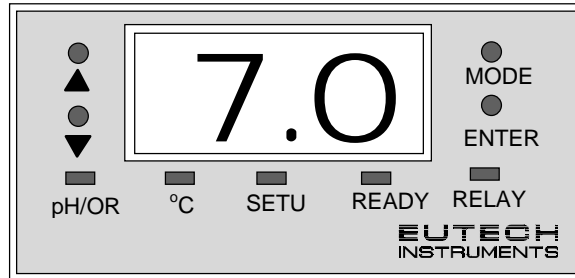


Alpha pH 100 C/CX
pH/ORP
Controller / Transmitter

INSTRUCTION MANUAL



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Preface

This manual serves to explain the use of the Alpha pH 100 pH/ORP Controller/Transmitter. The units covered are Alpha C and CX pH/ORP Controller/ Transmitter.

The instruction manual functions in two ways: first, as a step by step guide to help you operate and understand the operation of the unit and second, as a handy reference guide.

The information presented in this manual is subject to change as improvements are made, and does not represent a commitment of Eutech Instruments Pte Ltd.

This instruction manual is written to cover as many anticipated applications of the Alpha pH 100 C/CX pH/ORP Controller/Transmitter as possible. If there are doubts in the use, please do not hesitate to contact the nearest Eutech Instruments' Authorized Distributor or us at (65) 778-6876.

Eutech Instruments cannot accept any responsibility for damage or malfunction of the unit due to improper use of instrument.

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Version 1.0**

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1. Introduction

The alpha pH 100 series pH/ORP Controller/Transmitter is the latest innovation of process controllers from Eutech Instruments. Incorporated with the ASIC (Application Specific Integrated Circuit) microprocessor technology, this panel-mounted on-line controller provides many user-friendly features desirable in pH/ORP controllers.

This versatile pH/ORP unit can be used either for measuring and monitoring pH or ORP values at one time. It cannot be used for measuring both parameters simultaneously. When shipped, it will be set internally to the pH mode by means of an internal jumper. This jumper can be reset by you to select between the pH and ORP mode.

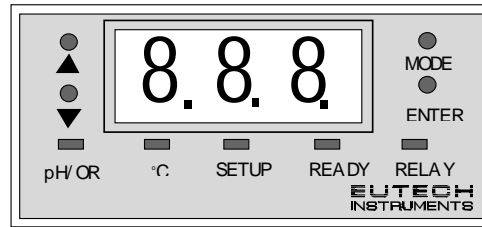
Some of the features of this Controller are :

- Automatic temperature compensation (with PT 100)
- Manual temperature compensation setting without the temperature probe
- Push button calibration up to 3 points
- Offset adjustment
- High and low alarm triggering relays
- User-defined password feature to prevent unauthorized entry to change the calibration data, hysteresis function, high and low setpoints information
- Alarm and operational message annunciators
- Hysteresis function to prevent chattering of relays around the setpoint
- High-end transmitter model with 4-20 mA current output for datalogging purposes (pH CTP0100 only)
- Built-in memory backup to ensure that calibration and other information will not be erased if power supply fails
- Switchable mains voltages of 110 VAC or 220 VAC via user selectable internal jumper

2. Getting Acquainted

2.1 Front Panel

The front panel consists of a 3 digit LED display together with 5 LED annunciators. There are also 4 keys as shown below.



The keys available are the ▲ (UP/INCREMENT), ▼ (DOWN/DECREMENT), **MODE** and **ENTER** keys.

The annunciators are pH/ORP, °C, SETUP, READY, and RELAY. The function of the annunciator is to provide additional information, for example, the pH/ORP annunciator lights up in pH/ORP measurement mode. The READY annunciator lights up when the pH/ORP stabilizes. RELAY lights up when any of the HI SET or LO SET relays is activated.

The **MODE** key allows you to select between pH or ORP display, the temperature display or the SETUP menu display. While in one of the SETUP menus, it also functions as an ESCAPE key. For example, while setting the Hi SET point, you can press **MODE** key if you change your mind about changing this information.

You can confirm changes or to enter into further levels of the lower menu by pressing the **ENTER** key. The ▲ (UP/INCREMENT) and ▼ (DOWN/DECREMENT) keys allow you to change information or to select between different menus. Holding down the key increases the scrolling speed, i.e. changeover of 1st digit (ones) to 2nd (tens) and then 3rd digit (hundreds).

2.2 Back Panel

The back panel consists of two connectors. The first one is a 4-way screw terminal and the second is a 12-way screw terminal. Refer to the label on top of the unit for diagram.

The connection for the 4-way screw terminals are (from the left to right):

1. PT 100 connection
2. PT 100 connection
3. No connection
4. No connection

The connections for the 12-way screw terminals are (from left to right),

5. Low Set Relay deactivated position
6. Low Set Relay center pole
7. Low Set Relay activated position
8. High Set Relay deactivated position
9. High Set Relay center pole
10. High Set Relay activated position
11. 4-20 mA - ve connection (for transmitter models only)
12. 4-20 mA + ve connection (for transmitter models only)
13. Protective earth
14. Protective earth
15. Neutral
16. Live

2.3 Selecting pH/ORP Measurement Mode

You can set the appropriate pH/ORP measurement mode from the jumper. See Appendix 1 for details on the jumper positions for **pH mode** and Appendix 2 for jumper positions for **ORP mode**.

2.4 Wiring

Connect the power supply to the GND (EARTH) - **13** or **14**, NEUTRAL - **15** and LIVE - **16** screw terminals. Make sure that the power supply jumper setting matches the mains voltage (110 VAC or 220 VAC). See Appendix 2 for the jumper setting for the voltage selection.

Connect the pH electrode to the BNC connector at the back panel. Wire up the PT 100 temperature probe to the PT 100 connections (see back panel connections).

Power on the controller and the display automatically shows the pH/ORP reading. The pH/ORP annunciator lights up. Once the reading is stable, the READY annunciator lights up. However, if the PT 100 temperature probe is not connected, automatic temperature compensation does not function. You can set the temperature at a selected value. The temperature is set to factory default at 25.0 °C.

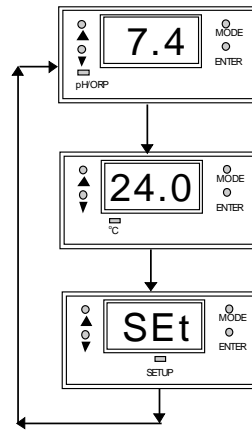
NOTE: Eutech Instruments will not be responsible for incorrect application of the controller using improper voltage sources or wrong jumper settings.

3. Operating the Controller

3.1 The Main Display

Press **MODE** key to switch to three main displays - the pH/ORP display, the temperature display and "SEt" display.

Press **MODE** key once to get into the temperature measurement. The °C annunciator lights up when you are measuring temperature. The display shows current measured temperature (with ATC) or the temperature that was set in MTC mode. Press **MODE** key again and the display toggles to the "SEt" for SETUP menu.

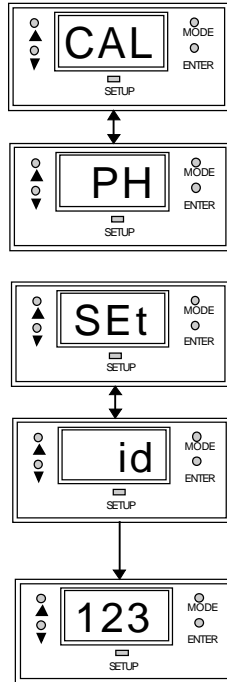


Press **ENTER** key to go into the lower-level setup menus while the display shows "SEt". These lower-level menus allow calibration of pH/ORP, Temperature and other parameters including set password, Hi or Lo Setpoints, and Hi or Lo Hysteresis values.

4. Setting Up the Controller

4.1 Setting and Changing the Password

4.1.1 Setting New Password



To set a password, press **MODE** key until the "**SEt**" is displayed.

1. Press **ENTER** key and the display shows "**CAL**" and "**PH**" alternately. Press **▲** key once and the display shows "**SEt**" "**id**".
2. Press **ENTER** to enter your desired password. Follow the steps below (e.g. using a password "**123**").
 1. Initially, the display shows "**000**" with the first digit blinking.
 2. Use **▲** (UP/INCREMENT) key to enter "**1**" on the 1st digit of the password. Press **ENTER** once and the second digit will blink. Similarly, enter the second digit of the password "**2**" and press **ENTER** key again. Repeat with the third digit accordingly.
3. Press **ENTER** key and the display shows "**CAL**" and "**PH**" alternately. Use **▲** or **▼** key to get into the "**SEt**" and "**id**"

menu, press **ENTER** and set your desired password by following the above steps.

1. Once completed, press **ENTER** to confirm and then press **MODE** key to return to the pH display.

To calibrate the controller at any time, you may have to enter the password that you set, in order to access the calibration mode. Once you have entered the password correctly, the display shows "**CAL PH**" indicating that you are in one of the lower-level SETUP menus.

If you enter the wrong password, the display reverts back to the pH display. Alternatively, if you prefer no password protection, set the password to "000", "**CAL PH**" immediately displays after you press **ENTER** key while you are in the "**Set**" menu.

NOTE : The user set password is a protection code. Thus, it is very important to keep this password strictly confidential to authorized personnel. You are advised to remember the password that you have set, in order to protect the controller settings and prevent any unauthorized tampering to the system!

IMPORTANT : In case the password set is forgotten, use the master password "555".

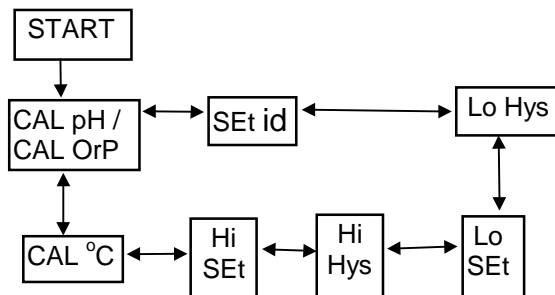
4.1.2 Changing the Password

Enter the Set id menu with already set password or "555". Change a new password as per steps mentioned for setting the password.

5. Calibrating the Controller

5.1 The Lower Level Menus

The "CAL PH/CAL OrP" display is the first menu seen upon entering the lower-level menus, depending on which mode is set. Press ▲ or ▼ key to display the various menus as shown in the figure below. Press **ENTER** key to go to the lower level menus.

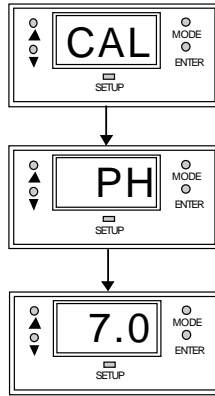


5.2 Calibrating for pH Measurement

5.2.1 The CAL PH menu

1. Enter this menu by pressing the **MODE** key twice to the "SEt" display if you are in measurement mode.
2. Press **ENTER** key. If the password has been set earlier, key in the password using the method described in section 4.1. Press **ENTER** once to confirm. After you set the correct password, you can see the "CAL" and "PH" displays, blink alternately.
3. Press **ENTER** key to enter into the pH calibration mode. Dip both the pH electrode and temperature probe in the standard solution for a few minutes.
4. When "CAL PH" displays, press **ENTER** key. The current measured value (7 ± 0.3 pH) will be displayed. Once the reading stabilizes, press **ENTER** to confirm.
5. Use ▼ keys to scroll to the other buffer values "PH4" and "PH10", in that sequence. Press **ENTER** to confirm and

complete the pH calibration, as for pH 7.0. Press **MODE** key to return to measurement mode.



Note : If the pH value is not near to any buffer, pressing **ENTER** will not calibrate the controller. If at any point, you decide not to calibrate, you can return to the previous mode by pressing the **MODE** key.

5.3 Changing the Offset

If the controller calibration has drifted, you can reset the offset of controller. First, go to the calibration mode. Press **ENTER** when pH7 is being displayed and the present pH value is shown (blinking). Using the **▲** or **▼** key,

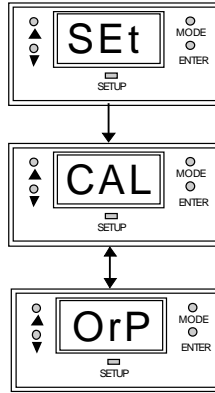
change the current pH to 7.0. Press **ENTER** to confirm, and it resets the pH calibration curve completely.

NOTE : Gently stir the electrode in a container filled with buffer solution to create a homogenous sample. Remember to rinse the electrode before calibrating to the next solution. Minimum two points calibration is recommended. For full range accuracy, three points calibration is advised.

This is useful for on-line operations. For example, the controller while in use shows a reading of pH 8.4. Using a pre-calibrated portable meter, a measurement is made and the reading shows pH 8.6. The offset of controller can be set to 8.6 by going into the CAL mode. While the controller displays "PH7", press **ENTER**. The current reading will be displayed. Using the **▲** or **▼** key, change the reading to pH 8.6 to reset the offset. Press **ENTER** to confirm offset setting. Press **MODE** key returns to the controller back to the measurement mode. This allows a one-point calibration to be made while the controller is still in operation to adjust for slight drifts of the controller. For details, refer to Appendix 3.

5.4 Calibrating for ORP Measurement

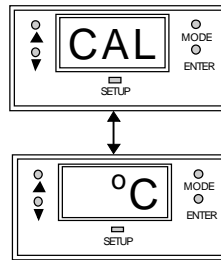
1. Make sure that the ORP mode is set before calibration.
2. Enter this menu by pressing **MODE** key twice to the “**SEt**” display if you are in measurement mode.
3. Press **ENTER** key. If the password has been set earlier, key in the password using the method described in section 4.1. Press **ENTER** once to confirm. After you set the correct password, you can see the “**CAL**” and “**OrP**” displays blink alternately.
4. Press **ENTER** key to enter into the ORP calibration mode. Dip both the ORP electrode and temperature probe in the standard solution for a few minutes.
5. When “**CAL OrP**” displays, you can see the present mV value blinking, press ▲ or ▼ key to adjust the mV value. To confirm press **ENTER** key.
6. Press **MODE** key to return the controller to its measurement mode.



5.5 Calibrating for Temperature Measurement

5.5.1 The CAL °C Menu

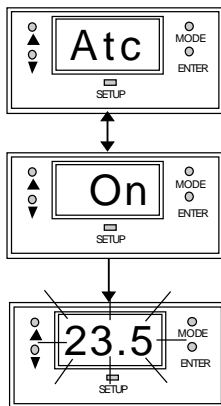
1. Enter this menu by pressing **MODE** key twice to the “**SEt**” display if you are in measurement mode.
1. Press **ENTER** key. If the password has been set earlier, key in the password using the method described in section 4.1. Press **ENTER** once to confirm. After you set the correct password, you see



the "CAL" and "PH" display blinks alternatively. Press ▼ key once, the display shows "CAL" "°C" blinking.

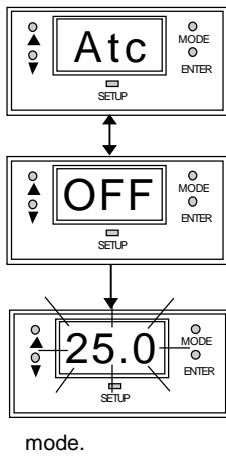
2. Press **ENTER** and the display alternatively shows "Atc" and "On" or "Atc" and "OFF". Use ▲ and ▼ keys to choose between both ATC ON and ATC OFF.

5.5.2 ATC ON/OFF



ATC ON : If a PT 100 is connected, use ▲ and ▼ keys to adjust the temperature offset of the PT 100 by ± 5 °C. Dip the temperature probe into the sample liquid. Make sure that the display is set to ATC ON, press **ENTER** and the display now shows the actual temperature reading (blinking).

Use ▲ and ▼ keys to adjust the reading to its actual temperature - as measured by an external thermometer. Once done, press **ENTER** key and the display will flash "CAL" "PH" alternatively.



mode.

ATC OFF : If a PT 100 is not used, then the ATC should be set to OFF. In step 3 above, choose by pressing ▲ and ▼ keys to select ATC OFF. Then press **ENTER**. The display will now show the default of 25 °C or the last set value (blinking). Use ▲ and ▼ keys to set your desired value. Press **ENTER** to confirm and the display shows "**CAL**" "**Con**".

Note : For ATC OFF, you can adjust the set temperature values from 0.0 to 99.9 °C. This value will be used for its temperature compensation e.g. pH in the MTC

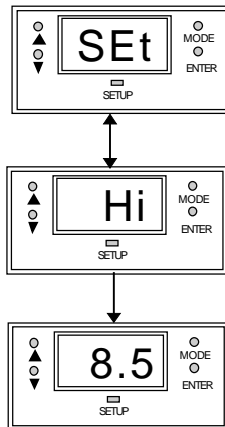
5.6 Setting the Alarm Feature

This menu allows you to change the High and Low Setpoint and Hysteresis values. See Section 8 for hysteresis applications.

IMPORTANT : When SETUP mode is entered, the 4-20 mA output (only for transmitter CX model) freezes and the relay de-activates (if it was in an alarm condition).

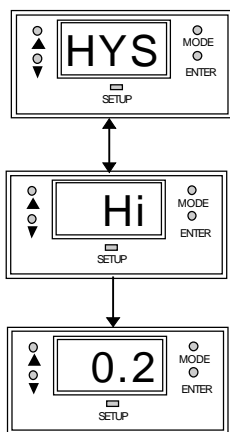
5.6.1 The Hi SET Menu

1. Enter this menu by pressing **MODE** key twice to the “SEt” display if you are in measurement mode.
2. Press **ENTER** key. If the password has been set earlier, key in the password using the method described in section 4.1. Press **ENTER** once to confirm.
3. After you set the correct password, you see the “CAL” and “PH” display blinks alternately. Press ▼ key twice, the display shows “Hi” “SEt” blinking alternately.
1. Press **ENTER** key to access the Hi SET menu and the display shows the last Hi SET value. Use ▲ and ▼ keys to change the value of the Hi SET point.
2. Press **ENTER** to confirm the value of the Hi SET point.
3. Press **MODE** key to exit to the measurement mode. You can press **MODE** key (as an ESCAPE key) to revert to the measurement value if **ENTER** is not pressed; the set value is not stored into memory.



TE : The Hi SET relay activates if the current pH/ORP reading exceeds Hi SET point + ½ Hi HYS value. The Hi SET value cannot be lower than the Low SET value.

5.6.2 The Hi HYS Menu

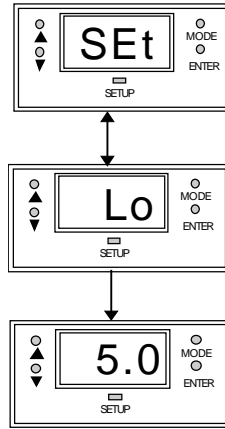


NOTE : The maximum value of Hysteresis is 0.2 pH to 2.0 pH or 20 mV to 200 mV. The HI HYS hysteresis is spread equally on either side of the Hi SET point.

1. Enter this menu by pressing the **MODE** key to the “**SET**” display if you are in the measurement mode.
2. Press **ENTER** key. If the password has been set earlier, key in the password using the method described in section 4.1. Press **ENTER** once to confirm. After you set the correct password, you see the “**CAL**” and “**PH**” display blinks alternatively. Press **▼** key thrice, the display shows “**Hi**” “**HYS**” blinking.
1. Press **ENTER** key to access the Hi HYS menu and the display shows the last Hi HYS value. Use **▲** and **▼** keys to change the value of the Hi HYS point.
2. Press **ENTER** to confirm the value of the Hi HYS.
3. Press **MODE** key to exit to measurement mode. You can press **MODE** key (as an ESCAPE key) to revert to the measurement value if **ENTER** is not pressed; the set value is not stored into memory.

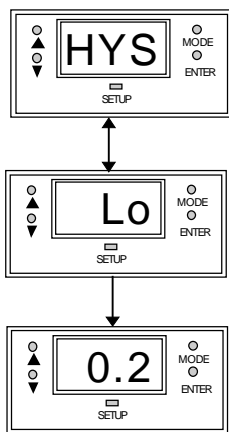
5.6.3 The Lo SET Menu

1. Enter this menu by pressing **MODE** key twice to the “**SEt**” display if you are in measurement mode.
2. Press **ENTER** key. If the password has been set earlier, key in the password using the method described in section 4.1. Press **ENTER** once to confirm.
3. After you set the correct password, you see the “**CAL**” and “**PH**” display blinks alternately. Press **▼** key four times, the display shows “**Lo**” “**SEt**” blinking alternately.
1. Press **ENTER** key to access the Lo SET menu and the display shows the last Lo SET value. Use **▲** and **▼** keys to change the value of the Lo SET point.
2. Press **ENTER** to confirm the value of the Lo SET point.
3. Press **MODE** key to exit to measurement mode. You can press **MODE** key (as an ESCAPE key) to revert to the measurement value if **ENTER** is not pressed; the set value is not stored into memory.



NOTE : The Lo SET relay activates if the current pH/ORP reading exceeds Lo SET point - ½ Lo HYS value. The Lo SET value cannot be higher than the Hi SET value.

5.6.4 The Lo HYS Menu



NOTE : The maximum value of Hysteresis is 0.2 pH to 2.0 pH or 20 mV to 200 mV. The Lo HYS hysteresis is spread equally on either side of the Lo SET point.

1. Enter this menu by pressing the **MODE** key to the “**SET**” display if you are in the measurement mode.
2. Press **ENTER** key. If the password has been set earlier, key in the password using the method described in section 4.1.
3. Press **ENTER** once to confirm. After you set the correct password, you see the “**CAL**” and “**PH**” display blinks alternately. Press **▼** key five times, the display shows “**Lo**” “**HYS**” blinking alternately.

1. Press **ENTER** key to access the Lo HYS menu and the display shows the last Lo HYS value. Use **▲** and **▼** keys to change the value of the Lo HYS point.
2. Press **ENTER** to confirm the value of the Lo HYS. Press **MODE** key to exit to the measurement mode. You can press **MODE** key (as an ESCAPE key) to revert to the measurement value if **ENTER** is not pressed; the set value is not stored into memory.

IMPORTANT : The $Lo\ SET + \frac{1}{2} Lo\ HYS$ should be less than $Hi\ SET - \frac{1}{2} Hi\ HYS$ i.e. $Hi\ SET$ and $Lo\ SET$ value (in consideration of the hysteresis band) can never overlap. $Lo\ HYS$ and $Hi\ HYS$ can be set independent of each other; this allows non-symmetrical hysteresis option.

6. Using the Controller Current Loop for Datalogging (for Transmitter Model Only)

The 4-20 mA Current Loop

A 4-20 mA current loop can be connected if a remote data logging is required. The current will be proportional to the pH/ORP displayed on the panel display. The 4-20 mA current loop can drive a load resistance of no more than 200 Ω .

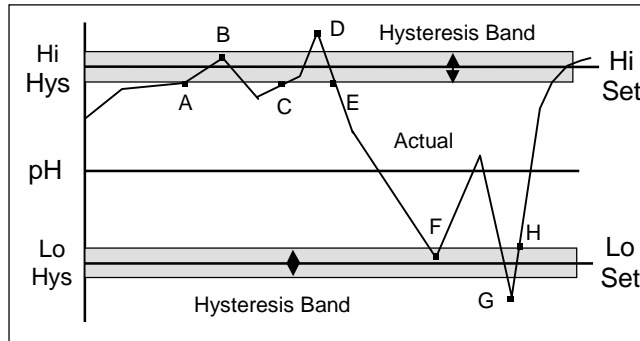
If the pH is less than 0.0 pH, the current signal will be set to approximately 0 mA. If the pH is greater than 14.0 pH, it will be set to approximately 21 mA. In this way, the remote data logger can detect when out of range conditions arise. Please note that the 4-20 mA loop is not galvanically isolated from the source.

7. Additional Information

The controller allows you to set High and Low alarms that switch on or off relays, and activating or deactivating devices linked to the controller. In cases where the pH/ORP values fluctuate close to the high or low setpoints, the relays will continuously switch on/off very quickly and may cause problems to the linked devices. The hysteresis band allows you to set an allowable range of fluctuations to prevent the relays from activating and deactivating too quickly. See below.

It is not possible to set the high set point lower than the low set point and vice versa (taking the hysteresis band into consideration). For example, when the high set point is 8.50 pH and the high hysteresis band is set at 0.40 pH, then the low setpoint cannot be set at higher than $8.50 - \frac{1}{2} \text{ Hi HYS}$.

NOTE : The shaded area indicates the hysteresis band.



Explanation of the diagram in the previous page

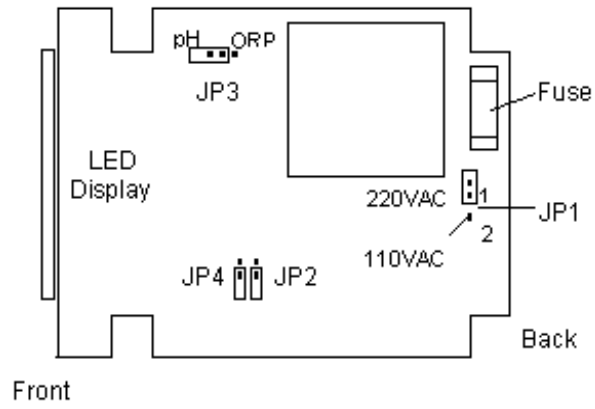
- A - Reading reaches (Hi SET - $\frac{1}{2}$ HI HYS), the Hi-Set relay remains inactivated.
- B - Reading reaches above High Setpoint but below (Hi SET + $\frac{1}{2}$ Hi HYS), Hi-Set relay remains inactivated.
- C - Reading reaches between (Hi SET - $\frac{1}{2}$ Hi HYS), the Hi-Set relay remains inactivated.
- D - Reading reaches above (Hi SET + $\frac{1}{2}$ Hi HYS), and the Hi-Set relay is activated.
- E - The Hi-Set relay is inactivated only when the reading falls below (Hi SET - $\frac{1}{2}$ Hi HYS).
- F - Reading reaches between (Lo SET - $\frac{1}{2}$ Lo HYS), the Lo-Set relay remains inactivated.
- G - Reading reaches below (Lo SET - $\frac{1}{2}$ Lo HYS), the Lo-Set relay is activated.
- H - The Lo-Set relay remains activated until the reading goes above the (Lo SET + $\frac{1}{2}$ Lo HYS)

Appendix 1 - Jumper Positions (Inside Controller)

JP1	Selects the input voltage between 110 VAC or 220 VAC			
JP3 & JP4	Selects for pH or ORP mode. Please refer to Appendix 2A and 2B for the diagrams			
JP2	OPEN (DEFAULT)		SHORT	
Terminals	5 & 6, 8 & 9	6 & 7, 9 & 10	5 & 6, 8 & 9	6 & 7, 9 & 10
Power On	OPEN	CLOSE	CLOSE	OPEN
pH within setting	OPEN	CLOSE	CLOSE	OPEN
pH exceeding setting	CLOSE	OPEN	OPEN	CLOSE
Fuse	Note that there is a fuse internal to the controller. Before opening the unit, ENSURE that the power cable is physically separated from the mains supply. Replace the fuse with the one recommended by the manufacturer.			

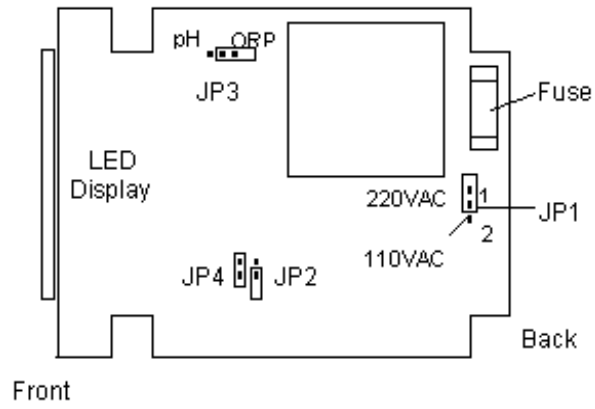
Appendix 2A - Jumper Positions, pH

Jumper Positions - inside the Controller

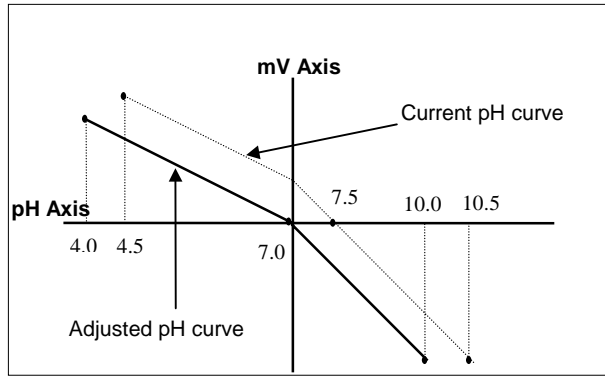


Appendix 2B - Jumper Positions, *ORP*

Jumper Positions - inside the Controller



Appendix 3 - pH Offset / Slope



8. Technical Specifications

pH Range	0.0 to 14.0 pH
Resolution	0.1 pH
Relative Accuracy	+/- 0.1 pH
mV Range	-1250 to +1250 mV
Resolution	10 mV
Relative Accuracy	+/- 10 mV
Temperature Compensation	Automatic / Manual (0 to 100.0 °C)
Temperature	0 to 100 °C
Resolution	0.1 °C
Relative Accuracy	+/- 0.5 °C
Sensor	PT 100
Calibration	Push-bush 1 to 3 points
Calibration Options	pH 4.0, 7.0 and 10.0
Output	4-20 mA, screw terminals (non-isolated); Max. load 200 Ω
Display	LED, 3 digits
Inputs	BNC, screw terminals
Input Impedance	10 ¹² Ω
Input Bias Current	50 pA max. at 25 °C
Recommended Input Cable Length	Less than 5 meters
Relays	
<i>No. Of Relays</i>	2 - High set & Low set SPDT
<i>Maximum Voltage</i>	240 VAC
<i>Maximum Current</i>	3A
<i>High Hys. Band</i>	0.2 to 2.0 pH or 20 to 200 mV
<i>Low Hys. Band</i>	0.2 to 2.0 pH or 20 to 200 mV
Power Requirements	110 VAC or 220 VAC (Jumper selectable)
Environmental Requirements	
<i>Operating</i>	0 to 50 °C
<i>Storage</i>	-10 to 60 °C
<i>Humidity Limits</i>	10 to 95% RH (non condensing)
Storage Temp. Range	0 to 50 °C
Dimensions	1/8 DIN size; 96 (L) x 48 (H) mm (Front panel)

NOTES