WPH Series
pH & ORP Controller
Instruction Manual

Notice

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1.0 Introduction

The Walchem WPH300 Series controllers are wall mount pH/ORP controllers that are available in on/off or modulated pulse proportional versions. On/Off models may be programmed for Time Proportional Control operation. Two additional relays are available for use as alarms or probe washing. A fifth output is used as a diagnostic alarm. An isolated 4-20 mA output is optional.

They are compatible with any amplified electrode. The choice of pH or ORP operation is selected through the keypad. Use of Antimony pH electrodes is acceptable. Automatic temperature compensation may be used via a Pt1000 or Pt100 input if pH operation is selected. The controller will prompt you to calibrate the electrode at the desired frequency. Automatic buffer recognition may be used in the calibration routine.

2.0 Specifications

2.1 Measurement Performance

pH Range:	-2 to 16 pH
pH Resolution:	.0015 pH units (.01 pH displayed)
pH Accuracy (Calibrated):	± .01 pH
ORP Range:	-1500 to 1500 mV
ORP Resolution:	92 µV (1mV displayed)
ORP Accuracy:	±1 mV
Temp Comp (optional):	100 or 1000 ohm platinum RTD
Temperature Range:	32-212°F (0-100°C)
Temperature Resolution:	±.09°F (.05°C)
Temperature Accuracy:	± .9°F (± .5°C)

2.2 Electrical: Input/Output

Input Power

Controller	110-120VAC	or	220-240VAC
	50/60 Hz, 10A	or	50/60 Hz, 5A

Input Signal

pH/ORP	±1500 mV
Temp Comp (optional)	Pt100 or Pt1000
Interlock (optional)	Isolated dry contact closure required (i.e., flow, level, etc.)

Output

Control 1/2 (ON/OFF)	
Internally powered relays	@ 120 VAC, 10A resistive, 1/8 HP @ 240 VAC, 6A resistive, 1/8 HP
Control 1/2 (Proportional)	
Opto-isolated	150mA, 40 VDC Max.
Solid State Relay	VLOWMAX = .13V @ 18 mA
AUX1, AUX2, Alarm	
Dry contact relays	@ 120 VAC, 10A resistive, 1/8 HP @ 240 VAC, 6A resistive, 1/8 HP

Note: The Alarm relay is non-programmable. Refer to the Main Menu diagram on page 14 for the list of error conditions that trigger the alarm relay.

4-20 mA (optional)	Fully isolated, internally powered, 600 Ω max. resistive load. Resolution .001% of span, accuracy ±1% of reading.
pH/ORP Preamp Power (supplied by controller)	±5 VDC, 5 mA

Agency Approvals

UL	ANSI/UL 61010-1:2004, 2nd Edition*
CAN/CSA	C22,2 No.61010-1:2004 2nd Edition*
CE Safety	EN 61010-1 2nd Edition (2001)*
CE EMC	EN 61326 :1998 Annex A*

Note: For EN61000-4-6,-3 the controller met performance criteria B.

*Class A equipment: Equipment suitable for use in establishments other than domestic, and those directly connected to a low voltage (100-240 VAC) power supply network which supplies buildings used for domestic purposes.

2.3 Mechanical

Controller

Enclosure:	Fiberglass
NEMA Rating:	NEMA 4X
Dimensions:	8.5" x 6.5" x 5.5"
Display:	2 x 16 character backlit liquid crystal
Operating Ambient Temp:	32 - 122°F (0 - 50°C)
Storage Temperature:	-20 to 180°F (-29 to 80°C)
Shipping Weight:	7 lbs (3kg) (approximately)

Flow Switch Manifold Assembly

Temperature:	140°F (60°C) max
Pressure:	150 PSI max
Process Connections:	¾" NPTF

3.0 Unpacking and Installation

3.1 Unpacking the unit

Inspect the contents of the carton. Please notify the carrier immediately if there are any signs of damage to the controller or its parts. Contact your distributor if any of the parts are missing. The carton should contain a WPH300 controller and instruction manual. Any options or accessories will be incorporated as ordered.

3.2 Mounting the electronic enclosure

The WPH series controller is supplied with mounting holes on the enclosure. It should be wall mounted with the display at eye level, on a vibration-free surface, utilizing all 4 mounting holes for maximum stability. Use M6 (1/4" diameter) fasteners that are appropriate for the substrate material of the wall. The enclosure is NEMA 4X rated. The maximum operating ambient temperature is 122°F (50°C). The enclosure requires the following clearances:

Top:	2"
Left:	8"
Right:	4"
Bottom:	7"

3.3 Installation

Once the enclosure is mounted, the metering pumps may be located at any distance from the controller. The electrode, once amplified, may be placed up to 1000 feet from the controller. Shielded cable with twisted pairs is required. Always route AC voltage wiring in conduit that is separated by 6 inches from low voltage DC signal lines (such as the electrode signal).

Electrode Installation

The WPH controllers are designed to work with most AMPLIFIED pH, ORP or ISE electrodes. When in doubt, follow the electrode manufacturer's instructions for installation.

If you have ordered your controller with an external preamplifier pre-wired to the controller, simply attach the electrode to the BNC connector on the preamplifier. If you are using automatic temperature compensation, wire the ATC element to the preamplifier as shown in figure 3.

If you have ordered the external preamplifier separately, see figure 3 for wiring instructions.

NOTE: The cable between the electrode and the preamplifier is carrying an extremely sensitive high impedance voltage signal. Never cut, splice or otherwise destroy the integrity of the cable or unstable readings and susceptibility to electrical noise will result.

Instructions for physically mounting the electrode into the process solution will vary greatly with the type of electrode and circumstances involved in your application. Here are some general guidelines to assist you. Refer to figure 1, Typical Installation.

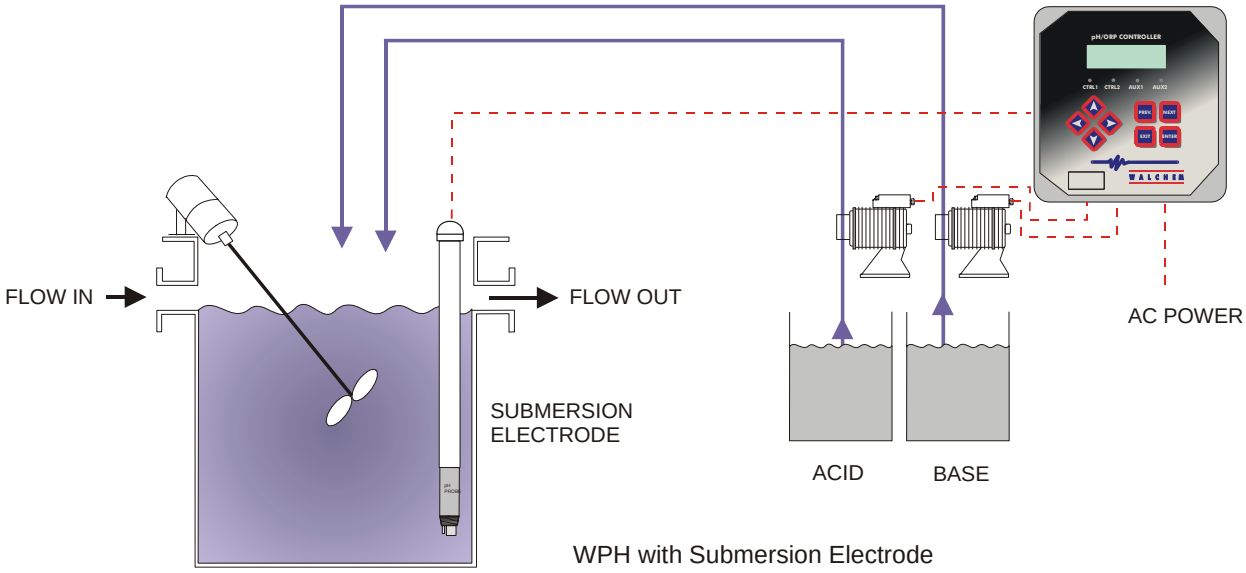
The electrode should be installed such that the measuring surfaces will always stay wet. Many electrodes have to be installed vertically, with the measuring surfaces pointing down. Follow the manufacturer's recommendations if this is the case. If the electrode dries out, a slow response and short life will result.

For submersion applications, mount the electrode below the minimum solution level. If the tank will be completely emptied, plan on removing the electrode and storing it in tap water (NOT DI water) or pH 4 buffer solution while the tank is empty. If this is not desirable, a recirculation loop may be installed with the electrode mounted in-line. The WEL electrode cable is not waterproof and must be protected from moisture by connecting a pipe to the top of the electrode housing. The opposite end of the pipe should also be protected from moisture using a cable gland. When submerging the electrode, make sure the cable is protected by a length of pipe, sealed at the top using a cable gland.

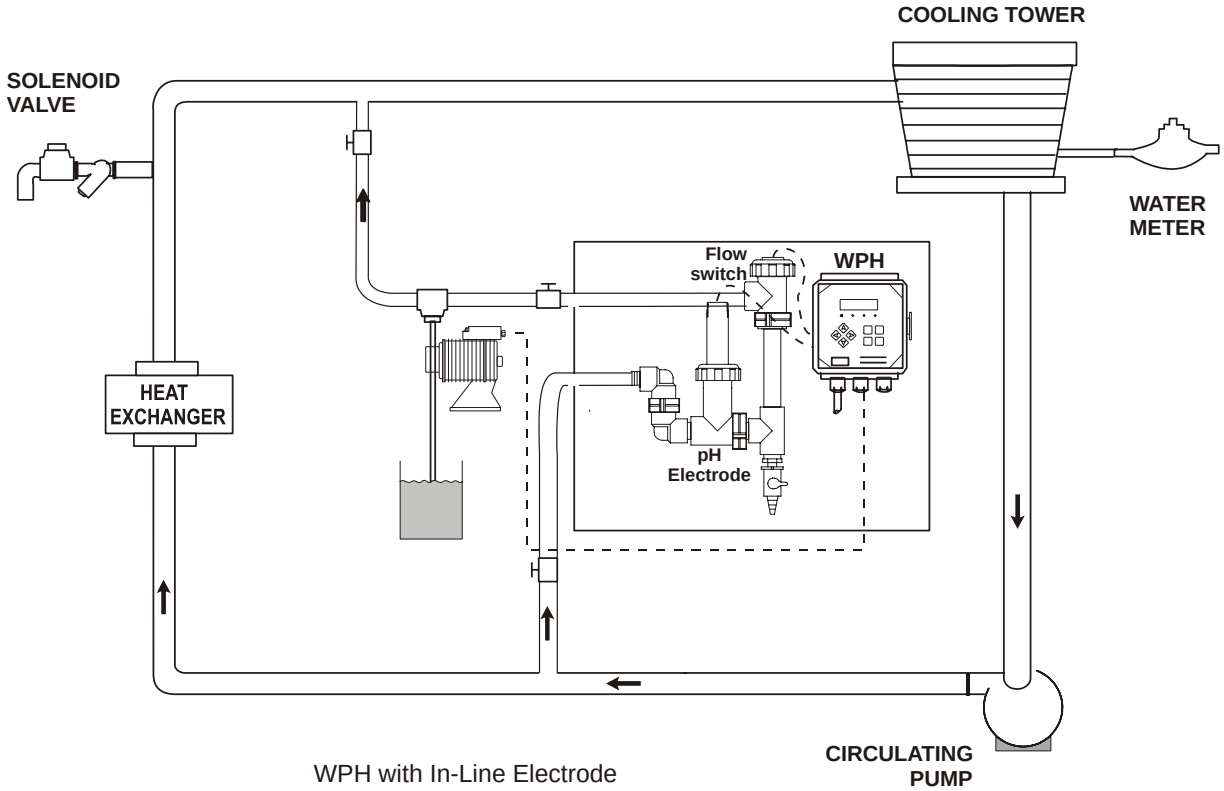
For in-line applications, where the electrode is installed in a pipe, the electrode should be placed on the discharge side of the pump (under positive pressure). A "U" trap should be included so that if flow stops, the electrode is still immersed in the solution. If the flow through the pipe can not be shut down for cleaning and calibrating the electrode, install the electrode in a by-pass line with isolation valves to allow for electrode removal.The electrode should be installed in an area where there is good solution movement and where it will respond rapidly to chemical additions. The placement of the electrode relative to the placement of chemical replenishment, along with the quality of the mixing and replenishment flow rate, is critical to accurate control. When connecting pipe to the in-line mounting tee of a WEL electrode, use no more than 3 wraps of Teflon tape and only screw in the pipe to FINGER TIGHT. Over-tightening will crack the tee. Do not use pipe dope to seal the threads of the flow switch because the clear plastic will crack!

3.4 Icon Definitions

Symbol	Publication	Description
	IEC 417, No.5019	Protective Conductor Terminal
	IEC 417, No. 5007	On (Supply)
	IEC 417, No. 5008	Off (Supply)
	ISO 3864, No. B.3.6	Caution, risk of electric shock
	ISO 3864, No. B.3.1	Caution



WPH with Submersion Electrode



WPH with In-Line Electrode

Figure 1 Typical Installation

3.5 Electrical Installation

Based on the model number, the following voltages are required:

WPH3xx-1xx	120 VAC, 50/60 Hz, prewired
WPH3xx-2xx	120 VAC, 50/60 Hz, prewired
WPH3xx-4xx	120 VAC, 50/60 Hz, hardwired
WPH3xx-5xx	240 VAC, 50/60 Hz, hardwired

The various standard wiring options are shown below. Your WPH series controller will arrive from the factory prewired or ready for hardwiring. Depending on your configuration of controller options, you may be required to hardwire some or all of the output devices. Refer to figures 2, 3 and 4 for circuit board layout and wiring.

Note: When wiring the optional 4-20 mA output or a remote flow switch, it is advisable to use stranded, shielded, twisted pair wire between 22-26 AWG. Shield should be terminated at the controller ground stud (see figure 4).

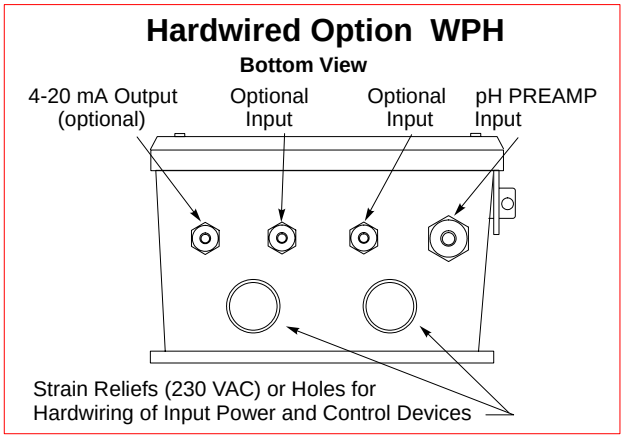
CAUTION! There are live circuits inside the controller even when the power switch on the front panel is in the OFF position! The front panel must never be opened before power to the controller is REMOVED!
If your controller is prewired, it is supplied with a 8 foot, 18 AWG power cord with USA style plug. A tool (#1 phillips driver) is required to open the front panel.

CAUTION! When mounting the controller, make sure there is clear access to the disconnecting device!

CAUTION! The electrical installation of the controller must be done by trained personnel only and conform to all applicable National, State and Local codes!

CAUTION! Proper grounding of this product is required. Any attempt to bypass the grounding will compromise the safety of persons and property.

CAUTION! Operating this product in a manner not specified by Walchem may impair the protection provided by the equipment.



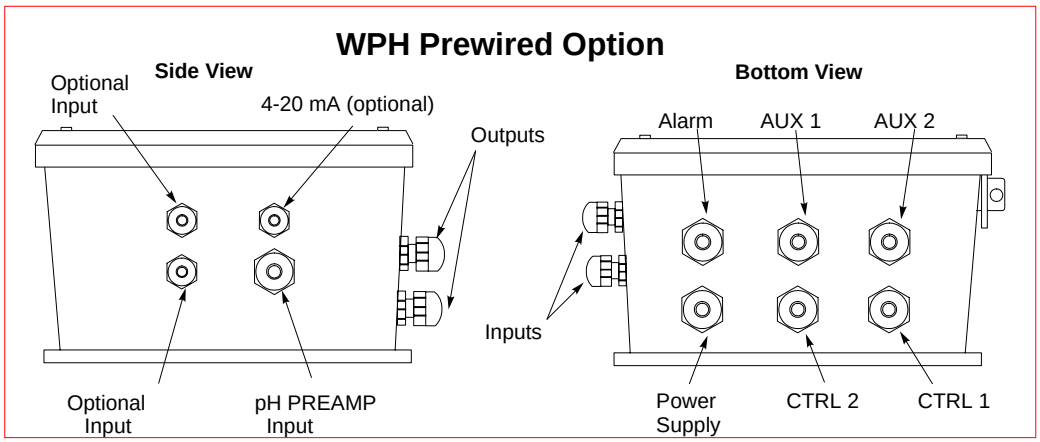


Figure 2 Conduit/Wiring Options

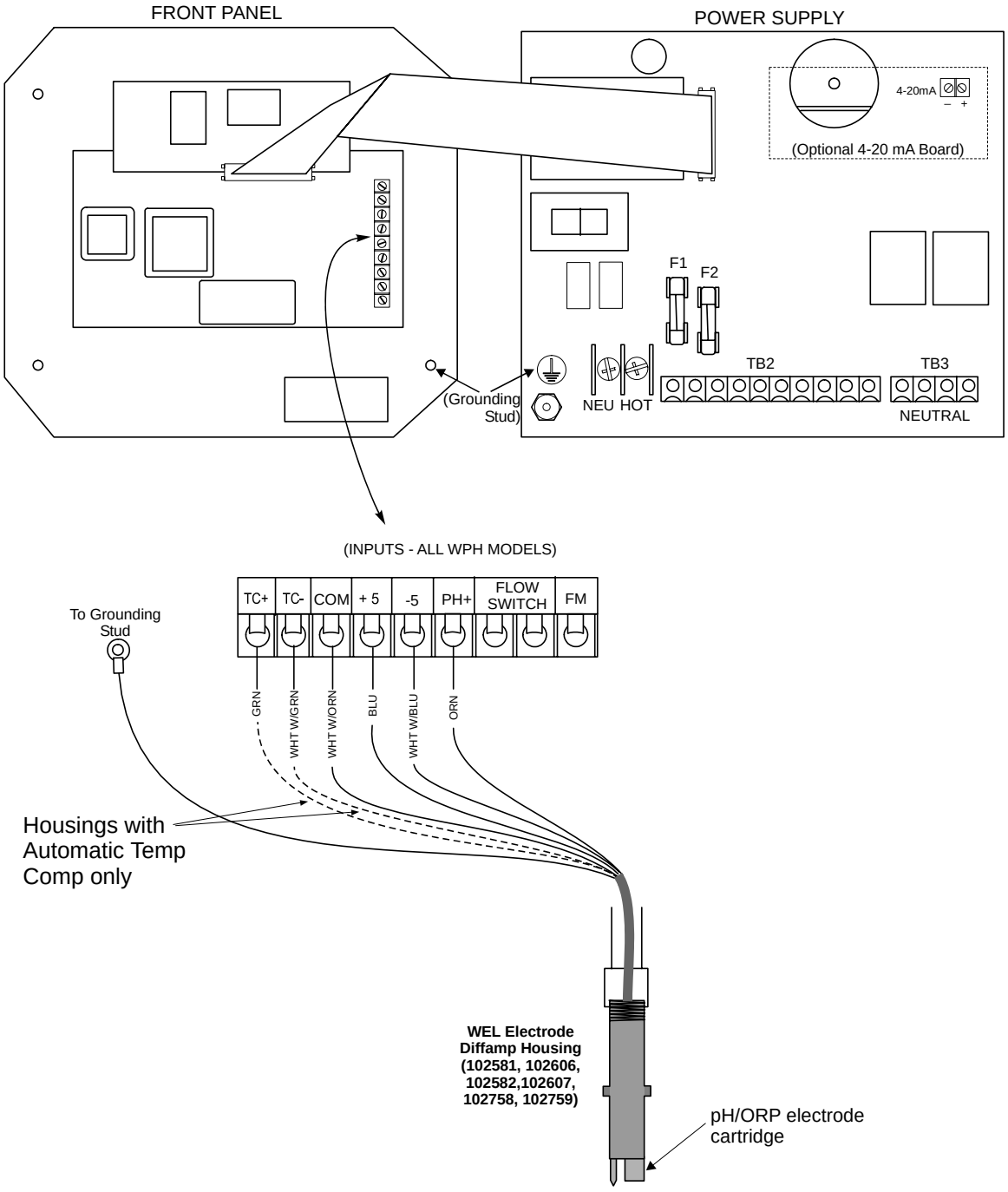


Figure 3 Wiring to WEL pH/ORP Electrode Housing

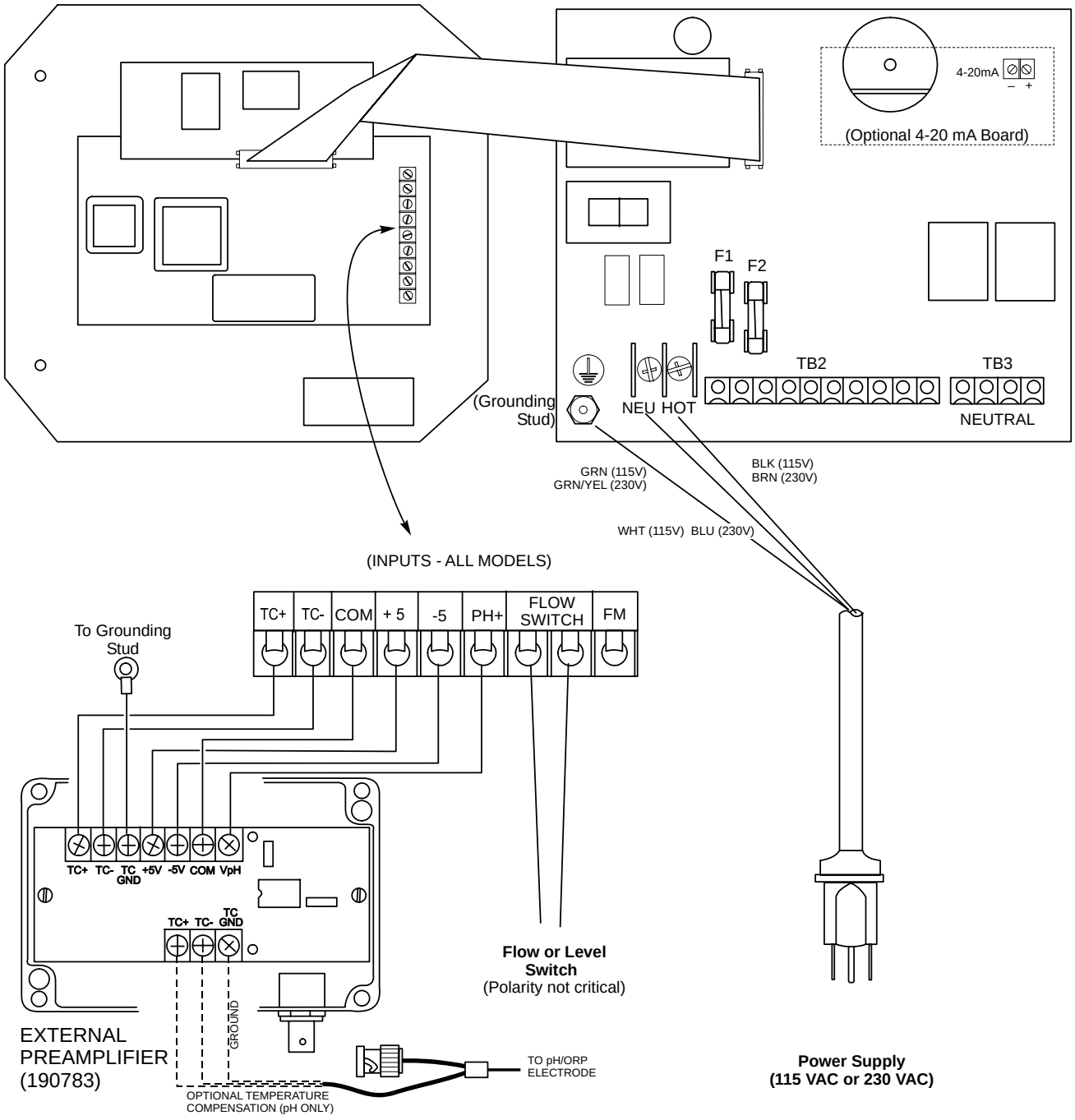


Figure 3a Wiring a pH/ORP Electrode &External Preamplifier To a WPH300 Controller (power relay board 190873)

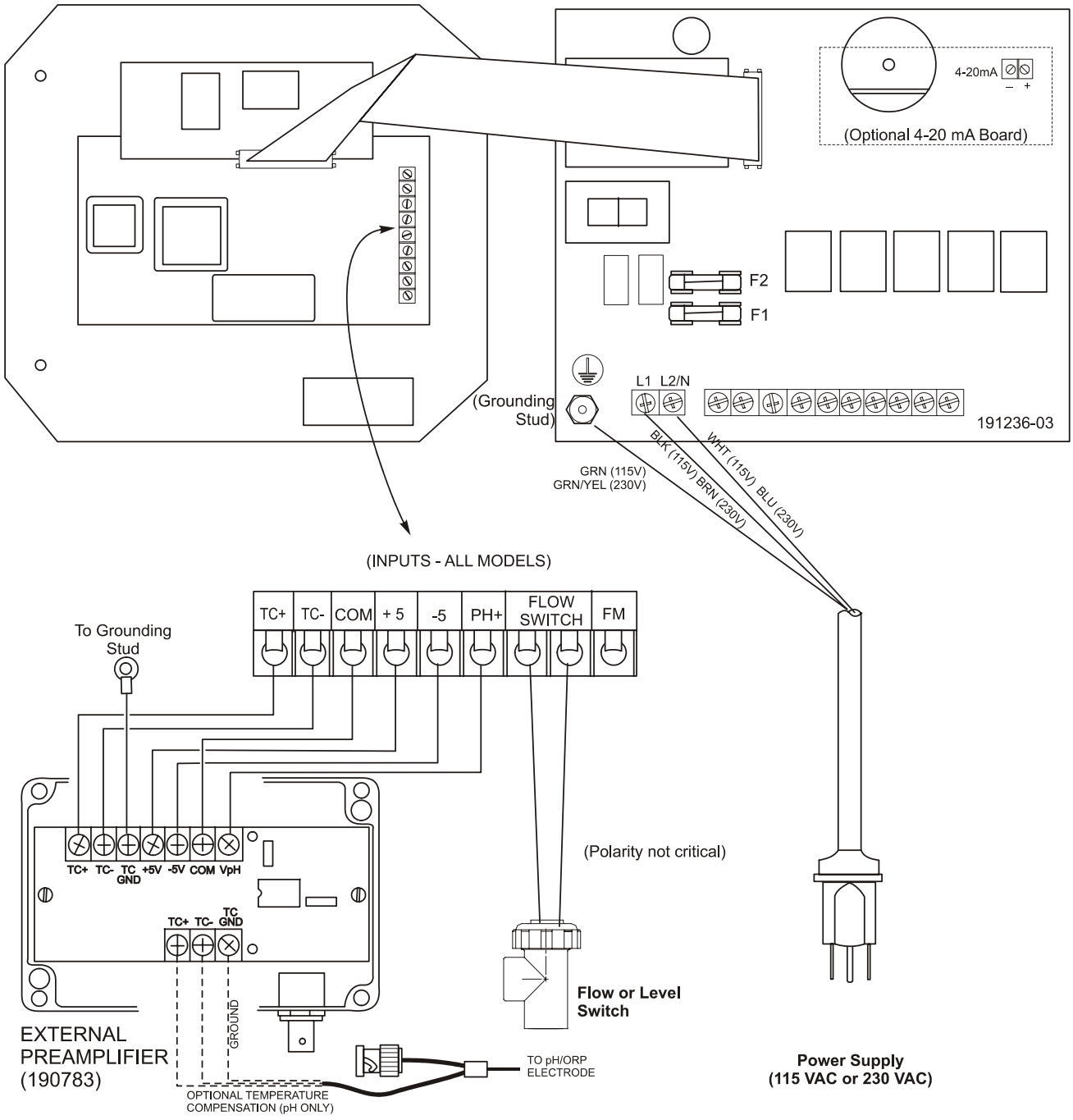


Figure 3b Wiring a pH/ORP Electrode & External Preamplifier To a WPH300 Controller (power relay board 191236)

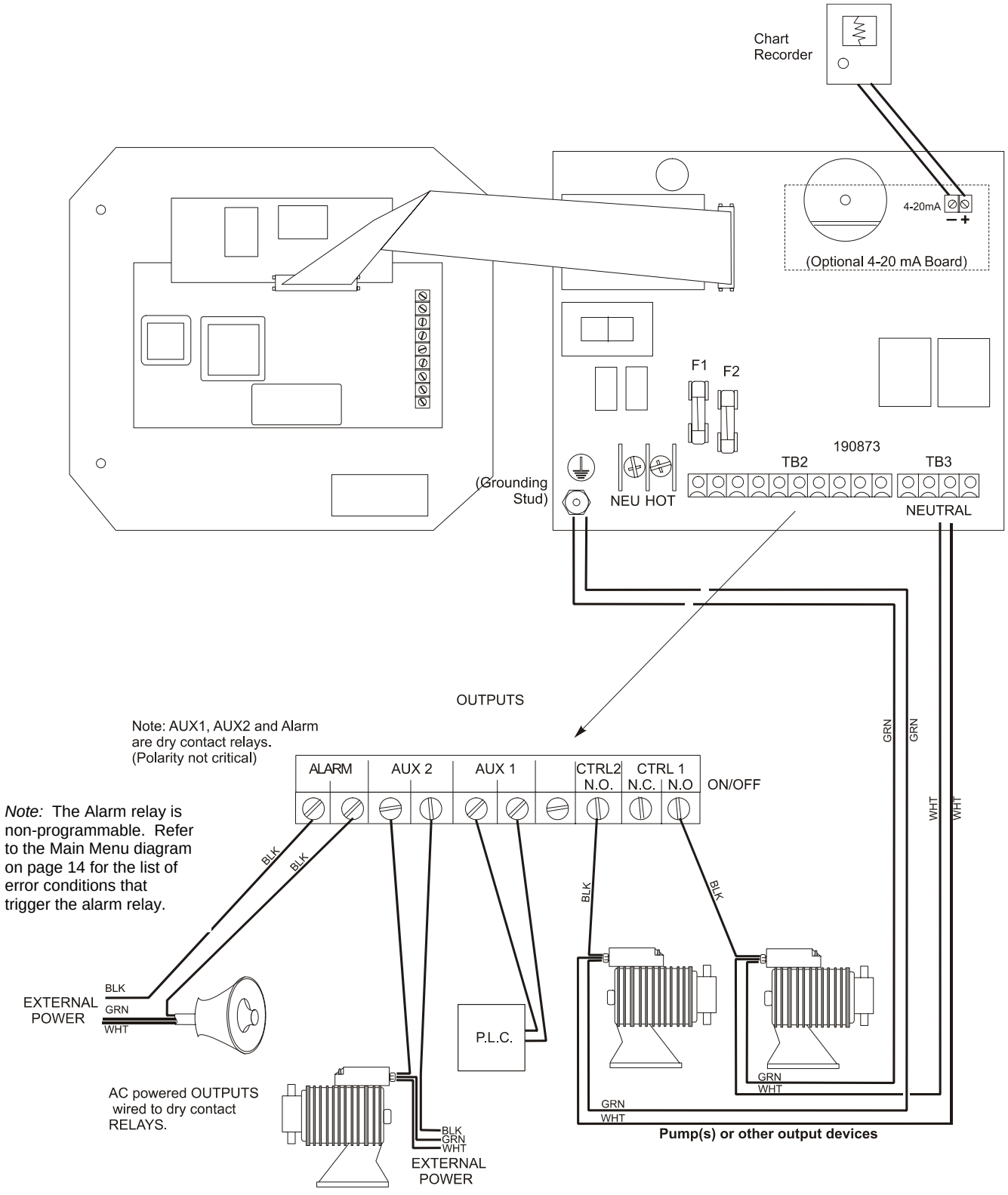


Figure 4 WPH310 Outputs (for power relay board 190873)

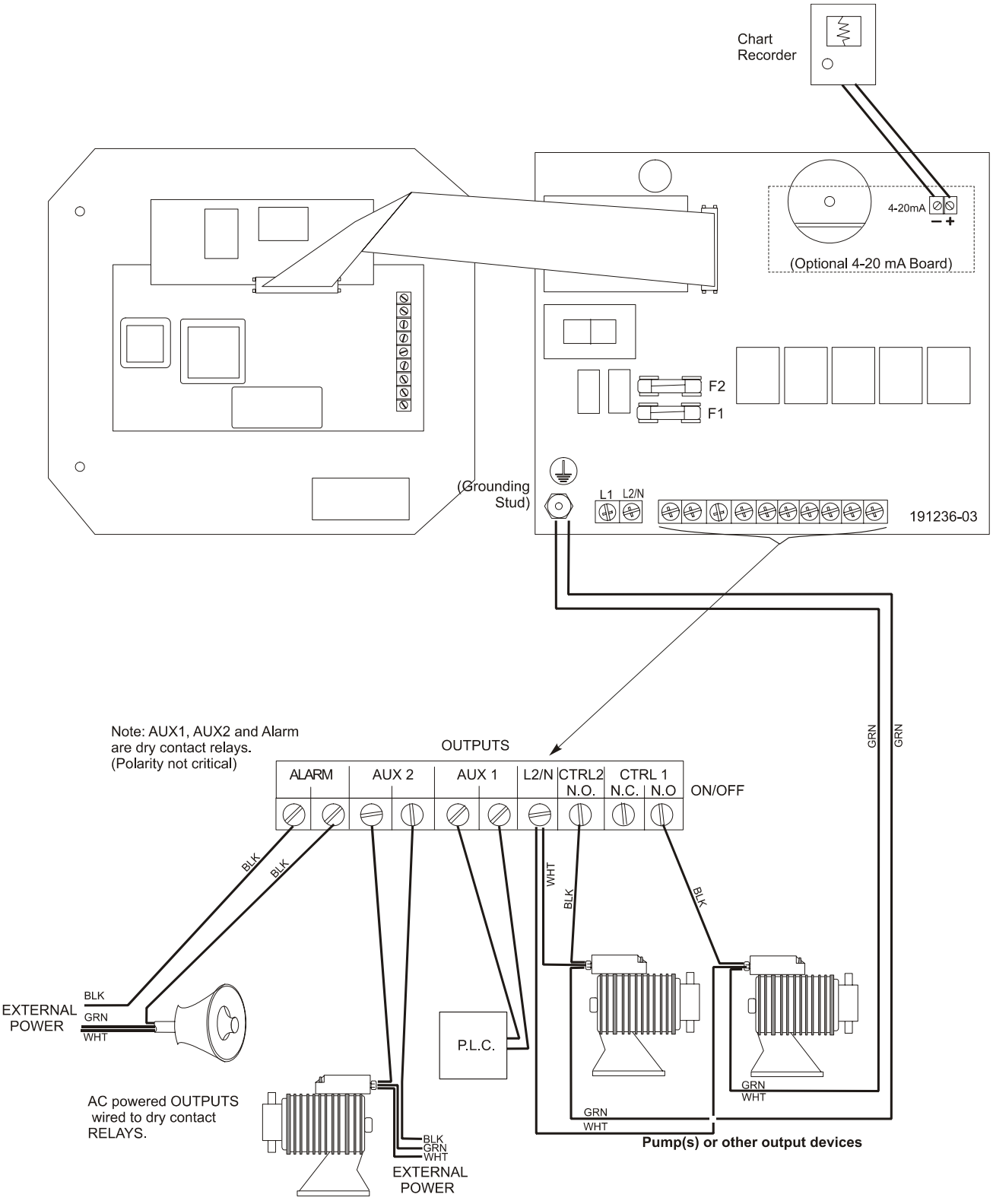


Figure 4a WPH310 Outputs (for power relay board 191236)

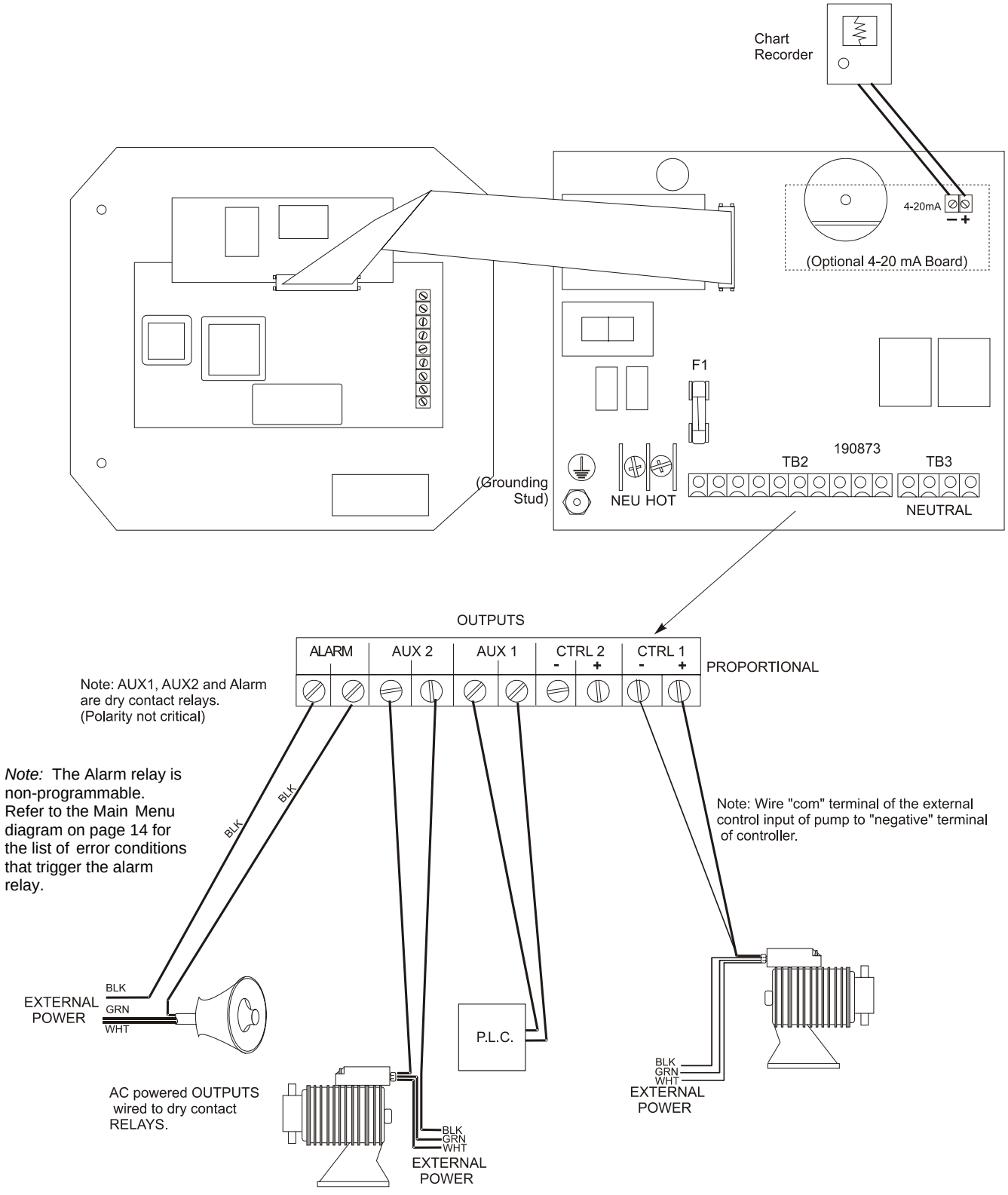


Figure 5 WPH320 Outputs (for power relay board 190873)

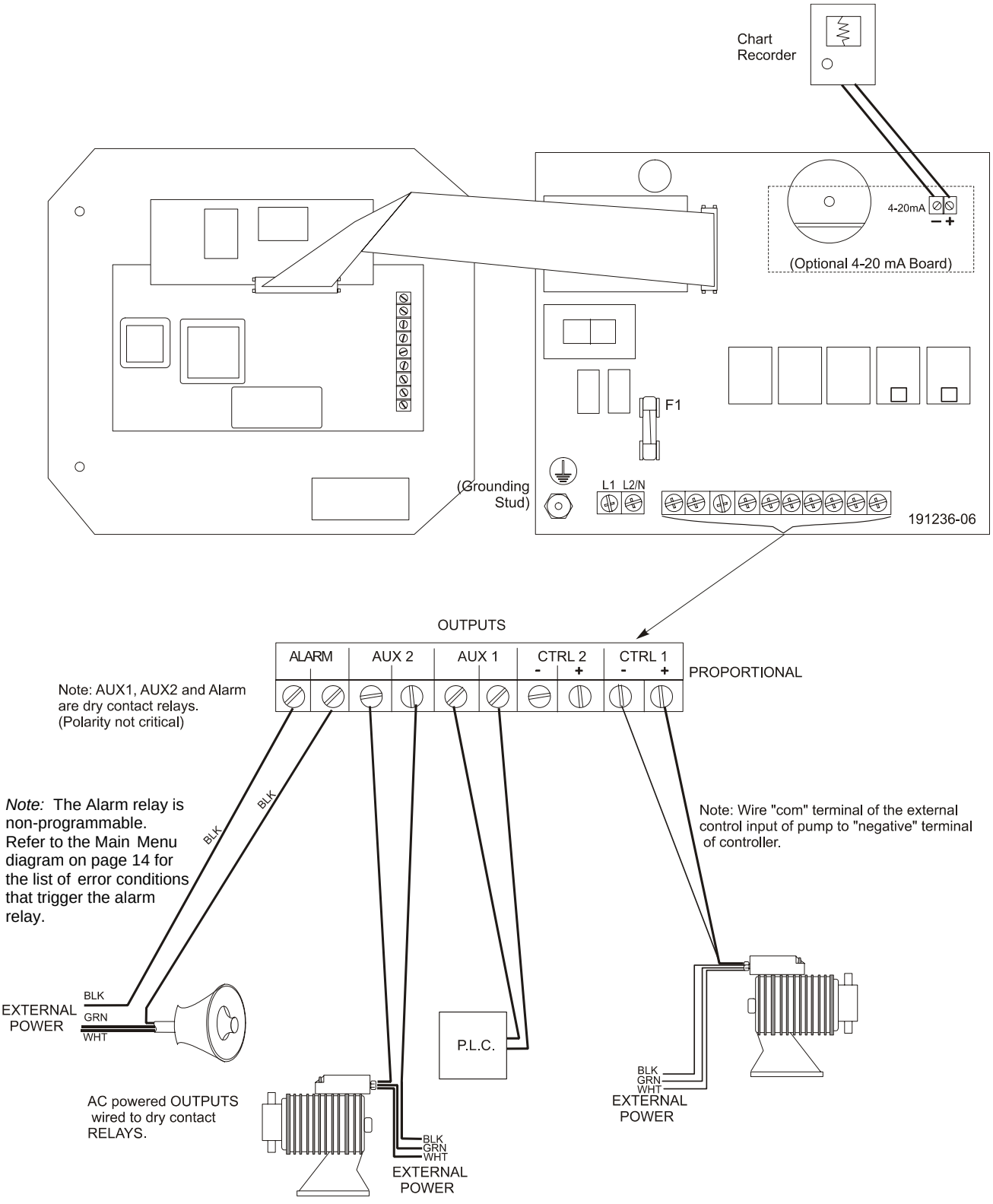
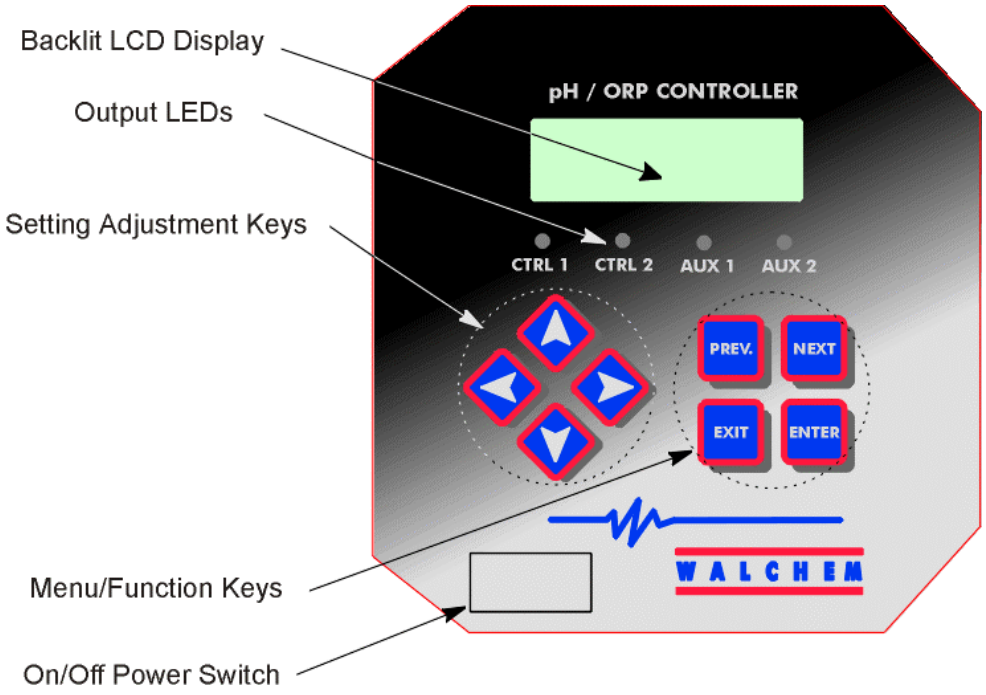


Figure 5a WPH320 Outputs (for power relay board 191236)

4.0 Function Overview

4.1 Front Panel



4.2 Display

A summary screen is displayed while the WPH controller is on. This display shows a bar graph of the pH/ORP process value relative to the set point, a digital display of the pH/ORP process value, and the current operating conditions.

Towards the center of the bar graph are the (S)'s, which represent the set points. The bar graph grows from the left hand side, and the point furthest to the right indicates where the process value is relative to the set points.

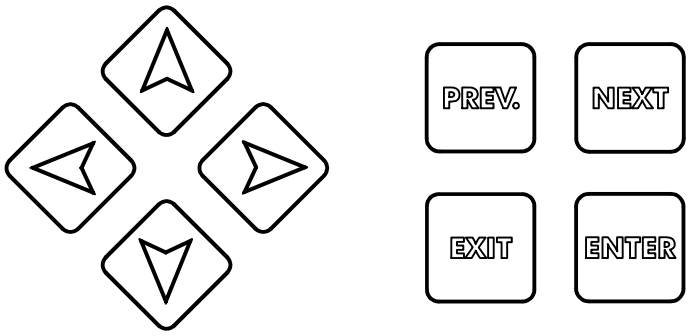
The bottom line of the summary screen displays the following potential status messages: Probe Error, Temp Sensor Err, Calibration Time, Output Timeout, High/Low Alarm, Range Alarm, In Range Output, Output1 On, Output2 On, Probe Wash, Probe Wash Hold, Normal and Interlock.

Summary Screen

4.3 Keypad

The keypad consists of 4 directional arrows and 4 function keys. The arrow keys are used to move the adjustment cursor and change settings, while the function keys are used to enter values, and navigate the various menu screens. The function keys are **ENTER, EXIT, NEXT and PREV** (previous). **NEXT** and **PREV** scroll through the various menu choices. **ENTER** is used to enter a submenu and to enter a value. **EXIT** is used to back up one menu level. If you are at the main menu level, **EXIT** will return you to the summary screen.

To change a value in a submenu, the left/right arrow keys move the cursor left and right to each digit or option that can be changed. The up/down arrows will change numeric values up or down, or scroll through option choices. Press **ENTER** only when you have finished making ALL of the changes for that menu screen.



4.4 Access Code

The WPH series controller is shipped with the access code disabled. If you wish to enable it, see Section 5.10 for operation. With the access code enabled, any user can view parameter settings, but not change them. Note that this provides protection only against casual tampering. Use a lock on the cover latch if you need more protection.

4.5 Startup

Initial Startup

After having mounted the enclosure and wired the unit, the controller is ready to be started.

Plug in the controller and turn "ON" the power switch to supply power to the unit. The display will briefly show the WPH model number and then revert to the normal summary screen. Scroll through the menus and calibrate the electrode, and set the control parameters as detailed in Section 5, Operation.

To return to the summary screen, press the **EXIT** key until you return to this screen. The controller will automatically return to this screen after 10 minutes.

Normal Startup

Startup is a simple process once your set points are in memory. Simply check your supply of chemicals, turn on the controller, calibrate the electrode if necessary and it will start controlling.

4.6 Shutdown

To shut the WPH controller down, simply turn off the power switch. Programming remains in memory.

The electrode must be stored with the measuring surfaces wet. If an extended shutdown will result in the electrode dehydrating, it must be removed from its position in the process and stored in pH 4 buffer solution.

5.0 Operation

These units control continuously while power is applied. Programming is accomplished via the local keypad and display.

To view the top level menu, press any key. The menu structure is grouped by inputs and outputs. Each input has its own setup menu for calibration and unit of measure selection as needed. Each output has its own setup menu including set points, timer values, direction of control, etc. as needed. After 10 minutes of inactivity in the menu, the display will return to the summary screen. Keep in mind that even while browsing through the menus, the unit is still controlling.

5.1 Main Menu

The exact configuration of your WPH controller determines which menus are available as you scroll through the settings. Certain menus are only available if you select certain options. All settings are grouped under the following main menu items:

Sensor
Temperature
Control 1
Control 2
Auxiliary 1
Auxiliary 2
4-20 mA (Only if 4-20 mA option circuit board is installed)
Time
Access Code

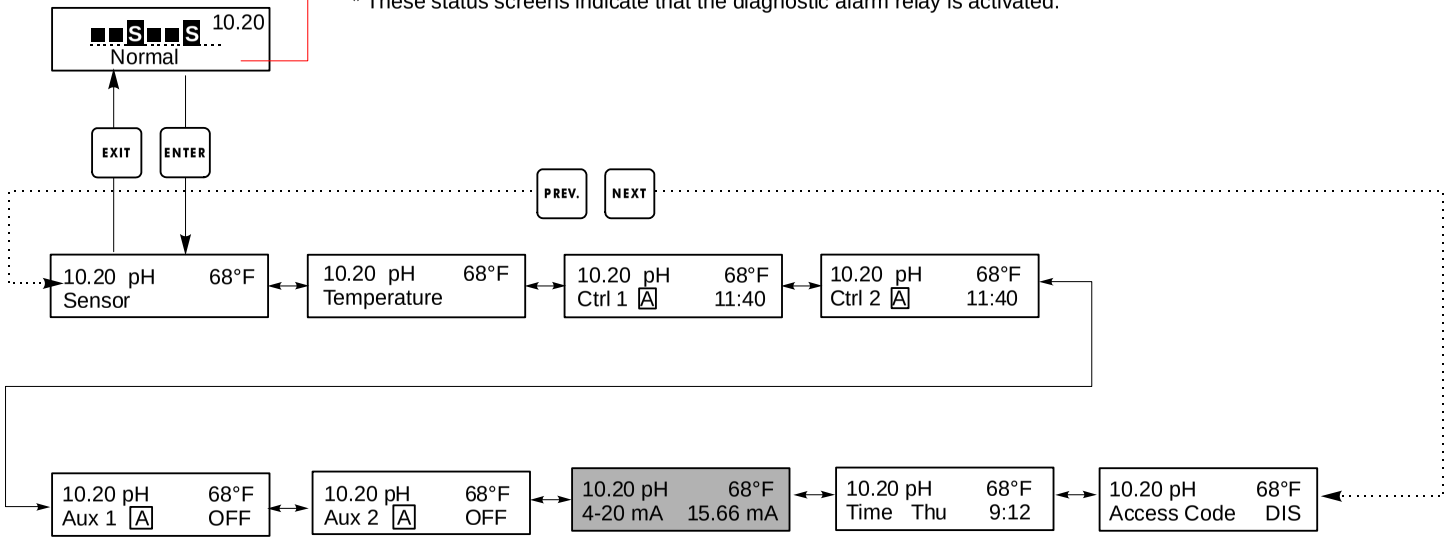
The **NEXT** key travels forward through this list while the **PREV** key travels backwards through the list. Pressing **ENTER** will enter the lower level menu that is currently displayed.

Main Menu

Possible Status Screens

* Probe Error
* Temp Sensor Err
  Probe Wash
  Probe Wash Hold
* Interlock
* Output Timeout
* Calibration Time
  Range Alarm
  In Range Output
  High/Low Alarm
  Output 1 On
  Output 2 On
  Normal

* These status screens indicate that the diagnostic alarm relay is activated.



Legend

4-20mA menu is only present if 4-20mA option is installed.

Operation

Press Enter key to enter menu or submenu.
Press Exit key to exit menu.
After 10 minutes of inactivity the controller will automatically return to the summary screen.

5.2 Sensor Menu

The sensor menu provides the following settings: Calibration history (informational only), 2 point calibration, 1 point calibration, pH/ORP selection, and other calibration menus. Each is discussed in detail below. Refer to the Sensor Menu chart on the next page.

Note: If you are programming the unit for the first time, press the **PREV** key once, and set the "Sensor Type" menu first to choose standard pH, antimony pH, or ORP. Then press **PREV** three times to get to the "Use Buffer Rec"menu and choose whether you want to use automatic buffer recognition or not. Then press **ENTER**.

Cal'd

Displays the date of the last electrode calibration.

2 Pt Calibration

Press the **ENTER** key to perform a 2 point calibration of the electrode.

Note: 2 point calibration instructions are given in the following order:
pH electrodes, using Auto Buffer Recognition,
pH electrodes, not using Auto Buffer Recognition,
ORP electrodes (Auto Buffer Recognition not available)

2 Pt Calibration for pH electrodes, using Auto Buffer Recognition:

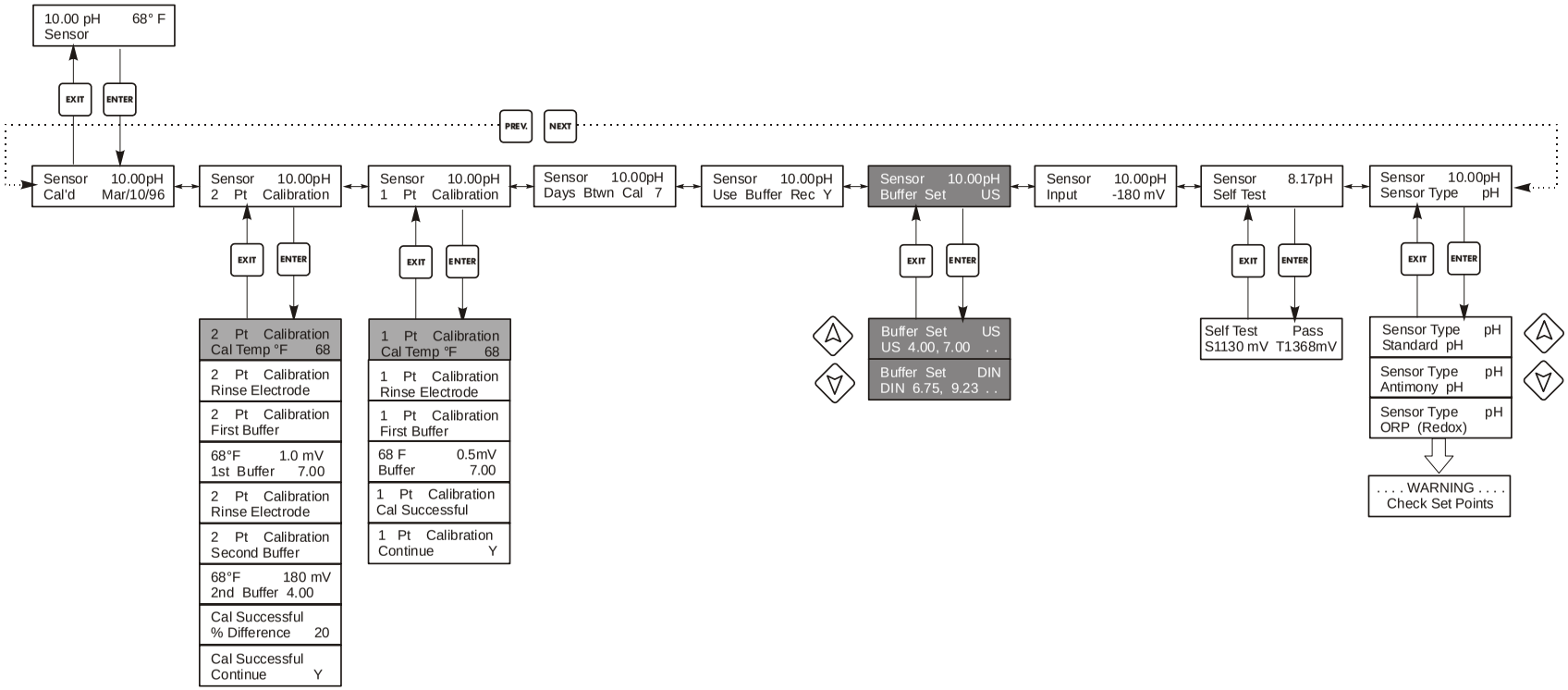
If using manual temperature compensation, the first display will be:
Cal Temp °F/C 68
Use the arrow keys to enter the actual temperature of the buffer solutions. If using automatic temperature compensation, this display will not appear. Press **ENTER** to continue.

Rinse Electrode
Remove the electrode from the process and rinse it off. Press **ENTER** to go to the next step.

First Buffer
This is a prompt to place the electrode in the first buffer. In a few seconds the controller will automatically go to the next step.

1st Buffer 7.00
The top line will show the temperature and the mV output from the electrode.
The bottom line will read "1st Buffer" on the left hand side and either "??.??" or a pH value on the right hand side. If it reads a pH value, that means that it has recognized the buffer solution. Once the buffer value is recognized, it will stop flashing and the mV value will begin flashing. Once this has stabilized, it will stop flashing and go on to the next step.

Sensor Menu



Legend

Menu choices that appear when Buffer Recognition is selected.

Menu choices that appear only when Auto Temperature Compensation is not recognized.

Operation

Press Enter key to enter menu.
Press Exit key to exit menu.
Blinking fields may be edited with the adjust arrows.
Press Enter when modification is complete to return to Main Menu Level.

If it reads "??.??", that means it hasn't recognized the buffer solution because the mV output of the electrode is too far away from a standard buffer solution's theoretical mV value. If it can't recognize the buffer solution, the controller will beep and display "Unknown Buffer", and then display its best guess. Press **ENTER** to accept that guess, or change the value to the correct one using the arrow keys.

If you press ENTER when it reads “??.??”, the display will switch to “Buffer Override” and allow you to manually enter the buffer value.

Rinse Electrode
Remove the electrode from the first buffer solution and rinse it off with water. Press **ENTER** to continue.

Second Buffer
Place the electrode in the second buffer solution. The controller automatically advances.

2nd Buffer 4.00
The top line will display the temperature and mV readings, which will blink until they become stable. The bottom line will say "2nd Buffer" on the left hand side, either display the pH of the buffer solution or "??.??" on the right hand side and will go to the next step or display "Unknown Buffer" as in 1st Buffer above.

Cal Successful/Cal Failed
If the electrode response is good, then the display will read "Cal Successful". If the mV output of the electrode did not change enough between the two buffer solutions, it will read "Cal Failed". A failure usually means that the electrode needs to be cleaned, or replaced. It will also display the % difference from the theoretical slope. A failure occurs if the slope is more than 80% different than theoretical. See Troubleshooting Section for “Probe Error” if calibration failed.

Continue Y
The controller will hold this display until you have replaced the electrode in the process, and press **ENTER**. Control will not begin until **ENTER** is pressed, or 10 minutes go by. If calibration failed, control will begin using old calibration setpoints.

2 Pt Calibration for pH electrodes, not using Auto Buffer Recognition:

If using manual temperature compensation, the first display will be:
Cal Temp °F/C 68
Use the arrow keys to enter the actual temperature of the buffer solutions. If using automatic temperature compensation, this display will not appear. Press **ENTER** to continue.

Rinse Electrode
Remove the electrode from the process and rinse it off. Press **ENTER** to go to the next step.
First Buffer
This is a prompt to place the electrode in the first buffer. In a few seconds the controller will automatically go to the next step.

1st Buffer 7.00
The bottom line will display "1st Buffer" on the left hand side and "7.00" on the right hand side. Use the arrow keys to set the pH value of the 1st buffer, then press **ENTER**. The top line will now show the temperature and the mV input from the electrode. The mV will blink until the value is stable. The controller will automatically go onto the next step or you may press **ENTER** to go to the next step.

Rinse Electrode
Remove the electrode from the buffer and rinse it off. Press **ENTER** to go to the next step.

Second Buffer
This is a prompt to place the electrode in the second buffer. Again, in a few seconds the controller will automatically go to the next step.

2nd Buffer 4.00
The bottom line will display "2nd Buffer" on the left hand side and "4.00" on the right hand side. Use the arrow keys to set the pH value of the 2nd buffer, then press **ENTER**. The top line will now show the temperature and the mV input from the electrode. The mV will blink until the value is stable. The controller will automatically go onto the next step or you may press **ENTER** to go to the next step.

The controller will go on to the next step once the mV signal is stable.

Cal Successful/Cal Failed
If the electrode response is good, then the display will read "Cal Successful". If the mV output of the electrode did not change enough between the two buffer solutions, it will read "Cal Failed". A failure usually means that the electrode needs to be cleaned, or replaced. It will also display the % difference from theoretical slope. A failure occurs if the slope is more than 80% different than theoretical.

Continue Y
The controller will hold this display until you replace the electrode in the process and press **ENTER**. Control will not begin until **ENTER** is pressed or 10 minutes go by.

2 Pt Calibration for ORP electrodes (no Auto Buffer Recognition available):

Rinse Electrode
Remove the electrode from the process and rinse it off. Press **ENTER** to go to the next step.

First Buffer
This is a prompt to place the electrode in the first buffer. In a few seconds the controller will automatically go to the next step.

Input XX mV
The display will show the mV reading from the electrode. The entire number will blink until the reading is stable, then the display will change to:

Buffer XX
Now you can change the mV value of the buffer, by using the arrow keys and pressing **ENTER.**

Rinse Electrode
Remove the electrode from the buffer and rinse it off. Press **ENTER** to go to the next step.

Second Buffer
This is a prompt to place the electrode in the second buffer. Again, in a few seconds the controller will automatically go to the next step.

Input XXX mV
The display will show the mV reading from the electrode. The entire number will blink until the reading is stable, then the display will change to:

Buffer XXX
Now you can change the mV value of the buffer, by using the arrow keys and pressing **ENTER.**

Cal Successful/Cal Failed
If the electrode response is good, then the display will read "Cal Successful". If the mV output of the electrode did not change enough between the two buffer solutions, it will read "Cal Failed". A failure usually means that the electrode needs to be cleaned, or replaced.

Continue Y
The controller will hold this display until you replace the electrode in the process and press **ENTER**. Control will not begin until **ENTER** is pressed or 10 minutes go by.

1 Pt Calibration

Press **ENTER** to perform a 1 point calibration of the electrode.

Note: 1 point calibration instructions are given in the following order:
pH electrodes, using Auto Buffer Recognition
pH electrodes, not using Auto Buffer Recognition
ORP electrodes (Auto Buffer Recognition not available)

1 Pt Calibration for pH Electrodes, using Auto Buffer Recognition:

If using manual temperature compensation, the first display will be:
Cal Temp °F/C 68
Use the arrow keys to enter the actual temperature of the buffer solutions. If using automatic temperature compensation, this display will not appear.

Rinse Electrode
Remove the electrode from the process and rinse it off. Press **ENTER** to go to the next step.

First Buffer
This is a prompt to place the electrode in the first buffer. In a few seconds the controller will automatically go to the next step.

1st Buffer 4.00
The top line will show the temperature and the mV output from the electrode. These values will blink until they become stable.

The bottom line will read "1st Buffer" on the left hand side and either "??.??" or a pH value on the right hand side. If it reads a pH value, that means that it has recognized the buffer solution. The controller will then go on to the next step.
If it reads "??.??", that means it hasn't recognized the buffer solution because the mV output of the electrode is too far away from a standard buffer solution's theoretical mV value. If it can't recognize the buffer solution, the controller will beep and display "Unknown Buffer", and then display its best guess. Press **ENTER** to accept that guess, or change the value to the correct one using the arrow keys.

If you press **ENTER** when it reads “??.??”, the display will switch to “Buffer Override” and allow you to manually enter the buffer value.

Cal Successful/Cal Failed
If the electrode response is good, then the display will read "Cal Successful". If the controller can not calculate an acceptable slope from that mV reading, it will read "Cal Failed". A failure usually means that the electrode needs to be cleaned or replaced.

Continue Y
The controller will hold this display until you replace the electrode in the process and press **ENTER**. Control will not begin until **ENTER** is pressed or 10 minutes go by.

1 Pt Calibration for pH electrodes, not using Auto Buffer Recognition

If using manual temperature compensation, the first display will be:
Cal Temp °F/C 68
Use the arrow keys to enter the actual temperature of the buffer solutions. Press **ENTER** to go on to the next step. If using automatic temperature compensation, this display will not appear.
Rinse Electrode
Remove the electrode from the process and rinse it off. Press **ENTER** to go to the next step.

First Buffer
This is a prompt to place the electrode in the first buffer. In a few seconds the controller will automatically go to the next step.

Buffer 4.00
Use the arrow keys to change the value of the buffer being used, then press ENTER.

1st Buffer 4.00
The bottom line will display "1st Buffer" on the left hand side and "4.00" on the right hand side. Use the arrow keys to set the pH value of the 1st buffer, then press **ENTER**. The top line will now show the temperature and the mV input from the electrode. The mV will blink until the value is stable. The controller will automatically go onto the next step or you may press **ENTER** to go to the next step.

Cal Successful/Cal Failed
If the electrode response is good, then the display will read "Cal Successful". If the controller can not calculate an acceptable slope from that mV reading, it will read "Cal Failed". A failure usually means that the electrode needs to be cleaned or replaced.

Continue Y
The controller will hold this display until you replace the electrode in the process and press **ENTER**. Control will not begin until **ENTER** is pressed or 10 minutes go by.

1 Pt Calibration for ORP electrodes (no Auto Buffer Recognition available):

Rinse Electrode
Remove the electrode from the process and rinse it off. Press **ENTER** to go to the next step.

First Buffer
This is a prompt to place the electrode in the first buffer. In a few seconds the controller will automatically go to the next step.

Input 96 mV
The display will show the mV reading from the electrode. The entire number will blink until the reading is stable, then the display will change to:

Buffer 96
Now you can change the mV value displayed to the known value of the buffer, by using the arrow keys and pressing **ENTER**.

Cal Successful/Cal Failed
If the electrode response is good, then the display will read "Cal Successful". If the controller can not calculate an acceptable slope from that mV reading, it will read "Cal Failed". A failure usually means that the electrode needs to be cleaned or replaced.

Continue Y.
The controller will hold this display until you replace the electrode in the process and press **ENTER**. Control will not begin until **ENTER** is pressed or 10 minutes go by.

Days Btwn Cal

Use the arrow keys to set the number of days that you would like to go by before recalibrating the electrode. The controller will prompt you to recalibrate when that time has expired. Setting the number of days to zero will disable this feature.

Use Buffer Rec

Use the Up and Down arrows to toggle between Y (yes) and N (no). If you choose to use automatic buffer recognition, then the controller will recognize which buffer solution the electrode has been placed in. If you choose not to, then you will have to enter the information manually during the 1 or 2 point calibration procedures. Press **ENTER** to accept the choice displayed.

Buffer Set

This menu will only appear if you have decided to use automatic buffer recognition. Press **ENTER** to change the type of buffers that will be used. Use the Up and Down arrows to toggle between US buffers (pH 4, 7 and 10) or DIN standard buffers (pH 6.75, 9.23, etc.) then press **ENTER** to make your selection.

Input

This menu displays the mV from the electrode. It is useful for troubleshooting.

Self Test

Press **ENTER** to perform a self-test. If it says "FAIL" in the upper right hand corner, try again with the electrode wires disconnected. If it still says “FAIL”, this indicates a problem with the controller which should be returned for repair. If it passes, and you have a problem calibrating, it is an electrode or preamp problem.

Sensor Type

Press **ENTER** to set up the controller to match the type of electrode to be used. Use the Up and Down arrows to toggle between standard pH, antimony pH, and ORP, then press **ENTER** to make your selection. The controller will warn you to check your set points because the units of measure have changed.

Press any key to clear the warning messages.

5.3 Temperature Menu (THIS MENU DOES NOT APPEAR IF AN ORP SENSOR HAS BEEN SELECTED)

The temperature menu contains the following settings: Calibrate and Units (if the Pt100 or Pt1000 sensor is detected when the unit is powered on) or Manual Temp and Units (if no Pt100 or Pt1000 sensor is detected at power-up). Refer to the Temperature Menu chart on the next page.

Calibrate

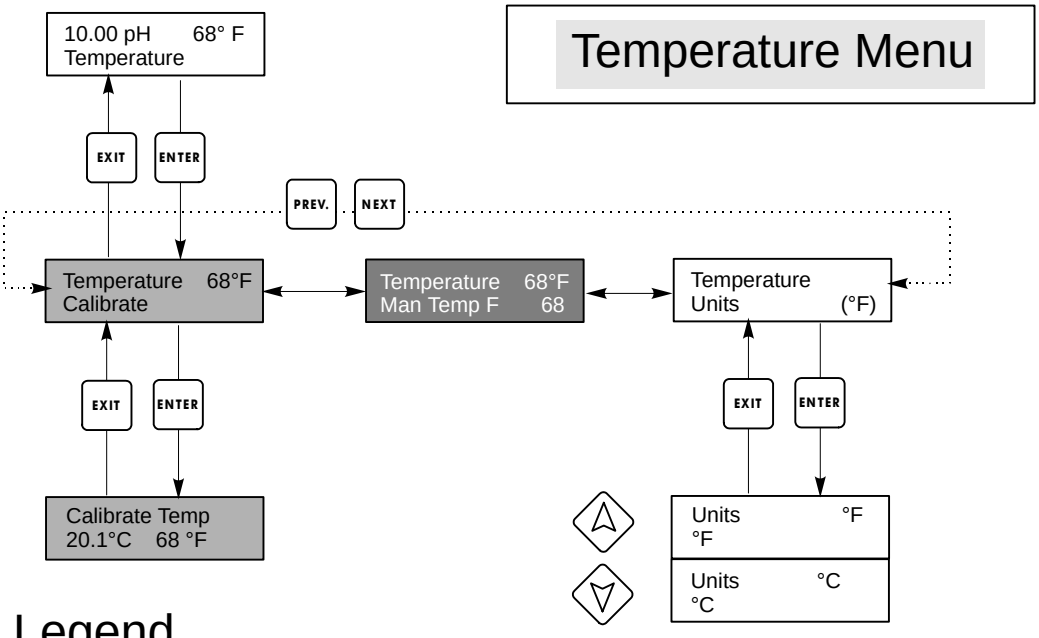
Only appears if a temperature sensor is connected. Press **ENTER** to calibrate the temperature display to match a thermometer. Use the Up or Down keys to adjust the reading, and press **ENTER** to accept the change. Press **EXIT** to exit the calibration.

Man Temp

Only appears if no temperature sensor is connected. Use the Up or Down arrows to set the temperature to match that of the process solution to be controlled.

Units

Press **ENTER** to change the units of measure. Use the Up and Down arrows to toggle between degrees F and C, then press **ENTER** to accept the change.



Legend

Menu wording that appears when Automatic Temperature Compensation is selected.

Menu wording that appears when Manual Temperature Compensation is selected.

Temperature Menu

5.4 Control 1 and Control 2 Menus (FOR ON/OFF CONTROLLERS)

The Control 1 and Control 2 menus are separate from each other but operate in exactly the same way. Each menu provides the following independent settings: Set Point, Dead Band, Time Limit, Interlock, Control Direction, HOA, Set Point, Dead Band, and Time Limit.

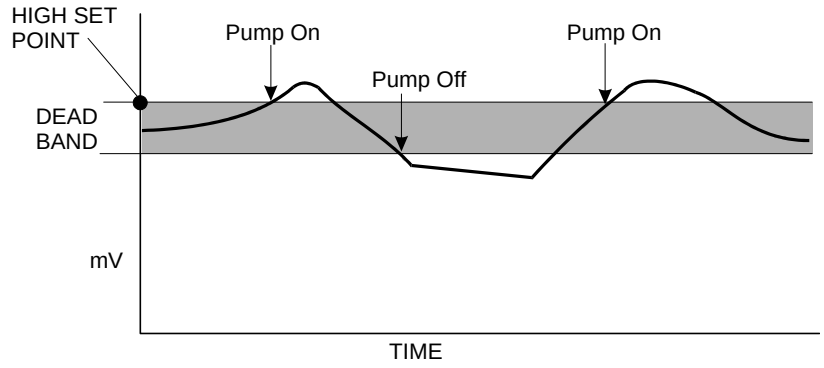
The top level menu status line may display the following messages: Off, Intrlck, Timeout, or a time. "Off" indicates that the output is off. "Intrlck" indicates that a signal from a flow switch or level switch is stopping control and has disabled the control outputs. "Timeout" indicates that the output has been on for longer than the maximum time programmed by the user. The time shows that the output is on, and has been for that amount of time. Refer to the Control 1 & 2 menus on the following pages.

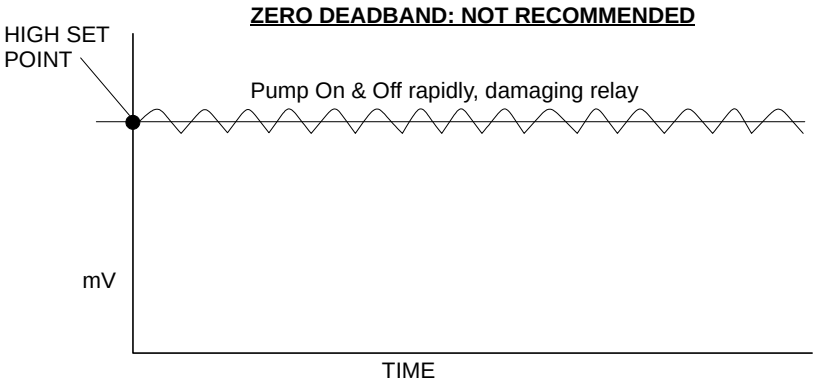
Hi/Lo Set Point

Use the arrow keys to adjust the display to read the desired set point value. Press **ENTER** to accept the change.

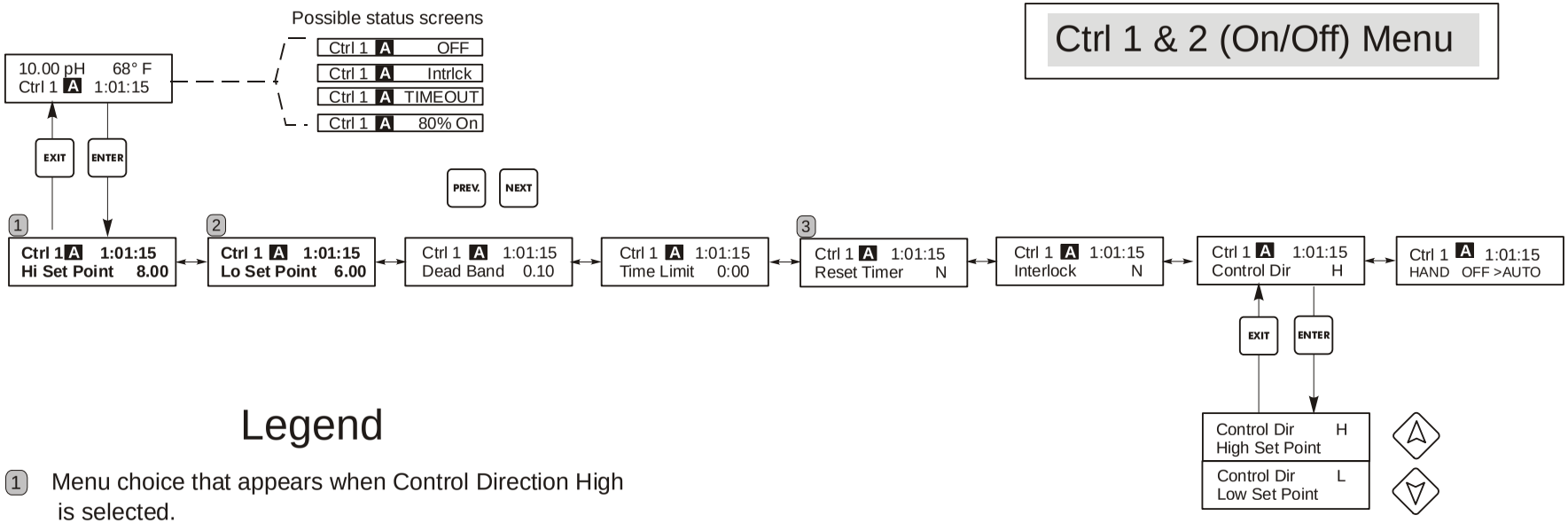
Dead Band

Use the arrow keys to set the desired dead band, then press **ENTER.** If the set point is pH 7.00, and the dead band is 0.05 pH units, then the relay will close at pH 7.00 and open 0.05 pH units away from 7.00.





Ctrl 1 & 2 (On/Off) Menu



Legend

1. Menu choice that appears when Control Direction High is selected.
2. Menu choice that appears when Control Direction Low is selected.
3. Only appears if time limit has expired.

Operation

Press Enter key to enter menu.
Press Exit key to exit menu.
Blinking fields may be edited with the adjust arrows.
Press Enter when modification is complete to return to Main Menu Level.

Time Limit

Use the arrow keys to set the time limit in min:sec for the output to be active, then press **ENTER.** If it is set for "0:00", no limit will be imposed, and the output could stay on forever.

Interlock

Use the Up and Down arrows to toggle between Y(Yes) and N(No). Choosing Y means that the output will deactivate if the device attached to the controller is open. For example, if the electrode is installed in a recirculating pipe line, a flow switch that is closed if flow is sufficient and open if flow is insufficient may be installed in the line, so that if flow past the electrode stops, the controller will not pump in chemicals based on a stagnant sample. Similarly, a level switch may be attached to prevent control of an empty batch tank.

Control Dir

Press **ENTER** to change the direction of control, then use the Up and Down arrows to toggle between High Set Point and Low Set Point, and press **ENTER** to make your choice. A high set point will turn on the relay when the process value goes over the set point value (to add an acid, or reducing agent, or as a high alarm). A low set point will turn on the relay when the process value goes below the set point value (to add an alkali, or oxidizer, or as a low alarm).

HOA

Use the Left and Right arrows to move between Hand, Off and Auto. In Hand (Manual) mode, the output will be turned on immediately for a maximum of 10 minutes. In the Off mode, the output will be turned off indefinitely. In the Auto mode, the output turns on and off in response to changes in the process value relative to the set point. The letter inside the block on the status screen indicates which mode the output is in.

5.5 Control 1 and Control 2 Menu (FOR PROPORTIONAL CONTROLLERS)

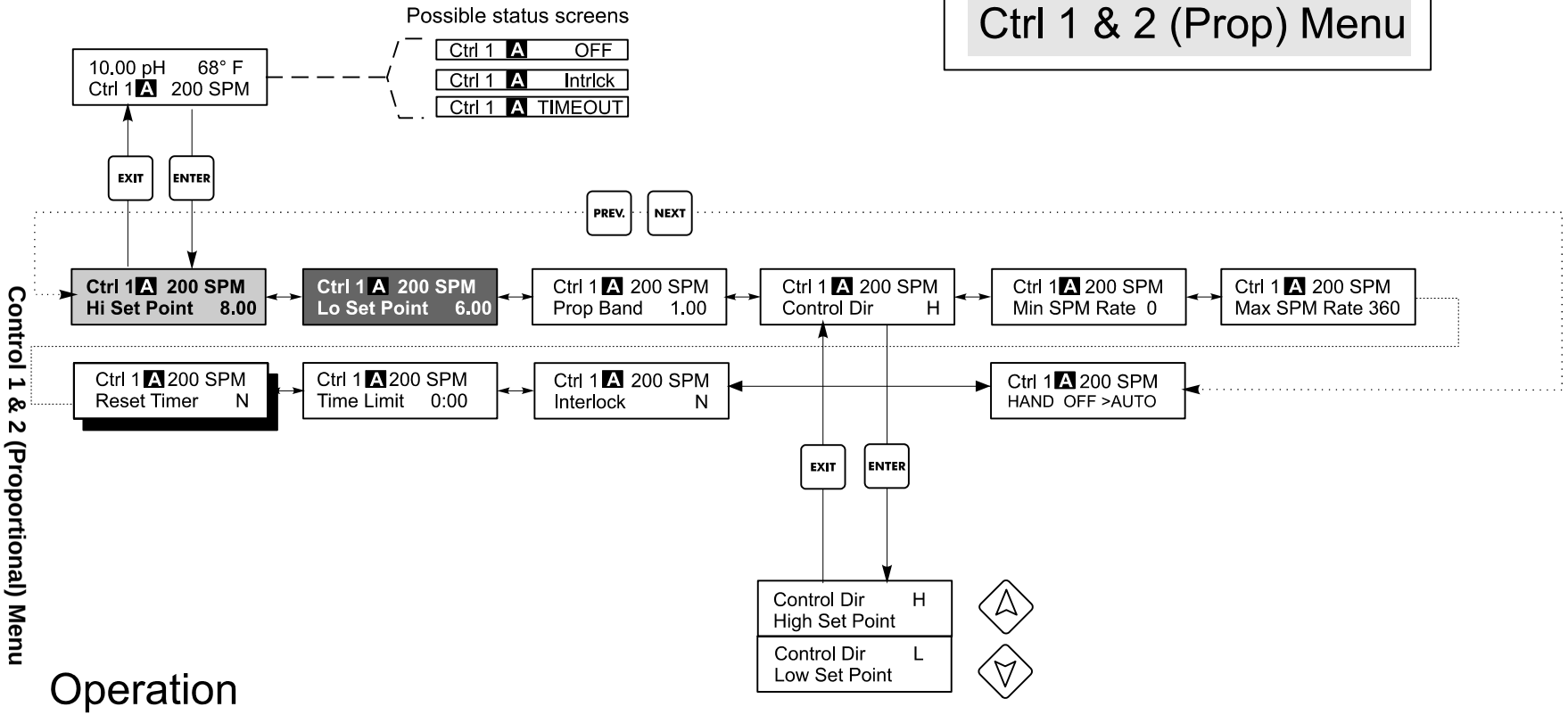
The Control 1 and Control 2 menus are separate from each other but operate in exactly the same way. Each menu provides the following independent settings: Set Point, Prop Band, Control Direction, Min SPM Rate, Max SPM Rate, Time Limit, Interlock and HOA.

The top level menu status line may display the following messages: Off, Intrlck, Timeout or SPM. "Off" indicates that the output is off. "Intrlck" indicates that the output would be on but is not because of a signal from a flow switch or level switch is stopping control. "Timeout" indicates that the output has been on for longer than the maximum time programmed by the user. The SPM display shows the stroke rate of the pump. Refer to Control 1 & 2 chart on the following pages.

Hi/LoSet Point

Use the arrow keys to adjust the display to read the desired set point value. Press **ENTER** to accept the change.

Ctrl 1 & 2 (Prop) Menu



Operation

Press Enter key to enter menu.
Press Exit key to exit menu.
Blinking fields may be edited with the adjust arrows.
Press Enter when modification is complete to return to Main Menu Level.

Legend

Menu choice that appears when Control Direction High is selected.

Menu choice that appears when Control Direction Low is selected.

Only appears if time limit has expired.

Prop Band

Use the arrow keys to adjust how far away from the set point the process value must get before the pump is stroking at the maximum rate. For example, if the lower set point is 6.00 pH, and the proportional band is 0.5, then the pump will stroke at its maximum rate when the pH is 0.5 units away from the set point (at pH 5.5).

Control Dir

Press **ENTER** to change the direction of control, then use the Up and Down arrows to toggle between High Set Point and Low Set Point, and press **ENTER** to make your choice. A high set point will turn on the relay when the process value goes over the set point value (to add an acid, or reducing agent, or as a high alarm). A low set point will turn on the relay when the process value goes below the set point value (to add an alkali, or oxidizer, or as a low alarm). The further away from the set point the process value gets, the faster the pump will stroke.

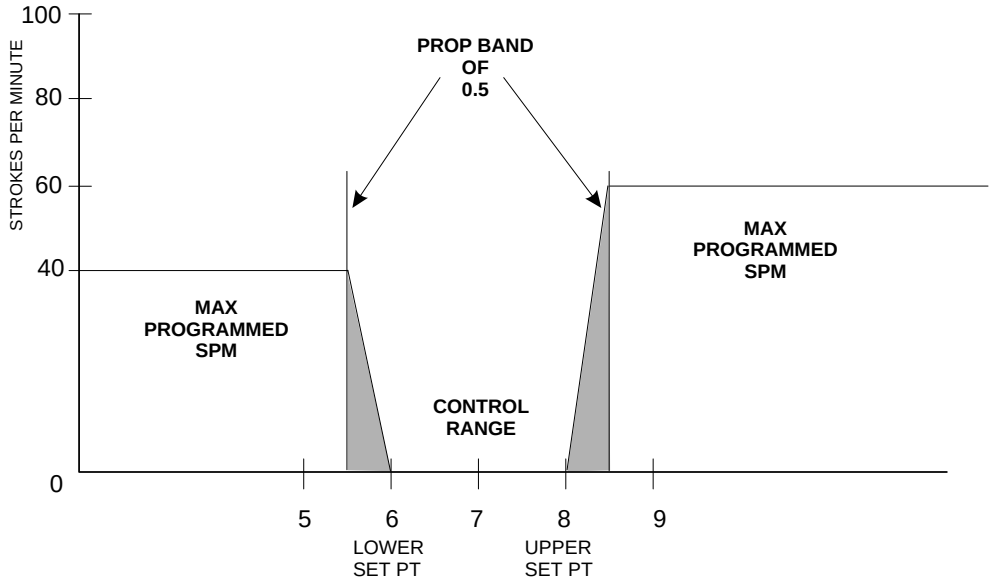
Min SPM Rate

Use the arrow keys to set the minimum stroke rate of the pump. If you want to stop when the set point has been reached, enter 0. If you need the pump to run at a certain rate regardless of the set point, enter that stroke rate. This may be useful in once-through control schemes.

Max SPM Rate

Use the arrow keys to enter the maximum stroke rate of the pump. This may be the maximum that the pump is capable of, or it may be less if the pump is oversized for your application, but it can NOT be higher than the pump is capable of, or the pump will not stroke at all.

The following graph shows the effect of the various settings:



If the controller overshoots the set point, make the prop band larger. If the controller can't keep up with the additions, make the prop band value smaller, or increase the Max SPM rate value, or source a pump with a higher flow output.

Time Limit

Use the arrow keys to set the time limit in min:sec for the output to be active, then press **ENTER**. If it is set for "0:00", no limit will be imposed, and the output could stay on forever.

Interlock

Use the Up and Down arrows to toggle between Y(Yes) and N(No). Choosing Y means that the output will deactivate if the device attached to the controller is open. For example, if the electrode is installed in a recirculating pipe line, a flow switch that is closed if flow is sufficient and open if flow is insufficient may be installed in the line, so that if flow past the electrode stops, the controller will not pump in chemicals based on a stagnant sample. Similarly, a level switch may be attached to prevent control of an empty batch tank.

HOA

Use the Left and Right arrows to move between Hand, Off and Auto. In Hand (Manual) mode, the output will be turned on immediately at the maximum programmed rate for a maximum of 10 minutes. In the Off mode, the output will be turned off indefinitely. In the Auto mode, the output turns on and off in response to changes in the process value relative to the set point. The letter inside the block on the status screen indicates which mode the output is in.

5.6 Auxiliary 1 and 2 Menu

The Aux 1 and 2 relays may be configured to operate in a number of ways. They may be a low alarm, high alarm, an out-of-range alarm, an in-range output, or a probe wash.

The Aux 1 and 2 menus provides the following settings, which only appear if the appropriate output mode is selected: Low Alarm Pt, High Alarm Pt, Probe Wash Sched, Hold Time, Mode. Refer to the Auxiliary 1 and 2 Menu chart.

Note: When programming the controller for the first time, press **ENTER** to get into the submenus, then press **PREV** twice to get to the Output Mode menu.

Mode

Press **ENTER** then use the Up and Down arrows to toggle between the various choices:

Low Alarm
Press **ENTER** if you want the Aux 1 relay to close if the process value goes below a certain value.

High Alarm
Press **ENTER** when this is displayed if you want the Aux 1 relay to close if the process value goes above a certain value.

Out Range Alarm
Press **ENTER** if you want the Aux 1 relay to close if the process value goes either above or below certain values.

In Range Output
Press **ENTER** if you want the Aux 1 relay to close if the process value is between two values. This is useful to open a solenoid valve if the pH/ORP has been corrected and you want to empty a batch tank.

Probe Wash
Press **ENTER** if you want to use the Aux 1 relay to interrupt control and activate a pump or valve to wash down the electrode.

Lo Alarm Pt

Only appears if either the low alarm or in/out range mode has been selected.

Use the arrow keys to adjust the process value below which the relay will close. (In the in-range mode, it is the process value ABOVE which the relay will close).

Hi Alarm Pt

Only appears if either the high alarm or in/out range mode has been selected.

Use the arrow keys to adjust the process value above which the relay will close. (In the in-range mode, it is the process value BELOW which the relay will close).

Dead Band

Use the arrow keys to set the desired dead band, then press **ENTER**.

Probe Wash Sched

Only appears if the probe wash mode has been selected.

Press **ENTER** to program the probe wash schedule. The display may read "Event A 12:00 20" which indicates that the probe wash will start at noon and the pump will run for 20 seconds. Use the arrow keys to change the time of day or the pump on-time. The maximum wash time is 99 seconds. If the electrode needs to be cleaned more than once a day, additional events may be accessed by pressing **NEXT**. The time is Military time (1:00 PM = 13:00).

Press **EXIT** to go back to the Aux 1 menu level

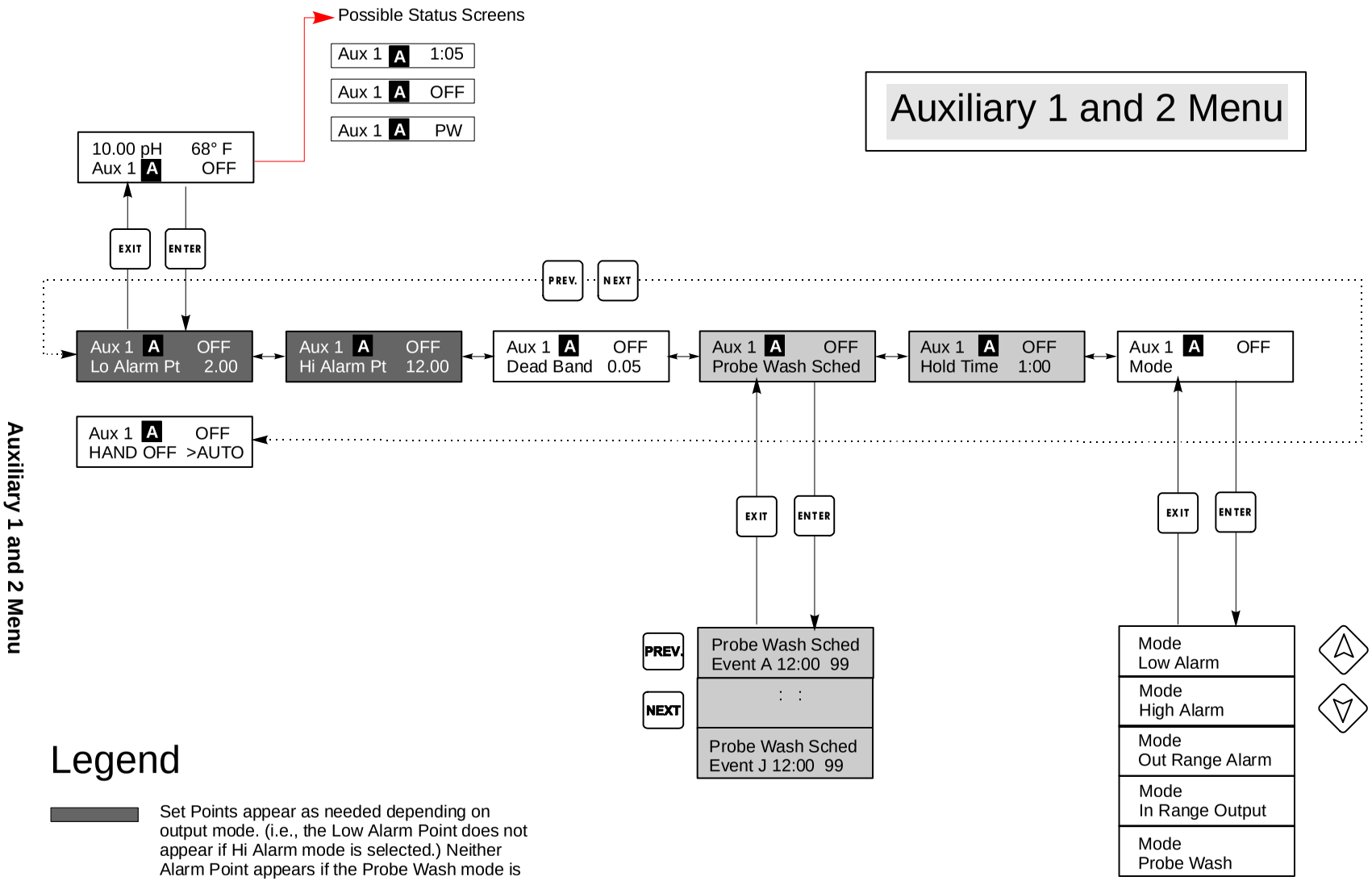
Hold Time

Only appears if the probe wash mode has been selected.
Use the arrow keys to select the time delay in seconds between the probe wash ending and control beginning again. The hold time can be programmed for a maximum of 99 seconds.

HOA

Use the Left and Right arrows to move between Hand, Off and Auto. In Hand (Manual) mode, the output will be turned on immediately at the maximum programmed rate for a maximum of 10 minutes. In the Off mode, the output will be turned off indefinitely. In the Auto mode, the output turns on and off in response to changes in the process value relative to the set point. The letter inside the block on the status screen indicates which mode the output is in.

Auxiliary 1 and 2 Menu



Legend

Set Points appear as needed depending on output mode. (i.e., the Low Alarm Point does not appear if Hi Alarm mode is selected.) Neither Alarm Point appears if the Probe Wash mode is selected.

Menu choices that appear when Probe Wash mode is selected.

5.7 4-20 mA Menu (Optional)

This menu will only appear if the optional 4-20 mA output board is installed. It is used to set the scale of the 4-20 mA output. It contains the following menu selections: 4 mA Point, 20 mA Point, and Calibrate.

Note: When programming the controller for the first time, first go to the Assign Inputs Menu, then program the other menus.

Assign Inputs

Press **ENTER** to assign the 4-20 mA output to a sensor input. Use the arrow keys to toggle between "pH/ORP" and "Temp." Press **ENTER** when the desired choice is displayed.

4 mA Pt

Use the arrow keys to enter the process value (in either pH units, or mV if ORP) that you want to correspond to a 4 mA output from the controller.

20 mA Pt

Use the arrow keys to enter the process value that you want to correspond to a 20 mA output from the controller.

Calibrate

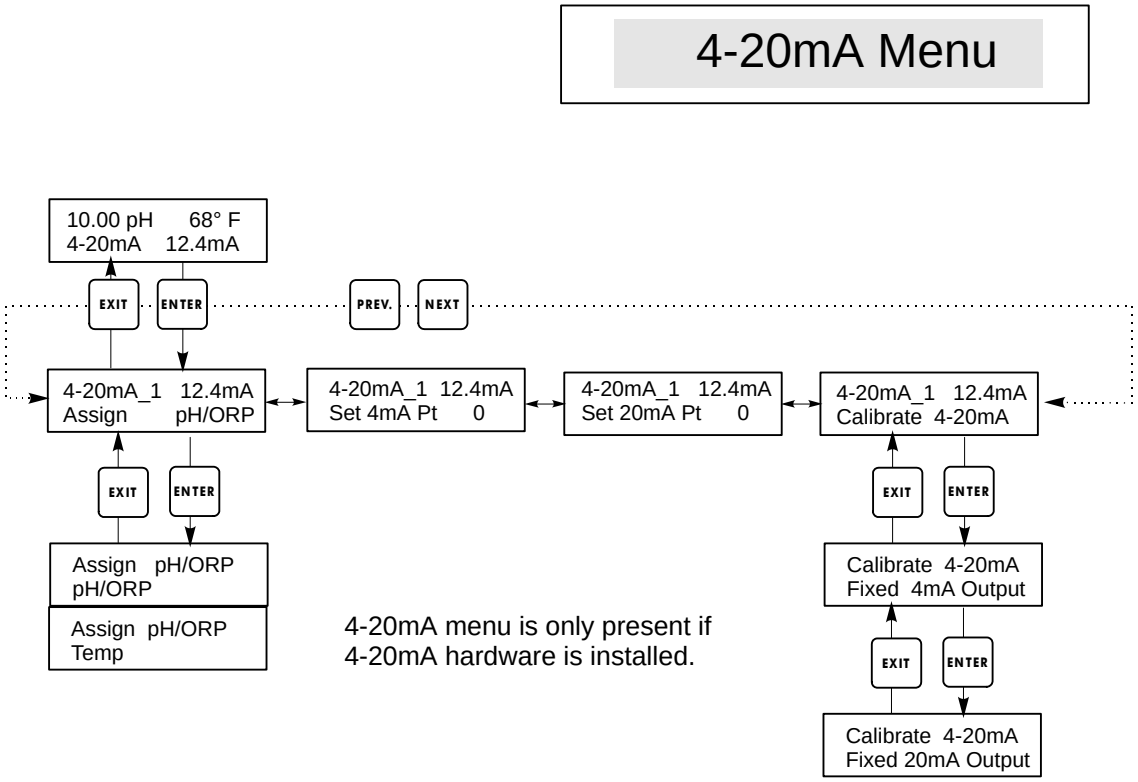
This menu is used to calibrate instruments connected to the mA output. The 4-20 mA output is extremely accurate and stable and therefore will never need calibration. This feature allows other devices to be calibrated at the 4 and 20 mA points. Press **ENTER** to start the calibration.

Fixed 4 mA Out

The controller will output 4.00 mA. Adjust the chart recorder or data logger per its instruction so that the process value displayed is what is expected for a 4.00 mA input.

Fixed 20 mA Out

As above, except that the controller will output 20.00 mA.
The design of the 4-20 mA output is such that it should never need calibration. If the mA signal is not what it should be, call the factory for service.


4-20mA Menu
10.00 pH 68° F
4-20mA 12.4mA
EXIT
ENTER
PREV.
NEXT
4-20mA_1 12.4mA
Assign pH/ORP
4-20mA_1 12.4mA
Set 4mA Pt 0
4-20mA_1 12.4mA
Set 20mA Pt 0
4-20mA_1 12.4mA
Calibrate 4-20mA
EXIT
ENTER
Assign pH/ORP
pH/ORP
Assign pH/ORP
Temp
4-20mA menu is only present if
4-20mA hardware is installed.
EXIT
ENTER
Calibrate 4-20mA
Fixed 4mA Output
EXIT
ENTER
Calibrate 4-20mA
Fixed 20mA Output

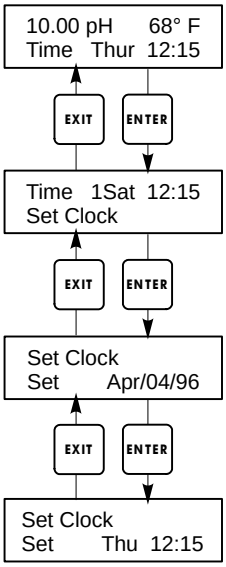
4-20 mA Menu

5.8 Clock Menu

The clock menu is used to set the date and time that the controller uses to schedule probe washing and calibration prompts. There is only one menu selection: Set Clock.

Set Clock

Press **ENTER** to set the clock. Use the arrow keys to change the year, date, and month, then press **ENTER**. Use the arrow keys again to set the day of the week and the time. Use military time (for example, 1:00 PM is 13:00). Press **ENTER** to return to the top level clock menu.



Set Clock Menu

5.9 Access Code Menu

This menu determines whether the access code feature of the controller is enabled or disabled and allows you to customize the access code to your own value. The access code controls whether or not you are allowed to change the parameters in the controller. With the access code disabled, any user may change any parameter. With the access code enabled, any user can view any parameter, but cannot change them.

Once an attempt is made to change a parameter, the display will prompt the user to enter the access code. If the correct code is entered, the parameter can be changed. (If the cursor is blinking, a change will be allowed; if the number or words are not blinking, they can't be changed). Once the correct access code has been entered, it will remain valid until there is a period of 10 minutes without a key being pressed.

Possible status screens are: Access Code REQ, Access Code OK, and Access Code DIS.

The first indicates that the access code is required to alter settings. The second indicates that the access code is required and has been entered correctly, and the last indicates that the access code has been disabled.

Enable Y/N

Use the arrow keys to select Y(Yes) or N(No) and press **ENTER** to enable or disable the access code. If the code was enabled, you must enter the access code in order to disable it.

New Access Code

Press **ENTER** to display the current access code value and use the arrow keys to change it to any value between 0 and 9999. If the access code has been enabled, you will be prompted to enter the current access code before being allowed to change it.

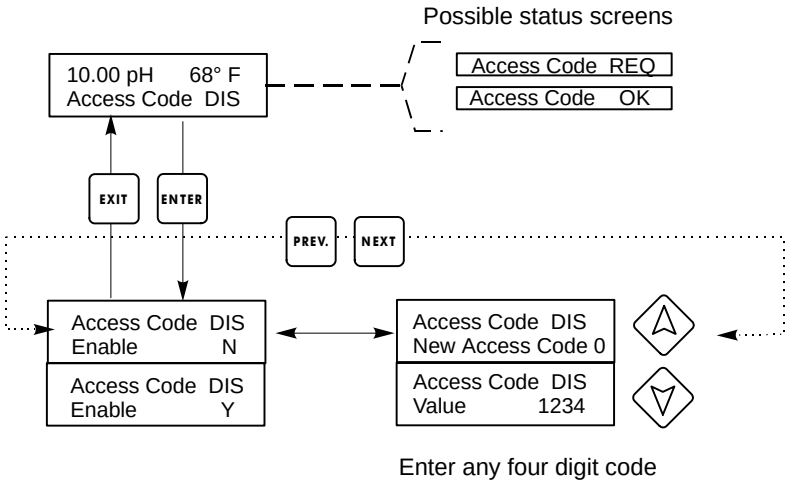
The factory default access code is 1995.

If you change the access code and can't remember it, follow this procedure:
1. Turn off the power to the controller.
2. Wait 10 seconds.
3. Press and hold the Up and Down arrow keys while turning on the power.
4. Read the access code on the display.
5. Release the arrow keys and the code will disappear.

Access Code Menu

Any Top Display
Access Code 0000

The Access Code prompt may appear at any screen in the entire menu structure if the current access code has not been entered by the user. Access code entries will be valid for 10 minutes from the most recent key press.



Enter any four digit code

Access Code Menu

6.0 Maintenance

The WPH control module itself needs very little maintenance. Clean the outside of the controller enclosure with a damp cloth. Do not spray down the controller unless the enclosure door is closed and latched. "Pigtails" should be protected from spray or washdown. Check the cords and cables for damage.

6.1 Electrode Maintenance

The pH or ORP electrodes require periodic cleaning and calibration. These electrodes are like batteries and their voltage outputs will change with time even if they are not being used. After installation, the rate of change increases, and factors such as temperature, extremes of pH, abrasion and chemical attack will increase the required frequency of calibration. If the process solution contains oils, scale or other solids, the electrode surfaces will tend to coat, its response time will slow down and cleaning will be required.

The frequency of cleaning and calibrating will vary greatly depending upon the application, the factors listed above, as well as the accuracy of control you require. The best way to determine the optimum number of days between calibrations is to remove the electrode from the process periodically (weekly in clean water applications, daily in dirty or hot applications) and check its accuracy in a buffer solution. If using manual temperature compensation, remember to change the temperature from that of the process to that of the buffer. If the accuracy of the reading is within your required tolerances, and the speed of response is good, replace the electrode in the process. If not, clean the electrode and perform a two point calibration.

The method of cleaning the electrode will depend upon the coating, as well as the materials of construction of the electrode. Do not use a solvent that will attack the electrode! Care must be taken to avoid scratching the pH electrode's glass, as this will shorten its life. An ORP electrode's platinum surface may be cleaned with 600 grit silicon carbide paper, jewelers rouge or very fine steel wool.

Oily coatings should be removed with a mild detergent or isopropyl alcohol. Hard scales such as calcium carbonate can usually be removed with a dilute hydrochloric acid solution. Soft coatings can be removed using a soft cloth or soft toothbrush.

A two point calibration should always be performed after cleaning the electrode.

Because the electrode signal is so sensitive, the condition of the cable and connectors between the electrode, preamplifier and controller is critical. Make sure that all electrical connections stay clean and dry. Never splice the cable prior to preamplification. Replace the cable if there is any sign of damage.

6.2 Replacing the Fuses

CAUTION: Disconnect power to the controller before opening front panel!

Locate the fuses on the circuit board at the back of the controller enclosure. (See figure 3.) Gently remove the old fuse from its retaining clip and discard. Press the new fuse into the clip, secure the front panel of the controller and return power to the unit.

Warning: Use of non-approved fuses can affect product safety approvals. Fuse ratings depend on controller power rating. Specifications are shown below. To insure product safety certifications are maintained, it is recommended that a Walchem fuse is used.

Controller Rating	F1	Walchem P/N	F2	Walchem P/N
120VAC	5x20mm,0.125A,250V	102369	5x20mm,10A,125V	102432
240VAC	5x20mm,0.063A,250V	103363	5x20mm,5A,250V	102370

7.0 Troubleshooting

CAUTION: Disconnect power to the controller before opening front panel!

Troubleshooting and repair of a malfunctioning controller should only be attempted by qualified personnel using caution to ensure safety and limit unnecessary further damage. Contact the factory.

7.1 Error Messages

Calibration Time

This message appears to prompt you to perform the routine maintenance of cleaning and calibrating the electrode. It does not appear based upon any analysis of the condition of the electrode. The frequency of calibration is set by the user in the "Days Between Cal" menu found in the "Sensor" menu. If you do not want to be prompted to perform a calibration, set this menu to "0".

Output Timeout

This error message appears if one of the control outputs has been on longer than the maximum amount of time programmed in the "Time Limit" menu found in the "Control 1" or "Control 2" menus. It is reset by answering "Yes" to the "Reset Timer" prompt that will appear. There are a number of possible reasons that the output could go on for longer than normal:

Possible Causes	Corrective Action
1. The process went further out of control than normal.	Increase time limit or reset timer.
2. The chemical supply has run out.	Replenish the chemical supply.
3. The pump or valve or supply line is faulty.	Repair or replace the control device.
4. Wrong chemical is being controlled.	Replace with correct chemical.

5. The electrode is not responding to changes.	Replace electrode, cable or preamplifier. Evaluate mixing or recirculation.

High Alarm

This error message appears if the pH/ORP reading exceeds the set point for one of the AUX outputs that has been configured as a high alarm output. There are a number of possible causes for this condition:.

Possible Causes	Corrective Action
1. The process went further out of control than normal.	May have to increase chemical flow rate.
2. The chemical supply has run out.	Replenish the chemical supply.
3. The pump or valve or supply line is faulty.	Repair or replace the control device.
4. Wrong chemical is being controlled.	Replace with correct chemical.
5. The electrode is not responding to changes.	Replace electrode, cable or preamplifier. Evaluate mixing or recirculation.
6. The pump is siphoning, valve leaking.	Repair or replace the control device or re-route tubing.
7. Control output has been left in "HAND" mode.	Switch back to "AUTO".
8. It may be a normal part of the process.	None required.

Low Alarm

As above for "High Alarm", except that the pH/ORP reading is below the set point of one of the AUX outputs that has been set up as a low alarm output. Refer to the possible causes and corrective actions listed above for the "High Alarm" error message.

Out Range Alarm

This error message appears if the pH/ORP reading is outside of the range selected for one of the AUX outputs that has been programmed as an "Out of Range Alarm". Refer to the possible causes and corrective actions listed above for the "High Alarm" error message.

In Range Output

This error message appears if the pH/ORP reading is inside of the range selected for one of the AUX outputs that has been programmed as an "In Range Alarm". Refer to the possible causes and corrective actions listed above for the "High Alarm" error message.

Temp Sensor Err

This error message appears if the signal from the automatic temperature compensation element disappears during operation. It is usually caused by a failure of the platinum RTD, or by a problem with the cabling or connections of the cable.

The Pt1000 RTD should read 1000 ohms at 0°C and 3.85 ohms/degree C above zero. At 25°C it should read 1096.25 ohms ±1%. A higher reading or open circuit (infinite resistance) may indicate a bad connection. A lower reading may indicate a shorted cable.

Measure the resistance at each connection between the sensor and the controller to determine if the sensor, cabling or connections are faulty.

Probe Error

This error message appears if the pH/ORP input signal is outside of the normal range. This usually indicates that the electrode has been disconnected or is faulty. It could appear under normal conditions if the pH is outside of the operating range of -2 to 16pH, or if the ORP is outside of the normal range of ±1450 mV.

Possible Causes	Corrective Action
1. Controller is faulty; fails self test (see section 5.2)	Re-check pH self test with preamp disconnected. If it still fails, send controller back for repair. If it passes, preamp is faulty.
2. Preamplifier has no power to it.	If battery powered preamp, replace battery. If preamp is powered by our controller, check +5V, -5V terminals vs COM terminal. Should read +5VDC ±5% and -4.6 VDC ±-5%.
3. Preamplifier is faulty.	Indicated if ±5VDC power out of spec w/preamp attached, but in spec without preamp attached. Repair or replace preamp.
4. Electrode is faulty	Replace electrode.

Interlock

This error message indicates that control has been stopped because the closed contact signal from a flow switch or level switch is now open and one or more control outputs have been programmed to interlock.

Possible Causes	Corrective Action
1. Flow has stopped, level too low.	May be a normal condition, otherwise restore flow or level.
2. Flow, level switch disconnected.	Reconnect.
3. Flow, level switch faulty.	Verify that switch closes using an ohmmeter. If not, repair or replace.
4. Controller faulty.	Verify that error message disappears if controller flow switch input is shorted. If not, repair controller.

Check Set Points

This is a normal display if you have changed the choice of sensor from pH to ORP or vice versa. The default set points for each choice is different, and will not match what you need for your application. Always select the sensor type before setting the control or auxiliary output set points.

8.0 Service Policy

The WPH Series pH/ORP Controller has a 2-year warranty on electronic components and a 1-year warranty on mechanical parts (keypad, terminal strip and relays).

We stock circuit boards for immediate exchange after we have isolated the cause of the problem.

Factory authorized repairs that are received by next-day-air will be returned within 24 hours. Normal priority for returns is two weeks.

Out of warranty repairs or circuit board exchanges are done on a flat fee basis after the warranty is expired.