – 2: The Relay Mode Key



Pressing the Relay Mode key on the front face panel shows you which options have been assigned relays, and each of the relays' current mode (AUTO/MANUAL OFF/MANUAL ON) and its state (Off or On).

Pressing the Relay Mode key again will cycle through the Relay Modules connected to the controller, showing what is assigned to those relays and their current state.



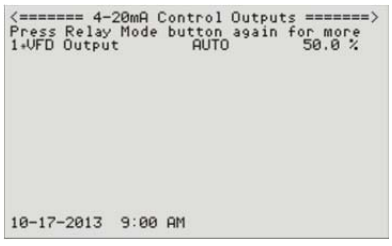
By selecting one of the assigned relays, you are allowed to choose between automatic, manual on or manual off. Unused relays and the alarm relay cannot be manually overridden, but their current state is always displayed.

If Manual On is selected, you will be prompted to enter how long the relay can stay in Manual On before returning to Auto (the maximum on time is 30 minutes).

To test a relay or to prime a pump (on the local relay screen), lock the screen while in the main Relay Mode menu, then press the relay's numeric key (i.e., for relay 3, press the 3 key). This will turn the relay on for as long as you are pressing that key. If the relay is already on, this will have no affect.

The Relay Expansion modules have a button to test the relays.

If you have the controller set up to control a VFD, pressing the Relay Mode Key again will display the 4-20mA Control Outputs.



From here you can switch between auto and manual on. There are two different manual on options:

- Manual % Out and Manual Flow Rate.
- Manual % Out sets the VFD output at a specified value.

Manual Flow Rate changes the VFD output to maintain a specified flow rate.

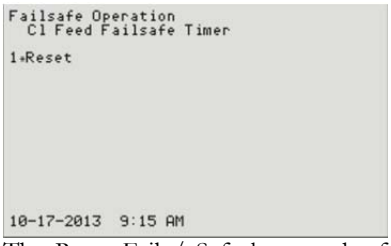
C – 3: The Cal Key (calibration)

The Cal (calibration) key on the front face panel, when pressed shows you the inputs you can perform a single point calibration. The standard inputs that can be calibrated are pH and ORP. Any other inputs you have enabled can also be calibrated from this Menu screen. Select the input you wish to calibrate and enter the proper value.

Perform a single point calibration if the reading is off by a consistent amount throughout the input range.

If the readings are accurate at one reading, but are off by an increasing amount the farther away you go from that reading, contact your distributor.

C – 4: The Reset Fail / Safe Key



The Reset Fail / Safe key on the front face panel, when pressed, provides the following information and options:

- Lists any active failsafe alarms and provides the option to reset them. A failsafe alarm is generally triggered when one of the relays has remained on past the set time the function has been given to reach its set point. By choosing to reset the failsafe, the control that triggered the failsafe will be able to resume operating normally once again.

Warning: Before resetting any failsafe alarms, ensure that all functions of the controller are working properly.

- Displays the remaining time a relay may remain on before a failsafe will occur for each active feed with a failsafe time set.
- Provides the option to abort the Flow Restored Feed Delay whenever the flow restored feed delay is enabled and is currently delaying feeds.

C – 5: The Emergency Off Key

When the Emergency Off button is pressed, all relays are automatically shut off except for the alarm relay which will turn on. All the other relays will remain off until the emergency off button is pressed again.

The BECSys controller requires no maintenance other than a periodic calibration check and sensor cleaning.

D – 1: Potentiometric Sensors (pH and ORP)

D – 1.1: Electrode Cleaning

Slow response time and large offsets may indicate the electrode has become coated. The nature of the coating will dictate the type of cleaning technique that should be used.

⚠ Warning: You may lightly blot the water On a pH sensor tip on a paper towel, but never vigorously rub or wipe the pH bulb because this may scratch the delicate outer layer on the pH glass impairing its response.

- Soft coatings, like bacterial films, are best removed using a squirt bottle or the water jet from a faucet. If this is not successful, then gently wipe with a soft wet cloth.
- For a more severe coating, first try a strong detergent (something similar to Dawn liquid detergent) and warm water, using a soft brush (like a toothbrush). Isopropyl alcohol on a Q-tip is another good choice. Rinse the measuring end in distilled water before reinstallation.
- Greasy and oily coatings are best removed with a detergent solution or a solvent that will not attack the sensor body. Methanol and isopropyl alcohol are good choices for solvents. Acetone, MEK, THF, or trichloroethane will irreparably harm the electrode.
- Hard coatings, like calcium or lime scale, are best removed with a solvent appropriate for the particular coating. A 5% solution of hydrochloric acid (HCl) would be a good choice for calcium scale. If unsure of the proper solvent to remove a hard mineral coating, then alternate between a 5% hydrochloric acid and a 4% sodium hydroxide (NaOH) for 10 minutes each. After treating the electrode with these strong acids or bases, rinse the electrode with water and soak it in a pH 4 buffer for at least 1/2 hour.
- The platinum tip of an ORP sensor can be cleaned with an abrasive as a last resort. Gently scour the platinum with a 600 grit wet emery cloth, or preferably, a 1-3 micron alumina polishing powder.

D – 1.2: Long-Term Storage

Save the wetting cap that came with the sensor for long-term storage. After removing the sensor from the flow cell, clean it as in routine maintenance, then store it in the wetting cap using a pH 4 buffer saturated with potassium chloride (KCl). The potassium chloride will prevent electrolyte from leaching out of the sensors reference cell. The wetting cap only needs to be half full. If a number of sites are going to be serviced, for example, at the end of a season, then it might be a good idea to carry a pint of 4.0/KCl storage solution.

D – 2: Free Chlorine Sensor

Check the sensor measurement at regular intervals (at least once a month), and perform a recalibration if necessary.

As a rule of thumb, refill the measuring cell with electrolyte once per season (or every 12 months).

D – 2.1: Cleaning

- If the sensor membrane is visibly soiled, then remove the sensor from the flow cell and clean the membrane with a gentle water jet, or soak the membrane for a few minutes in a 1% to 10% hydrochloric acid (HCl) solution. Avoid chemical additives as they may damage the membrane.
- Replace a heavily soiled or damaged membrane.

D – 2.2: Long-Term Storage

Save the yellow protective cap that came with the sensor for long-term storage. After removing the sensor from the flow cell, empty the measuring cell of electrolyte (particularly if dehydration of the membrane is possible). Rinse the measuring chamber and electrode shaft with cold water and let them dry. Then screw the measuring cell down loosely and not to the stop, so that the membrane remains unstressed. When the sensor is put back into service, it will have to be refilled with electrolyte and run through an initial polarization before calibration.

D – 2.3: Filling electrolyte

- Unscrew the measuring chamber from the shaft.
- Hold the measuring chamber at an angle and fill in approximately 7 to 8 ml electrolyte, up to approximately 1 cm under the top edge.
- Tap the filled chamber several times on a flat surface to release any air bubbles.
- Screw the electrode shaft into the measuring chamber vertically from above, displacing all air from inside. Tighten slowly to the stop.

D – 3: Total Chlorine Sensor

Check the sensor measurement at regular intervals (at least once a month), and perform a recalibration if necessary.

As a rule of thumb, refill the measuring cell with electrolyte every 3 to 6 months. The membrane should be replaced once a year.

D – 3.1: Long Term Storage

After removing the sensor from the flow cell, empty the measuring cell of electrolyte (particularly if dehydration of the membrane is possible). Rinse the measuring chamber and electrode shaft with cold water and let them dry. Then loosely screw the measuring cell down. The membrane must not rest against the measuring electrode.

When the sensor is put back into service, the electrode tip must be cleaned with the special abrasive paper and a new membrane cap must be used.

D – 3.2: Cleaning The Electrode Tip

To clean the electrode tip, first remove the membrane cap. Be sure to expose the vent when removing the membrane cap to prevent damage to the membrane. Clean the electrode finger using a clean, dry paper towel. The special abrasive paper is used on just the electrode tip. Place the special abrasive paper on a paper towel and hold it at one corner. Hold the probe perpendicular to the paper towel and abrasive paper and rub the electrode tip two or three times across the abrasive paper. Once the tip has been cleaned, replace the electrolyte.

D – 3.3: Filling Electrolyte

The lower portion (below the upper band) unscrews. Be sure to lift the hose ring that covers the vent while removing the membrane cap.

⚠ Warning: The membrane may be damaged if the vent is not opened while removing the membrane cap.

⚠ Warning: Never touch the electrode finger.

Fill the membrane cap to the edge with the electrolyte. Make sure there are no bubbles.

Insert the sensor into the membrane cap. Slowly screw the membrane cap onto the sensor. Excess electrolyte will escape through a valve in the membrane cap – do not block this valve. Rinse excess electrolyte off with water.

To re-install the sensor in the flow cell:

The Probe Ring is installed first.

Slide the smaller diameter O-Ring up the sensor body until it rests against the Probe Ring.

Insert the larger diameter O-Ring into the O-Ring retainer.

Slide the O-Ring retainer (O-Ring side towards membrane) up against the O-Ring just installed.

Insert the complete assembly into the Flow Cell. Check the Teflon Tape around the Probe Nut and re-wrap if necessary. Use the Probe Nut to secure the sensor inside the Flow Cell. The top of the Probe Nut should be at the bottom of the label.

The voltage applied by the controller to the Free Chlorine Sensor polarizes the surface of the gold cathode. The polarization period (one hour) must elapse before calibration is performed based on the results acquired through the use of a DPD test kit.

D – 4: Conductivity Sensor

D – 4.1: Cleaning

- The sensor should be kept as clean as possible for optimum measurement accuracy. The frequency of cleaning will depend upon the application.

⚠Warning: Residue from cleaning solutions, or even skin contact, can leave trace elements on the sensor that may affect the reading.

- When necessary, wash with strong detergent (something similar to Dawn liquid detergent) and warm water, using a pipe cleaner or small soft brush for most fouling. Rinse with tap water to completely remove the detergent, and then perform a final rinse with distilled or de-ionized water.
- For hard scale, try a mild acid solution. Vinegar will often do it, 5% hydrochloric acid if the vinegar doesn't work. You can use acetone or something similar on this sensor.

⚠Warning: Do not soak the sensor in a strong solvent as the O-rings may be attacked after time.

Section E: Feed Charts

Use the charts on the following pages to determine the correct amount of chemical to add to spa or pool water to achieve desired conditions. Choose which chart to use by the chemical indicated and the number of gallons to be treated.

E – 1: Spa Feed Charts

Quantity of Muriatic Acid Needed to Lower Total Alkalinity

Desired Decrease In ppm	Gallons in Spa					
	100	150	250	500	750	1000
10	1.25 ts	2.00 ts	1.00 tb	2.00 tb	3.00 tp	0.25 cp
20	2.50 ts	4.00 ts	2.00 tb	0.25 cp	0.33 cp	0.50 cp
30	1.25 tb	2.00 tb	3.00 tb	0.33 cp	0.67 cp	0.75 cp
40	5.00 ts	2.50 tb	0.25 cp	0.50 cp	0.75 cp	1.00 cp
50	2.00 tb	3.00 tb	5.00 tb	0.67 cp	1.00 cp	1.33 cp
60	2.50 tb	0.25 cp	0.33 cp	0.75 cp	1.00 cp	1.50 cp
70	3.00 tb	0.25 cp	0.50 cp	1.00 cp	1.33 cp	1.75 cp
80	3.50 tb	0.33 cp	0.50 cp	1.00 cp	1.50 cp	2.00 cp
90	0.25 cp	0.33 cp	0.67 cp	1.00 cp	1.67 cp	2.33 cp
100	0.25 cp	0.50 cp	0.67 cp	1.33 cp	2.00 cp	2.50 cp

ts = teaspoon tb = tablespoon cp = one cup (8 fl oz)

Quantity of Sodium Bisulfate Needed to Lower Total Alkalinity

Desired Decrease In ppm	Gallons in Spa					
	100	150	250	500	750	1000
10	1.50 ts	2.50 ts	1.00 tb	2.50 tb	0.25 cp	0.33 cp
20	1.00 tb	1.50 tb	2.50 tb	0.33 cp	0.50 cp	0.67 cp
30	1.50 tb	2.50 tb	0.25 cp	0.50 cp	0.75 cp	1.00 cp
40	2.00 tb	3.00 tb	0.33 cp	0.67 cp	1.00 cp	1.25 cp
50	2.50 tb	0.25 cp	0.50 cp	0.75 cp	1.25 cp	1.50 cp
60	3.00 tb	4.50 tb	0.50 cp	1.00 cp	1.50 cp	2.00 cp
70	0.25 cp	0.33 cp	0.50 cp	1.00 cp	1.67 cp	2.25 cp
80	0.25 cp	0.33 cp	0.67 cp	1.25 cp	2.00 cp	2.50 cp
90	0.33 cp	0.50 cp	0.75 cp	1.50 cp	2.25 cp	3.00 cp
100	0.33 cp	0.50 cp	0.75 cp	1.67 cp	2.50 cp	3.25 cp

ts = teaspoon tb = tablespoon cp = one cup (8 fl oz)

Quantity of Bicarbonate of Soda Needed to Raise Total Alkalinity

Desired Increase In ppm	Gallons in Spa					
	100	150	250	500	750	1000
10	1.25 ts	2.00 ts	4.00 ts	2.50 tb	0.25 cp	0.33 cp
20	1.00 tb	1.50 tb	2.50 tb	5.00 tb	0.50 cp	0.50 cp
30	1.50 tb	2.00 tb	3.50 tb	0.50 cp	0.67 cp	1.00 cp
40	2.00 tb	3.00 tb	0.33 cp	0.50 cp	1.00 cp	1.00 cp
50	2.50 tb	3.50 tb	6.00 tb	0.75 cp	1.00 cp	1.50 cp
60	3.00 tb	0.25 tb	0.50 cp	1.00 cp	1.33 cp	1.75 cp
70	3.50 tp	0.35 cp	0.50 cp	1.00 cp	1.50 cp	2.00 cp
80	0.25 cp	0.33 cp	0.50 cp	1.25 cp	1.75 cp	2.50 cp
90	0.33 cp	0.50 cp	0.67 cp	1.33 cp	2.05 cp	2.75 cp
100	0.33 cp	0.50 cp	0.75 cp	1.50 cp	2.25 cp	3.00 cp

ts = teaspoon tb = tablespoon cp = one cup (8 fl oz)

Quantity of Calcium Chloride Needed to Increase Calcium Hardness

Desired Increase In ppm	Gallons in Spa					
	100	150	250	500	750	1000
10	1.25 ts	2.00 ts	1.00 tb	2.00 tb	3.00 tb	0.25 cp
20	2.50 ts	4.00 ts	2.00 tb	0.25 cp	0.33 cp	0.50 cp
30	1.25 tb	2.00 tb	3.00 tb	0.33 cp	0.67 cp	0.75 cp
40	4.00 ts	2.50 tb	0.25 cp	0.50 cp	0.75 cp	1.00 cp
50	2.00 tb	3.00 tb	5.00 tb	0.67 cp	1.00 cp	1.33 cp
60	2.50 tb	0.25 cp	0.33 cp	0.75 cp	1.00 cp	1.50 cp
70	3.00 tp	0.25 cp	0.50 cp	1.00 cp	1.33 cp	1.75 cp
80	3.50 tp	0.25 cp	0.50 cp	1.00 cp	1.50 cp	2.00 cp
90	0.25 cp	0.33 cp	0.33 cp	1.00 cp	1.67 cp	2.33 cp
100	0.25 cp	0.50 cp	0.67 cp	1.33 cp	2.00 cp	2.50 cp

ts = teaspoon tb = tablespoon cp = one cup (8 fl oz)

Quantity of Chlorine Compound Needed to Increase 1 ppm

Percent Chlorine In Product	Gallons in Spa					
	100	150	250	500	750	1000
5	0.50 tb	2.00 ts	1.25 tb	2.50 tb	0.25 cp	0.33 cp
10	0.25 tb	1.00 ts	2.00 ts	1.25 tb	2.00 tb	2.50 tb
12	0.25 tb	1.00 ts	0.50 tb	1.00 tb	1.50 tb	2.00 tb
30	0.25 tb	0.33 ts	0.75 ts	1.25 ts	2.00 ts	2.50 ts
40	0.167 ts	0.25 ts	0.500 ts	1.00 ts	1.50 ts	2.00 ts
50	0.167 ts	0.25 ts	0.375 ts	0.75 ts	1.25 ts	1.50 ts
60	0.167 tb	0.200 ts	0.375 ts	0.50 ts	1.00 ts	1.25 ts
65	0.100 ts	0.167 ts	0.250 ts	0.50 ts	0.75 ts	1.00 ts

ts = teaspoon tb = tablespoon cp = one cup (8 fl oz)

E – 2: Pool Feed Charts

Quantity of Muriatic Acid Needed to Lower Total Alkalinity									
Desired Decrease In ppm	Gallons in Pool								
	10,000	25,000	50,000	75,000	100,000	200,000	500,000	750,000	1,000,000
10	1.30 pt	1.62 qt	3.25 qt	1.22 gl	1.62 gl	3.25 gl	8.13 gl	12.20 gl	16.25 gl
20	1.30 pt	3.25 qt	1.62 gl	2.43 gl	3.25 gl	7.50 gl	16.20 gl	24.30 gl	32.50 gl
30	1.95 qt	1.22 gl	2.44 gl	3.86 gl	4.98 gl	9.76 gl	24.40 gl	36.60 gl	48.80 gl
40	2.80 qt	1.63 gl	3.25 gl	4.87 gl	6.50 gl	13.00 gl	32.50 gl	48.80 gl	65.00 gl
50	3.25 qt	2.03 gl	4.07 gl	6.10 gl	8.14 gl	16.28 gl	40.70 gl	61.00 gl	81.40 gl
60	3.90 qt	2.44 gl	4.88 gl	7.32 gl	9.76 gl	19.52 gl	48.80 gl	73.20 gl	97.80 gl
70	1.14 gl	2.84 gl	5.69 gl	8.54 gl	11.38 gl	22.76 gl	56.90 gl	85.45 gl	113.80 gl
80	1.30 gl	3.25 gl	6.50 gl	9.75 gl	13.00 gl	26.00 gl	65.00 gl	97.50 gl	138.00 gl
90	1.48 gl	3.66 gl	7.31 gl	10.96 gl	14.82 gl	29.24 gl	73.10 gl	109.60 gl	146.20 gl
100	1.63 gl	4.06 gl	8.12 gl	12.18 gl	16.24 gl	32.48 gl	81.20 gl	121.80 gl	162.40 gl
120	1.96 gl	4.88 gl	9.76 gl	14.64 gl	19.52 gl	39.00 gl	97.80 gl	148.40 gl	196.20 gl
150	2.44 gl	6.09 gl	12.18 gl	18.27 gl	24.40 gl	48.80 gl	121.80 gl	182.70 gl	244.00 gl
200	3.25 gl	8.12 gl	18.24 gl	24.36 gl	32.50 gl	65.00 gl	162.40 gl	243.80 gl	325.00 gl

pt = one pt (16 fl oz) qt = one quart (32 fl oz) gl = one gallon (128 fl oz)

Quantity of Bicarbonate of Soda Needed to Raise Total Alkalinity									
Desired Increase In ppm	Gallons in Pool								
	10,000	25,000	50,000	75,000	100,000	200,000	500,000	750,000	1,000,000
10	1.50 lb	3.75 lb	7.50 lb	11.25 lb	15.00 lb	30.00 lb	75.00 lb	112.50 lb	150.00 lb
20	3.00 lb	7.50 lb	15.00 lb	22.50 lb	30.00 lb	60.00 lb	150.00 lb	225.00 lb	300.00 lb
30	4.50 lb	11.25 lb	22.50 lb	33.75 lb	45.00 lb	90.00 lb	225.00 lb	337.50 lb	450.00 lb
40	6.00 lb	15.00 lb	30.00 lb	45.00 lb	60.00 lb	120.00 lb	300.00 lb	450.00 lb	600.00 lb
50	7.50 lb	18.75 lb	37.50 lb	56.25 lb	75.00 lb	150.00 lb	375.00 lb	562.50 lb	750.00 lb
60	9.00 lb	22.50 lb	45.00 lb	67.50 lb	90.00 lb	180.00 lb	450.00 lb	675.00 lb	900.00 lb
70	10.50 lb	26.25 lb	52.50 lb	78.75 lb	105.00 lb	210.00 lb	525.00 lb	787.50 lb	1050.00 lb
80	12.00 lb	30.00 lb	60.00 lb	90.00 lb	120.00 lb	240.00 lb	600.00 lb	900.00 lb	1200.00 lb
90	13.50 lb	33.75 lb	67.50 lb	101.25 lb	135.00 lb	270.00 lb	675.00 lb	1012.50 lb	1350.00 lb
100	15.00 lb	37.50 lb	75.00 lb	112.50 lb	150.00 lb	300.00 lb	750.00 lb	1125.00 lb	1500.00 lb

lb =pounds of dry chemical

Quantity of Calcium Chloride Needed to Increase Calcium Hardness									
Desired Increase In ppm	Gallons in Pool								
	10,000	25,000	50,000	75,000	100,000	200,000	500,000	750,000	1,000,000
	lb oz	lb oz	lb oz	lb oz	lb oz	lb	lb oz	lb oz	lb
10	1 4	3 2	6 4	9 6	12 8	25	62 8	93 12	125
20	2 8	6 4	12 8	18 12	25 0	50	125 0	197 8	250
30	3 12	9 6	18 12	28 2	37 8	75	187 8	281 4	375
40	5 0	12 8	25 0	37 8	50 0	100	250 0	375 0	500
50	6 4	15 10	31 4	46 14	62 8	125	312 8	468 12	625
60	7 8	18 12	37 8	56 4	75 0	150	375 0	562 8	750
70	8 12	21 14	43 12	65 10	87 8	175	437 8	658 4	875
80	10 0	25 0	50 0	75 0	100 0	200	500 0	750 0	1,000
90	11 4	28 2	56 4	84 6	112 8	225	562 8	843 12	1,125
100	12 8	31 4	62 8	93 12	125 0	250	625 0	937 8	1,250
150	18 12	46 14	93 12	104 10	187 8	375	937 8	1,406 4	1,875
200	25 0	62 8	125 0	187 8	250 0	500	1,250 0	1,875 0	2,500

Quantity of Chlorine Compound Needed to Increase 1 ppm									
Percent Chlorine In Product	Gallons in Pool								
	10,000	25,000	50,000	75,000	100,000	200,000	500,000	750,000	1,000,000
5	3.2 cp	2 qt	1 gl	1.5 gl	2 gl	4 gl	10 gl	15 gl	20 gl
10	1.6 cp	1 qt	2 qt	3 qt	1 gl	2 gl	5 gl	7.5 gl	10 gl
12	1.33 cp	1.67 pt	1.517 qt	2.276 pt	3.33 qt	1.665 gl	4.163 gl	6.245 gl	8.326 gl
30	0.278 lb	0.665 lb	1.390 lb	2.085 lb	2.780 lb	5.580 lb	13.900 lb	20.850 lb	27.800 lb
40	0.209 lb	0.521 lb	1.043 lb	1.565 lb	2.086 lb	4.172lb	10.430 lb	15.645 lb	20.860 lb
50	0.167 lb	0.417 lb	0.834 lb	1.251 lb	1.668 lb	3.336lb	8.340lb	12.511 lb	16.680 lb
60	0.139 lb	0.348 lb	0.695 lb	1.043 lb	1.390 lb	2.780lb	6.950 lb	10.425 lb	13.900 lb
65	0.128 lb	0.321 lb	0.642 lb	0.963 lb	1.284 lb	2.568lb	6.420 lb	9.630lb	12.840 lb
70	0.119 lb	0.298 lb	0.596 lb	0.894 lb	1.192 lb	2.384lb	5.960lb	8.940 lb	11.920 lb
75	0.111 lb	0.278 lb	0.556 lb	0.834 lb	1.112 lb	2.224 lb	5.560 lb	8.340 lb	11.120 lb
80	0.104 lb	0.261 lb	0.521 lb	0.782 lb	1.042 lb	2.064 lb	5.210 lb	7.815 lb	10.420 lb
85	0.096 lb	0.417 lb	0.491 lb	0.737 lb	0.982 lb	1.964 lb	4.910 lb	7.365 lb	9.829 lb
90	0.093 lb	0.232 lb	0.463 lb	0.695 lb	0.926 lb	1.852 lb	4.630 lb	6.945 lb	9.260 lb
100	0.083 lb	0.209 lb	0.417 lb	0.626 lb	0.634 lb	1..668 lb	4.170 lb	6.225lb	8.340 lb

cp = one cup (8 fl oz) pt = one pt (16 fl oz) qt = one quart (32 fl oz)
gl = one gallon (128 fl oz) lb =pounds of dry chemical

Section F: Replacement Parts

Fuses		
8140086	**115V Unit** Main Fuse	Time Lag 250mA 250V
8140093	**230V Unit** Main Fuse	Time Lag 125mA 250V
8140088	Relays 1-4	Time Lag 3A 250V
8140059	RS485 Fuse	Time Lag 250mA 250V
8140091	4-20mA Loop Power Board	Time Lag 50mA 250V
8320053	Fuse Cap	

Sensors	
pH Sensors	
9660013	BECSys pH Sensor (30" cable) [range: 0 to 14.0 pH]
9660010	BECSys pH Sensor (10' cable) [range: 0 to 14.0 pH]
ORP Sensors	
9660022	BECSys ORP Sensor Platinum Band (30" cable) [range: 0 to 1000mV]
9660023	BECSys ORP Sensor Platinum Band (10' cable) [range: 0 to 1000mV]
9660038	BECSys ORP Sensor Solid Gold Band (30" cable) [range: 0 to 1000mV]
9660040	BECSys ORP Sensor Solid Gold Band (10' cable) [range: 0 to 1000mV]
pH/ORP Sensor Accessories	
8500061	4/KCl solution (pint); for long-term storage of sensors
8680015	½" Wetting Cap for pH and ORP sensors
Temperature Sensors	
9660016	Temperature Sensor (30" cable) [range: 32°F to 212°F (0°C to 100°C)]
9660003	Temperature Sensor (10' cable) [range: 32°F to 212°F (0°C to 100°C)]
Flow Switches	
9660006	Reed flow switch [Switch Point (On): 2.0 gpm]
9660007	Rotary flow switch [Switch Point (On): 1.5 gpm]
9060547	Spring Check Valve
8680019	Rotary Flow Switch Replacement Kit includes: 1 Pin, 1 Cover, 1 Wheel, 1 O-ring
8060663	Rotary Flow Switch Replacement Pin
8060664	Rotary Flow Switch Replacement Cover
8060665	Rotary Flow Switch Replacement Wheel
8060666	Rotary Flow Switch Replacement O-Ring
Amperometric PPM (Cl)	
9660005	Amperometric Sensor only, no flow cell [range: 0 to 20 ppm]
8680016	Replacement Membranes (2 pieces) for Chlorine Sensor 9660005
8680017	Electrolyte (50 ml) for Chlorine Sensor 9660005
2220363	Amperometric ppm Probe Nut
Total Chlorine	
8660044	Total Chlorine Sensor only, no flow cell [range: 0 to 20 ppm]
2220359	Probe Ring
2220360	Total Chlorine Probe Nut
2220361	O-Ring Retainer
8060808	O-Ring 3/32x0.987 ID
8060809	O-Ring 3/32x1.174 ID
Pressure and Vacuum	
8660029	Pressure transducer only, no cable [range: 0 to 100 PSI]
8660033	Vacuum transducer only, no cable [range: -14.7 to 85 PSI]
9660019	Vacuum Swichgage [range: 0 to 30 in. HG]
9660020	Pressure Swichgage [range: 0 – 50 PSI]
8660021	Differential Swichgage [range: 0 – 50 PSI]
Conductivity/TDS	
9660012	BECSys Conductivity Sensor [range: 0 to 20,000 micromho]
Turbidimeter	
1210261	BECSys Turbidimeter [range: 0 to 20.00 NTU]
9680024	Dessicant Tray – Refill
Flowmeters	
8660008	Flowmeter (1/2" to 4") [range: 0 to 655.35 Kgpm]
9660009	Flowmeter (5" to 8") [range: 0 to 655.35 Kgpm]
9660004	Flowmeter (10" to 36") [range: 0 to 655.35 Kgpm]

Boards	
1200409	BECSys5 CPU/Relay PCB
1200411	BECSys5 UI PCB
Input Boards	
1200413	BECSys5 Standard Input Board
1200506	BECSys5 Conductivity Input Board
1200531	Remote Probe Module Interface Board
Communications Boards	
1200459	BECSys 56k Data/Fax Modem PCB
1200491	BECSys Ethernet PCB
1200438	BECSys Ethernet + 56k Data Modem PCB
1200612	BECSys Modbus Ethernet PCB
1200613	BECSys Modbus Ethernet + 56k Data Modem PCB
Other Boards	
1200494	BECSys Loop Power Board (4 power supplies for 4-20mA inputs)
1200453	BECSys 4-20mA output board (4 channel, 440 ohm) with 4 power supplies for 4-20mA inputs

Software	
1230079	BECSys5 Program IC (DIP)
2230079	BECSys5 Program IC (PLCC)
1230089	BECSys for Windows CD and Manual (media only, no license)
8680025	DIP Extraction Tool
8680026	DIP Insertion Tool
9680014	PLCC Extraction Tool

Documentation	
8620007	BECSys5 Operation and Maintenance Manual
8620013	BECSys5 Installation and Technical Manual
8620036	BECSys5 Quick Reference Sheet

Misc	
Enclosure Parts	
8060627	Enclosure Plug 0.875"
8060628	Enclosure Plug 1.125"
8520173	Single BNC cable assembly
8060736	Small watertight cord grip PG-7
8060735	Large watertight cord grip NPT ½"
9440137	BECSys5 Overlay
M000069	BECSys5 Lid Assembly
Internal Components	
8060237	Stack Board Standoffs
8060452	Stack Board Screws
9060526	Shield Screws
8380650	RS485 IC
9520039	Ribbon Cable
8020003	Battery
8041102	2 Position Pluggable Terminal Block (Inputs)
8041103	3 Position Pluggable Terminal Block (RS485, Flow Meter, Flow Switch)
8041104	5 Position Pluggable Terminal Block (Direct Connect)
Communications Cables	
9520136	BECSys DB9 6 ft Direct Connect Cable
9520196	BECSys DB9 50 ft Direct Connect Cable
9520197	BECSys USB 6 ft Direct Connect Cable
9520198	BECSys USB 50 ft Direct Connect Cable

Flow Cell Replacement Parts	
Round Flow Cell	
1220210	Round Flow Cell Body
1220205	Acrylic Cover for Round Flow Cell
8060626	O-Ring for Round Flow Cell
1220207	PVC Mounting Plate for Round Flow Cell
8080625	Screws – Mounting Plate
Rectangular Flow Cell	
1220201	2-Sensor Rectangular Flow Cell Body
1220200	Acrylic Cover for 2-Sensor Rectangular Flow Cell
8060669	O-Ring for 2-Sensor Rectangular Flow Cell
1220288	3-Sensor Rectangular Flow Cell Body
1220287	Acrylic Cover for 3-Sensor Rectangular Flow Cell
8060695	O-Ring for 3-Sensor Rectangular Flow Cell
Common Flow Cell Components	
8060189	Screws – Acrylic Cover
8060623	Elbow, 90° PVC
8060624	Elbow, 45° PVC
8060538	Plug, ¼" PVC
8060541	Nipple, ½" Close
8060621	Sample Valve, ¼" Ball Cock
8060546	Ball Valve ½" PVC
9060549	S80 Bushing, PVC ¾ x ½
9060544	Pressure Gauge
8060673	Pressure Regulator

LIMITED WARRANTY

BECS warrants the controller electronics and flow cell against any defect in workmanship or materials for a period of five years from the date of shipment. BECS warrants the pH and ORP sensors against any defect in workmanship or materials for a period of two years from the date of shipment. In the event of a component failure due to any defect in workmanship or materials, BECS will repair, or if repair is not possible, replace the defective part or parts of the BECSys controller.

BECS will have the sole right to determine whether to repair or replace a product. BECS will not be responsible for any expense associated with installation of repaired or replacement parts.

LIMITATIONS AND EXCLUSIONS

This is a LIMITED WARRANTY. BECS makes NO WARRANTIES other than those contained herein. The LIMITED WARRANTY replaces and is in lieu of any WARRANTIES of MERCHANTABILITY or of FITNESS FOR A PARTICULAR PURPOSE which are expressly DISCLAIMED. All GENERAL, SPECIAL, INDIRECT, INCIDENTAL AND/OR CONSEQUENTIAL DAMAGES ARE EXCLUDED AND DISCLAIMED.

This Limited Warranty is governed by Missouri Law and all disputes related to or arising from this transaction or Limited Warranty shall be resolved in Circuit Court of St. Louis County, Missouri.

Any claims under this Limited Warranty must be brought within ONE YEAR after the cause of action accrued.

BECS TECHNOLOGY has been designing and manufacturing the industry's most reliable water chemistry controller for over 20 years. Our 24,000 ft^2 facility in Saint Louis, Missouri is home to an exceptional design team, and all manufacturing is performed onsite at this facility where we can personally assure the quality of our products. The BECS commitment to excellence drives the most innovative new products and unparalleled customer service.

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BECS TECHNOLOGY
9487 Dielman Rock Island Ind Dr, St. Louis, MO 63132 www.becs.com