



USFilter

STRANTROL SYSTEM4

TECHNICAL GUIDE

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Mounting the System4 - Chapter 1

The Strantrol® System4 should be mounted to the wall. Make sure that the System4 is mounted in a location that is easily accessible, (Fig 1.1) free from chemical fumes and excessive heat, isolated from electrical interference, and powered by a power source protected by a ground fault interrupter. The System4 enclosure is weather resistant, but if mounting outdoors, locating the unit under a hood or overhang is recommended.

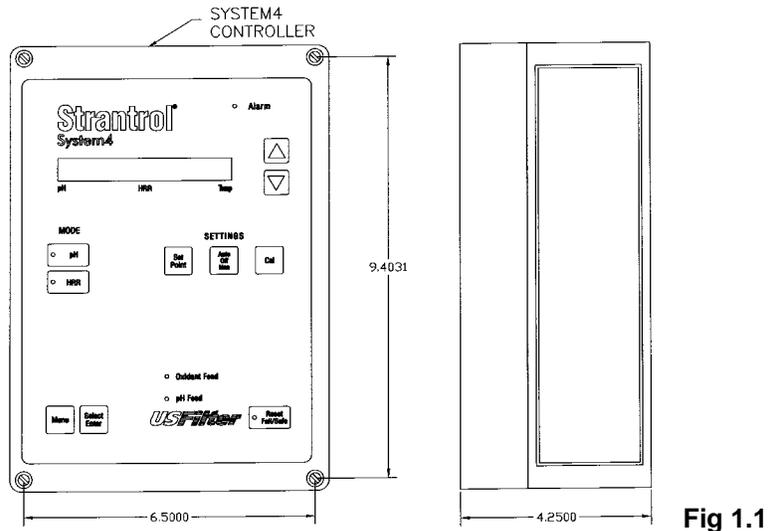


Fig 1.1

The flowcell can be mounted using two different techniques:

- Mount the flowcell next to the controller and run tubing from the flowcell to the sampling point (after filter, before heater) and discharge (before recirculation pump) of the recirculation system. (Fig 1.2)

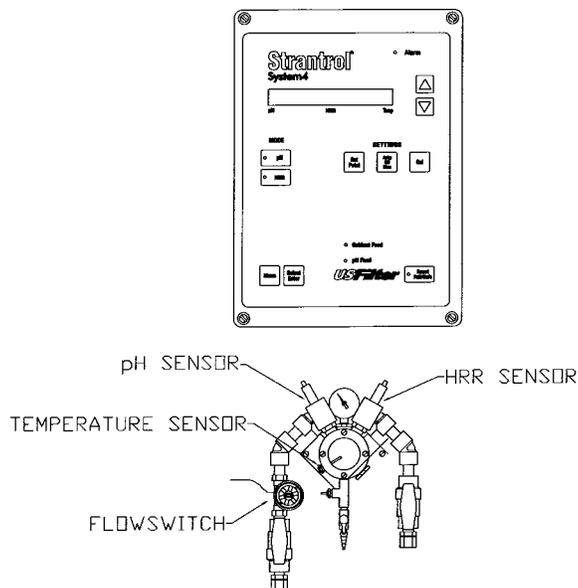


Fig 1.2

- Refer to Signal Transmitter (p 3-10).

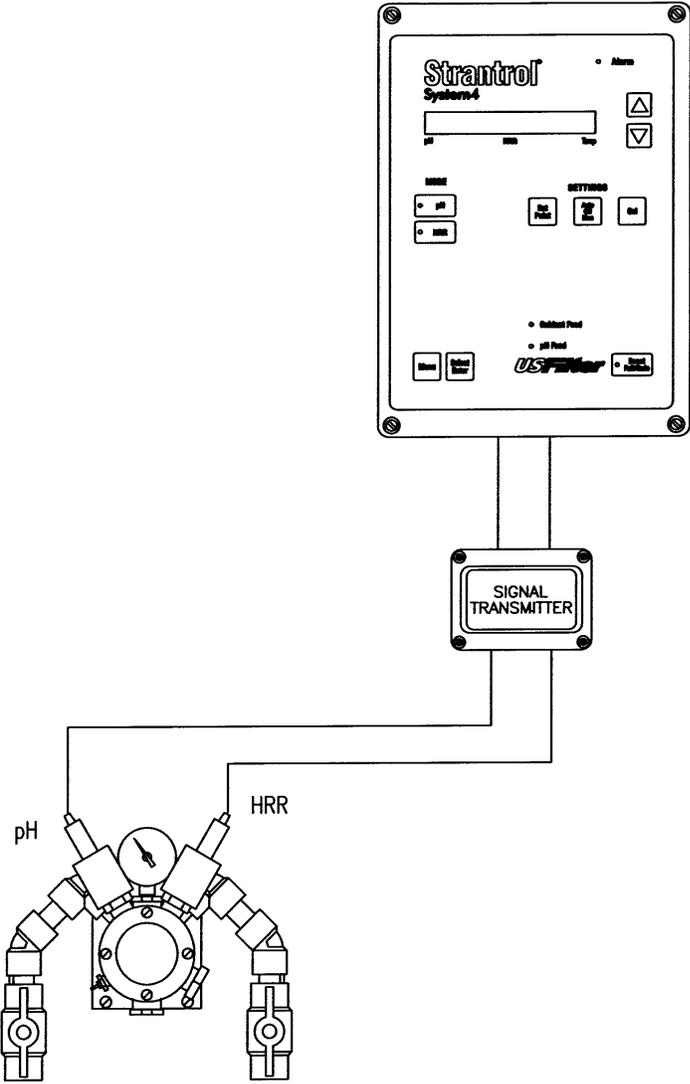


Fig 1.3

Plumbing Flowcell - Chapter 2

Assembling the flowcell

- First, wrap each fitting three times around clockwise with the Teflon[®] tape provided.
- Install ½” ball valves to allow isolation of the sample lines.
- Once you have finished assembling the flowcell, close the valves.
- Install the Paddlewheel Flow Switch in the sample stream. Make sure you only wrap the male fitting three times with Teflon[®] tape so as not to risk breaking the female fitting on the Paddlewheel Flow Switch. (Fig 2.1)



“Warning” Failure to incorporate a flow switch into the sample stream of your USFilter chemical controller can result in injury or harm to swimmers in or around the pool if the recirculation pump should fail or shut down.

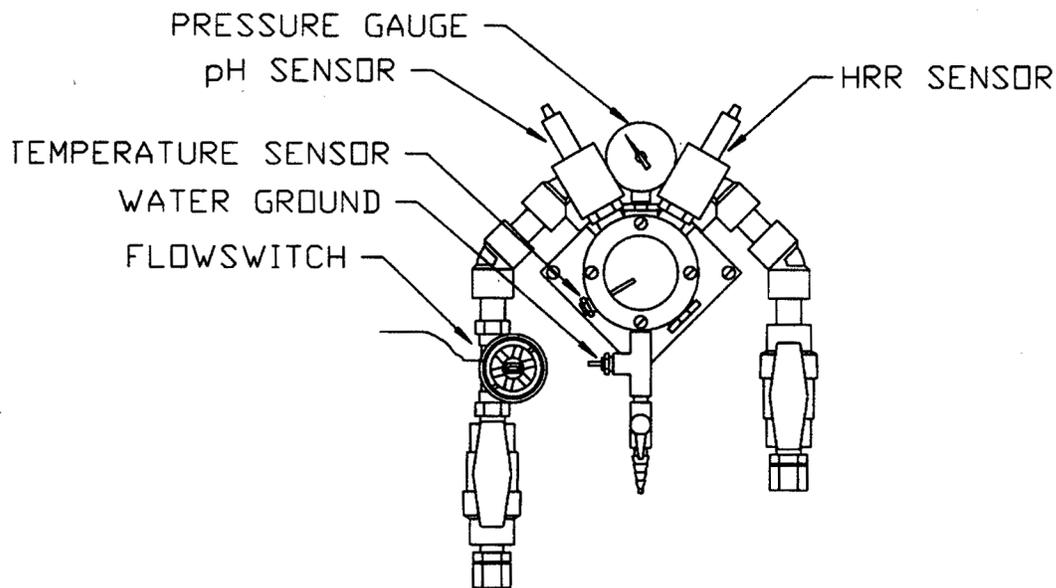


Fig 2.1

Plumbing the flowcell

- Half-inch tubing is recommended for sample stream pickup and return. We have included two connector fittings with the flowcell if needed.
- For the sampling point of the flowcell, tap downstream (after) of filter and upstream (before) of heater and chemical injection points.
- For the discharge point of the flowcell, tap upstream (before) of recirculation pump. (Fig 2.2)
- Remove the cap to the pH and HRR sensors. Clean tips with a toothbrush and dish soap and then a light acid (10% muratic).
- Screw pH, HRR and Temperature sensors into flowcell. (Fig 2.1)

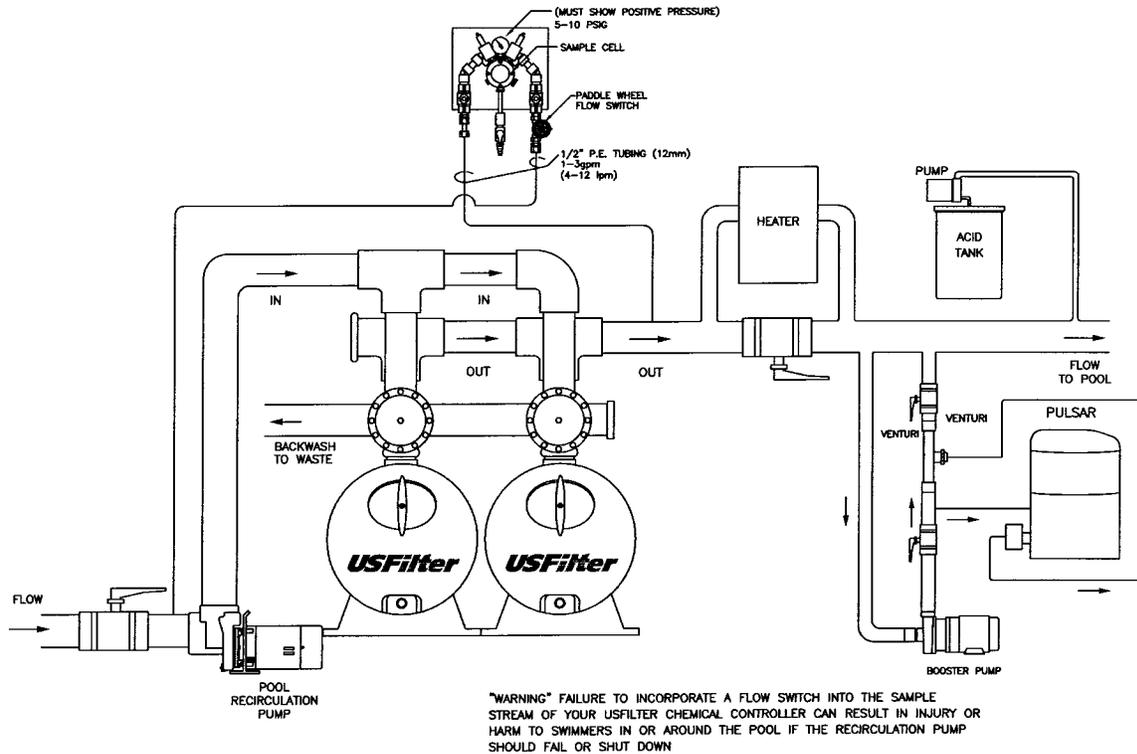


Fig 2.2

Checking the Flowcell

- Open the sample stream valves and check for leaks.
- Make sure the compound pressure gauge is showing a positive and steady pressure.
- Adjust the valves or relocate point at which the sample stream is connected to the recirculation system to ensure positive and steady pressure.
- Allow the sensors to rinse in the sample flowcell while you do the wiring.
- Open wet-test valve and make sure that it generates a vigorous stream.

System Startup - Chapter 3

System4 Board Types

This page describes connections that your Strantrol representative needs to make in order for your System4 to function. Connections are presented in order of board type (or location):

Key	Description
2	Input Board (Fig 3.1)
1	CPU Board (Fig 3.1)

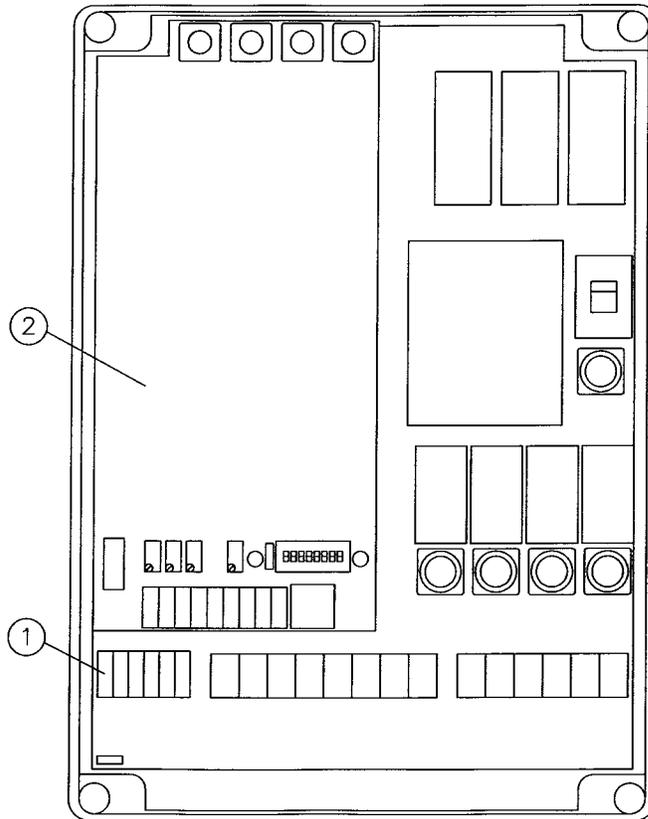


Fig 3.1

Running Power to System4

- Open System4 and place lid to the left, lining up the right two holes of the lid with the left two holes of the base. (Fig 3.3)

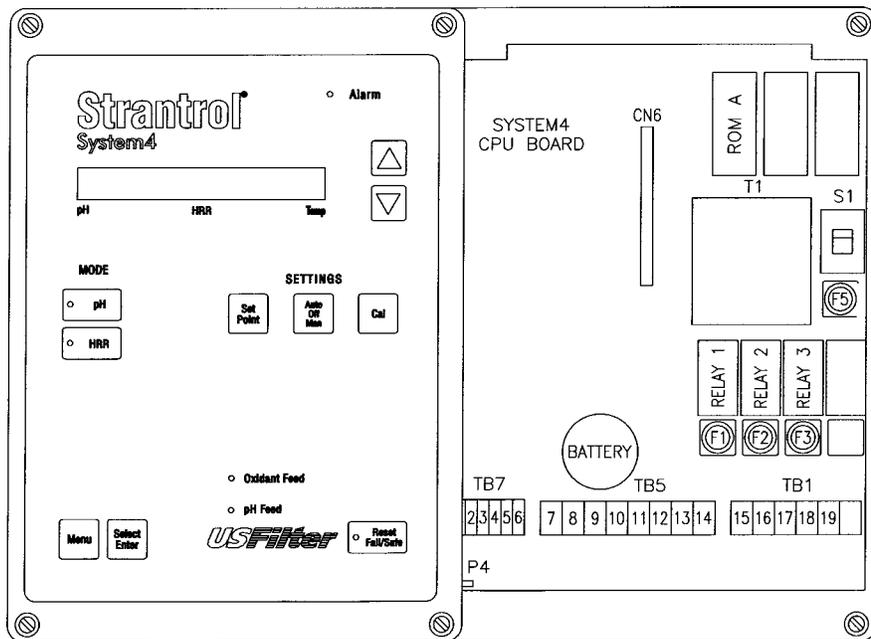


Fig 3.3

- If you are planning to use pigtailed for the power, be sure to use NEMA 4X cord grips and plugs for unused holes.
- Locate Terminal labeled "TB5".
- Run 120VAC, 60Hz, 15 AMP **surge protected** Line (Black) to terminal labeled "Line". (Both "Line" terminals are connected.)
- Run Ground (Green) to terminal labeled "Ground". (All three "Ground" terminals are connected.)
- Run Neutral (White) to terminal labeled "Neutral". (All three "Neutral" terminals are connected.) (Fig 3.4)

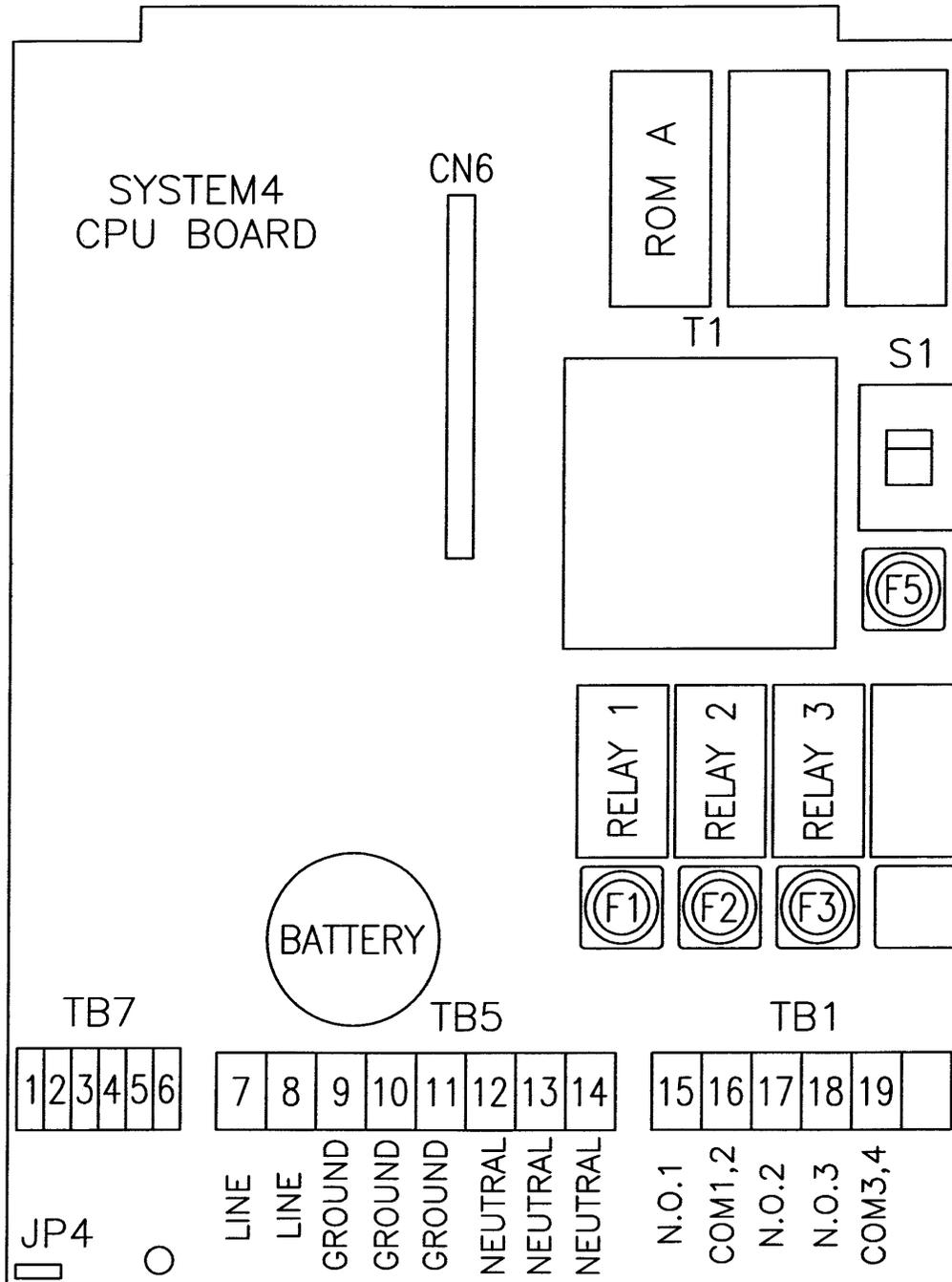


Fig 3.4

CPU Board Connections

CPU BOARD TERMINAL DESCRIPTIONS			
Terminal	Description	Comments/Notes	
TB7	1	Connects to face panel board terminal 1 (RS422 A)	TB7 provides wiring positions for connection to the user interface. Terminals 1 through 6 should be connected to TB1 on the user interface in the same order. (This cable may be extended up to 4000 feet by using the remote interface kit.)
	2	Connects to face panel board terminal 2 (RS422B)	
	3	Connects to face panel board terminal 3 (RS422 Y)	
	4	Connects to face panel board terminal 4 (RS422 Z)	
	5	Connects to face panel board terminal 5 (RS422 V+)	
	6	Connects to face panel board terminal 6 (RS422 GND)	
TB5	7	AC Line (Main) (Black)	One line terminal is used for power in. 120VAC, 60Hz, 15 AMP surge protected
	8	AC Line	
	9	Earth Ground (Green)	Used as Main Power, Earth, and Neutral connections.
	10	Earth Ground	
	11	Earth Ground	
	12	AC Neutral (White)	NEVER connect controller power neutral to pump power neutral. Warranty will be voided!
	13	AC Neutral	
	14	AC Neutral	
TB1	There are two common terminals on TB1, terminals 16 & 19. Each one is a common for two of the three dry-contact relays. The other three terminals (15,17 and 18) on TB1, are the remaining output contacts for those relays.		
	15	Relay Output 1(pH)	Switched AC LOAD from Relay #1 (pH control)
	16	Common AC Power for Relay Output 1 & 2	LINE Power to Relay 1 & 2 (MAINS) which must be interlocked with main water recirculation pump control relay (motor starter aux. contact) to disable chemical feed when main recirculation pump is disabled.
	17	Relay Output 2	Switched AC LOAD from Relay # 2 (default configuration is Sensor Wash)
	18	Relay Output 3 (chlorine)	Switched AC LOAD from Relay # 3 (chlorine/Bromine)
	19	Common AC Power for Relay Output 3	LINE Power to Relay 3 (MAINS) which must be interlocked with main water recirculation pump control relay (motor starter aux. contact) to disable chemical feed when main recirculation pump is disabled.

CPU Board Connections

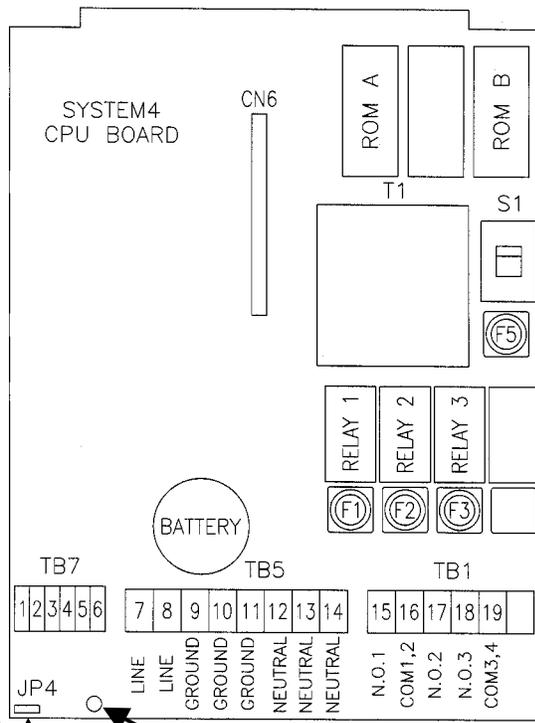


Fig 3.5

CPU BOARD FUSE DESCRIPTIONS	
Terminal	Description
F1	3 amp Slo Blo fuse for Relay Output 1
F2	1 amp Slo Blo fuse for Relay Output 2
F3	3 amp Slo Blo fuse for Relay Output 3
F5	Internal 3/4 amp Fuse for Strantrol Power

1 amp and 3 amp fuses needed for CSA, UL, and CE approvals

JP4 is the battery switch. Place the jumper to the two right most pins to turn the battery ON. Typical life of the battery is 5 years.

- Connect the Signal Generator 700 (SG-700) (Shield) to the test Ground for Calibration.

Wiring Devices to Relays in the System4

WARNING!

Controller power and feed device power must be separated. This setup reduces noise inside the controller and eliminates controller damage due to transient spikes from the pumps.

NEVER connect controller power neutral to feed device power neutral or **WARRANTY WILL BE VOID!**

- Relays 1 and 3 are configured for pH feed down and chlorine and cannot be changed.
- Relay 2 is already configured for a specific function but can be reconfigured for your application.

Relay 1	pH Feed Down
Relay 2	Sensor Wash
Relay 3	Chlorine Feed

- Other relay functions are below.

Control Action	Factory Default
pH Feed - Down	Relay 1 (not configurable)
pH Feed - Up	
Sensor Wash	Relay 2
Chlorine/Bromine	Relay 3 (not configurable)
Relay #2 can be interchanged in any order, including multiple relays controlling the same function. Note: If two relays control the same function, they will trigger at the same setpoint.	

- Locate Terminal labeled “TB1” in the System4. (Fig. 3.7)
- Connect device line to terminal labeled “N.O.#” (the # corresponds to the Relay #).

WARNING:	Failure to provide recirculation pump interlock could result in equipment damage and/or constitute a safety hazard.
-----------------	--



WARNING

PREVENT ELECTROCUTION

DISCONNECT ALL SUPPLY CONNECTIONS BEFORE SERVICING
THIS APPLIANCE HAS UP TO 3 SUPPLY CONNECTIONS

CAUTION: FOR CHANGE OF OPERATING VOLTAGE, REFER TO AUTHORIZED SERVICE PERSON.

ATTENTION: POUR ADAPTER L'APPAREIL À LA TENSION D'ALIMENTATION, COMMUNIQUER AVEC UN TECHNICIEN AUTORISÉ.

CAUTION: THIS UNIT MAY HAVE UP TO 3 POWER SUPPLY CONNECTIONS. DISCONNECT ALL POWER SUPPLY CONNECTIONS BEFORE SERVICING.

ATTENTION: CET APPAREIL REÇOIT PLUSIEURS ALIMENTATIONS. LE DÉBRANCHMENT DES CORDONS NE SUFFIT PAS NÉCESSAIREMENT À LE METTRE HORS TENSION.

RELAY WIRING MUST HAVE MINIMUM RATINGS OF 105°C, 600VAC, 14AWG AND HAVE INSULATION OF PVC TO COMPLY WITH THE MAXIMUM LOAD RATINGS FOR THIS EQUIPMENT. CONSULT YOUR NATIONAL OR LOCAL ELECTRICAL CODES FOR PROPER WIRING OF LESSER LOADS.

Technical Guide

(Example: pH feed and Chlorine feed)

pH feed

- Locate Terminal labeled “N.O.1”. (TB1 #15)
- Run Line from pH feed device to “N.O.1”. (TB1 #15)
- Run Neutral to feed device neutral.
- Run Ground to feed device ground.

Chlorine Feed

- Locate Terminal labeled “N.O.3”. (TB1 #18)
- Run Line from chlorine device to “N.O.3”. (TB1 #18)
- Run Neutral to feed device neutral.
- Run Ground to feed device ground.

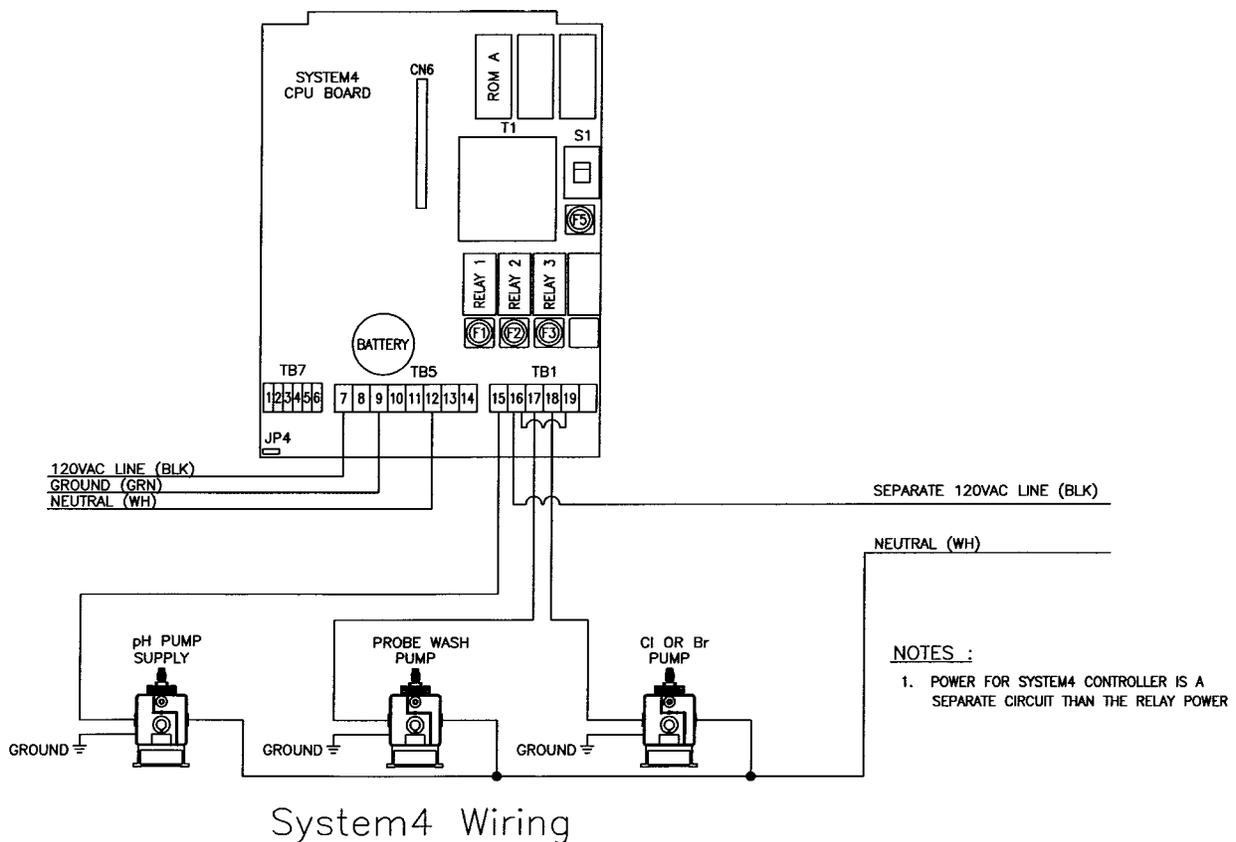


Fig 3.6

Connecting Flowcell to System4

pH, HRR and Temperature (optional) Sensors

- Plug pH sensor into the BNC jack on the left side of the System4 by twisting it a quarter of a turn to lock it.
- Plug HRR sensor into the BNC jack on the right side of the System4 by twisting it a quarter of a turn to lock it.
- Use a NEMA 4X cord grip to insert the Temperature Sensor cable into the System4.
- Locate the Input Board. (Fig. 3.7)
- Locate “+Temp-” in the Terminal labeled TB1. (Fig. 3.8)
- Connect the red wire to TB1 position 3.
- Connect the black wire to TB1 position 4.

Water Ground

- Locate the Input Board. (Fig 3.7)
- Locate “W.Gnd” in the Terminal labeled TB1. (Fig 3.8)
- Locate the stainless steel grounding screw provided as a part of the Flowcell.
- Using a recommended 18-gauge wire.
- Connect the stainless steel grounding screw to “W.Gnd” in TB1 position 1.

Flow Switch



“Warning” Failure to incorporate a flow switch into the sample stream of your USFilter chemical controller can result in injury or harm to swimmers in or around the pool if the recirculation pump should fail or shut down.

- Locate the Input Board (Fig 3.7)
- Locate “Flow”, “V+”, and “V-” in the Terminal labeled TB1. (Fig. 3.8)
- Locate the Flow Switch from the flowcell.
- Connect the White wire to “Flow” in TB1 position 5.
- Connect the Red wire to “V+” in TB1 position 6.
- Connect the Black wire to “V-” in TB1 position 7.

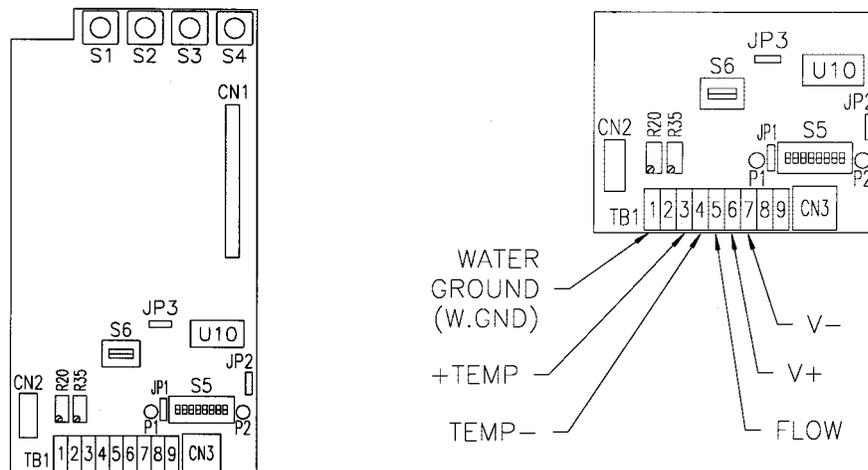


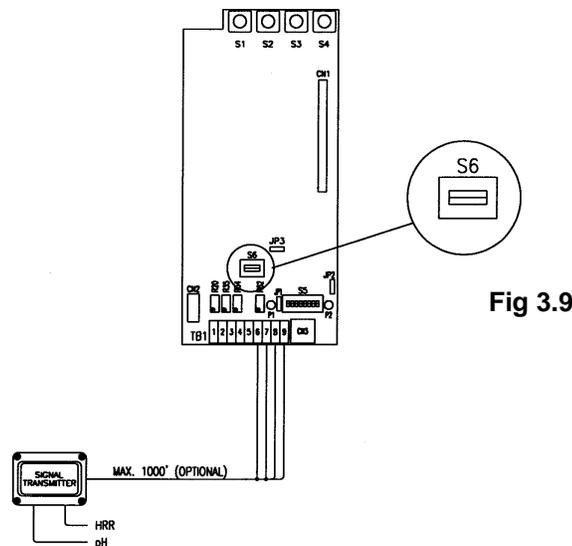
Fig 3.7 & Fig 3.8

Optional: Signal Transmitter

- Locate Input Board (Fig. 3.7)
- Locate Switch labeled S6 just above TB1. (Fig. 3.8)
- S6 must be in the up position. (Fig. 3.9)
- Locate the Terminal labeled JP1 in the Signal Transmitter.
- Connect “Flow” on the Input Board to JP1 position 5 in the signal transmitter.
- Connect “V+” on the Input Board to JP1 position 1 in the signal transmitter.
- Connect “V-“ on the Input Board to JP1 position 2 in the signal transmitter.
- Connect “1Pamp” on the Input Board to JP1 position 3 in the signal transmitter.
- Connect “Pamp2” on the Input Board to JP1 position 4 in the signal transmitter.

System4 Input Board	Signal Transmitter
Flow (TB1 position 5)	JP1 position 5
V+ (TB1 position 6)	JP1 position 1
V- (TB1 position 7)	JP1 position 2
1Pamp (TB1 position 8)	JP1 position 3
Pamp2 (TB1 position 9)	JP1 position 4

- Connect the White wire from the Flow Switch to JP2 position 7 in the Signal Transmitter.
- Connect the Red wire from the Flow Switch to JP2 position 6 in the Signal Transmitter.
- Connect the Black wire from the Flow Switch to JP2 position 8 in the Signal Transmitter.
- Plug pH sensor into the BNC jack on the left side of the Signal Transmitter by twisting it a quarter of a turn to lock it.
- Plug HRR sensor into the BNC jack on the right side of the Signal Transmitter by twisting it a quarter of a turn to lock it.
- Connect the Temperature sensor to the terminals on the lid of the Signal Transmitter.
- Connect the terminals of the lid to the Temperature TB1 positions 3 & 4 on the Input Board.
- Make sure the polarity is correct.
- Red in “+Temp” (TB1 position 3).
- Black in “Temp-” (TB1 position 4).
- The Signal Transmitter is just a junction box for the Temperature Sensor.



Input Board Connections

Input Board Terminal Descriptions (TB1) - Analog Input Connections		
Terminal/Description		Comments/Notes
1	Water Ground	The water ground MUST be connected to the water. This may be done by connecting wire between Terminal 1 and stainless screw provided in flowcell.
2	Not Used	Not used
3	Temperature (+) signal	Connect from Temperature Probe (Red)
4	Temperature (-) signal	Connect from Temperature Probe (Black)
5	Flow Input	Connect to white wire from flow switch.
6	+12VDC	Connect to red wire from flow switch.
7	DC Common	Connect to black wire from flow switch.
8	Transmitter Input #1	Isolated signal transmitter hook-up. Remote mounting up to 1000 ft.
9	Transmitter Input #2	

CAUTION: Failure to connect flow switch wires properly will result in damage to flow switch.

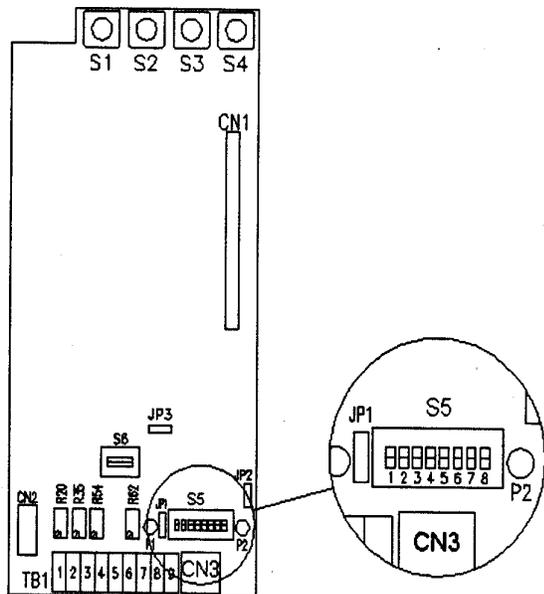


Fig 3.10

INPUT BOARD S5 POSITIONS / DESCRIPTIONS	
Position	Description
1	Not Used
2	Not Used
3	European Date- ON=dd/mm/yy English Date- OFF=mm/dd/yy
4	Not Used
5	Not Used
6	Not Used
7	Factory Use Only
8	Factory Use Only

Input Board Connections

INPUT BOARD PUSH BUTTONS (MOMENTARY CONTACT)	
Switch #	Description
S1	Manual Override for Relay 1
S2	Manual Override for Relay 2
S3	Manual Override for Relay 3
S1 through S3 will be used only by authorized personnel during installation.	

INPUT BOARD NOTES		
	Description	Comments/Notes
CN2	Connector for BNC inputs from pH/HRR sensors	See S6 below and use input terminal connections if using a signal transmitter.
S5	Main Dip Switch Bank	
S6	Determines whether the pH/HRR sensor inputs are from the BNC connectors or from a remote signal transmitter.	Set this switch UP to use the signal transmitter input. Set this switch DOWN to use the BNC inputs.

Common Installation Errors

Review of Common Problems and Solutions

Before contacting the USFilter Stranco Products service staff with questions on your new installation, review the following common problems and solutions.

The most common installation error is an improperly connected water ground.

The **water ground** must be connected to the proper terminal (terminal # 1 on input PCB) in the controller and to the connector on the flowcell.

Feed devices will not start

The relays are dry contact. To activate a feed device, power must be provided to the relay contacts.

To provide 120 VAC to all three relays (Com1, 2 + Com3):

- Connect a jumper wire from the CPU board TB5 #7 or #8 (both are AC line) to TB1 #16 (Com 1,2). Connect another jumper from TB1 #16 to TB1 #19 (Com 3).

WARNING: This will bypass the interlocking protection and should only be done for troubleshooting purposes.

- Consult the wiring diagram for correct wiring.
Fig 3.6

The HRR or pH Displays Fluctuate Rapidly

- Check the **water ground connection**, both in the controller and on the flowcell.
- Connect a signal generator and verify that the SG-700 ground lead is connected.
- Verify that the display matches the signal generator readings.
- Check BNC to input board connections.
- Check S6 input switch position.
Down (off) for BNC/sensor input,
Up (on) for preamp input.

Menu Access

A Manager or Representative access code is required to perform procedures described in this chapter.

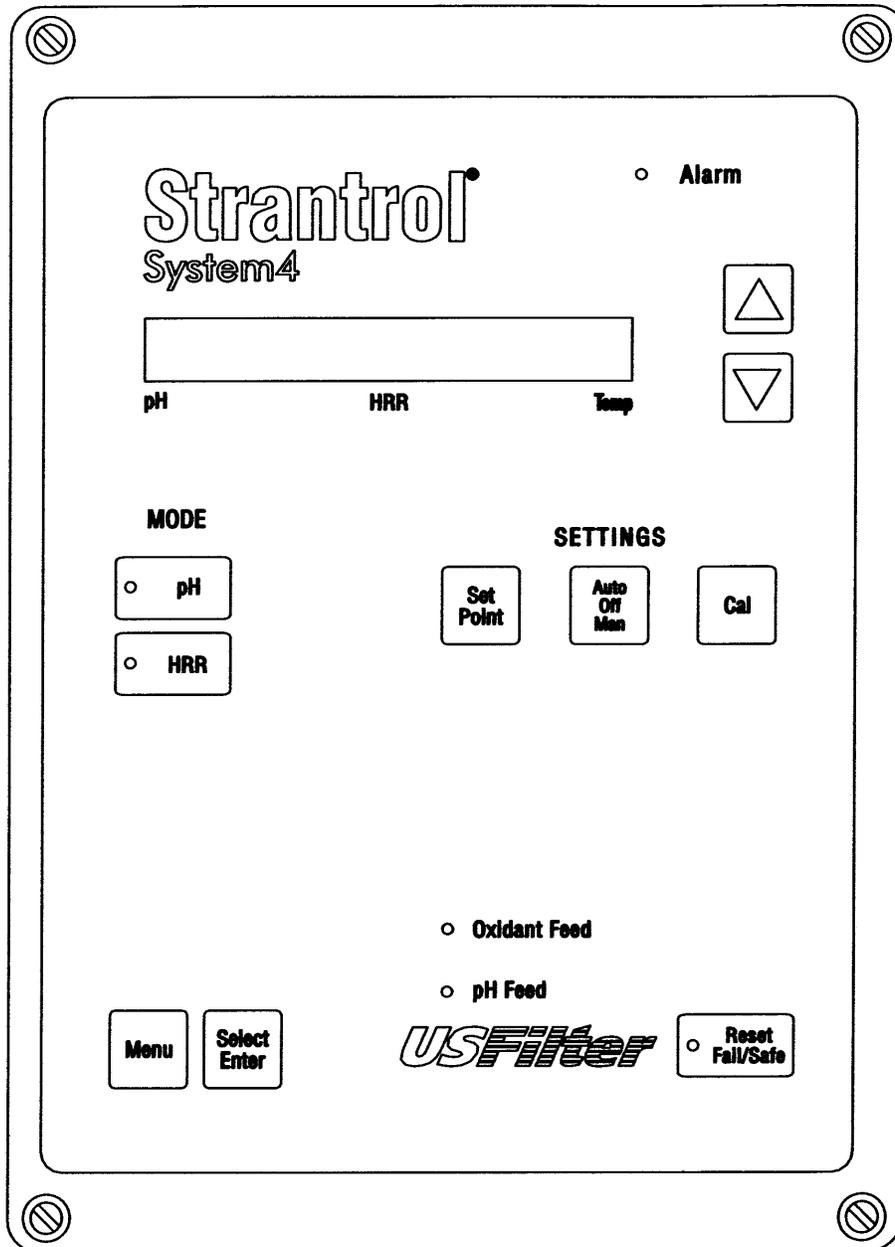


Fig 3.11

Access and Levels

General Use Levels

There are several SYSTEM4 access levels. Face panel buttons have more than one use, depending on the current access level. This chapter describes two levels for general use.

- Display level
- Operator level

Security Levels



In addition to the general use levels, the Strantrol SYSTEM4 offers two security levels:

- Manager level
- Strantrol representative level

The Menu button can be used with some applications to access the Manager level. Your Strantrol Representative also uses the Menu button to access security and troubleshooting menus. After the menu button is pressed, the controller prompts you for an access code.

Modes

In Display or Operator levels, there are two modes (or parameters):

Mode	Description
	Select pH parameters by pressing the pH button. The pH indicator LED will be on while pH is selected. For systems with optional dual feed relays, repeatedly pressing this key will alternate between pH feed-down parameters and pH feed-up parameters.
	Select HRR parameters by pressing the HRR button. The HRR indicator LED will be on while HRR is selected.

Message--[Not Active]

Some modes will be listed as [Not Active] when selected.

For example, chlorine feed is controlled by HRR.	Certain parameters can also be disabled via the menu interface. If the U. S. Filter/Stranco Representative has disabled a parameter, a [Not Active] message appears.
--	--

Display Level

What To Expect

Display level allows you to view the current settings or alarms for pH and HRR.

Display Level (Press and Hold the following buttons to:)	
<div style="border: 1px solid black; padding: 5px; width: 60px; margin: 0 auto;">Set Point</div>	View the current setpoints for all of the modes: pH and HRR
<div style="border: 1px solid black; padding: 5px; width: 60px; margin: 0 auto;">Auto On Man</div>	View the relay levels for all of the modes: pH and HRR
<div style="border: 1px solid black; padding: 5px; width: 60px; margin: 0 auto;">Cal</div>	View the current calibration values for all of the modes: pH This is also helpful when numerous alarms are being displayed. The Cal key returns the message scroll to the level display screen.

The three buttons (illustrated above) allow you to view setpoints and feed mode status.

Operator Level

What To Expect

The **Operator Level** allows you to EDIT settings for pH and HRR.

Prerequisite

In order to use the Operator Level, have your supervisor or the Strantrol Representative provide you with information regarding the Parameter Access Key.

To gain access, follow the procedure listed below:	
1	Press and hold <i>the hidden key to the left of Strantrol</i> (for three seconds) until display reads [Change Settings?].
2	Press <i>the hidden key to the left of Strantrol</i> again.
3	Display reads [access permitted].

Press One of the MODE Buttons:		And This Button
<div style="border: 1px solid black; padding: 5px; display: inline-block; margin-bottom: 5px;">○ pH</div> pH setpoint	<div style="border: 1px solid black; padding: 5px; display: inline-block; margin-bottom: 5px;">○ HRR</div> HRR setpoint	Select and EDIT a setpoint parameter. <div style="border: 1px solid black; padding: 5px; display: inline-block; margin-left: auto; margin-right: auto;">Set Point</div>
<div style="border: 1px solid black; padding: 5px; display: inline-block; margin-bottom: 5px;">○ pH</div> pH auto pH off <i>or</i> pH manual	<div style="border: 1px solid black; padding: 5px; display: inline-block; margin-bottom: 5px;">○ HRR</div> HRR auto HRR off <i>or</i> HRR manual	Select and CHANGE the relay control mode for a parameter. If the relay mode is left in MANUAL or OFF, the controller will flash that relay mode name as an alarm. Select the AUTO mode to stop the flashing display <div style="border: 1px solid black; padding: 5px; display: inline-block; margin-left: auto; margin-right: auto;">Auto Off Man</div>
<div style="border: 1px solid black; padding: 5px; display: inline-block; margin-bottom: 5px;">○ pH</div> pH Calibration		Restandardize the reading for a parameter. <div style="border: 1px solid black; padding: 5px; display: inline-block; margin-left: auto; margin-right: auto;">Cal</div>

**Arrow Keys:
Select/Enter**

The arrow keys allow you to increase or decrease the values that appear in the numeric display. Numerical values can be changed one digit at a time, starting at the far-left digit. The underscore under a digit serves as a “cursor” and indicates the digit to be modified.

Arrow keys are also used to change relay modes from Auto to Manual to OFF.

Buttons	Description
<div style="border: 1px solid black; padding: 5px; display: inline-block;">▲</div>	Increases the value of the digit above the cursor in the numeric display. Press and hold this button to change the value at a faster rate.
<div style="border: 1px solid black; padding: 5px; display: inline-block;">▼</div>	Decreases the value of the digit above the cursor in the numeric display. Press and hold this button to change the value at a faster rate.
<div style="border: 1px solid black; padding: 5px; display: inline-block;">Select Enter</div>	Moves the cursor to the next digit to the right, allowing you to increase or decrease one digit at a time.

Quick Reference Guide - Functions & Access Levels

Functions - Listed by Level:			
	Representative Level	Manager Level	Operator Level
	Hardware Calibration Software Calibration Rep startup All Manager Level options Control tuning	Alarm setup Sensor wash programming Superchlorination programming Current date programming Current time programming	pH setpoint pH auto-off-manual pH calibration (standardize) HRR setpoint HRR auto-off-manual
To Gain Access:			
	Representative Level	Manager Level	Operator Level
1	Press the hidden key to the left of “Strantrol” until “Change Settings?” appears.		
2	Press the hidden key to the left of “Strantrol again until “Access Permitted” appears.		
3	Press the “Menu” button. “Access Code: 000” will appear.		Press the pH or HRR button on the face of the controller.
4	Press the up or down arrows to the proper number.		Press the setpoint, auto on off, or cal to select that setting.
5	Press the “Enter” button after the first and second numbers. After the third number press the hidden key before “Strantrol” to gain Representative access.	Press the “Enter” button after each number.	Press the up or down arrow to change the setting.
6	Menus have a two-minute time-out. If there is no activity on the control buttons for at least two minutes, the system exits the menu and reverts to the Display Level.		

Data Logging

Event

The System4 considers changes within its system as **events**. Examples of events would be:

- Relays opening and closing
- Alarm conditions
- Parameter changes

Event Buffer

Each time an **event** occurs, an entry is made in the event buffer.

When an event is stored, it received a time stamp. You can therefore; trace changes to the system to the time the event occurred.

The event buffer has room for 1000 entries. When the buffer fills up, the oldest entry is erased to make room for new entries.

The SVC program allows you to download the event buffer to a PC hard drive or a floppy diskette. If you download the event buffer before it fills up, you will have a PC-compatible record of the event history saved. In the meantime, the System4 will erase the oldest entries to make room for new ones.

How frequently you schedule your downloads depends on whether you want to save high resolution or low resolution storage information.

*High/Low
Resolution Logs*

The System4 stores parameter readings at two resolutions simultaneously:

High Resolution, which stores minimum, maximum, average and sample values for the specified time frame.

Low Resolution, which stores minimum, maximum, average and sample values for the specified time frame.

	High Resolution	Low Resolution
The default time period stores values every:	6 minutes	2 hours
The minimum setting is:	1 minute	1 hour
The maximum setting is:	6 minutes (the default)	4 hours
When using the minimum setting, history is stored for:	9 hours	17 days
When using the maximum setting, history is stored for:	2 days - 6 hours	68 days
When using the default setting, history is stored for:	2 days - 6 hours	34 days

The amount of time that history is stored represents the maximum amount of time you can schedule downloads. For example, if your high resolution is set at the default, you must download high-resolution data every 2 days -6 hours. If you wait 2 days - 7 hours between downloads, System4 will erase the oldest information in the buffer in order to make room for the new information.

Control Logic & Functionality

System Startup

A system startup occurs after a power is cycled or a system reset. During system startup the LCD displays the message "System Startup." An underscore moves along the bottom of the System Startup message.

Enabling the Temperature Control Option

To enable or disable the Temperature Option, enter the menu through the Representative Level. [Diagnostics] : [Hardware Calibration] : [Temperature].

Here is some useful information on the ranges and resolution of pH and HRR.

	pH Input	HRR Input
Range:	0.0 to 14.0 pH	0 mV to 1000 mV
Resolution:	0.01 pH	1 mV

Parts and Supplies

You may order parts needed below from your local representative or by calling your local USFilter Stranco Products office and ask for Aquatic Customer Support. If you need any other parts for your Strantrol System4, contact your local Strantrol representative or your nearest USFilter Stranco Products office. Your nearest USFilter Stranco Products office is listed on the back of this manual.

Part Reference	Part Description	USFilter Stranco Part Number
Fuse F1 and F3	3 Amperes, 250 Volt	S403 Locally available
Fuse F2	1 Ampere, 250 Volt	S403 Locally available
Fuse F5	¾ Ampere, 250 Volt	S403 Locally available
Relays R1, R2 and R3	5 Amperes, 280 Volt, solid state	7373002
Battery B1	Lithium, 3 Volt	1380005
Acid/Caustic Sensor Short Yellow	pH Sensor 32 inches	7040004
Acid/Caustic Sensor Long Yellow	pH Sensor 10 Feet	7040002
Chlorine/Bromine Sensor Short Blue	HRR Sensor 32 inches	7042002
Chlorine/Bromine Sensor Long Blue	HRR Sensor 10 Feet	7042003
Temperature Sensor	Zener Diode, 2 wire, w/Thermowell	7047001

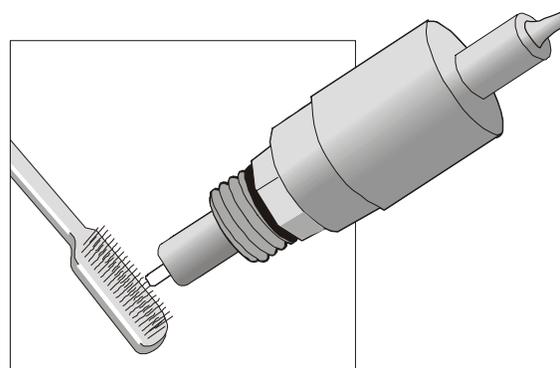
Controller Maintenance

Manual Sensor Cleaning

Sensors will operate best when cleaned monthly.

To manually clean sensors:

1. Turn off power to chemical feeders.
2. Close the sample stream supply valves.
3. Unscrew the sensor from the flowcell.
4. Using a toothbrush, scrub the tip of the sensor with a liquid detergent (i.e. dawn, palmolive, generic dish soap, etc.)
5. Rinse the tip with clean water.
6. Shake down sensor to allow the gel to flow towards the tip.
7. Return the sensor to the flowcell.
8. Restore water flow immediately. Adjust water flow to the recommended 2 – 20 psig. Make sure the psig is constant within 5 psig for accurate readings.
9. After sensor cleaning, reading will shift. Allow about 30 minutes to 1 hour for sensor to recover.
10. After sensors recover, restore power to chemical feeders, take water test and calibrate if needed.
11. You may have to do a slight calibration or change of HRR setpoint the next day.



Do not touch the Sensors with your fingers.

Technical Guide

Annually	<p>It is recommended that the Strantrol receive an annual check-up.</p> <ul style="list-style-type: none">• The check up involves checking the sensors with a probe tester and checking the calibration of the controller with a SG-700.
Startup	<p>The System is calibrated at our Bradley, Illinois factory. During startup use your signal generator 700 (SG-700) to do an additional calibration check.</p> <ol style="list-style-type: none">1. Follow Manual Sensor Cleaning instructions.2. After power is restored calibrate system and sensors.3. Disconnect the sensors.4. Connect the Signal Generator – 700 pH (yellow) and HRR (blue) to the Strantrol.5. If it is a System4, 5, or 6 you must use the water ground on the BNC of the SG-700.6. Switch the SG-700 to pH and run the display from pH of 6.00 to 9.00.7. Make sure the pH is not off more than .2.8. Switch the SG-700 to ORP and run the display from 600 mV to 900mV.9. Make sure the HRR (ORP) is not off more than 5 mV.10. Connect your pH or HRR (ORP) sensor to the sensor tester and wait until the reading stabilizes (30 seconds).11. The reading on the tester should be close to the reading on the controller ($\pm 2\text{mV}$ or $\pm .1$).12. Reconnect sensors to controller. Check and clean water ground connection on flowcell and in controller.13. Test flow switch by shutting off flow to the flowcell. Verify green light on the flow switch turns off and that the controller goes into a no flow alarm.14. Verify chemical feed devices, are operating correctly, and turning on when HRR reading is below setpoint and pH reading is above setpoint. <p>NOTE: Do not calibrate your sensors until your pool water temperature is higher than 73°F. If you calibrate the sensors below the 73°F mark you will experience continual calibration of the readings as the temperature of the water increases.</p>
End of Pool Season	<p>If your process is to be shut down for more than one month, or if freezing temperatures may be encountered, the controller and sensors should be moved to a heated indoor area for storage.</p> <ul style="list-style-type: none">• When storing sensors, immerse the tips in a small container of water to keep them from drying out. Threaded caps are supplied with the electrodes for this purpose.

Basic Control Theory

The functions of the Strantrol SYSTEM4 can be compared to your home thermostat.

The thermostat monitors room temperature.	Strantrol systems continuously monitor the water's chlorine or bromine level and pH level.
When the temperature of the room drops, the thermostat activates the furnace.	When the pool chemistry has fallen from the programmed "setpoints" of the units, the Strantrol automatically activates chemical feeders.

Process Overview

A simple overview of inputs and outputs appears in the table below.

A continuous sample of water is brought from the filter system to the sensors in the flowcell. A sample valve on the flowcell allows you to test the same water that the Strantrol system is sensing.	
The pH sensor continually senses the pH of the water sample passing through the flowcell, and transmits an electronic signal to the controller. The controller in turn, displays the pH level. As the pH level of the water rises above the setpoint, the pH feed light turns on and the acid/CO ₂ feeder is activated. (This process is reversed for Caustic Feed Systems)	The HRR sensor detects the disinfecting power (of available chlorine) in the water sample passing through the flowcell and sends an electronic signal to the controller. The controller in turn, displays the HRR or disinfection levels in mVs. As the HRR level drops below setpoint, the chlorine feed light turns on and the chlorine/bromine feeder is activated.
When the water chemistry returns to the desired setpoint level, the controller shuts off the appropriate feeders until additional chemical feed is needed.	
Each channel of the system can provide chemical feed proportional to demand.	

Time-Based Proportional Feed

Proportional feed is a safeguard that reduces "overshooting" the chemical level. Your Strantrol controller actually adjusts the rate at which the feeder delivers chemicals to the pool by varying the "on" time. The "on" time is based on precise measurement of the rate of chemicals being consumed by the bather load in the pool. The proportional feed capability sets Strantrol apart from simple "on/off" controllers which are not capable of feed rate adjustments in response to changing water conditions. In addition, other controllers that do have the ability to change feed rate do not continuously change feed rate based on demand.

Adjustable Pump Operating Times

If the chemical level of the water sample is barely below the setpoint level, the chemical feeder pumps only about 10 seconds out of every minute. The further away the chemical level is from the setpoint level, the more seconds per minute the feeder pumps. At a certain distance away from the setpoint level, the chemical feeder will run continuously to catch up quickly.

As the water chemistry level re-approaches the setpoint level, the controller again limits the feeder to diminishing parts of each minute until the setpoint level is reached and the chemical feeder stays off.

Feed Failsafe Alarm

The Strantrol system contains a feed failsafe alarm (visual) and shutdown. Under normal conditions, the Strantrol system returns the water chemistry into balance in minutes. However, if a chemical feeder runs continuously for a programmable time (factory default is over four hours) without catching up, the Strantrol assumes a problem has occurred and shuts down that side of the chemical feed system.

- The alarm light comes on and a feed failsafe message is displayed, alerting you to a feeding problem. After correcting the feeding problem, you may reset the controller by pressing the Fail/Safe reset button.

NOTE: You should always examine the Chemical Feed System when a failsafe alarm occurs, before resetting the failsafe timer.

Control Tuning - Chapter 4

pH Control Options

	pH Feed-down	pH Feed-up
	Feed-down means that when chemical is fed, the pH lowers.	Feed-up means that when chemical is fed, the pH rises.
	Hook-up the pH feed device to appropriate relay as shown in the wiring diagrams.	Hook-up the pH feed device to appropriate relay as shown in the wiring diagrams. (Reprogram Relay)
1	Enter the menu system using a Manager or Representative access code.	
2	Scroll down the menu by pressing the down arrow until configuration appears.	
3	Press "Enter".	
4	Select "Control Values" by pressing enter.	
5	Select "pH Control" by pressing enter.	
6	Select "ProppH" On/Off [disable] or Proportional [enable].	
7	Select whether the pH control is on/off [0] or proportional[1]. With on/off control (and pH feed-down), whenever the pH is above the setpoint, the pH feed device will be [on] until setpoint is reached.	With on/off control (and pH feed-up), whenever the pH is below the setpoint, the pH feed device will be [on] until setpoint is reached.
8	If you selected on/off control, ignore step #9.	
9	Select [pHdnprp.spn](proportional span). If you selected proportional mode, select the control proportional span. The proportional span defines the "window" of control for the pH chemicals.	
	<u>Settings</u> Setpoint 7.5 Proportional span .5 <u>Input pH Value</u> <u>Feed device Duty Cycle</u> 8.0 100% 7.8 60% 7.5 0%	<u>Settings</u> Setpoint 7.5 Proportional span .5 <u>Input pH Value</u> <u>Feed device Duty Cycle</u> 7.0 100% 7.2 60% 7.5 0%
10	Select [pHdown].	
11	The fail/safe alarm sets a feed time-out value. If the feed device operates for this period of time without reaching setpoint, a fail/safe alarm is recognized and the control relay is disabled (locked out).	

Chlorine or Bromine Control Options

Hook-up the chlorine (or bromine) feed device to the appropriate relay. Action of chlorine feed device will be controlled from an HRR sensor.

Software Programming for the Chlorine (or Bromine) Relay (relay 3).									
1	Enter menu system using Manager or Representative access codes.								
2	Scroll down the menu by pressing the down arrow until configuration appears.								
3	Press "Enter".								
4	Select "Control Values" by pressing enter.								
5	Select "HRR Control" by pressing enter.								
6	Select "PropHRR" On/Off [disable] or Proportional [enable].								
7	Select whether the HRR control is on/off[0] or proportional[1]. With on/off control (and HRR feed-up), whenever the HRR is below the setpoint, the HRR feed device will be [on] until setpoint is reached.								
8	If you selected on/off control, ignore step #9.								
9	Select whether the chlorine control is on/off or proportional. NOTE: With on/off control, whenever the chlorine is below the set point, the chlorine feed device will be [on] until setpoint is reached.								
10	If proportional mode was selected (in step #11), select the control proportional span. If on/off was selected, ignore this step.								
11	Select [HRR prop span].								
12	NOTE: The proportional span defines the "window" of control for the System4.								
	<p><u>HRR Settings</u></p> <p>Set point = 750 Proportional span = 20</p> <table border="0"> <thead> <tr> <th><u>Input pH Value</u></th> <th><u>Feed device Duty Cycle</u></th> </tr> </thead> <tbody> <tr> <td>730</td> <td>100%</td> </tr> <tr> <td>740</td> <td>50%</td> </tr> <tr> <td>750</td> <td>0%</td> </tr> </tbody> </table>	<u>Input pH Value</u>	<u>Feed device Duty Cycle</u>	730	100%	740	50%	750	0%
<u>Input pH Value</u>	<u>Feed device Duty Cycle</u>								
730	100%								
740	50%								
750	0%								
13	Select [HRR F/S Alarm].								
14	The fail/safe alarm sets a feed time-out value. If the feed device operates for this period of time without reaching set point, a fail/safe alarm is recognized and the control relay is disabled (locked out).								

Menu Options - Chapter 5

Menu Tree — Reference Guide

This section outlines the options that may appear in the Strantrol System4 menus. The menu hierarchy is represented by the indented options. (For example, the pH Low Alarm can only be accessed from the Alarms menu.) Some options may not appear, depending on how your authorized Strantrol Representative set up your system.

An "R" indicates that this option appears ONLY under Strantrol Representative access.

The brackets () indicate the default values that were shipped on the ROM chip.

Home Menu

Date
Time
Access code (000)

Alarm Setpoints

High pH (8.0)
Low pH (7.0)
High HRR (800 mV)
Low HRR (650 mV)
High Temp (90 degF)
Low Temp (70 degF)

Alarms

No flow alarms
pH high alarm
pH low alarm
pHup F/S alarm
pHdn F/S alarm
HRR high alarm
HRR low alarm
Cl/Br F/S alarm
Temp high alarm
Temp low alarm

Probe Wash

Wash dur (02:00 min/sec)
Today
Day1 (allwk/evday)
Time1 (23:58 hr/min)
Day2 (disabled)
Time2 (00:00 hr/min)
Day3 (disabled)
Time3 (00:00 hr/min)
Day4 (disabled)
Time4 (00:00 hr/min)

RDiagnosics

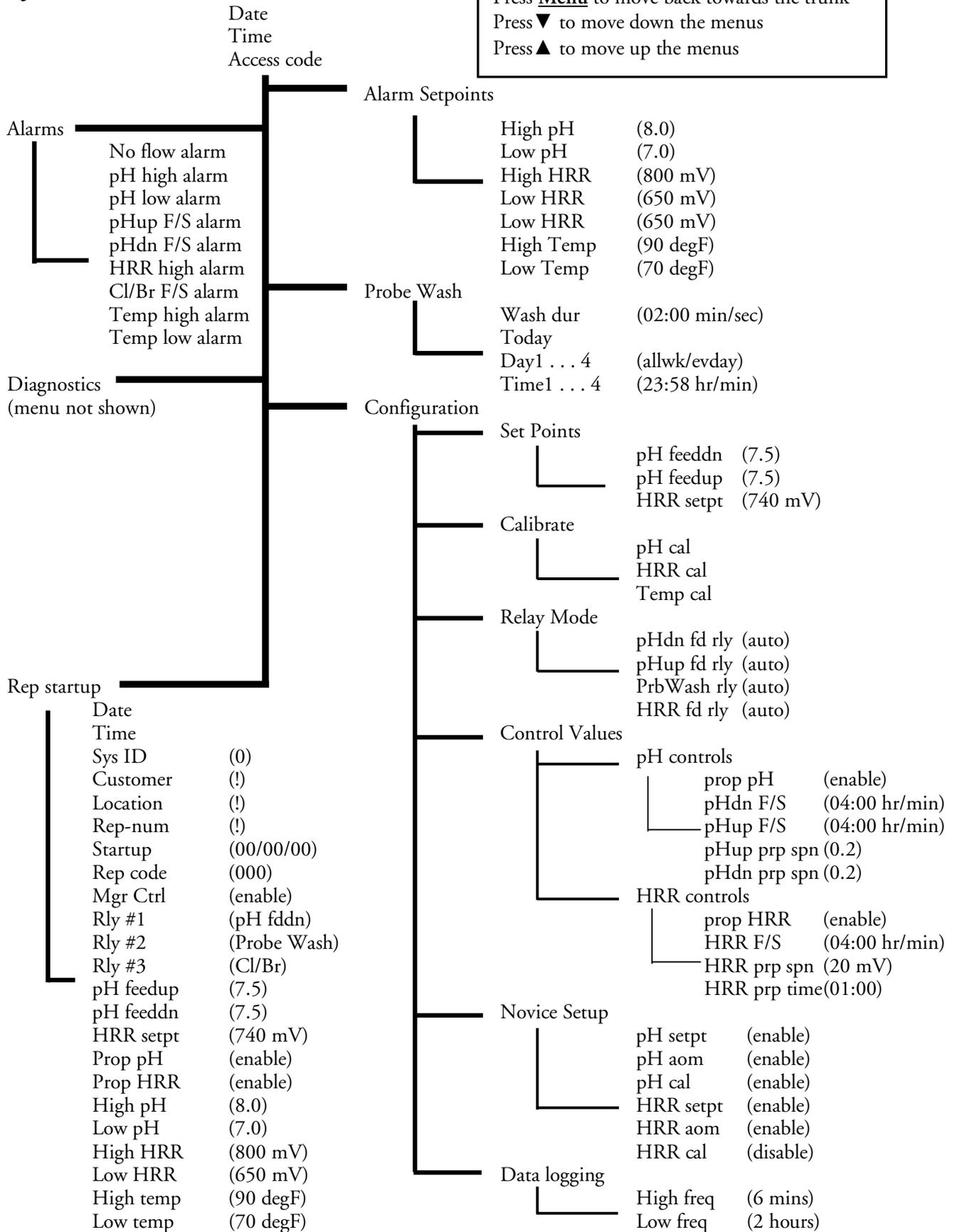
Version
Prog ver
Factory defaults
Software Cal

pH	
pH cal	
HRR	
HRR slope	
HRR zero pt	
Cyanuric	(disable)
Cyan slope	(77.0%)
Cyan offset	(0)
Lkup offset	(250)
Alt lkup	(disable)
pH for lkup	(7.5)
Temperature	
Temp slope	
Temp zero pt	
Temp units	(Fahrenheit)
Hardware Cal	
Temp	(disable)
Directbaud	(1200)
Configuration	
Set Points	
pH feeddn	(7.5)
pH feedup	(7.5)
HRR setpt	(740 mV)
Calibration	
pH Cal	
HRR Cal	
Temp Cal	
Relay Mode	
pHdn fd rly	(auto)
pHup fd rly	(auto)
HRR fd rly	(auto)
PrbWash rly	(auto)
Control Values	
pH controls	
prop pH	(enable)
pHdn F/S	(04:00 hr/min)
pHup F/S	(04:00 hr/min)
pHup prp spn	(0.2)
pHdn prp spn	(0.2)
pH prp time	(01:00)
HRR controls	
Prop HRR	(enable)
HRR F/S	(04:00 hr/min)
HRR prp spn	(20 mV)
HRR prp time	(01:00)
Novice Setup	
pH setpt	(enable)
pH aom	(enable)
pH cal	(enable)
HRR setpt	(enable)
HRR aom	(enable)
HRR cal	(disable)
Temp cal	(enable)

Data logging	
High freq	(6 mins)
Low freq	(2 hours)
RRep startup	
Date	
Time	
Sys ID	(0)
Customer	(!)
Location	(!)
Rep-num	(!)
Startup	(00/00/00 mm/dd/yy)
Rep code	(000)
Rly #1	(pH fddn) Unchangeable
Rly #2	(Probe Wash)
Rly #3	(Cl/Br) Unchangeable
pH feedup	(7.5)
pH feeddn	(7.5)
HRR setpt	(740 mV)
Cyanuric	(disable)
Cyan slope	(77.0%)
Prop pH	(enable)
Prop HRR	(enable)
High pH	(8.0)
Low pH	(7.0)
High HRR	(800 mV)
Low HRR	(650 mV)
High temp	(90 degF)
Low temp	(70 degF)

System4 Menu "Tree"

Press Select/Enter to move out onto a branch
 Press Menu to move back towards the trunk
 Press **▼** to move down the menus
 Press **▲** to move up the menus



Sensor Wash Option - Chapter 6

Sensor Wash

If the optional sensor wash is used, install the plumbing and configure the system for Sensor Wash use.

NOTE: For most applications, the default settings need not be changed.

Configure Sensor Wash

1. Choose one of the unused relays and assign it to sensor wash. Select Menu: [rep startup], the default sensor wash relay is #2.
2. Connect the feed device to the appropriate relay output.
3. Enter [Sensor Wash] sub-menu to modify the sensor wash settings.

Programming Sensor Wash

After the sensor wash option is enabled, steps must be taken to program the automatic sensor wash. The System4 automatic sensor wash program is based on:

- A four-week cycle that does not correspond to the day and week of the calendar.
 - The cycle begins with Sunday, week 1, and ends with Saturday, week 4.
- A 24-hour clock
 - Add 12 hours to calculate afternoon and evening times.
- Sensor Wash should be done on a daily basis. Time should be set for All week/Every day.
 - The operator should select time of day.
- Four programmable times that allows you to select 4 days out of selected weeks to run feed device.

NOTE: There is only one “on-line” duration setting.

- Start times are based on two components:
 - week and day
 - hour and minutes

Menu Displays

An explanation of the controller displays is presented in the following table.

Controller Choices		
Characters Shown on Display	Description	Days of the week
1 st week	Week 1	Monday
2 nd week	Week 2	Tuesday
3 rd week	Week 3	Wednesday
4 th week	Week 4	Thursday
Odd week	odd number week	Friday
Even week	even number week	Saturday
Every week	All weeks	Sunday
Disabled	No sensor wash	Everyday

EXAMPLE: Program the sensor wash system to wash the sensors every Monday, at 1:00 p.m., and every Thursday at 6:00 a.m. for 2 minutes.	
	Before programming a sensor wash cycle, verify that all steps in Configure Sensor Wash have been completed.
1	Enter the menu system using a Manager or Representative Level access code.
2	Select [Sensor Wash].
3	Select [Wash Duration].
4	Select the duration of sensor wash. If you select 2 minutes, then the sensor wash feed device will run for two minutes.
5	Select [Event #1].
6	Select [every week] and [Monday]. This means that on Monday of every week, the sensor wash feed device will engage at the designated time.
7	Select [Start time #1].
8	Enter [13:00]. (13.00 in military time represents 1.00 p.m.)
9	Select [Event #2].
10	Select [every week] and [Thursday]. This means that on Thursday of every week, the sensor wash feed device will engage at the designated time.
11	Select [Start time #2].
12	Select [06:00]. (06:00 represents 6:00 am)

NOTE: This example is being used to demonstrate how the sensor wash timer is set-up. Sensor wash should be initiated every day.

Introducing Strantrol Virtual Controller (SVC)

Welcome to Virtual Controller

Welcome to Virtual Controller, the premier Strantrol remote control program.

Strantrol Virtual Controller gives you full access to all operation and setup features of your Strantrol Water Quality Controller from virtually anywhere in the world. By equipping your desktop or laptop computer with a simple modem, you can access, monitor, control and analyze critical water quality standards maintained by your Strantrol instrument. It is no longer necessary to physically visit each instrument in order to fine-tune a setpoint, adjust a critical alarm point or simply view the status of the system. With Virtual Controller, a few clicks of the mouse is all that is necessary to effectively manage your water quality program.

Virtual Controller is easy to install and use. It is not necessary to be a computer whiz in order to enjoy the full benefits of this state-of-the-art telecommunications program. Its intuitive interface will have you up and running in just a few minutes. All the same, we recommend that you take the time to read this documentation in its entirety so you can utilize each feature to its fullest.

Benefits and Features

Here are some of the benefits and features of Virtual Controller:

- Feature: Virtual Controller is easy to use.
 - Virtual Controller takes advantage of the Windows™ user interface. If you are familiar with Windows, you are familiar with Virtual Controller.
 - Virtual Controller in many ways mimics the operation of your Strantrol controller, ensuring a consistent user interface.
- Benefit: Virtual Controller saves time and resources.
 - By accessing your Strantrol through Virtual Controller you and your staff avoid time-consuming site visits to simply check up on the water quality, saving time and resources.

Strantrol Virtual Controller (SVC)

Standard Version

What You Need

In order to install SVC on your personal computer and connect to a Strantrol System4, you will need the SVC Install disks and the phone number or direct connect cable required to access your Strantrol control system.

Starting SVC

To install SVC using Windows 3.1 or Windows 95

1. Insert Program Disk 1 into 3 ½ Floppy Drive
2. From the “File” menu in Program Manager of Windows 3.1 or under “Start” of Windows 95 choose *Run*
3. Type A:setup or B:setup and press *enter*
4. Follow the instructions on the screen

Once SVC has been installed on your system, it can be started by opening the *Strantrol Virtual Controller* Program Group and double clicking on the SVC icon.

When SVC starts for the first time, you will be asked to enter a new site name. Enter a name that will clearly identify the site. Don't be concerned about making a mistake, you can change the name later. You can even accept the default name *New Site: #1* if you wish.

Getting Connected

You must make several selections in the “Connection Menu” (under the “General” pull down menu on Site Database Screen) and specify the com port and baud rate (under “Settings” menu) before SVC can access System4 controller. After making these selections, you may click on the telephone icon or under “SITE” menu select “Monitor”.

You will then be required to enter the Access Code for the System4. If you do not have an access code you will be allowed “view only” access. The Standard Version SVC users will view the menu tree.

Menu Tree

On-line pH and HRR values are displayed on top of menu tree options. To change these features click on the desired option. Programmable values will be displayed on the right hand side of the screen.

Download Data

You may download data two ways, one way is to download the text and the second way is to download the graph.

- To download the System4 into a graph format you must do the following
- While you are monitoring the System4 on the menu screen click on  the icon in the top left hand corner.

- From the Site Database click on the graph icon. 

- This will switch you to the graph screen.

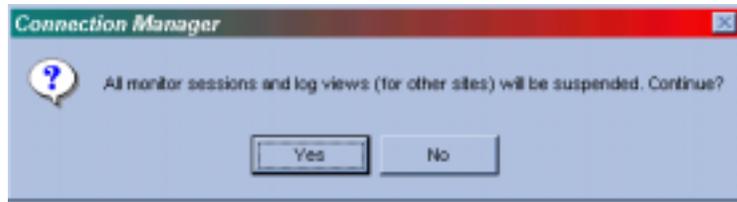
- A dialog box will appear click OK.



- At the top left of the screen select **Download > Logs**



- A dialog box will appear click **Yes**.



- Strantrol Virtual Controller (SVC) will start to download your System4.

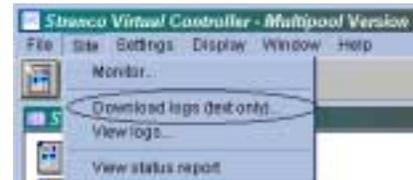
By selecting “Download Text Only” under “SITE” menu in the site database, you will download the data in text format from the System4. When downloading data from a System4, you will be prompted with a window, “Enter Prefix for Export Files”. Here specify a file name which describes your System4 site. SVC will download all the Hi, Low, Event and Status logs for you and store them under C:\svc\logdumps\.

You can view these files using any word processor. These files are saved as Text files with extension *.txt.

How to Graph Your System4 Text Download Using Excel.

Downloading System4 Text

- Begin monitoring session with your System4
- After monitoring session begins click on the  icon at the top left of the screen
- The Site Database will appear.
- Click on Site, then Download Text only



- The Log File Manager will appear
- Enter the name you would like to save the download as and click on **OK**.

Hint: the file name should not have any spaces or periods. (max 8 characters)



- The Connection Manager will appear. Displaying the status of your download

Note: Once the text is downloaded SVC, the path that your logs can be found is in C:\SVC\LOGDUMPS and will be a notepad format. Unless you have changed the location of SVC.



Opening Your System4 Download Through Excel

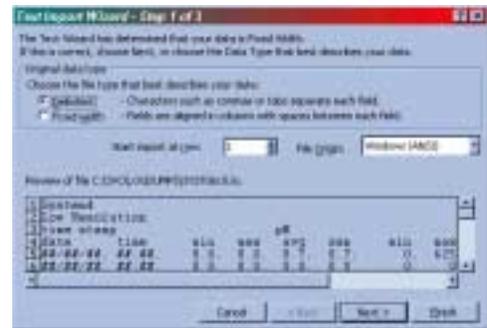
- Open your Excel program.
- Click on File and Open then choose path C:\SVCLOGDUMPS.
- Select “All Files” in the File of Type: box



The file extensions that will be available to you are listed below with the information they provide below:

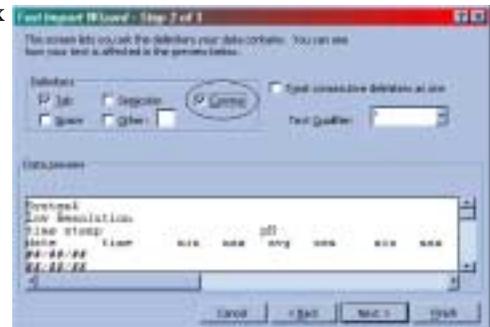
- *.evt – this file has the events of the pumps and alarms. For instance, when and how long the pumps have been running. *Note: *.evt will not be graphed*
- *.hi – this file is the high resolution of the pH, HRR, and temperature. It is referenced as high resolution because the intervals in which the controller logs the readings are every 6 minutes.
- *.lo – this file is the low resolution of the pH, HRR, and temperature. It is referenced as a low resolution because the intervals in which the controller logs the readings are every 2 hours.
- *.sta – this file has the status of the controller. For instance, what are the current setpoints and alarms programmed in the controller. *Note: *.sta will not be graphed*

- Select a file you would like to view. For this example I will choose my file with the .lo extension. Once I highlighted the file and clicked Open, an Excel Text Import Wizard – Step 1 of 3 screen appears.



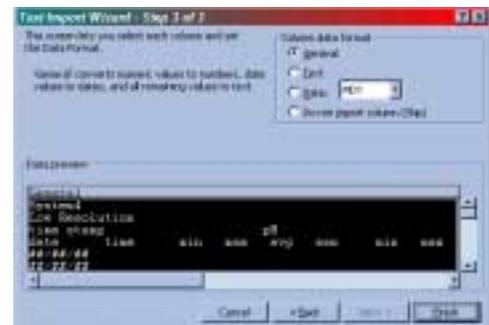
- Select **Delimited**
- Click on **Next >**

- **Step 2 of 3** appears and you will need to put a check in the box next to comma. This tells Excel to make a column separation at every comma.



- Click on **Next >**

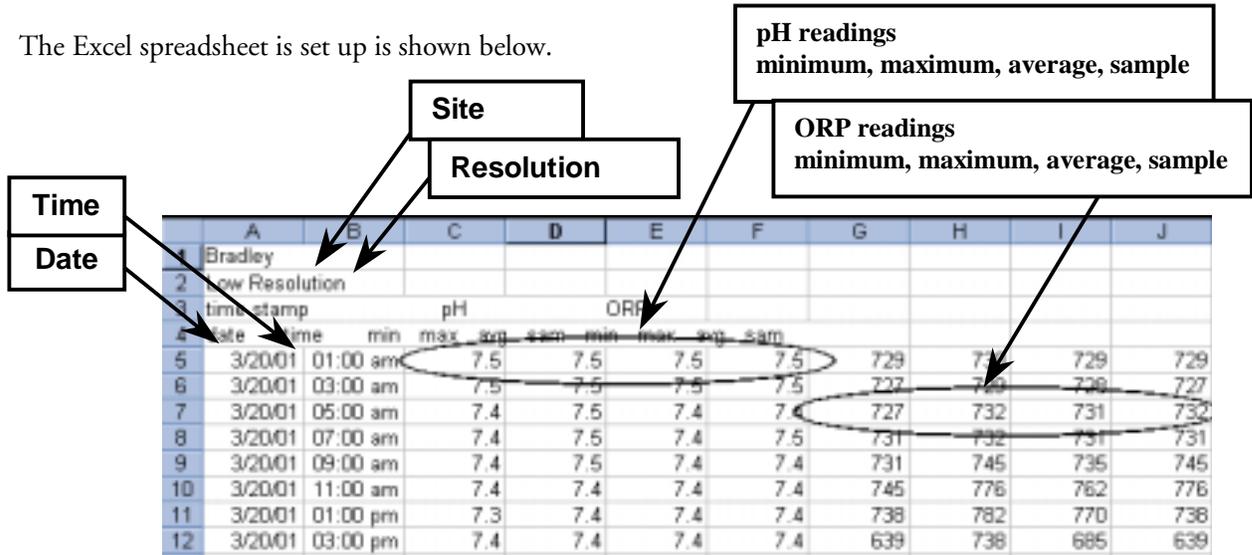
- **Step 3 of 3** appears the box next.



- Click on **Finish**
- The file will open with the pH, HRR, and Temperature (optional) separated in columns and each row is a 2-hour interval.

Graphing in the Download in Excel

- Now you have the text in your Excel with each parameter has its own column and each time interval has its own row.
- The Excel spreadsheet is set up is shown below.

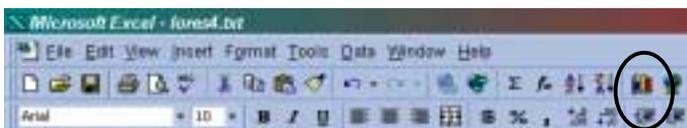


- pH, HRR and Temperature (optional) each have four readings minimum, maximum, sample, average. The readings are described below. *Note: sample will not be available in the *.hi logs.*

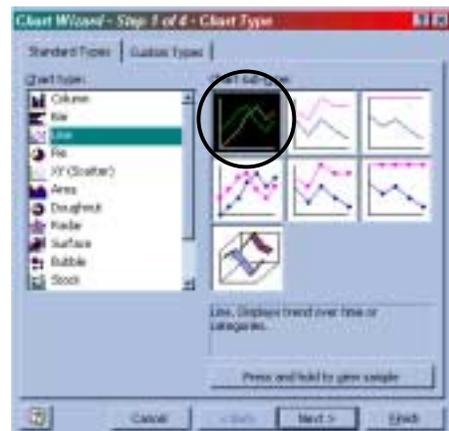
- Minimum – is the lowest reading that the System4 records in the programmed time interval.
- Maximum – is the highest reading that the System4 records in the programmed time interval.
- Sample – is the last actual reading that the System4 records at the end of the programmed time interval. *Note: sample will not be available in the *.hi logs*
- Average – is the median of the minimum and maximum reading.

Let's Graph ORP Sample and pH Sample

- In this case they are the sample columns for both pH and ORP, which is the fourth column for each reading.
- On the Excel toolbar press the  chart wizard icon.

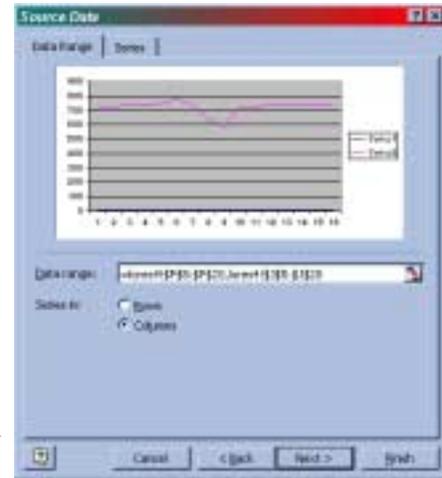


- The Chart Wizard – Step 1 of 4 will pop up on the screen.
- Choose line and the top left square for your graph
- Click on Next>



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- Step 2 of 4 will show up. **Source Data**
- You must select your data range.
- Click on the  icon to the right of the **Data range:** box
- Click and hold on cell F5 and drag the box to include all the pH values you wish to view.
- Take your finger off of the mouse
- Use the scroll bar to bring view the top of the page.
- Press and hold down the Ctrl key
- Click and hold on cell J5 and drag the box to include the same amount of ORP values as pH values.
- The two columns should have a dotted box around the individual columns.



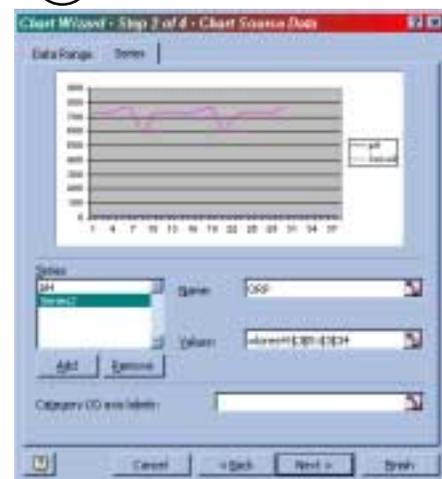
Selected columns

	A	B	C	D	E	F	G	H	I	J
1	Bradley									
2	Low Resolution									
3	time stamp	pH								
4	date	time	min	max	avg	sam	min	max	avg	sam
5	3/20/01	01:00 am	7.5	7.5	7.5	7.5	7.5	7.5	729	730
6	3/20/01	03:00 am	7.5	7.5	7.5	7.5	7.5	727	729	729
7	3/20/01	05:00 am	7.4	7.5	7.4	7.4	7.4	727	732	731
8	3/20/01	07:00 am	7.4	7.5	7.4	7.5	7.4	731	732	731
9	3/20/01	09:00 am	7.4	7.5	7.4	7.4	7.4	731	745	745
10	3/20/01	11:00 am	7.4	7.4	7.4	7.4	7.4	745	776	762
11	3/20/01	01:00 pm	7.3	7.4	7.4	7.4	7.4	738	782	770
12	3/20/01	03:00 pm	7.4	7.4	7.4	7.4	7.4	639	738	695
13	3/20/01	05:00 pm	7.4	7.4	7.4	7.4	7.4	688	639	610
14	3/20/01	07:00 pm	7.4	7.5	7.5	7.5	7.5	582	718	655
15	3/20/01	09:00 pm	7.4	7.5	7.5	7.5	7.5	716	727	721
16	3/20/01	11:00 pm	7.4	7.5	7.5	7.5	7.5	727	732	731
17	3/21/01	01:00 am	7.5	7.5	7.5	7.5	7.5	732	733	732
18	3/21/01	03:00 am	7.5	7.5	7.5	7.5	7.5	733	733	733
19	3/21/01	05:00 am	7.5	7.5	7.5	7.5	7.5	733	734	734
20	3/21/01	07:00 am	7.5	7.5	7.5	7.5	7.5	734	734	734

- In the **Source Data – Data range:** box click on the icon to the right of the box.



- The **Source Data** screen will appear showing your selection in the **Data range:** box.
- Click on the **Series** tab at the top left of the screen
- In the **Series** box highlight **Series1**
- In the **Name:** box type in pH
- Highlight **Series2** (**Series1** will change to pH)
- In the **Name:** box type in ORP
- Click on **Series2** again (**Series2** will change to ORP)
- In the **Category (X) axis labels:** box click on the  to the right of the box.



- Click and hold on cell A5 and drag the box to include all the days and times you wish to see on the x-axis.

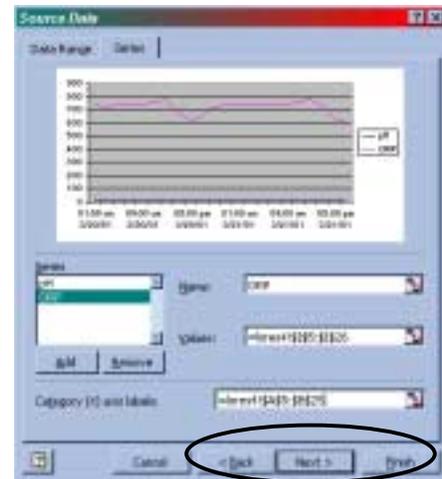
Box the cells that include your dates

time stamp	pH			ORP									
date	time	min	max	avg	sam	min	max	avg	sam	min	max	avg	sam
3/20/01	01:00 am			7.5	7.5	7.5		7.5	729	730	729		729
3/20/01	03:00 am			7.5	7.5	7.5		7.5	727	729	728		727
3/20/01	05:00 am			7.4	7.5	7.4		7.4	727	732	731		732
3/20/01	07:00 am			7.4	7.5	7.4		7.5	731	732	731		731
3/20/01	09:00 am			7.4	7.5	7.4		7.4	731	745	735		745
3/20/01	11:00 am			7.4	7.4	7.4		7.4	745	776	762		776
3/20/01	01:00 pm			7.3	7.4	7.4		7.4	738	782	770		738
3/20/01	03:00 pm			7.4	7.4	7.4		7.4	639	738	685		639
3/20/01	05:00 pm			7.4	7.4	7.4		7.4	588	639	610		588
3/20/01	07:00 pm			7.4	7.5	7.5		7.5	582	718	655		718
3/20/01	09:00 pm			7.4	7.5	7.5		7.5	716	727	721		727
3/20/01	11:00 pm			7.4	7.5	7.5		7.5	727	732	731		732
3/21/01	01:00 am			7.5	7.5	7.5		7.5	732	733	732		733
3/21/01	03:00 am			7.5	7.5	7.5		7.5	733	733	733		733

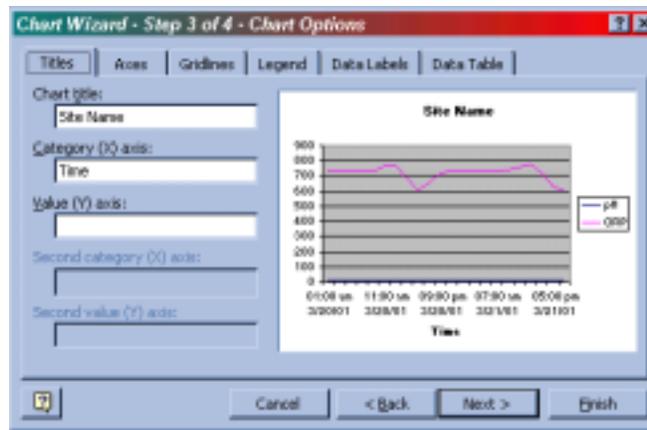
- In the Category (X) axis labels: box click on the icon to the right of the box.



- The Source Data screen will appear showing your selection in the Category (X) axis labels: box.
- Click Next > button

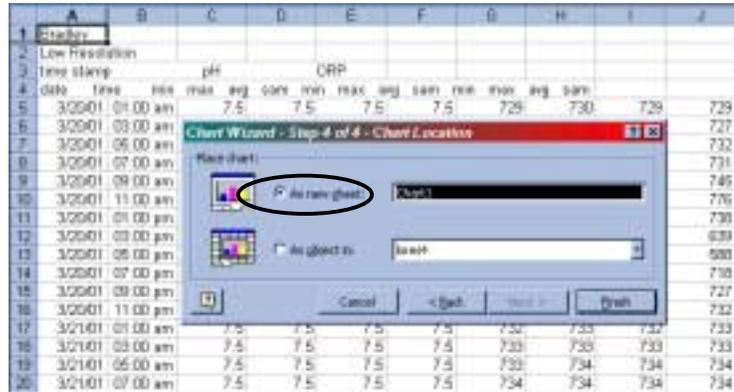


- Type in the Site name for the Chart Title:
- Type in Time for the Category (X) axis:
- Leave the Value (Y) axis: blank
- Click Next > button



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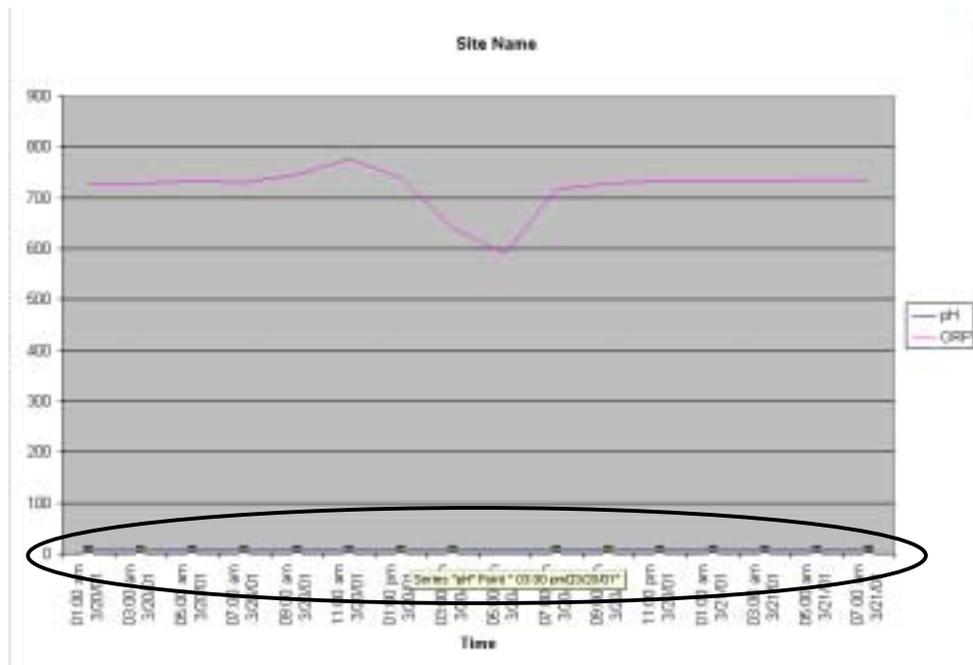
- Step 4 of 4 will appear.
- Click on the circle to the right of As new sheet:
- Click Finish



Changing the Look of Your Graph

The graph will pull up and you will only see the ORP with the pH at the very bottom of the graph.

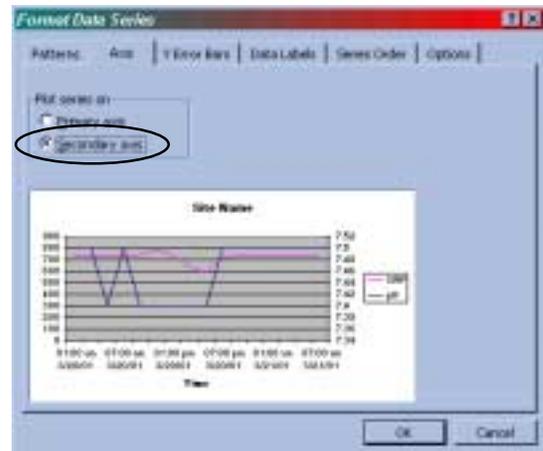
- Left click on the pH line at the bottom of your graph.



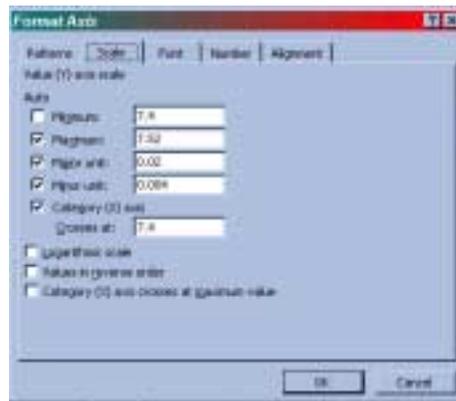
- Right Click on the line.
- Choose Format Data Series



- Click on the **Axis** tab at the top
- Click on the circle that is to the left of **Secondary axis**.
- This will make the pH a secondary y-axis so it will be easier to see.
- Click **OK**



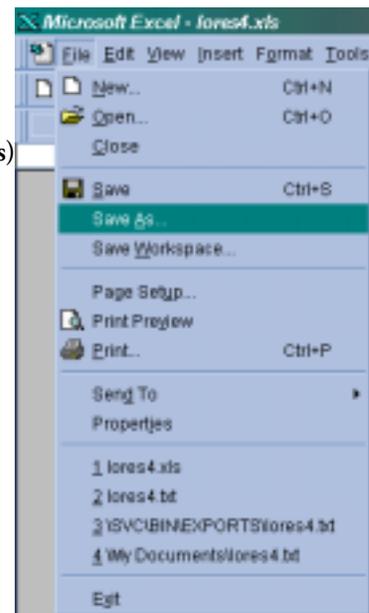
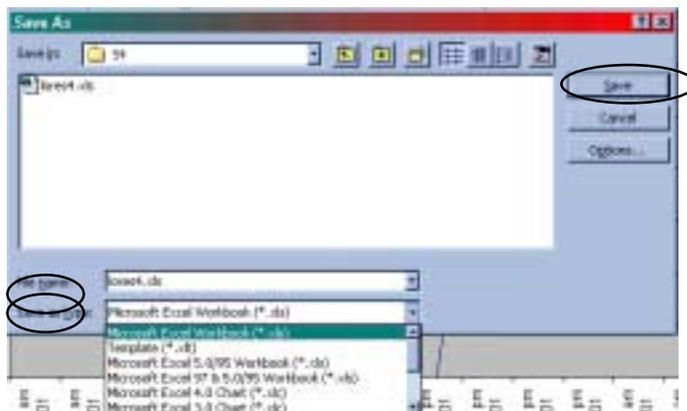
- You can change the y-axis resolution by clicking on the axis and then right clicking. An axis menu will pop up and you will select **Format Axis**.
- Click on the **Scale** tab at the top and change the minimum and maximum to the values you desire.
- In this mode you can change many things that have to do with the pH graph.
- The same can be done to the ORP graph.



Note: If you click on the item you want to change then right click a pop up menu will show up then you will be able to choose which screen and what you want to change.

Saving the File as an Excel File

- In the top left corner click on **File** then **Save As . . .**
- The **Save As . . .** screen will appear
- In the **File Name** box type in the name you wish to call the file.
- From the **Save as type:** box choose the **Microsoft Excel Workbook (*.xls)**
- Click on **Save**.



Communication Capabilities - Chapter 7

Communication Functionality

The user has the ability to communicate the System4 through either direct connection or telephone connection.

Direct Connection is done with a direct connection cable (RS-232). Direct connection is meant for communication up to 50'. Direct connection can run up to 4000' with line boosters on the computer and the controller ends. Direct connect can also run to a computer and then the computer can be connected by telephone line. Direct connection is the only way the System4 Controller can communicate.

Appendix I

Spas (Feed Charts)

Quantity of Muriatic Acid Needed to Lower Total Alkalinity

Desired Decrease in ppm	<i>Gallons in Spa</i>					
	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	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	2.33cp
100	0.25 cp	0.50 cp	0.67 cp	1.33 cp	2.00 cp	2.50 cp

Quantity of Sodium Bisulfate Needed to Lower Total Alkalinity

Desired Decrease in ppm	<i>Gallons in Spa</i>					
	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 cpb	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	3.00cp
100	0.33 cp	0.50 cp	0.75 cp	1.67 cp	2.50 cp	3.25 cp

Appendix II

Pools (Feed Charts)

Quantity of Muriatic Acid Needed to Lower Total Alkalinity

Desired Decrease in ppm	<i>Gallons in Pool</i>								
	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	36.6 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	48.70 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

Quantity of Bicarbonate of Soda Needed to Raise Total Alkalinity

Desired Decrease in ppm	<i>Gallons in Pool</i>								
	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

Strantrol System4

Technical Guide

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