

## 8. Warranty

Oakton Instruments warrants this product to be free from significant deviations in material and workmanship for a period of one year from the date of purchase. If repair is necessary and has not been the result of abuse or misuse within the warranty period, please return by freight pre-paid and amendment will be made without charge. The Customer Service Department will determine if the product problem is due to deviations or customer abuse. Out of warranty products will be repaired on a charge basis.

## 9. Return of Goods

Authorization must be obtained from our Customer Service Department before returning items for any reason. When applying for authorization, please include data regarding the reason the items are to be returned. For your protection, items must be carefully packed to prevent damage in shipment and insured against possible damage or loss. We will not be responsible for damage resulting from careless or insufficient packing. A restocking charge will be made on all unauthorized returns. NOTE: We reserve the right to make improvements in design, construction, and appearance of products without notice.

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**OAKTON®**

## OPERATING INSTRUCTIONS

# OAKTON WD-35100-00, -10 1/8 DIN pH/ORP Controller



R2 Printed in the U.S.A. 1/99

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## 1. Introduction

Thank you for purchasing an Alpha 100 Series 1/8 DIN pH/ORP Controller. This controller is a member of the line of quality process controllers available from OAKTON Instruments.

The 100 series controller features ASIC (Application Specific Integrated Circuit) microprocessor technology, which gives it many reliable, user-friendly features. Use this panel-mounted, on-line controller to measure and control pH and ORP.

When shipped, the controller is set internally to the pH mode. See Appendix 1, pages 34-35, for directions on selecting ORP mode.

Some of the features of this controller are:

- Rapid on/off control with two relays (high and low)
- Display switches between pH (ORP) and temperature readings with a button press
- Automatic temperature compensation (with temperature element attached); or manual temperature compensation (without temperature element attached)
- Push-button, three-point pH calibration with independent slope adjustment
- Offset temperature and ORP calibration
- User-defined password protection prevents unauthorized entry
- 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 (model WD-35100-10)
- 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. Overview

### 2.1 Front Panel

The front panel consists of a 3-digit LED display, 5 LED annunciators and 4 keys. See diagram below.



#### Annunciators

<b>pH/ORP</b>	Indicates the value shown in the main display is the pH (ORP) of your solution
<b>°C</b>	Indicates the value shown in the main display is the temperature of your solution
<b>SETUP</b>	Indicates the controller is in Set-up mode
<b>READY</b>	The READY annunciator lights when the pH (ORP) reading stabilizes (the reading does not fluctuate by more than 0.1 pH or 10 mV for a certain period)
<b>RELAY</b>	RELAY lights up when either the HI SET relay or the LO SET relay is activated

#### Keys

▲  
(Up/Increment)  
▼  
(Down/Decrement)

**MODE**

**ENTER**

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.

The MODE key allows you to select between:

- the pH (ORP) display;
- the temperature display;
- the SETUP menu display.

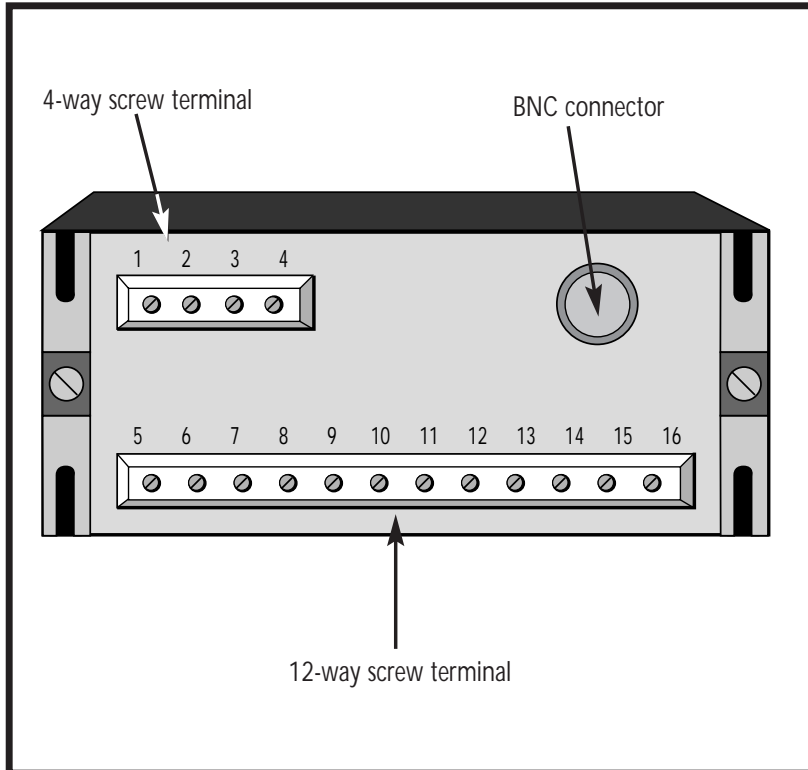
While in one of the SETUP menus, MODE also functions as an ESCAPE key. For example, while setting the Hi SET point, press the MODE key if you change your mind about changing this information.

Press the ENTER key to confirm changes or to enter into further levels of the lower menu.

## 2.2 Back Panel

The back panel consists of three different connectors:

- BNC connector (for pH electrode)
- 4-way screw terminal
- 12-way screw terminal.



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

1. Pt 100 connection (red or white wire from sensor)\*
2. Pt 100 connection (red or white wire from sensor)\*
3. unused
4. unused

\*If you are not using OAKTON sensors, consult sensor manufacturer to identify Pt 100 wires.

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 connection, negative (for WD-35100-10 only)
12. 4-20 mA connection, positive (for WD-35100-10 only)
13. VAC protective ground wire
14. VAC protective ground wire
15. VAC neutral wire
16. VAC live wire



**CAUTION:** Electrical shock hazard! Make sure to remove AC power to the controller before wiring input and output connections, and before opening the controller housing.

## 2.3 Wiring



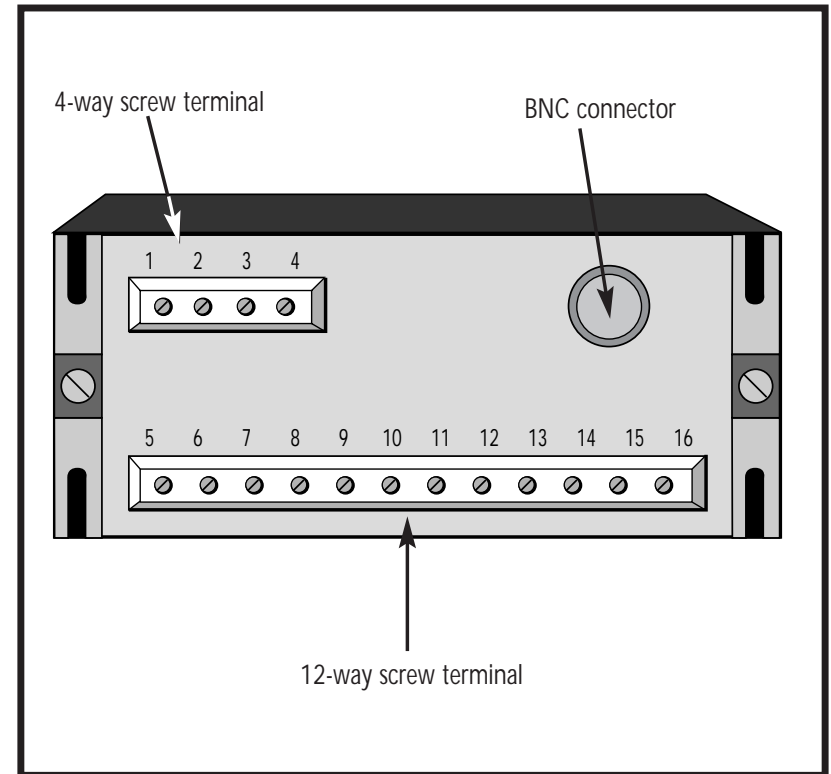
**CAUTION:** Electrical shock hazard! Make sure to remove AC power to the controller before wiring input and output connections, and before opening the controller housing.

1. 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 1 on pages 34-35 for instructions on how to select the voltage jumper setting.

2. Connect the Pt 100 temperature element to the 4-way screw terminal at the back panel - slots 1 and 2.
3. Slide the BNC connector of the pH (ORP) probe to the BNC connector on the back of the controller. Turn the notches of the connector until they lock into place.
4. Power on the controller. The display automatically shows the pH (ORP) reading, and the pH/ORP annunciator lights. Once the reading is stable, the READY annunciator lights. However, if the Pt 100 temperature probe is not connected, automatic temperature compensation does not function. You can manually set the temperature at a value of your choice—see page 25 for instructions. The temperature is set to factory default at 25.0 °C.

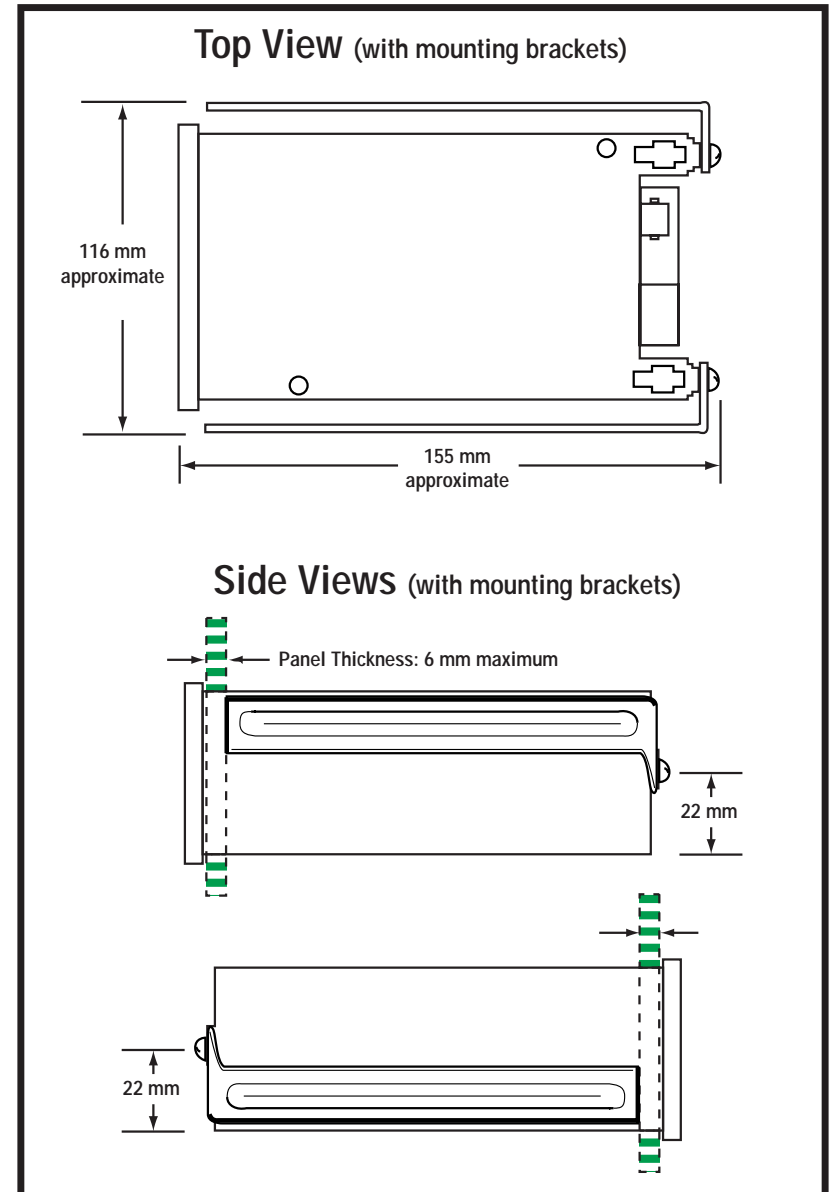
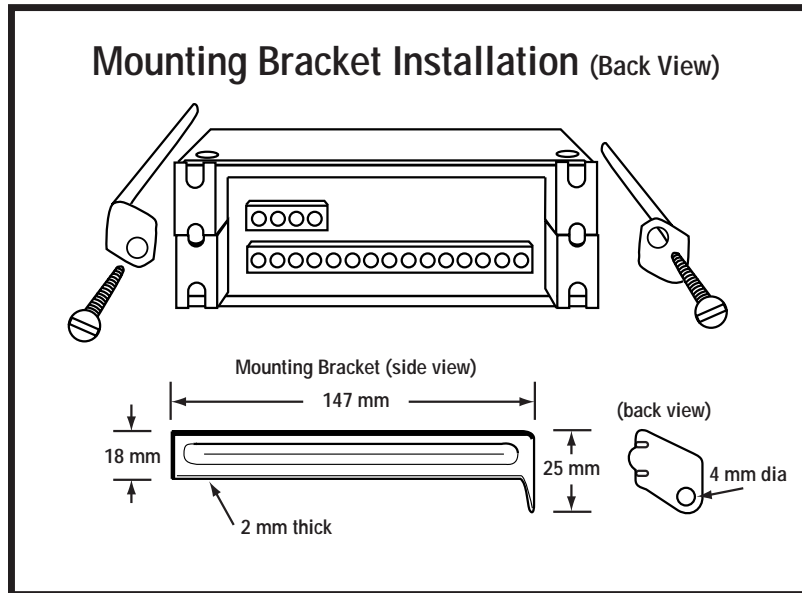


## 2.4 Panel-mounting the controller

The supplied mounting hardware allows surface mounting to all panels and protective enclosures. Mounting cut-out size is 91 x 45 mm.

To attach the mounting to the controller:

1. Align the hole on the mounting bracket to the nut enclosed inside the controller (see "Back view" diagram below).
2. Insert the bolt through the hole in the bracket and screw into the nut inside the controller. Tighten the bolt until the front of the bracket holds firmly against the back of the panel or protective housing (see "Side views" diagram on page 11). Repeat on the other side.

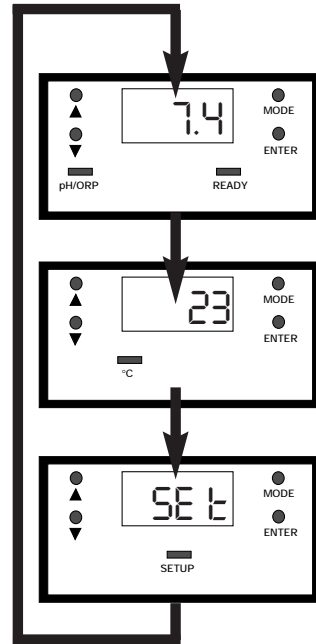


### 3. Measurement Mode

Pressing the MODE key toggles you between:

- pH (or ORP) measurement mode;
- Temperature measurement mode;
- Set-up mode

See diagram at right.



Pressing the MODE key toggles you between (from top to bottom)

- pH (or ORP)
- Temperature and
- Set-up Mode.

#### pH (or ORP) measurement mode

The controller starts up in pH (ORP) measurement mode when initially powered. The pH/ORP annunciator lights. Once the reading is stable, the READY annunciator lights.

NOTE: ORP measurements are expressed in Volts. For example, 1.25 V on the display = 1250 mV. See Appendix 1 on pages 34-35 for information on selecting the ORP measurement mode.

#### Temperature measurement mode

Press MODE key once to view the temperature measurement. The °C annunciator lights when you are measuring temperature. The display shows current measured temperature (either with ATC or the temperature that was set in manual temperature compensation mode).

If you have not connected a Pt 100 temperature probe, automatic temperature compensation does not function. You can operate the controller in manual temperature compensation mode as described in section 4.6. The temperature is set a to factory default of 25.0 °C.

#### Set-up mode

Press MODE key again and the display toggles to the "SEt" for SETUP menu. Press ENTER key to access the lower-level setup menus (see pages 14-15). These lower-level menus allow calibration of pH and Temperature; and other parameters including set password, Hi or Lo Setpoints, and Hi and Lo Hysteresis values.

## 4. Set-up Mode

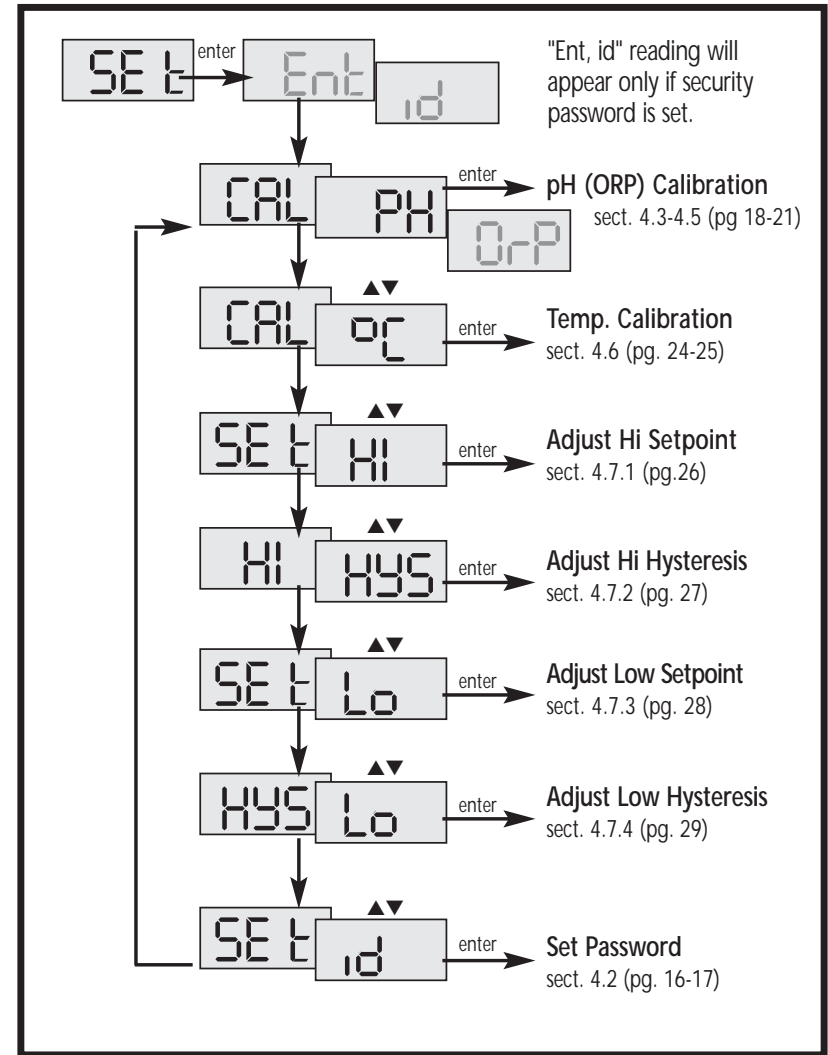
### 4.1 Set-up overview

**IMPORTANT:** When Setup mode is entered, the 4-20 mA output (35100-10 model only) freezes and the relay de-activates (if it was in an activated condition).

#### To enter set up mode:

1. Press the Mode key until the display shows “SEt” and the Setup annunciator lights.
2. Press the Enter key. The flashing “CAL” and ”pH” (“ORP”) display is the first menu seen upon entering the lower-level menus.
3. Press the ▲ or ▼ keys to display the various sub-menus shown at right.
4. When a sub-menu item is displayed, press the ENTER key to enter that sub-menu.
5. Press MODE key to leave Set-Up mode.

### SET-UP OVERVIEW



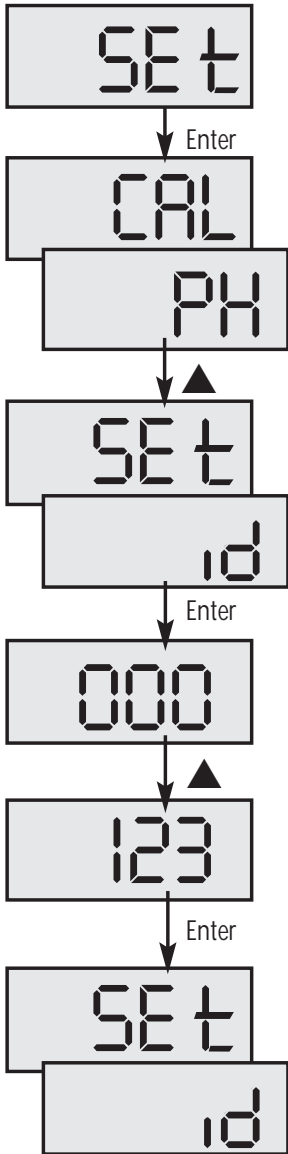
## 4.2 Setting and Changing the Password (*Set; id*)

### 4.2.1 Setting a New Password

The unit is factory set to allow you direct entry into the Set-up mode options without entering a password.

**IMPORTANT:** In case the password set is forgotten, use the master password “555”.

1. From measurement mode: press MODE key until you view “Set” display.
2. Press ENTER key. The display shows “CAL” and “pH (ORP)” alternately.
3. Press ▲ key once. The display shows “Set” “id”.
4. Press ENTER key. The display shows “000” with the first digit blinking.
5. Use ▲ (UP/INCREMENT) key to enter the 1st digit of the password.
6. Press ENTER once. The second digit will blink. Similarly, enter the second digit of the password and press ENTER key again.
7. Repeat with the third digit accordingly.
8. Press ENTER key. The display shows “Set” and “id” alternately. Use ▲ or ▼ key to continue through the Set-Up mode, or press MODE to return to pH (ORP) mode.



### 4.2.2 Entering Set up mode with a Password

After you set a password, when you want to access set up functions you need to:

1. Press MODE key until “Set” is displayed.
2. Press the ENTER key. The display shows “Set” “id”. Press the ENTER key again.
3. Key in the password with the ▲ key. Press the ENTER key to move from the 1st, 2nd and 3rd digits.
4. Press the ENTER key when finished.

Once you have entered the password correctly, the display shows “CAL pH”, which indicates that you are in the SETUP menu. If you enter the wrong password, the display reverts back to the pH (ORP) display.

If you prefer no password protection, set the password to “000”. “CAL pH” immediately displays after you press the ENTER key while you are in the “Set” menu.

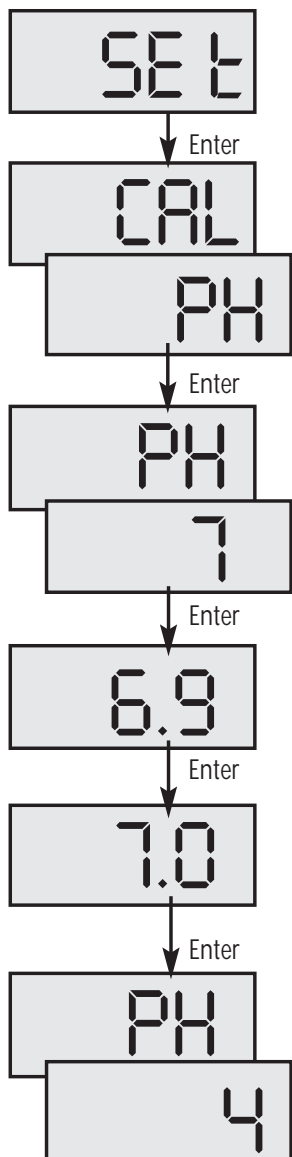
**NOTE:** The user set password is a protection code. Thus, it is important to keep this password strictly confidential to authorized personnel. You are advised to remember the password that you have set, in order to protect the controller settings and prevent any unauthorized tampering to the system!

### 4.2.3 Changing the Password

1. Enter the Set id menu with previously set password or “555”.
2. Change to new password as per steps in section 4.2.1.

### 4.2.4 Overriding the password protection

The pH 100 series controller features a security override password to use if you forget your password. The security override password is “555”. *You can use the security override password even if another password was set previously.*



### 4.3 pH Calibration (*CAL; pH*)

This controller features 3 preset pH values at which you can calibrate: pH 4, 7, and 10. The controller automatically recognizes these common buffer values for faster calibration.

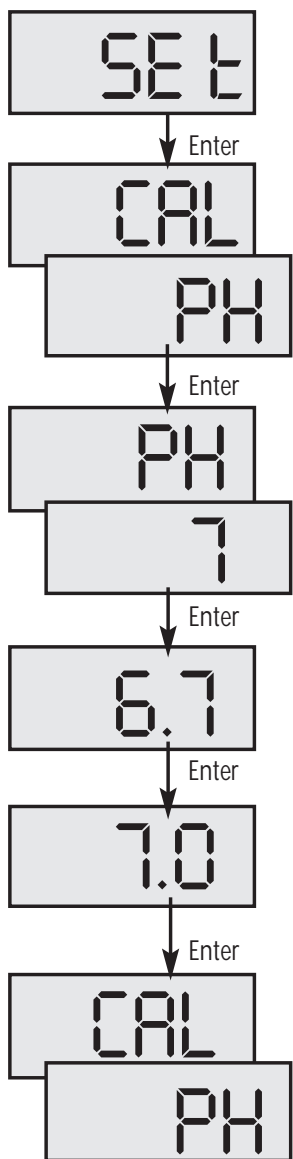
We recommend that you calibrate your controller for at least two points for best accuracy.

#### **To calibrate your controller:**

1. From measurement mode: press the MODE key until you view the “SEt” display.
2. Press the ENTER key.
  - *If you have not set a password:* “CAL” and “pH” flash alternately.
  - *If you have set a password:* “Ent” and “id” flash alternately. Key in the password using the method described in section 4.2. After entering the password, “CAL” and “pH” flash alternately.
3. Press the ENTER key.
4. Press the ▲ and ▼ keys to select between buffer values pH 7, 10, and 4.
5. Press the ENTER key to select a pH calibration buffer value.

6. Dip both the pH electrode and temperature probe in the appropriate standard buffer solution. Wait a few minutes for the probe to stabilize.
7. Press ENTER key to confirm the calibration value. The controller automatically moves to the next buffer.
  - To calibrate at other points, repeat steps 4 to 7 with the appropriate calibration buffers.
  - To return to measurement mode, press the MODE key twice.

NOTES: If the selected buffer value is not within  $\pm 1$  pH from the measured pH value, the controller will not calibrate at that point.



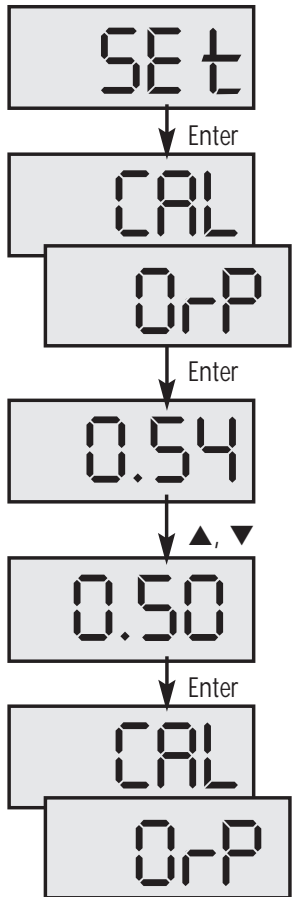
#### 4.4 pH offset (*CAL; pH*)

If the pH calibration drifts slightly over time, offset the pH display of the controller as follows:

1. From measurement mode: press the MODE key until you view the “SEt” display.
2. Press ENTER key.
  - *If you have not set a password:* “CAL” and “pH” flash alternately.
  - *If you have set a password:* “Ent” and “id” flash alternately. Key in the password using the method described in section 4.2. After entering the password, “CAL” and “pH” flash alternately.
3. Press the ENTER key. “pH” “7” will alternately flash.
4. Press the ENTER key again. You will see a flashing value.
5. Measure the pH of your solution with a pH meter known to be accurate.
6. Press the ▲ and ▼ keys on the controller to offset the controller display value to match the value read by the pH meter.
7. Press ENTER key again to confirm the offset value. The display flashes “CAL” and “pH” alternately. Press MODE key twice to return to measurement mode.

NOTES: Changing the offset is not considered a substitute for 2- or 3-point calibration. You may change the offset between calibrations to maintain better accuracy, but make sure to perform at least a two-point calibration for best accuracy (follow the directions on pages 18-19).

To revert to the original pH value, press the MODE key instead of the ENTER key in step 7. Any changes to the offset value will not be stored into memory.



## 4.5 ORP Calibration

ORP measurements are expressed in Volts. For example, 1.25 V on the display = 1250 mV. See Appendix 1 on pages 34-35 for information on selecting ORP measurement mode.

1. From measurement mode: press the MODE key until you view the “SEt” display.
2. Press the ENTER key.
  - *If you have not set a password:* “CAL” “ORP” flashes alternately.
  - *If you have set a password:* “Ent” “id” flashes alternately. Key in the password using the method described in section 4.2. After entering the password, “CAL” “ORP” flashes alternately.
3. Press the ENTER key again. You will see a flashing value.
4. Measure the ORP of your solution with an ORP meter known to be accurate.
6. Press the ▲ and ▼ keys on the controller to offset the controller display value to match the value read by the ORP meter.
7. Press the ENTER key again to confirm the offset value. The display flashes “CAL” and “ORP” alternately. Press MODE key twice to return to measurement mode.

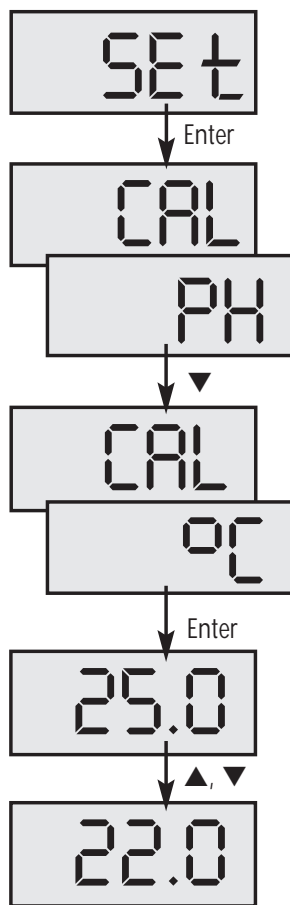
NOTES: ORP offset adjustment is limited to  $\pm 100$  mV from the original reading ( $\pm 0.10$  V on the display).

To revert to the original ORP value, press the MODE key instead of the ENTER key in step 7. Any changes to the offset value will not be stored into memory.

## 4.6 Temperature Calibration (CAL; °C)

Calibrate for temperature as follows:

1. From measurement mode: press the MODE key until you view the “SEt” display.
2. Press the ENTER key.
  - If you have not set a password: “CAL” “pH (ORP)” flashes alternately.
  - If you have set a password: “Ent” “id” flashes alternately. Key in the password using the method described in section 4.2. After entering the password, “CAL” “pH (ORP)” flashes alternately.
3. Press the ▼ key once. “CAL” “°C” will flash alternately.
4. Press the ENTER key. You will see a flashing value.
5. Measure the temperature of your solution with a thermometer known to be accurate.
6. Press the ▲ and ▼ keys on the controller to offset the controller display value to match the value read by the thermometer.
7. Press ENTER key again to confirm the offset value. The display flashes “CAL” “°C” alternately. Press MODE key twice to return to measurement mode.



NOTES: When automatic temperature compensation is on (when the Pt 100 temperature element is attached to the controller), you can adjust the temperature reading up to  $\pm 5^{\circ}\text{C}$  from the original temperature.

### Manual Temperature Compensation

When a Pt 100 temperature element is connected to the controller, the controller automatically compensates for temperature. When there is no temperature element connected to the controller, the controller manually compensates for temperature. If you choose to use manual temperature compensation, this controller lets you enter a temperature value between 0.0 and 100.0°C at which the controller will compensate readings.

Follow the directions in Section 4.6 to set a manual temperature value. *Before starting, make sure that there is no temperature element wired into the controller.* Enter the temperature of your process in step 6. This is the temperature at which the controller will compensate readings.

## 4.7 Adjusting the set-point values

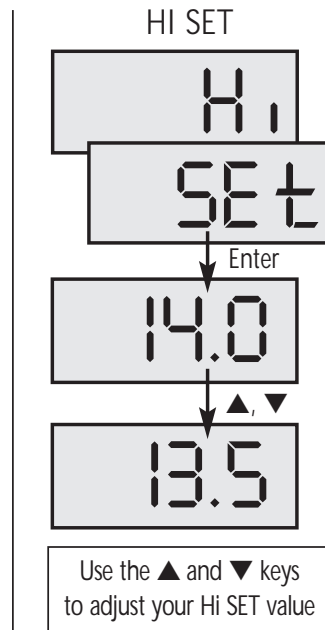
This menu lets you change the Hi and Lo Setpoint and Hysteresis values. See Appendix 2, pages 36-37 for hysteresis information.

**IMPORTANT:** When SETUP mode is entered, the 4-20 mA output (35100-10 model only) freezes and the relay de-activates (if it was in an activated condition).

### 4.7.1 The Hi SET Menu (*Hi; SET*)

**NOTE:** The Hi SET relay activates if the current pH (ORP) reading exceeds the Hi SET point  $\pm$  Hi HYS value. The Hi SET value cannot be lower than the Low SET value.

1. From measurement mode: press the MODE key until you view the “SEt” display.
2. Press the ENTER key.
  - *If you have not set a password:* “CAL” “pH (ORP)” flashes alternately.
  - *If you have set a password:* “Ent” “id” flashes alternately. Key in the password using the method described in section 4.2. After entering the password “CAL” “pH (ORP)” flashes alternately.
3. Press the ▼ key twice. “Hi” “Set” will flash alternately.
4. Press ENTER key to access the Hi SET menu. The display shows the last Hi SET value.
5. Adjust the Hi SET point using the ▲ and ▼ keys.
6. Press ENTER key to confirm the Hi SET point value.
7. Press ▲ or ▼ key to continue, or press MODE to return to Measurement Mode.



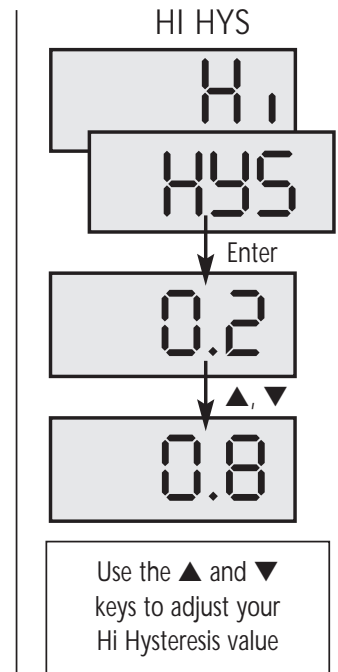
**NOTE:** To revert to the measurement value, press the MODE key instead of the ENTER key in step 6. Any changes to your set value will not be stored into memory.

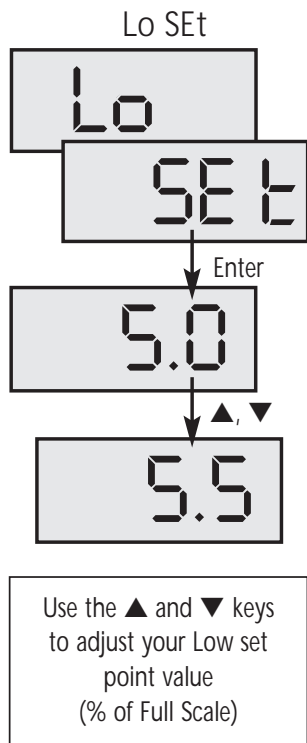
### 4.7.2 The Hi HYS Menu (*Hi; HYS*)

**NOTE :** You can set hysteresis in increments of 0.2 pH between 0.0 and 2.0 pH. The HI HYS hysteresis is spread equally on either side of the Hi SET point.

1. From measurement mode: press the MODE key until you view the “SEt” display.
2. Press the ENTER key.
  - *If you have not set a password:* “CAL” “pH (ORP)” flashes alternately.
  - *If you have set a password:* “Ent” “id” flashes alternately. Key in the password using the method described in section 4.2. After entering the password “CAL” “pH (ORP)” flashes alternately.
3. Press the ▼ key three times. “Hi” “HYS” will flash alternately.
4. Press ENTER key to access the Hi HYS menu. The display shows the last Hi HYS value or default.
5. Adjust the value of the Hi HYS point using ▲ and ▼ keys.
6. Press ENTER to confirm the value of the Hi HYS.
7. Press ▲ or ▼ key to continue through Set-Up, or press MODE to return to Measurement Mode.

**NOTE:** To revert to the measurement value, press the MODE key instead of the ENTER key in step 6. Any changes to your set value will not be stored into memory.





#### 4.7.3 The Lo SET Menu (Lo; SET)

NOTE : The Lo SET relay activates if the current pH (ORP) reading exceeds Lo SET point  $\pm$  the Lo HYS value. The Lo SET value cannot be higher than the Hi SET value.

1. From measurement mode: press the MODE key until you view the “SET” display.
2. Press the ENTER key.
  - If you have not set a password: “CAL” “pH (ORP)” flashes alternately.
  - If you have set a password: “Ent” “id” flashes alternately. Key in the password using the method described in section 4.2. After entering the password, “CAL” “pH (ORP)” flashes alternately.
3. Press ▼ key four times; the display shows “Lo” “SET” blinking alternately.

4. Press ENTER key to access the Lo SET menu. The display shows the last Lo SET value or default.
5. Use ▲ and ▼ keys to change the value of the Lo SET point.
6. Press ENTER to confirm the value of the Lo SET point.
7. Press ▲ or ▼ key to continue through Set-Up, or press MODE to return to Measurement Mode.

NOTE: To revert to the measurement value, press the MODE key instead of the ENTER key in step 6. Any changes to your set value will not be stored into memory.

#### 4.7.4 The Lo HYS Menu (Lo; HYS)

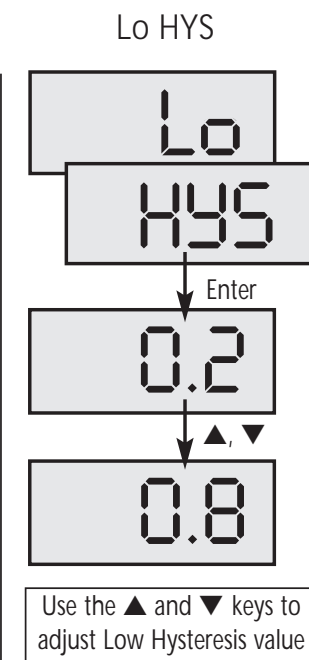
NOTE : You can set hysteresis in increments of 0.2 pH between 0.0 and 2.0 pH. The Lo HYS hysteresis is spread equally on either side of the Lo SET point.

1. From measurement mode: press the MODE key until you view the “SET” display.
2. Press the ENTER key.
  - If you have not set a password: “CAL” “pH (ORP)” flashes alternately.
  - If you have set a password: “Ent” “id” flashes alternately. Key in the password using the method described in section 4.2. After entering the password, “CAL” “pH (ORP)” flashes alternately.

3. Press ▼ key five times; the display shows “Lo” “HYS” blinking alternately.
4. Press ENTER key to access the Lo HYS menu. The display shows the last Lo HYS value or default.
5. Use ▲ and ▼ keys to change the value of the Lo HYS point.
6. Press ENTER to confirm the value of the Lo HYS.
7. Press ▲ or ▼ key to continue through Set-Up, or press MODE to return to Measurement Mode.

NOTE: To revert to the measurement value, press the MODE key instead of the ENTER key in step 6. Any changes to your set value will not be stored into memory.

IMPORTANT : The Lo SET  $\pm$  Lo HYS should be less than Hi SET  $\pm$  Hi HYS i.e. Hi SET and Lo SET value (in consideration of the hysteresis band) cannot overlap. Lo HYS and Hi HYS can be set independently of each other; this allows non-symmetrical hysteresis option.



## 5. Transmitter Function (35100-10 Model Only)

You can connect a 4-20 mA current loop if remote data logging is required. The current will be proportional to the pH (or ORP) displayed on the panel display. The 4-20 mA current loop can drive a load resistance of no more than 200  $\Omega$ . See the wiring diagram on pages 8-9 for information on how to hook up your transmitter to the controller.

Please note that the 4-20 mA loop is not galvanically isolated from the source.

## 6. Specifications

	Range	Resolution	Accuracy
<b>pH</b>	0.0 to 14.0 pH	0.1 pH	$\pm 0.1$ pH
<b>mV</b>	-1250 to 1250 mV*	10 mV (as 0.01 V)	$\pm 10$ mV (as 0.01 V)
<b>°C</b>	0 to 100°C	1°C	$\pm 1^\circ\text{C}$

\*Expressed as volts; i.e. 1250 mV = 1.25 V on the display

<b>Control type</b>	on/off
<b>Calibration</b>	up to 3 points (pH 4.0, 7.0, 10.0)
<b>Temp. Compensation</b>	Automatic / Manual (0 to 100.0 °C)
<b>Temperature sensor</b>	100 $\Omega$ Platinum RTD (PT 100)
<b>Output</b>	
<b>Control</b>	2 SPDT nonpowered relays; 6A @ 110 VAC, 250 VAC maximum
<b>Current</b>	(WD-35100-10 only) nonisolated 4-20 mA ; 200 $\Omega$ maximum load
<b>Display</b>	LED, 3 digits
<b>Inputs</b>	BNC, screw terminals
<b>Recommended Input</b>	
<b>Cable Length</b>	Less than 5 meters
<b>Hysteresis Bands</b>	One high and one low band; adjustable from 0.2 pH to 2 pH or 20 mV to 200 mV
<b>Power Requirements</b>	110 VAC or 220 VAC
<b>Environmental Requirements</b>	
<b>Operating</b>	0 to 50°C
<b>Storage</b>	-10 to 60°C
<b>Humidity Limits</b>	10 to 95% RH (non condensing)
<b>Storage Temperature Range</b>	0 to 50°C
<b>Dimensions</b>	1/8 DIN size

## 7. Accessories

### pH (ORP) Electrodes

**Submersible/in-line electrodes.** Feature CPVC housing with 3/4" NPT(M) thread on both ends. Sealed KCl/AgCl reference, 10 ft vinyl cable, BNC connector, Pt 100 temperature sensor.

**WD-35801-08** Submersible/in line electrode, double junction

**WD-35801-54** Submersion pipe, PVC, 3 ft L x 3/4" NPT(F) thread

**Submersible electrode.** Features a 3-ft long ABS plastic body for quick installation in tanks. Sealed KCl/AgCl reference, 10 ft vinyl cable, BNC connector, Pt 100 temperature sensor.

**WD-35806-01** Submersible electrode, double junction

**Self-cleaning flat pH electrodes.** Flat electrode surface prevents solids buildup. Features CPVC housing with 3/4" NPT(M) on both ends; sealed KCl/AgCl reference, 10 ft vinyl cable, BNC connector, Pt 100 temperature sensor.

**WD-35806-21** Self-cleaning flat pH electrode, double junction

**WD-35806-22** Self cleaning flat ORP electrode, double junction

**Semi-domed electrodes.** Vortexing reference design provides excellent self-cleaning performance; custom annular ceramic junction is ideal for dirty or viscous fluids. Feature epoxy housing with thread on both ends, sealed KCl/AgCl reference, 10 ft vinyl cable, BNC connector, Pt 100 temperature sensor.

**WD-35807-00** Semi-domed pH electrode, 3/4" NPT(M) thread, double junction

**WD-35807-05** Semi-domed pH electrode, 1" NPT(M) thread, double junction

### pH calibration solutions

**WD-00654-00** pH calibration buffer bottle, pH 4.01

**WD-00654-04** pH calibration buffer bottle, pH 7.00

**WD-00654-08** pH calibration buffer bottle, pH 10.00

### pH meters

**WD-35613-10** pH 6 Acorn series pH/mV/°C meter with pH electrode and temperature probe.  
Range: 0.00 to 14.00 pH / ±1000 mV / 0.0 to 100.0°C  
Resolution: 0.01 pH / 1 mV / 0.1°C  
Accuracy: ±0.01 pH / ±2 mV / ±0.5°C

**WD-35614-10** pH 20 Economy pH/mV/°C meter with pH electrode and temperature probe.  
Range: 0.00 to 14.00 pH / ±2000 mV / 0.0 to 100.0°C  
Resolution: 0.01 pH / 0.1 mV; 1 mV / 0.1°C  
Accuracy: ±0.01 pH / ±0.2 mV from ±400 mV; ±2 mV beyond / ±0.5°C

### Other accessories

**WD-35100-90** Power cord, 3 ft with bare leads, 3 prong U.S. plug, 110 VAC

**WD-35100-91** NEMA 12 electrical enclosure with one 1/2 DIN cutout. Designed for indoor and outdoor use. Nonmetallic with clear polycarbonate cover. Includes mounting plate and hardware for installation.

# Appendix 1

## Jumper Positions - Internal to the Controller



**CAUTION:** Electrical shock hazard! Make sure to remove AC power to the controller before opening the controller housing.

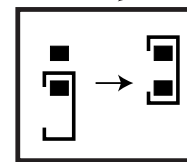
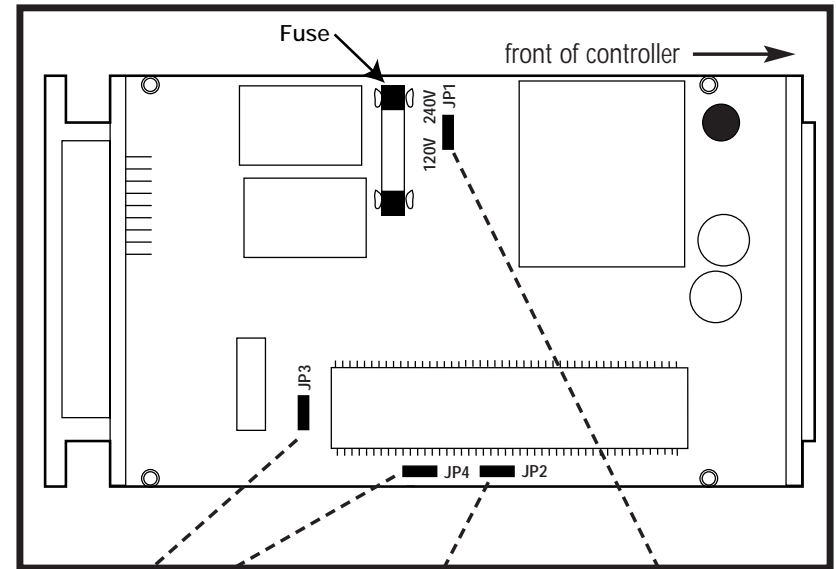
**JP1** Selects the input voltage between 120 VAC or 240 VAC. Controllers are factory shipped as 120 VAC units. To switch to 240 VAC, use tweezers or needle nose pliers to remove jumper from center/bottom pins, and move to center/top pins.

**JP2** Selects whether relays are activated or not activated when pH is in HI SET or LO SET bands. Default setting is not activated. To switch to activated relays, use tweezers or needle nose pliers to remove jumper from single pin only, and move to cover both pins (shorted).

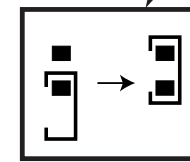
**JP3 + JP4** Selects whether the controller is used in pH or ORP mode. To switch to ORP mode, use tweezers or needle nose pliers to remove both jumpers from single pin only, and move to cover both pins (shorted). If you move only one jumper, the controller will still read in pH units.

**Fuse** Note that there is a fuse internal to the Controller. Replace the fuse with the one recommended by the manufacturer.

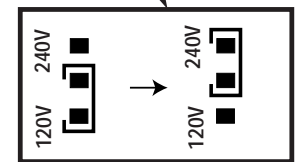
## INTERIOR OF CONTROLLER



JP3 + JP4:  
pH mode  
to ORP mode  
(switch both  
jumpers)



JP2: relays not  
activated to  
relays activated



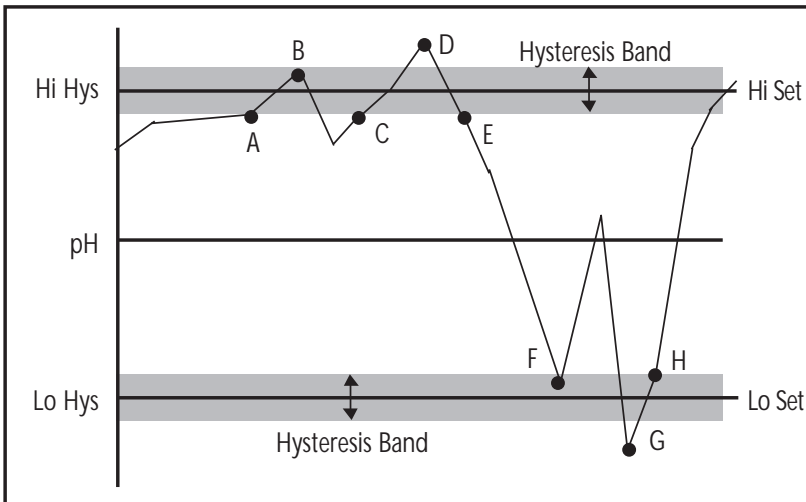
JP1: 120 V to 220 V

## Appendix 2

### About Hysteresis

The controller lets you set High and Low alarms that switch on or off relays, and activate or deactivate devices linked to the controller. In cases where the pH (or 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 lets you 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 8.5 pH and the high hysteresis band is set at 0.4 pH, then the low setpoint cannot be set at higher than  $8.5 - \frac{1}{2} \text{ Hi HYS}$ .



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 3

### Using controller with external relays

The relays on the Oakton 100 series controller are rated for 6 amps at 110 VAC and can be wired directly to your final control element if its power draw does not exceed this.

However, to preserve the life of your controller, or if higher power is needed, we recommend that you use the controller relay to drive an external relay.

The diagram at right shows a typical installation. Wiring should be changed appropriately if normally closed operation is desired.

