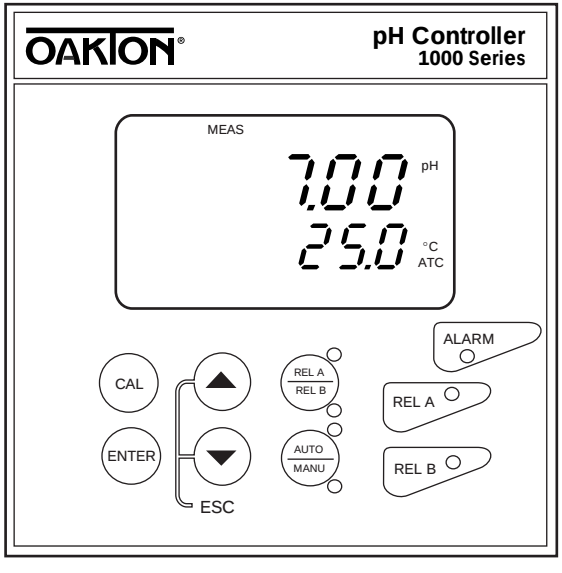
NOTES

List the name and information of your OAKTON distributor in the space below.

OPERATING INSTRUCTIONS

OAKTON 1000 series

¼ DIN pH/ORP Controller



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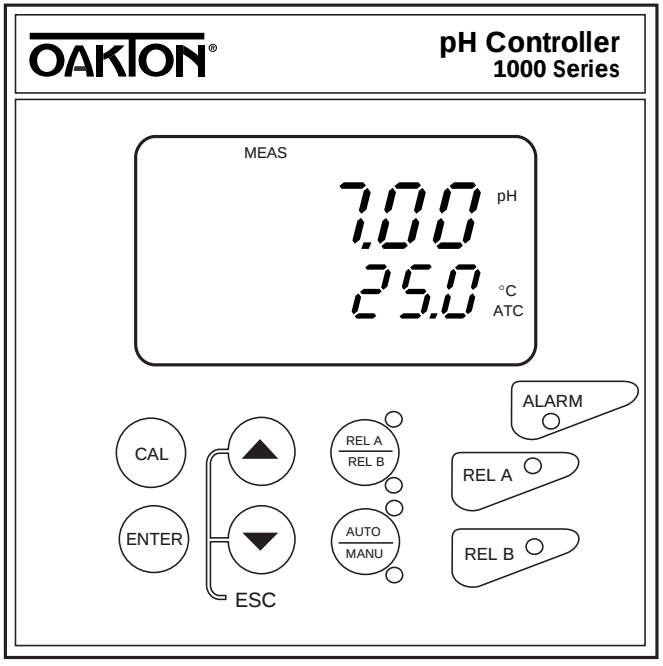
1. Introduction

Thank you for purchasing a microprocessor-based OAKTON 1000-series ¼ DIN pH / ORP controller. You can use this unit to measure either pH or ORP with proportional or on / off control. This controller has many user-friendly features; some of its features include:

- A **menu-driven program** that simplifies set-up
- Large **dual display** LCD shows pH (ORP) and temperature along with clear multiple annunciators
- **Two set point, two SPDT relay operation** for lo / lo, lo / hi, hi / lo or hi / hi control
- **Three control modes**: on / off, proportional pulse length or proportional pulse frequency
- 0 to 2000 second **time delay adjustment** on all relays—minimizes false alarms
- **Separate alarm relay** alerts you to set points exceeded for a specific length of time or a failed temperature sensor
- Separately adjustable **high and low set point hysteresis bands** prevent rapid contact switching if your pH (ORP) value is fluctuating near the set point
- **0-20/4-20 mA transmitter/recorder output** for remote monitoring and hard copy recording
- Protection against electromagnetic interference—**galvanically isolated output**
- **Push button two-point calibration** and electrode offset adjustment from the keypad
- Easy, fast calibration with **auto buffer recognition**
- **Two level password protection**—first level allows quick access to calibration; second level lets you change set up parameters
- **LED indicators** signal control activities to monitor controller status from a distance
- **Nonvolatile memory** maintains setup even when power fails

Use the OAKTON 1000-series controller in panel mounted enclosures for applications such as:

- **water treatment and monitoring**
- **chemical processing**
- **food processing**
- **waste water control.**



Included with your controller

Your controller includes:

- 17-way and 5-way right angled terminal block (one each)
- side threaded rod with catch (two)
- receptacle cable lug (one)
- rubber gasket (one)

About the manual

Please read the first five sections carefully. Section 6 is designed so you can either read the whole section linearly, or skip to the sections that are pertinent to your application. You may want to read through these sections in entirety to familiarize yourself with all of the controller's features.

If you have any questions about this controller, please contact your OAKTON distributor.

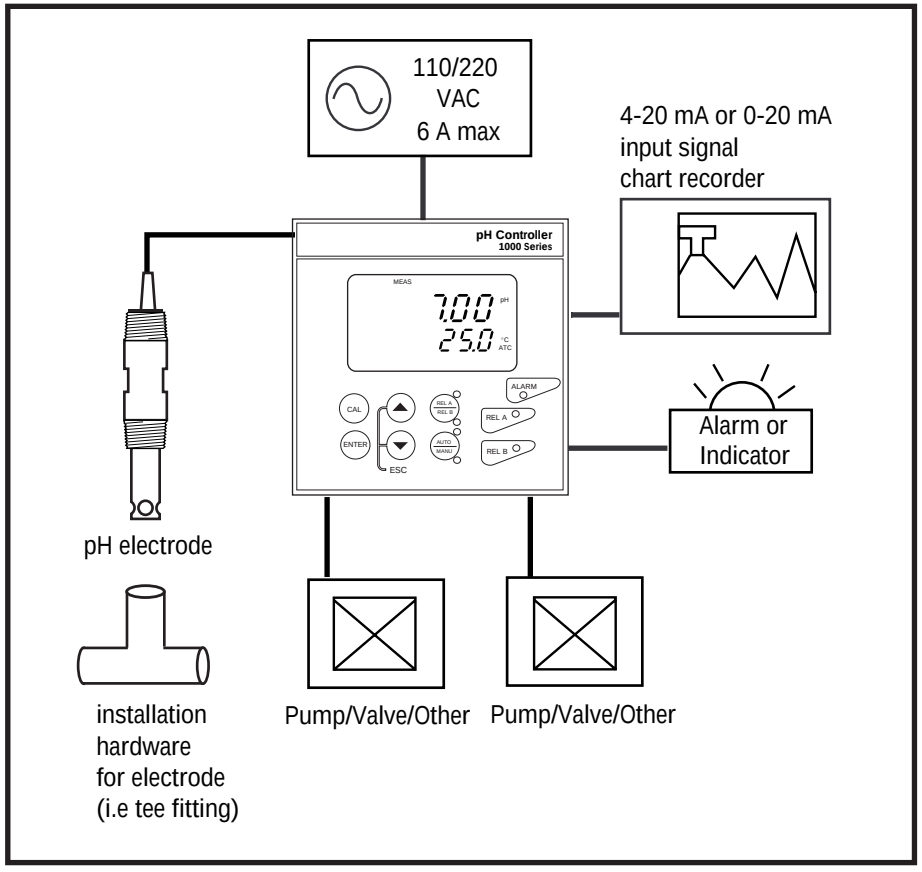
Please read through this manual carefully before installing and operating your controller.

2. Assembly and Installation

2.1 Typical Measurement and Control System

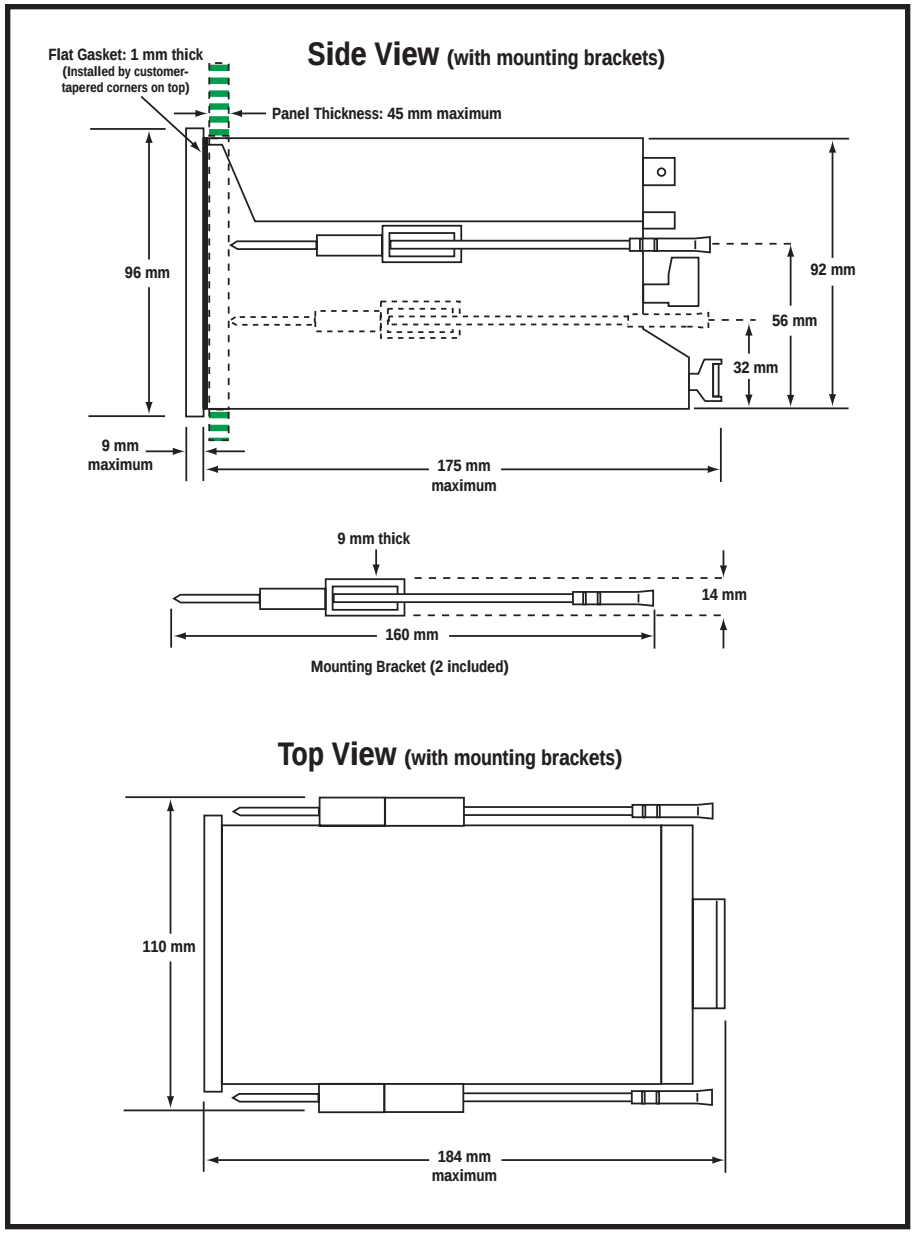
A typical measurement system consists of:

- power source
- the OAKTON 1000-series controller
- a pH (or ORP) combination electrode with integrated or separate temperature sensor (Pt 100 or 1000)
- installation hardware for electrode
- an appropriate pH or ORP measurement cable
- a final control element such as a pump or valve
- a recorder (optional)
- a visual and / or audible alarm (optional)



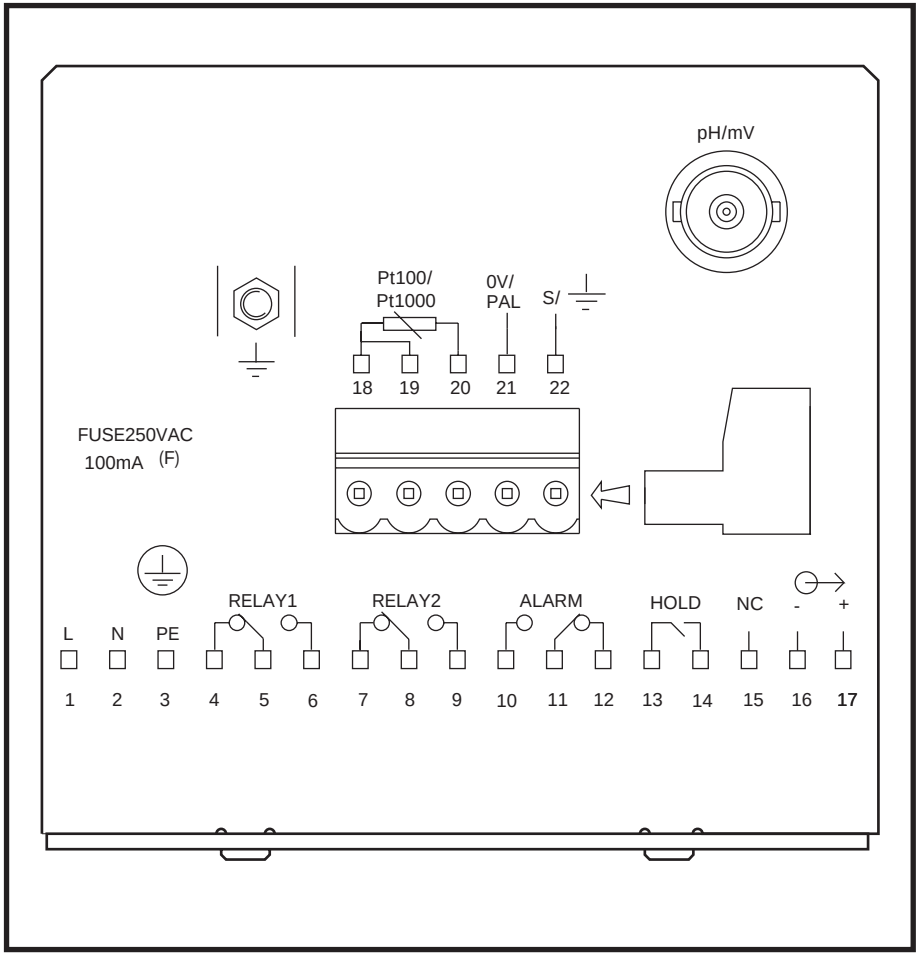
2.2 Unit dimensions

The field-tested control panel housing is 3.78" x 3.78" (96 x 96 mm).
The front panel meets protection class IP 54.



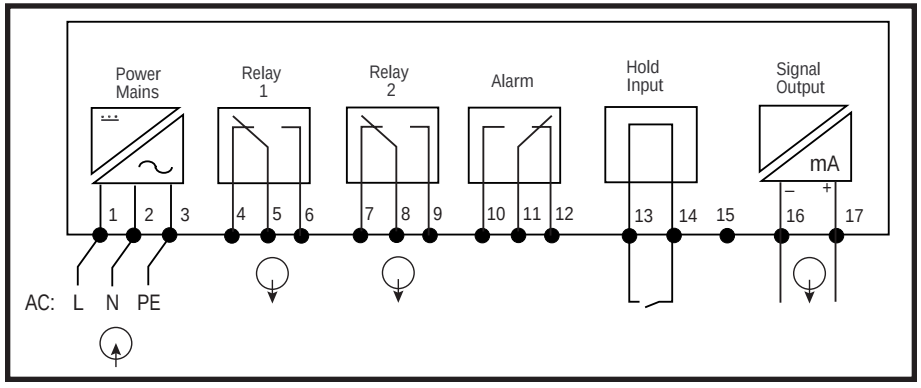
2.3 Back panel

The back panel consists of two different connectors: the 17-way PCB edge connector and the 5-way screw terminal connector.



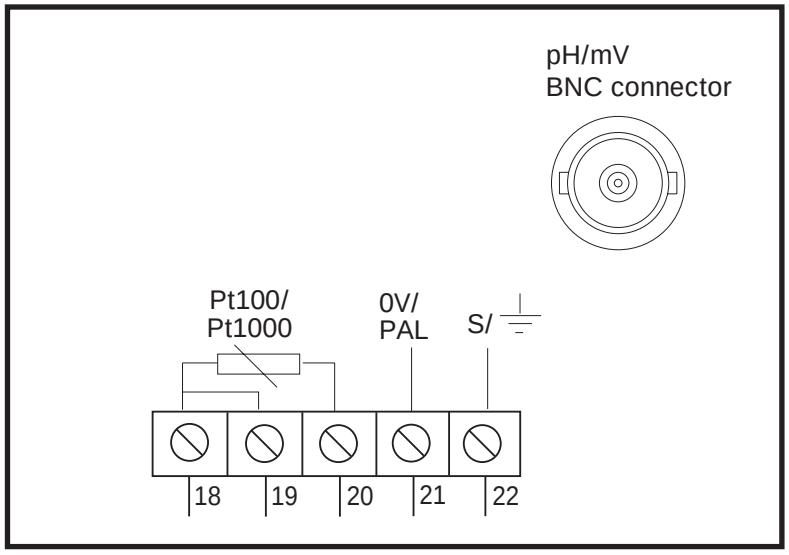
2.4 Electrical Connections

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. VAC live wire
2. VAC neutral wire
3. VAC protective ground wire
   NOTE: Power is selectable for 110 or 220 VAC via an internal jumper.
   Factory setting is indicated on the label on top of the controller.
   See Appendix 3 on page 66 for directions on switching the power type.
4. Low set relay resting position
5. Low set relay common
6. Low set relay working position
7. High set relay resting position
8. High set relay common
9. High set relay working position
10. Alarm relay resting position
11. Alarm relay common
12. Alarm relay working position
13. Hold function switch terminal 1
14. Hold function switch terminal 2
15. No connection
16. 0/4 - 20 mA for – current connection
17. 0/4 - 20 mA for + current connection

2.5 Electrode/temperature sensor connections



18. Pt100 / Pt1000 lead 1 terminal (compensating)
19. Pt100 / Pt1000 sense lead terminal (three-wire RTD)
20. Pt100 / Pt1000 sense lead 2 terminal

NOTE: If using a two-wire RTD, short terminal 19 to terminal 18.

NOTE: Pt100 / Pt1000 is selectable via an internal jumper. Factory default is Pt100. See Appendix 3 on page 66 for directions on switching the RTD type.

21. pH / ORP lead 1 (solution ground, or potential matching pin)
22. pH / ORP lead 2 (shield)

Connect any pH or ORP electrode with a BNC connector to the BNC connector located the upper right side of the controller back panel.

IMPORTANT: when using controller in symmetrical mode, be sure to connect solution ground (potential matching pin) to terminal 21. Failure to connect potential matching pin will result in unstable, erroneous readings. See Appendix 2 on page 65 for more information on symmetrical mode.

2.6 HOLD function

The HOLD function lets you force the relays to their resting position by applying a contact closure across terminals 13 and 14.

When the HOLD function is activated, the HOLD indicator will appear in the upper left corner of the display (see page 13 for a diagram of display characters).

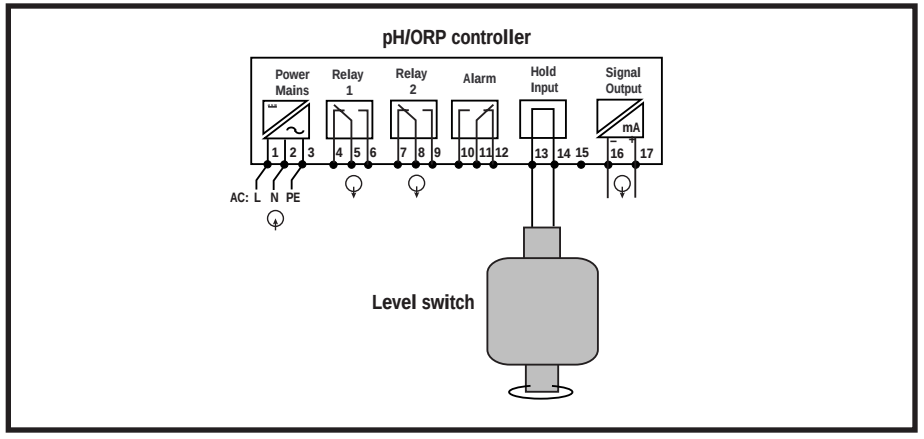
Typical applications:

Float or level switch: Connect to a float switch in your reagent feed tank to shut down pumps or tanks when out of reagent.

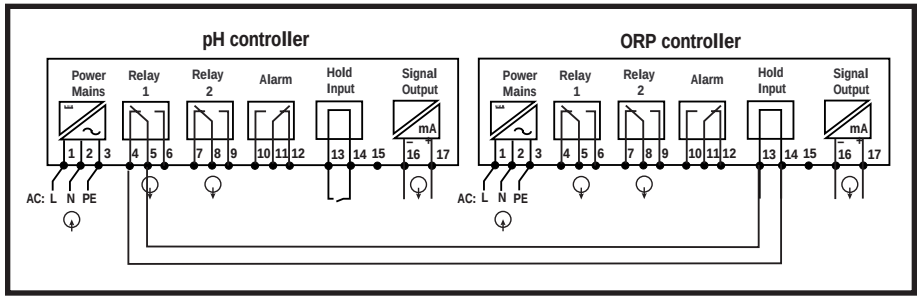
Flow switch: Connect to a flow switch to shut down pumps or valves when the process stream is shut down.

Dual pH/ORP control: Connect relay of pH controller to hold input of the ORP controller to ensure that Reducing / Oxidizing agent is only added when at a specified level.

Typical level switch wiring



Typical dual controller wiring



3. Overview: Keypad and display

3.1 Keypad

Calibration key

Lets you:

1. Perform rapid 1- or 2-point calibration (password required).

Enter key

Lets you:

1. Select individual parameters within the parameter group.
2. Store input data in the Set-up mode.
3. Start calibration in the Calibration mode.

▲ and ▼ keys

Let you:

1. Select various parameter groups.
2. Set parameters and numerical values in the Set-up mode.
   If you continuously hold the button, the setting speed increases.
3. Control the relays in the Manual mode.
4. Return to the Measurement mode when both keys are pressed at once.

Relay control key

Lets you:

1. Switch between Auto and Manual relay operation (password required).

Relay Selection key

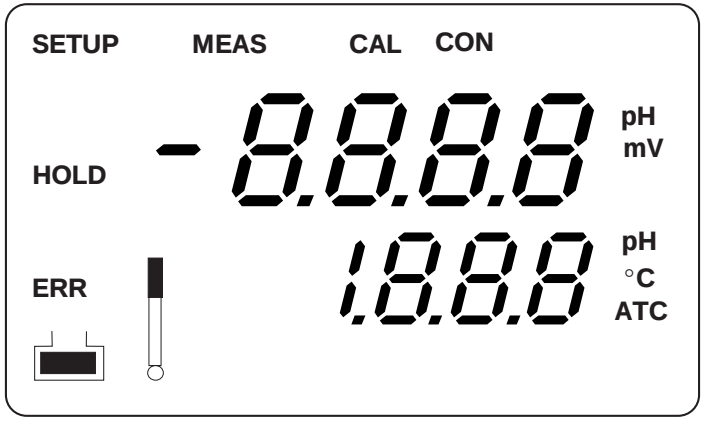
Lets you:

1. Display momentarily set-point values for the relay contacts in Auto relay operation mode.
2. Switch between Relay 1 and Relay 2 in Manual relay operation mode.

3.2 Display

The LCD display features two numerical displays that show measured values and status messages for easy, quick reference. The display provides short-text information for configuration and for setting parameters.

- The upper (primary) display shows pH or ORP readings
- The lower (secondary) display shows temperature readings



The LCD display area includes the following indicators:

HOLD: HOLD indicator

SETUP: Advanced Set-up mode

MEAS: Measurement mode

CAL: Calibration mode

CON: Confirmation indicator

ERR: error / alarm indicator

°C: temperature units

ATC: indicates automatic temperature compensation

 : buffer indicator

 : electrode indicator

3.3 LED Indicators

The LED indicators provide a quick way to check controller status. They show whether a parameter within its set limits (green light) or outside its set limits (red light).

Relay A

GREEN — Measured value is within limit entered for Set-point 1.

RED — Measured value is outside limit entered for Set-point 1.

Relay B

GREEN — Measured value is within limit entered for Set-point 2.

RED — Measured value is outside limit entered for Set-point 2.

Alarm

NONE — No alarm condition exists.

RED — Alarm condition exists. Measured value has been outside of set-point 1, set-point 2, or both for longer than set alarm delay time value. This indicator also will light if the temperature sensor fails. The error indicator will also appear on the display.

4. Starting up

When you initially connect power to the controller, it will automatically enter Measurement mode. This controller features a large dual display.

- The upper display will show the present pH (ORP) value
- The lower display will show the temperature value

Annunciators along the right side of the display will indicate whether the controller is set for pH or ORP measurement.

4.1 Security codes

To access calibration and set up functions, you need to enter a security code. This controller features two levels of security codes to protect the numerical values, calibration data and unit parameters from unintentional alteration.

The two security codes are as follows:

—pH (ORP) calibration mode security code = 11.
— Setup mode security code = 22.

You cannot change calibration and set up parameters unless you first enter the security code. You can, however, view all parameters without knowing the security code.

- Refer to Section 5 on page 19 for more information on the Calibration mode
- Refer to Section 6 on page 23 for more information on the Advanced Set-up mode.

Security code notes

If you are viewing the parameters only, the controller automatically reverts to Measurement mode if you do not press a button for 1 minute. If you are changing parameters, the controller automatically reverts to Measurement mode if you do not press a button for 15 minutes.

4.2 Viewing operating parameters

You can view operating parameters without entering the security code. However, you must enter the security code to change parameters.

Viewing relay set point values:

1. **Press the Relay Selection (Rel A/Rel B) key.** The upper display will show your set-point value for Relay A; the lower display will show “SP1”.
2. After two seconds the upper display will show your set-point value for Relay B; the lower display will show “SP2”.
3. After an additional two seconds the controller will return to Measurement mode.

Viewing electrode slope and offset:

1. **Press the CAL key.** The display will cue you to enter a security code (C.Cd).
2. **Leave the security code at “000”**.
3. **Press the ENTER key.** The upper display will show electrode slope. The lower display will show the pH reading at 0 mV.
4. **Press the ENTER key again** to return to measurement mode.

Viewing set up parameters:

1. **Press the ENTER key.** The display will cue you to enter a security code (S.Cd).
2. **Leave the security code at “000”**.
3. **Press the ENTER key again.** This lets you view (not change) sub groups.
4. **Press the ▲ and ▼ keys** to scroll through the groups.
5. **Press the ENTER key** to view a sub group you wish to see in more detail.
6. **Press the ENTER key repeatedly** to scroll through the parameters of the sub group you selected.
7. **Press the ▲ and ▼ keys** when you return to the sub group head to select another subgroup.
8. Repeat steps 4 to 7 as needed.
9. **Press the ▲ and ▼ keys together (escape)** at any time to return to Measurement mode.

4.3 Entering pH (ORP) Calibration mode

To change calibration data, follow these steps:

1. **Press the CAL key.** The upper display will show “000” and the lower display will show “C.Cd”.

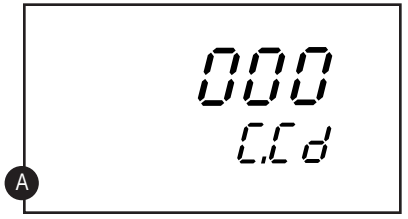
See figure A

2. **Press the ▲ key** to scroll the upper display to Calibration security code “11”.

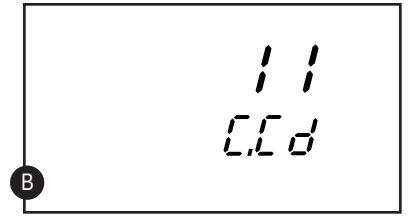
See figure B

3. **Press the ENTER key.**
   NOTE: Pressing ENTER at a security code other than “11” will cause the controller to revert to the Measurement mode.
4. **Press ENTER again** . This lets you begin calibration.

Press the ▲ and ▼ keys simultaneously (escape) to return to Measurement mode.



A



B

See pages 19-22 for pH and ORP calibration instructions.

Clearing the Calibration security code from the display

The Calibration security code automatically resets from “11’ to “000” after you return to Measurement mode, so you do not need to clear the security code from the display.

Notes

When you enter the Calibration mode with code “11”, the unit will automatically enter into the HOLD mode until you program further instructions (HOLD annunciator appears in upper left corner of display). While on HOLD, the current output and relay positions are frozen.

4.4 Entering Advanced Set-up mode

1. **Press the ENTER key.** The upper display will show “000” and the lower display will show “S.Cd”.

See figure A

2. **Press the ▲ key** to scroll the upper display to Set-up security code “22”.

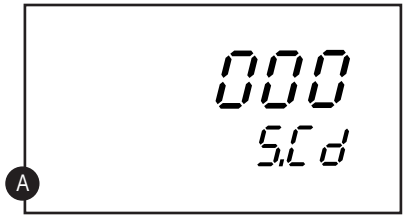
See figure B

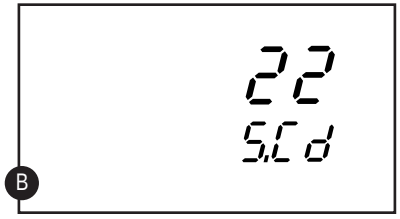
3. **Press the ENTER key.**

NOTE: Pressing ENTER at a value other than “22” will cause the controller to revert to the Measurement mode.

4. You are now in the Advanced set-up mode.

Press the ▲ and ▼ keys simultaneously (escape) to return to Measurement mode.





See pages 23-57 for Advanced Set Up mode instructions.

Clearing the Advanced Set-up security code from the display

After you have entered the security code and returned to Measurement mode, whenever you press the ENTER key the security code “22” will appear on the display. **To conceal the security code, you must manually reset the code.**

To clear the Advanced Set-up security code from the display:

1. **Press the ENTER key** in the Measurement mode.
2. **Press the ▲ and ▼ keys** to set display to any security code except 11 or 22.
3. **Press the ENTER. key.**

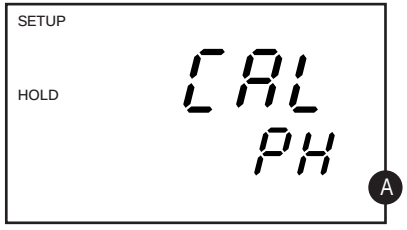
Notes

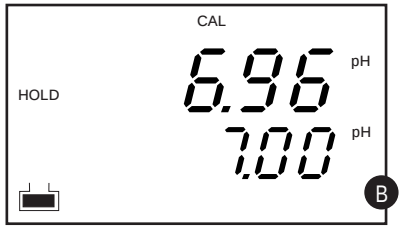
When you enter the Advanced Set-up mode with security code “22”, the unit will automatically enter into the HOLD mode until you program further instructions (HOLD annunciator appears in upper left corner of display). While on HOLD, the current output and relay positions are frozen.

5. Calibration

You can reach the Calibration mode in two ways:

- **From calibration mode.** From measurement mode, press the CAL key. Press the ▲ and ▼ keys to enter Security code “11”. Press the ENTER key.
- **From advanced set up mode.** From measurement mode, press the ENTER key. Press the ▲ and ▼ keys to enter Security code “22”. Press the ENTER key. Press the ▲ and ▼ keys to scroll to set up mode “CAL PH”.





5.1 pH Calibration

This unit features five preset buffer values (1.00, 4.00, 7.00, 9.00 and 10.00) for fast auto calibration. When you calibrate this instrument, you need a standard pH buffer solution that matches one of these values.

1. **Enter Calibration mode**. From measurement mode, press the CAL key. Press the ▲ key to enter Security code “11”. Press the ENTER key.

See figure A

NOTE: The upper and lower display should read CAL pH. If they read CAL OrP, see section 6.7.1 on page 49 for directions on how to switch from ORP to pH readings.

2. **Press the ENTER key** to begin calibration. The “CAL” and buffer indicator appear on the display.

   The upper display shows your present uncalibrated reading. The lower display indicates one of the preset pH buffer values.

3. **Press the ▲ and ▼ keys** to scroll the lower display to the buffer value that matches your standard solution.

See figure B

continued on next page

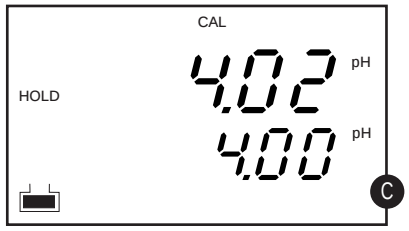
4. **Make sure the electrode is in your buffer solution**. In ATC mode, you must also immerse the temperature sensor in the buffer solution. In the symmetrically high-resistance measurement mode, you must also immerse the solution ground (potential equalization pin) in the buffer.
5. **Press the ENTER key** to confirm the buffer value. The electrode indicator and CAL indicator will both flash.
6. **Allow the electrode to stabilize.** You can press the ENTER key to enter the calibration value. If you do not press the ENTER key, the controller will automatically enter the calibration value when the electrode reading is stable.
7. If you want to calibrate the controller at a second point, repeat steps 4 through 6 with a second buffer.

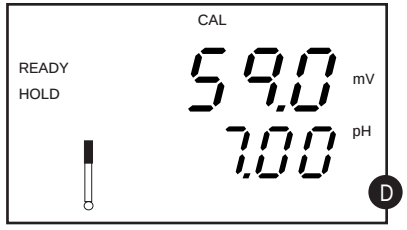
See figure C

8. After calibrating to a second buffer value, this controller automatically displays slope in the upper display and offset in the lower display.

See figure D

9. If you entered the Calibration mode using the CAL key, the controller will automatically return to the measurement mode. Or, press ▲ and ▼ (escape) together to return to measurement mode.





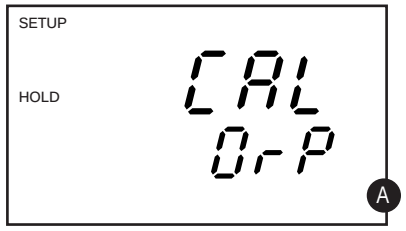
Notes

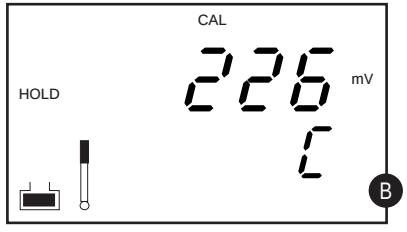
If there is a calibration error, the controller displays “ERR”. If this happens, push both ▲ and ▼ (escape) to restart the calibration beginning from step 1.

When calibrating with manual temperature compensation, the controller automatically changes from the preset process temperature to the preset calibration temperature. After leaving the Calibration mode, the controller switches back to the process temperature. To set the calibration temperature and the process temperature, see section 6.3.4 on page 31.

You can view the values for electrode slope and offset without calibration—see section 4.1 on page 16 for instructions. The slope and offset are re-determined after each calibration.

5.2 ORP Calibration





5.2.1 ORP mV calibration

1. **Enter Calibration mode**. From measurement mode, press the CAL key. Press the ▲ key to enter Security code “11”. Press the ENTER key. The display reads CAL ORP.

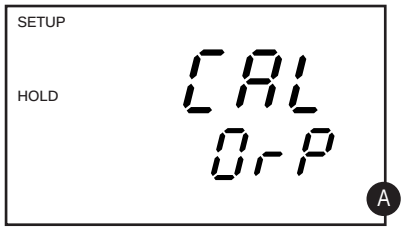
See figure

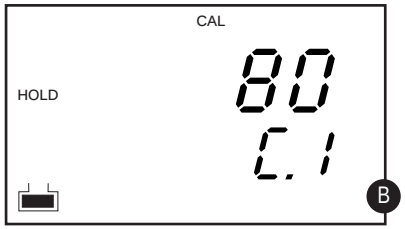
NOTE: If the upper and lower display read CAL PH, see section 6.7.1 on page 49 for directions on how to switch from pH to ORP mV readings.

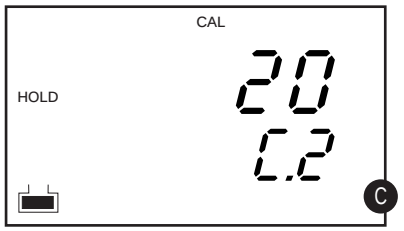
2. **Place sensor in the calibration solution.**
3. **Press the ENTER key** to begin calibration. The “CAL” indicator will appear on the display. The upper display shows the current mV output of the electrode without any offset adjustment.

See figure

4. Determine the mV value of your solution with a meter known to be accurate.
5. **Press the ▲ and ▼ keys** to offset the mV value on the controller display to match the value of the solution you are measuring.
6. To return to Measurement mode, **press the ENTER key** again.







5.2.2 ORP % Calibration

The ORP % mode lets you calibrate at two points: a low concentration sample (20%) and a high concentration sample (80%).

To calibrate your controller for ORP:

1. **Enter Calibration mode**. From measurement mode, press the CAL key. Press the ▲ key to enter Security code "11". Press the ENTER key. The display reads CAL ORP.

See figure A

NOTE: If the upper and lower display read CAL PH, see section 6.7.1 on page 49 for directions on how to switch from pH to ORP %readings.

2. **Press the ENTER key** to begin calibration. The "CAL" indicator will appear on the display. The upper display will show 80. The lower display will show C1 (= calibrated value 80%).

See figure B

3. **Place sensor in the high concentration sample** (relative value of 80%).
4. **Press the ENTER key** to confirm the value. The electrode indicator and CAL indicator will flash. The unit automatically adjusts its reading to match the solution value.
5. **Press the ENTER key** to calibrate at 20% (low concentration value). The upper display will show 20. The lower display will show C2 (= calibrated value 20%).

See figure C

6. **Place sensor in the low concentration sample** (relative value of 20%).
7. **Press the ENTER key** to confirm the value. The electrode indicator and CAL indicator will flash. The unit automatically adjusts its reading to match the solution value.
8. If you entered the Calibration mode using the CAL key, the controller will automatically return to the Measurement mode upon completion.

Notes

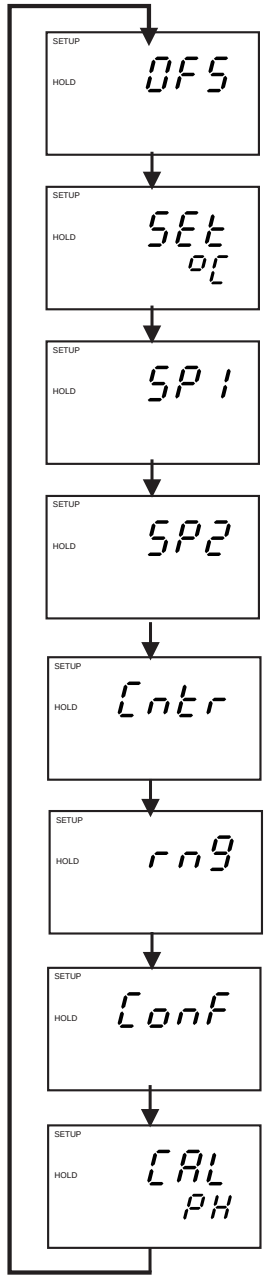
If there is a calibration error, the controller displays "ERR," and does not automatically return to Measurement mode. If this happens, push ▲ and ▼ at the same time (escape) to restart the calibration beginning from step 1.

If you stop calibration after entering the first value, or if calibration is defective, the controller will use its original calibration data.

6. Advanced set up mode

The OAKTON 1000-series pH / ORP controller features eight sub groups that organize all set-up parameters. These parameters let you customize your controller for your exact process.
The sub groups are:

1. Offset adjustment (OFS)
2. Temperature settings (SEt °C)
3. Control Relay 1 configuration (SP1)
4. Control Relay 2 configuration (SP2)
5. Control type (Cntr)
6. Current output (rng)
7. Controller configuration (ConF)
8. pH (or ORP) calibration (CAL pH or CAL ORP)



To view set-up parameters without access to change them:
From measurement mode:
• Push the ENTER key.
• Leave the security code at "000".
• Push the ENTER key again.

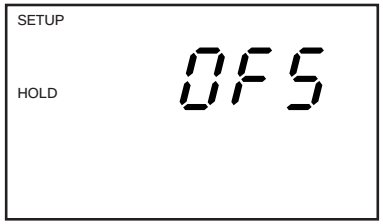
To change set-up parameters:
From measurement mode:
• Push the ENTER key.
• Press the ▲ key to scroll to security code "22".
• Push the ENTER key again.

See pages xx-xx for detailed information on each set up parameter.

Notes

To simplify operations, the controller will not display set up parameters that are not relevant to the set up of the controller. For example: If you set the controller for On / Off control, it will not display pulse length settings.

6.1 Advanced set-up mode sub group overview

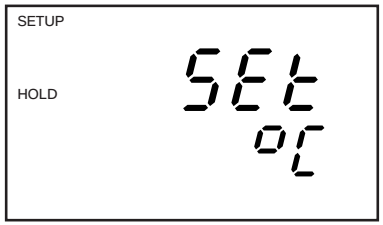


See pages 26-27 for complete offset mode set up instructions

OFS: Offset mode

Available during pH operation only:

- Set probe offset value



See pages 28-32 for complete temperature settings set up instructions

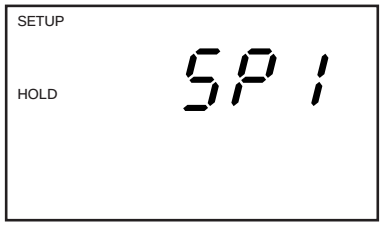
SET °C: Temperature settings

Available during pH operation only:

- Toggle automatic temperature compensation (ATC) on or off

If ATC selected on:
- Temperature sensor calibration

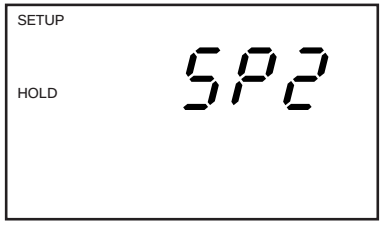
If ATC selected off:
- Set process temperature
- Set calibration temperature



See pages 33-38 for complete Control Relay 1 set up instructions

SP1: Set up for relay 1

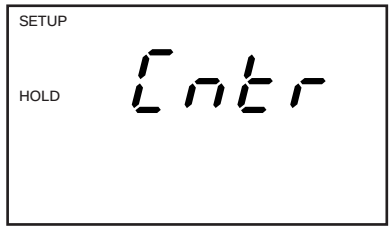
- Select value for relay 1
- Select relay as low or high set point
- Set hysteresis (dead band)
- Set time delay for when relay switches on
- Set time delay for when relay switches off



See pages 33-38 or complete Control Relay 2 set up instructions

SP2: Set up for relay 2

- Select value for relay 2
- Select relay as low or high set point
- Set hysteresis (dead band)
- Set time delay for when relay switches on
- Set time delay for when relay switches off



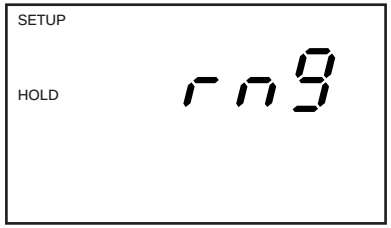
See pages 39-43 for complete controller type set up instructions

CNTR: Control type

- Select control type (on / off, pulse frequency, pulse length, or controller off)

On/off, pulse frequency, pulse length modes only:
- Select break contact (de-energized) or make contact (energized) relay type

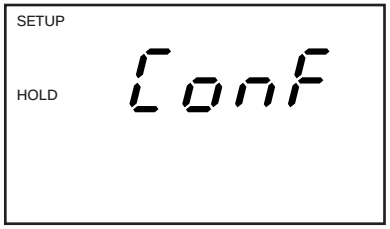
Pulse frequency or pulse length modes only:
- Set proportional band
- Select relay period duration (or select maximum frequency)



See pagess 44-47 for complete current output set up instructions

rng: Current output

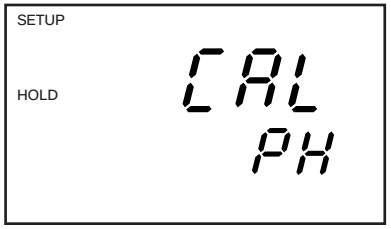
- Choose 0-20 or 4-20 mA output
- Select value equivalent to 0 (4) mA
- Select value equivalent to 20 mA



See pages 48-53 for complete controller configuration set up instructions

ConF: Controller configuration

- select pH, ORP mV, or ORP % measurement, plus symmetrical or asymmetrical mode
- Select alarm relay delay in seconds
- Select steady or pulse alarm contact
- Select electrode type: glass or antimony
- Reset to controller default settings



See pages 54-57 for complete calibration set up instructions

CAL pH (ORP): pH (ORP) Calibration

- Calibrate first value
- Calibrate second value
- Automatic display of slope and offset after second calibration point

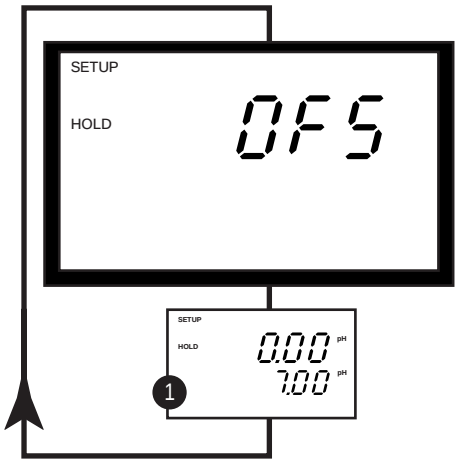
6.2 OFS: Offset sub group

OFS: Offset subgroup overview

The Offset sub group lets you:

1. Set pH probe offset value

This sub group is available during pH operation only.



6.2.1 Calculating the pH electrode offset value

NOTE: *you can only perform electrode offset in the pH mode.*

The offset sub group lets you change the pH probe offset without removing the probe from your system. You can make adjustments of up to ±120 mV of the displayed value.

The controller will add or subtract the offset value from the measured pH and display the correct value. However, if you need to offset the value beyond the average offset you would expect in your application type, consider a full calibration or even electrode replacement. To determine your pH offset value:

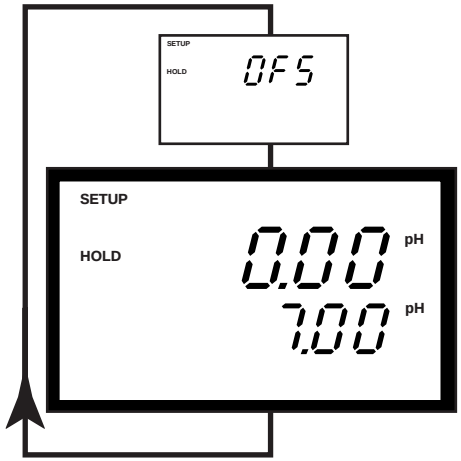
1. **Pull a grab sample from your system.** Record the controller's pH reading at the time you take the sample.
2. **Measure the pH of your grab sample using a calibrated pH meter.** Record the correct pH value.
3. **Subtract the correct pH value from the controller's reading in step 1.** This value is your offset.

6.2.2. Entering the pH offset value:

From measurement mode:

1. **Enter Advanced set-up mode.** Push the ENTER key. Press the ▲ key to scroll to security code "22". Push the ENTER key again.
2. **Press the ▲ and ▼ keys** to scroll until the upper display shows OFS.
3. **Press the ENTER key.** The lower display shows the current measured pH value. The upper display shows the current offset value.

   See bold figure at right.



4. **Press the ▲ and ▼ keys** to adjust the offset value until the upper display shows the offset value calculated as explained in directions above. As you adjust the offset value, the lower display will update to match the current reading plus the electrode offset.
5. **Press the ENTER key** to enter the offset value.
6. Proceed to step 3 of section 6.2.1, or press the ▲ and ▼ keys together to return to measurement mode.

Notes

The offset value is reset during full calibration. See Section 5.1 starting on page 19 for pH calibration instructions.

6.3 SET °C: Temperature settings

SET °C: Temperature settings

The temperature settings sub group lets you:

1. Toggle automatic temperature compensation (ATC) on or off

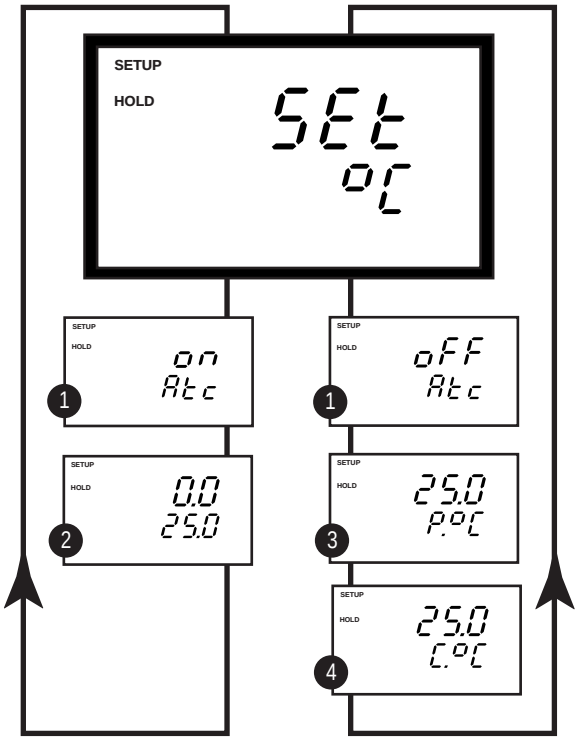
If ATC selected on:

2. Temperature sensor calibration

If ATC selected off:

3. Set process temperature
4. Set calibration temperature

This sub group is available during pH operation only.



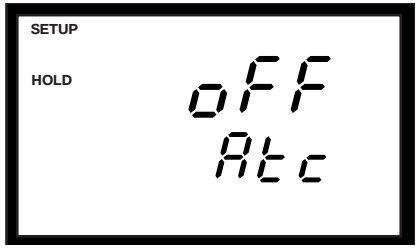
This set up group has two different sub paths. The screens you see depend on if you select ATC on or off.

6.3.1 Selecting automatic or manual temperature compensation

From measurement mode:

1. **Enter Advanced set-up mode.** Push the ENTER key. Press the ▲ key to scroll to security code “22”. Push the ENTER key again.
2. **Press the ▲ and ▼ keys** to scroll until the upper display shows SEt °C.
3. **Press the ENTER key.** The lower display will show “Atc”; the upper display will show “on” or “oFF”.

   See figures at right



4. **Press the ▲ and ▼ keys** to toggle between ATC on and off.
5. **Press the ENTER key** to confirm selection.
6. • **If you selected ATC on:** Proceed to step 3 of section 6.3.2
   • **If you selected ATC off:** Proceed to step 3 of section 6.3.3
   • **To return to Measurement mode:** Press the ▲ and ▼ keys together

6.3.2 Temperature sensor calibration (ATC mode only)

NOTE: *This parameter is blanked out when the controller is set for ATC off.*

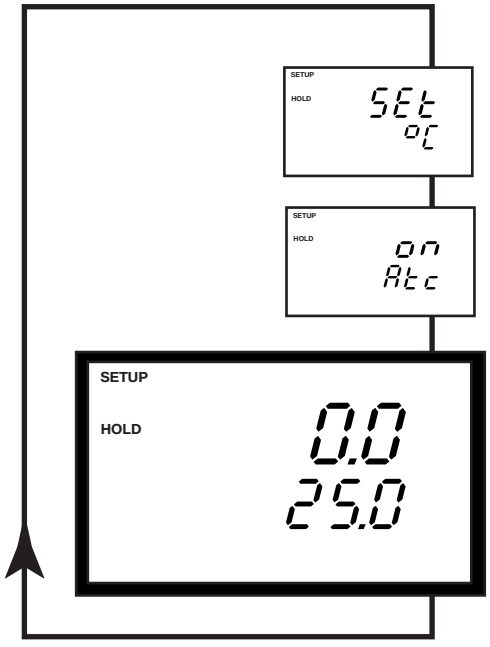
This mode lets you offset the controller to compensate for small inaccuracies in your temperature sensor. You can offset the temperature sensor up to ±5°C.

1. **Select "ATC on"** as described in Section 6.3.1.
2. **Press the ENTER key.** The upper display shows the temperature offset. The lower display shows the current measured temperature.

See bold figure at right

3. **Compare the current measured temperature on the controller display to a thermometer known to be accurate.**
4. **Press the ▲ and ▼ keys** to scroll the lower display to match the known temperature. The upper display shows the amount of offset. You can offset temperature up to ±5°C.
5. **Press the ENTER key** to confirm selection and return to advanced set up mode.

Return to Measurement mode by pressing the ▲ and ▼ keys (escape) simultaneously.



6.3.3 Manual temperature compensation

Manual temperature compensation lets you ignore your temperature probe input or use a probe without a built-in temperature sensor. The controller will compensate for temperature at the values you enter.

For manual temperature compensation, you can set two different temperatures:
- process temperature
- calibration temperature

This allows calibration at a temperature other than your process temperature.

Example: setting a calibration temperature of 25°C lets you calibrate using standard buffer solutions at 25°C, even if your process temperature is a different temperature.

You can set process and calibration temperatures between –9.9 to 125°C.
Default temperature is 25°C.

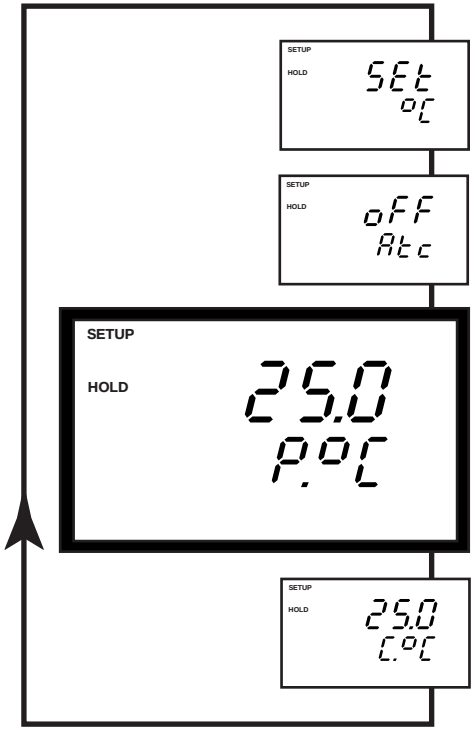
6.3.4 Setting pH Process Temperature

NOTE: *This parameter is blanked out when the controller is set for ATC on.*

1. **Select "ATC off"** as described in Section 6.3.1.
2. **Press the ENTER key.** The upper display shows the current process temperature and the lower display shows P.^{O}C (process temperature).

See bold figure at right

3. **Press the ▲ and ▼ keys** to adjust the process temperature value. You can adjust the value from –9.9 to 125°C.
4. **Press the ENTER key** to confirm selection.
5. Proceed to step 3 of section 6.3.5, or press the ▲ and ▼ keys together to return to measurement mode.



6.3.5 Setting pH Calibration Temperature

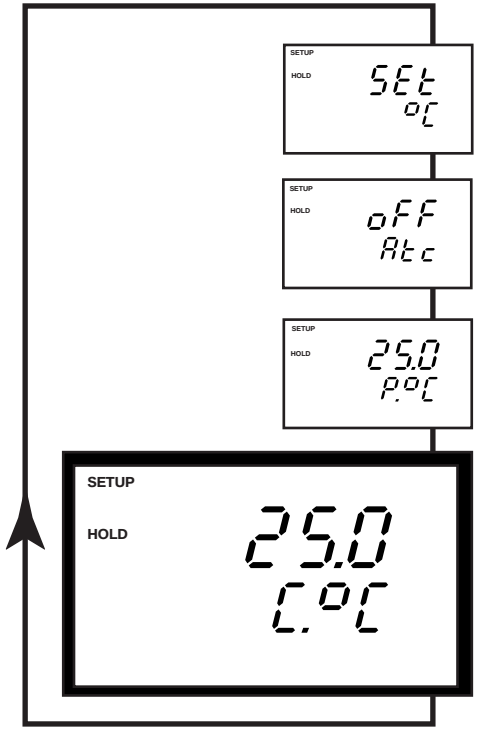
NOTE: *This parameter is blanked out when the controller is set for ATC on.*

From measurement mode:

1. **Select "ATC off"** as described in Section 6.3.1
2. **Press the ENTER key twice.** The upper display shows the current calibration temperature and the lower display shows C.°C (calibration temperature).

   See bold figure at right
3. **Press the ▲ and ▼ keys** to adjust the calibration temperature value. You can adjust the value from –9.9 to 125°C.
4. **Press the ENTER key** to confirm selection and return to advanced set up mode.

Return to Measurement mode by pressing the ▲ and ▼ keys (escape) simultaneously.



6.4 SP1 (SP2): Set up for Relay 1 (2) sub group

SP1 (SP2): Set up for relay SP1 (SP2) overview:

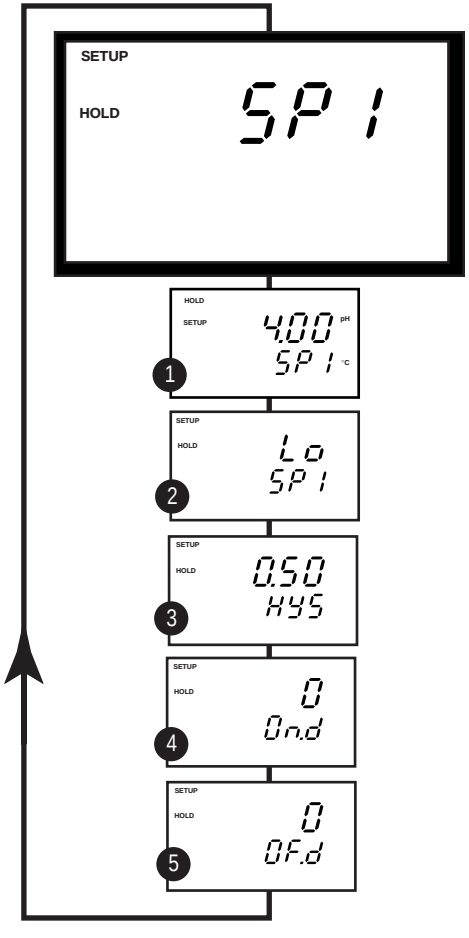
Relay set up 1 and relay set up 2 sub groups let you:

1. Select value for relay SP1 (SP2)
2. Select relay as low or high set point

These modes appear only if on/off control type is selected (select control type in Controller sub group—see page 40):

3. Set hysteresis (dead band)
4. Set time delay for when relay switches on
5. Set time delay for when relay switches off

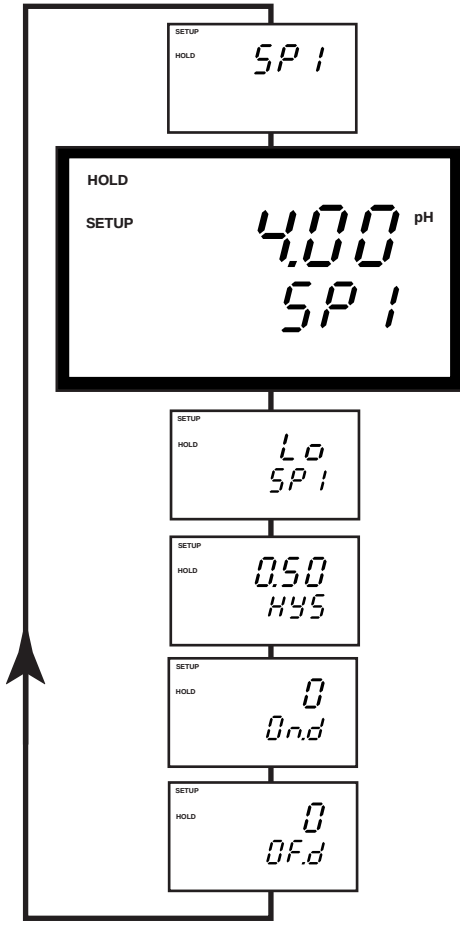
The SP1 option sets the operating parameters for relay 1; the SP2 option sets the operating parameters for relay 2. Since these two groups offer the same set-up parameters, they are described together.



6.4.1 Selecting the relay set point values

This lets you choose the pH (or ORP) value that will cause your controller to activate.

If this value is crossed, and the alarm relay is selected ON, the alarm will trigger. Additionally, the set point relay LED will turn from green to red.



From measurement mode:

1. **Enter Advanced set-up mode.** Push the ENTER key. Press the ▲ key to scroll to security code "22". Push the ENTER key again.
2. **Press the ▲ and ▼ keys** to scroll until the upper display shows SP1 (SP2).
3. **Press the ENTER key.** The upper display shows the current set point value and the lower display shows SP1 (SP2).

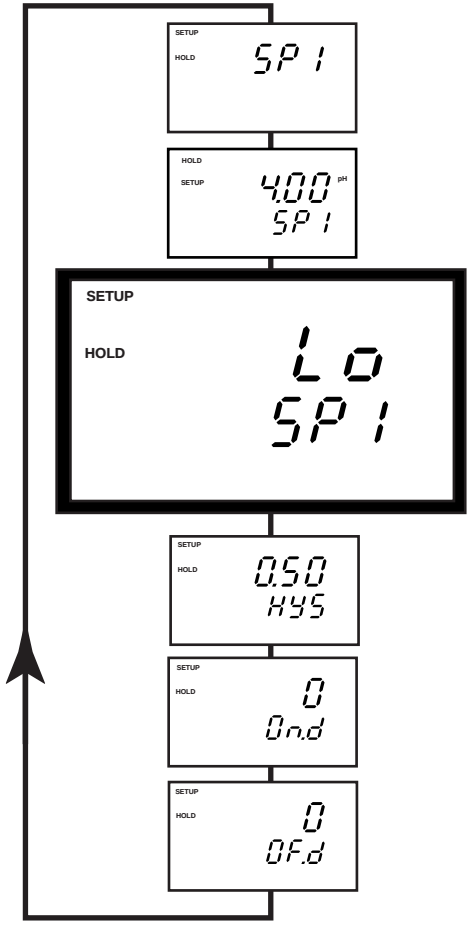
See bold figure at right.

4. **Press the ▲ and ▼ keys** to enter your value for Set Point 1 (Set Point 2). Your controller will activate at the value you select.
5. **Press the ENTER key** to confirm your selection.
6. Proceed to step 3 of section 6.4.2, or press the ▲ and ▼ keys together to return to measurement mode.

6.4.2 Selecting relay as high or low set point

Select a low set point to activate controller when your value undershoots the set point; select a high set point to activate controller when your value overshoots the set point.

Using both SP1 and SP2, you can select lo / lo, lo / hi, hi / lo, or hi / hi set points.



From measurement mode:

1. **Enter Advanced set-up mode.** Push the ENTER key. Press the ▲ key to scroll to security code "22". Push the ENTER key again.
2. **Press the ▲ and ▼ keys** to scroll until the upper display shows SP1 (SP2).
3. **Press the ENTER key** until the upper display shows Lo or Hi (for low or high set point) and the lower display shows SP1 (SP2).

See bold figure at right.

4. **Press the ▲ and ▼ keys** to toggle between low (lo) or high (hi) set point for SP1 (SP2).
5. **Press the ENTER key** to confirm your selection.
6. Proceed to step 3 of section 6.4.3, or press the ▲ and ▼ keys together to return to measurement mode.

Notes

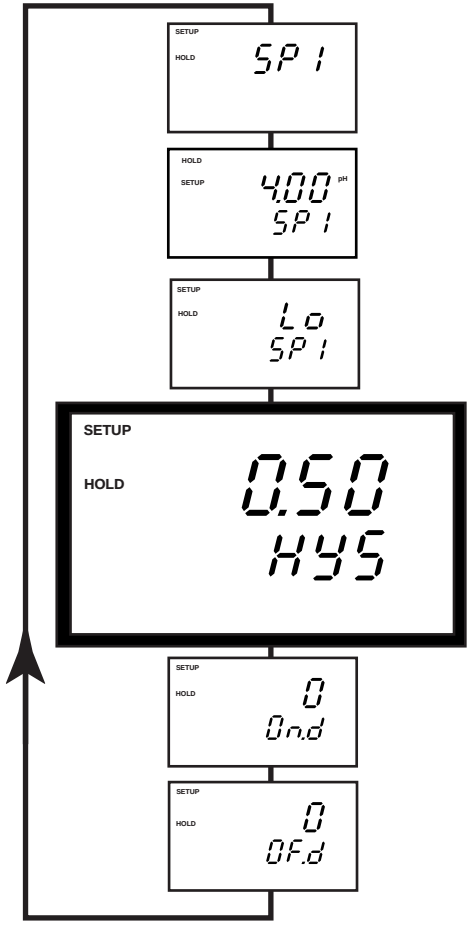
If controller is set for proportional control, you will return to Advanced Set up mode after pressing ENTER. See page 40 for information on changing your controller type.

6.4.3 Selecting a hysteresis (dead band) value

NOTE: *this parameter appears only if on/off control type is selected.*

Hysteresis prevents rapid contact switching if your value is fluctuating near the set point. It allows the set point value to overshoot by the specified hysteresis value. You can set the hysteresis value from:

- pH mode: 0.1 to 1.0 pH
- ORP mV mode: 10 to 100 mV
- ORP % mode: 1 to 10.0%



From measurement mode:

1. **Enter Advanced set-up mode.** Push the ENTER key. Press the ▲ key to scroll to security code "22". Push the ENTER key again.
2. **Press the ▲ and ▼ keys** to scroll until the upper display shows SP1 (SP2).
3. **Press the ENTER key** until the upper display shows the hysteresis (dead band) value and the lower display shows HYS.

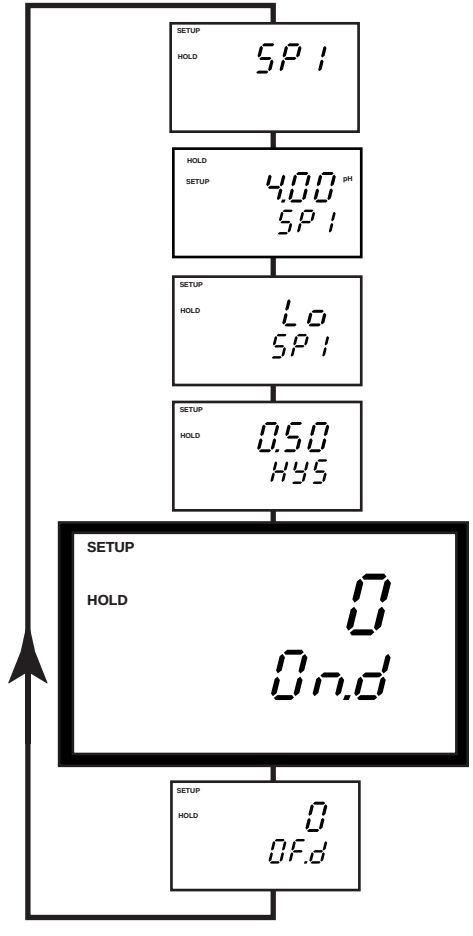
See bold figure at right.

4. **Press the ▲ and ▼ keys** to enter your hysteresis value for SP 1 (SP 2). Your controller will activate at the value you select.
5. **Press the ENTER key** to confirm your selection.
6. Proceed to step 3 of section 6.4.4, or press the ▲ and ▼ keys together to return to measurement mode.

6.4.4 Setting an on-delay time lag

NOTE: *this parameter appears only if on/off control type is selected.*

You can set a time delay for each relay, which stops the relay from switching on too soon. This helps prevent premature relay action and false alarms. This controller lets you set a 0 to 2000 second time delay before your relay activates.



From measurement mode:

1. **Enter Advanced set-up mode.** Push the ENTER key. Press the ▲ key to scroll to security code "22". Push the ENTER key again.
2. **Press the ▲ and ▼ keys** to scroll until the upper display shows SP1 (SP2).
3. **Press the ENTER key** until the upper display shows the "on delay" time and the lower display shows On.d.

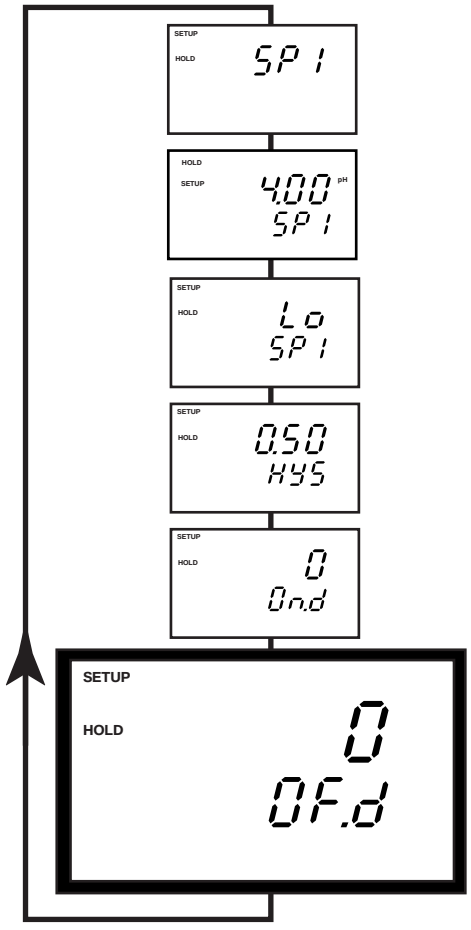
See bold figure at right.

4. **Press the ▲ and ▼ keys** to enter on delay time for Set Point 1 (Set Point 2). Your controller will delay activation for the number of seconds (0 to 2000) you select.
5. **Press the ENTER key** to confirm your selection.
6. Proceed to step 3 of section 6.4.5, or press the ▲ and ▼ keys together to return to measurement mode.

6.4.5 Setting an off-delay time lag

NOTE: *this parameter appears only if on/off control type is selected.*

You can set a time lag for each relay, which helps to prevent your relay from switching off too soon. This helps prevent premature relay action and false alarms. This controller lets you set a 0 to 2000 second time delay before your relay deactivates.



From measurement mode:

1. **Enter Advanced set-up mode.** Push the ENTER key. Press the ▲ key to scroll to security code "22". Push the ENTER key again.
2. **Press the ▲ and ▼ keys** to scroll until the upper display shows SP1 (SP2).
3. **Press the ENTER key** until the upper display shows "off delay" time and the lower display shows OF.d.

See bold figure at right.

4. **Press the ▲ and ▼ keys** to enter off delay time for Set Point 1 (Set Point 2). Your controller will delay activation for the number of seconds (0 to 2000) you select.
5. **Press the ENTER key** to confirm your selection and return to advanced set up mode.

Press the ▲ and ▼ keys together to return to measurement mode.

6.5 Cntr: Control type sub group

CNTR: Control type sub group overview

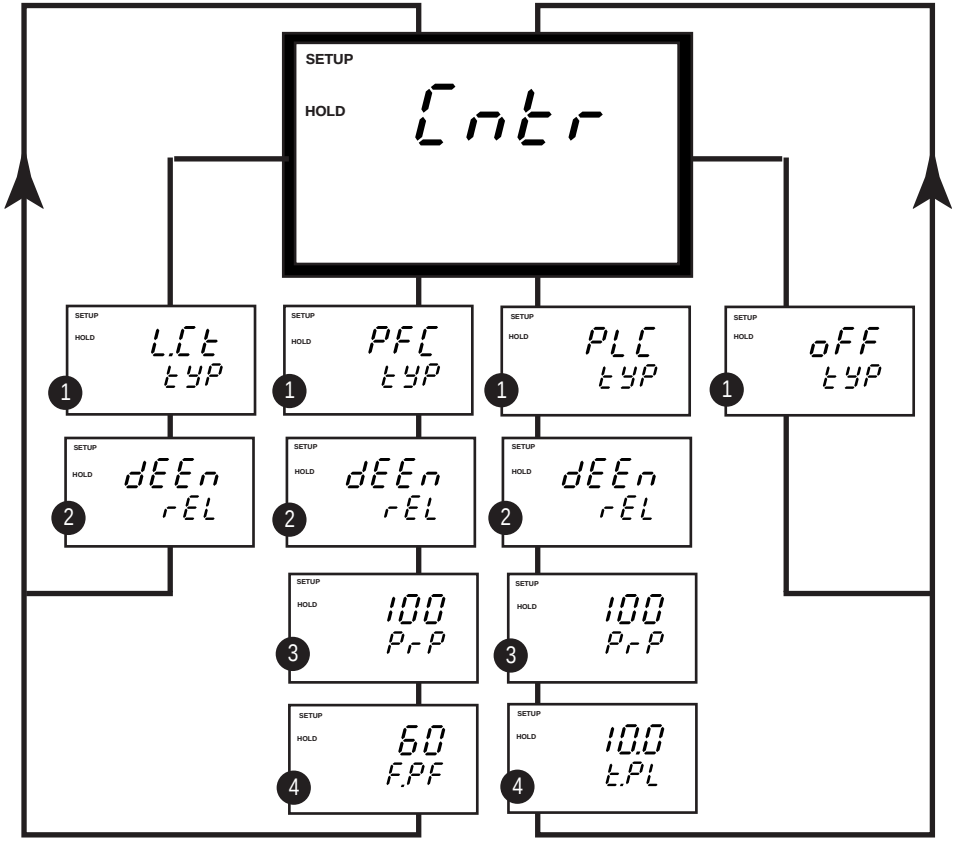
1. Select control type:
   [on / off, proportional (pulse frequency or pulse length), or controller off]

On/off, pulse frequency, and pulse length modes only:

2. Select break contact (de-energized) or make contact (energized) relay type

Pulse frequency and pulse length modes only:

3. Set proportional band
4. Select relay period duration (or maximum frequency)



6.5.1 Selecting control type

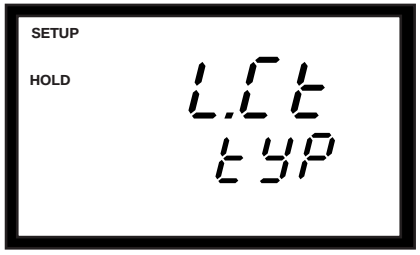
This mode lets you choose one of four controller types:

—**L.Ct On/off control:** use with pumps or valves for fast response.

—**PFC Pulse frequency proportional control:** use for smooth operation of frequency-dependent pumps.

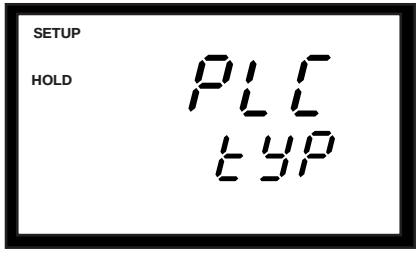
—**PLC Pulse length proportional control:** use for smooth, precise control of valves.

—**oFF Controller off:** use to operate controller as a monitor only or to keep relays from switching when changing set-up parameters.

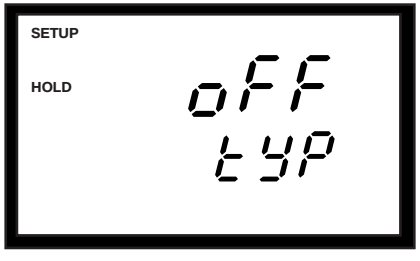


On/off control

Pulse frequency proportional control



Pulse length proportional control



Controller off

From measurement mode:

1. **Enter Advanced set-up mode.** Push the ENTER key. Press the ▲ key to scroll to security code “22”. Push the ENTER key again.
2. **Press the ▲ and ▼ keys** to scroll until the upper display shows Cntr.
3. **Press the ENTER key** until the upper display shows the current controller type and the lower display shows tyP.
4. **Press the ▲ and ▼ keys** to select your controller type.

See bold figures at right.

5. **Press the ENTER key** to confirm your selection.
6. Proceed to step 3 of section 6.5.2, or press the ▲ and ▼ keys together to return to measurement mode.

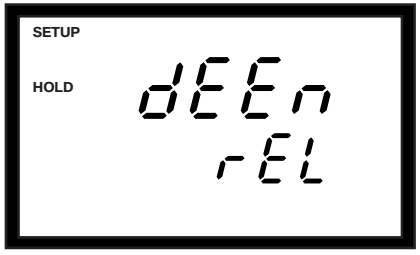
6.5.2 Selecting break/make contact relay type

NOTE: *If the controller type “oFF” is set, this parameter is blanked out.*

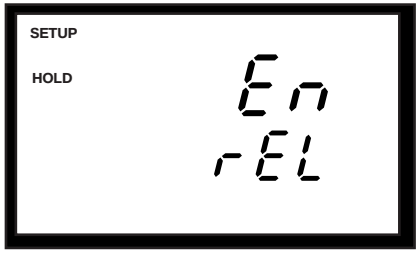
This mode lets you determine which relay state will trigger the alarm state:

- **de-energized (break contact):** relay is de-energized in no alarm condition
- **energized (make contact):** relay is energized in no alarm condition

Controller default is de-energized (break contact).



De-energized relay



Energized relay

From measurement mode:

1. **Enter Advanced set-up mode.** Push the ENTER key. Press the ▲ key to scroll to security code “22”. Push the ENTER key again.
2. **Press the ▲ and ▼ keys** to scroll until the upper display shows Cntr.
3. **Press the ENTER key** until the lower display shows rEL and the upper display shows the current relay selection (de-energized = dEEN or energized = EN).

See bold figures at right.

4. **Press the ▲ and ▼ keys** to choose de-energized (break contact) or energized (make contact) relays.
5. **Press the ENTER key** to confirm your selection.
6. Proceed to step 3 of section 6.5.3, or press the ▲ and ▼ keys together to return to measurement mode.

6.5.3 Selecting proportional band

NOTE: *If you set controller "oFF" or "L.Ct", the parameter listed below is blanked out.*

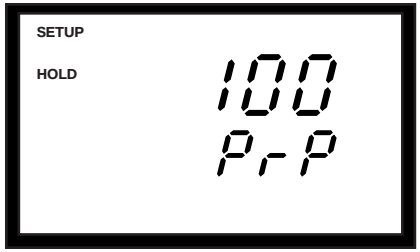
This lets you determine the proportional band. The proportional band is the deviation from your set point at which the relays pulse at their maximum frequency (or at which the pulse length is at its maximum length). You can select this range from 10 to 200% of full-scale.

From measurement mode:

1. **Enter Advanced set-up mode.** Push the ENTER key. Press the ▲ key to scroll to security code "22". Push the ENTER key again.
2. **Press the ▲ and ▼ keys** to scroll until the upper display shows Cntr.
3. **Press the ENTER key** until the upper display shows the proportional range (a number from 10 to 200%), and the lower display shows PrP.

See bold figure at right.

4. **Press the ▲ and ▼ keys** to choose the proportional band value.
5. **Press the ENTER key** to confirm your selection.
6. Proceed to step 3 of section 6.5.4, or press the ▲ and ▼ keys together to return to measurement mode.



Proportional band

6.5.4 Selecting period duration / maximum frequency

NOTE: *If you set controller type "oFF" or "L.Ct", the parameter listed below is blanked out.*

This mode lets you:
- in pulse length (PLC) mode: set the period duration (seconds)
- in pulse frequency (PFC) mode: set the maximum frequency (in ⅟min)

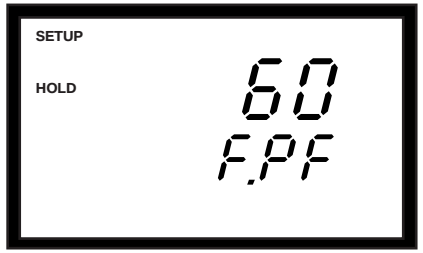
From measurement mode:

1. **Enter Advanced set-up mode.** Push the ENTER key. Press the ▲ key to scroll to security code "22". Push the ENTER key again.
2. **Press the ▲ and ▼ keys** to scroll until the upper display shows Cntr.
3. **Press the ENTER key** until the lower display shows t.PL or F.PF
   - —**In PLC (pulse length) mode:** The lower display will show t.PL to indicate pulse length. The upper display will show your current pulse length. You can select any value from 0.5 to 20 seconds.
   - —**In PFC (pulse frequency) mode:** The lower display will show F.PF to indicate pulse frequency. The upper display will show your current maximum pulse rate. You can select any value from 60 to 120 pulses per minute.

See bold figures at right.

4. **Press the ▲ and ▼ keys** to choose the period duration or maximum frequency, depending on your mode.
5. **Press the ENTER key** to confirm your selection and return to advanced set up mode.

Press the ▲ and ▼ keys together to return to measurement mode.



maximum frequency (pulse frequency)

Period duration (pulse length)

Notes

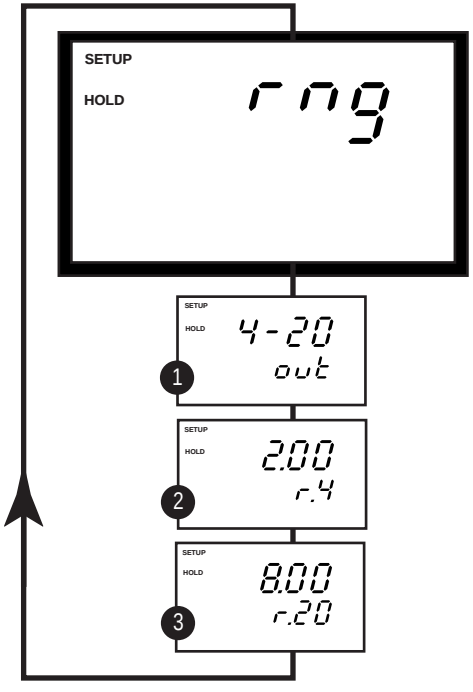
In pulse frequency mode, when the measured value exceeds the deviation from the set-point, the controller will pulse the relay at this rate.

6.6 rng: Current output sub group

rng: Current output subgroup overview

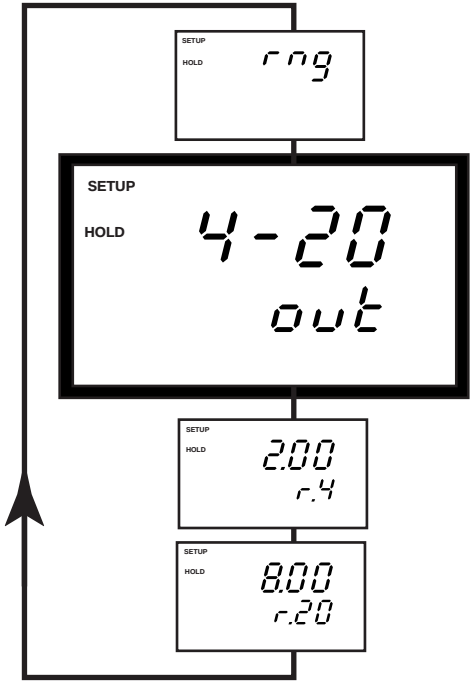
Current output sub group lets you:

1. Choose 0-20 or 4-20 mA output
2. Select pH (or ORP) value equivalent to 0 (4) mA
3. Select pH (or ORP) value equivalent to 20 mA



6.6.1 Choosing output range (4-20 or 0-20 mA)

This parameter lets you select an output range of 4-20 or 0-20 mA. If you select 4-20 mA, the minimum current supplied by terminal 17 and 16 of the 17-way terminal block corresponds to 4 mA. If you select 0-20 mA, the minimum current corresponds to 0.



From measurement mode:

1. **Enter Advanced set-up mode.** Push the ENTER key. Press the ▲ key to scroll to security code “22”. Push the ENTER key again.
2. **Press the ▲ and ▼ keys** to scroll until the upper display shows “rng”.
3. **Press the ENTER key** until the upper display shows the output type (0-20 or 4-20) and the lower display shows “out”.

See bold figures at right.

4. **Press the ▲ and ▼ keys** to select your output range: 0-20 or 4-20 mA.
5. **Press the ENTER key** to confirm your selection.
6. Proceed to step 3 of section 6.6.2, or press the ▲ and ▼ keys together to return to measurement mode.

6.6.2 Selecting pH (ORP) value at 0 (4) mA

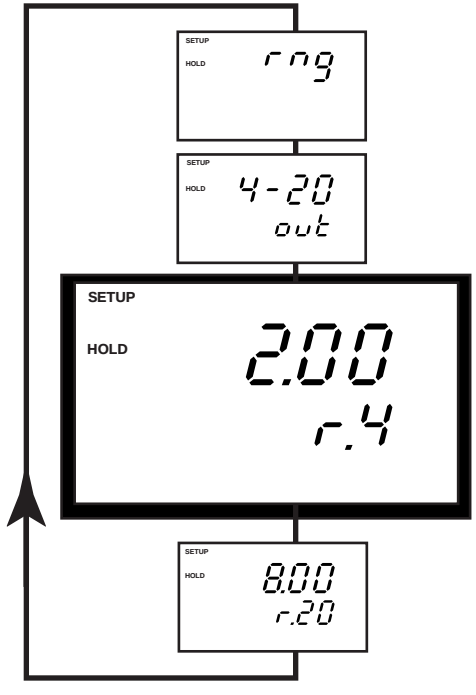
This parameter lets you choose a pH (ORP) value to be equivalent to 0 (4) mA. Select the lowest value of the pH (ORP) range that you want a recorder or transmitter to detect.

From measurement mode:

1. **Enter Advanced set-up mode.** Push the ENTER key. Press the ▲ key to scroll to security code "22". Push the ENTER key again.
2. **Press the ▲ and ▼ keys** to scroll until the upper display shows "rng".
3. **Press the ENTER key** until the upper display shows a pH value and the lower display shows "r.0" or "r.4"

See bold figures at right.

4. **Press the ▲ and ▼ keys** to select the pH (ORP) value equivalent to 0 (4) mA.
5. **Press the ENTER key** to confirm your selection.
6. Proceed to step 3 of section 6.6.3, or press the ▲ and ▼ keys together to return to measurement mode.



6.6.3 Selecting pH (ORP) value at 20 mA

This parameter lets you choose a pH (ORP) value to be equivalent to 20 mA. Select the highest value of the pH (ORP) range that you want a recorder or transmitter to detect.

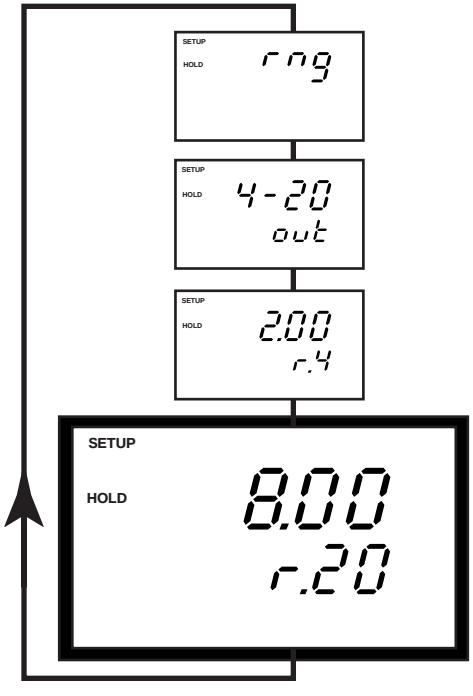
From measurement mode:

1. **Enter Advanced set-up mode.** Push the ENTER key. Press the ▲ key to scroll to security code "22". Push the ENTER key again.
2. **Press the ▲ and ▼ keys** to scroll until the upper display shows "rng".
3. **Press the ENTER key** until the upper display shows a pH (ORP) value and the lower display shows "r.20".

See bold figures at right.

4. **Press the ▲ and ▼ keys** to select the pH (ORP) value equivalent to 20 mA.
5. **Press the ENTER key** to confirm your selection and return to advanced set up mode.

Press the ▲ and ▼ keys together to return to measurement mode.



Notes

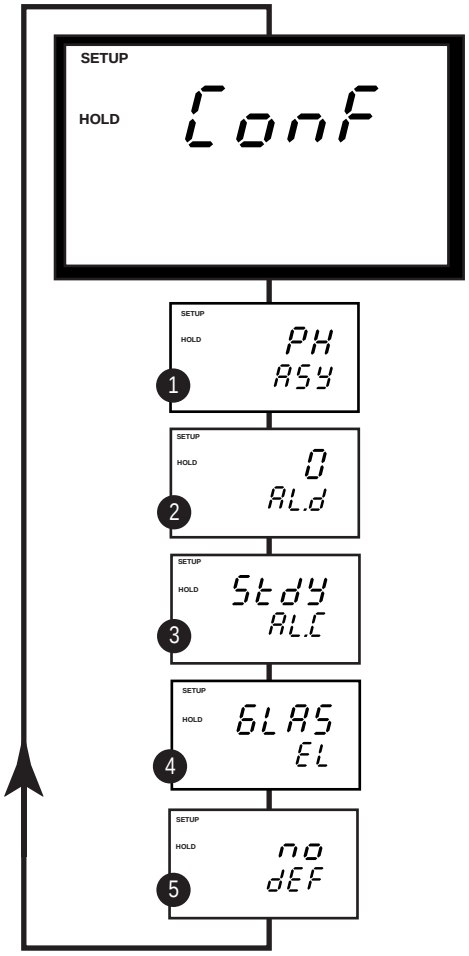
The measurement range corresponding to the current output must be at least 1 pH unit or ±50 mV.

6.7 ConF: Configuration sub group

ConF: Configuration subgroup overview

Configuration sub group lets you:

1. Select pH, ORP mV, or ORP % measurement units
2. Select alarm delay in seconds
3. Select steady or pulse alarm contact
4. Select electrode type (glass or antimony)
5. Reset to default settings



6.7.1 Selecting measurement units (pH, ORP mV, or ORP %)

This parameter group lets you select pH, ORP mV, or ORP % readings, and input type symmetrical or asymmetrical. Use asymmetrical mode under normal operating conditions. Use symmetrical mode when the measuring environment is electrically noisy (i.e. in electroplating environments). Default setting is pH measurement in asymmetrical mode.

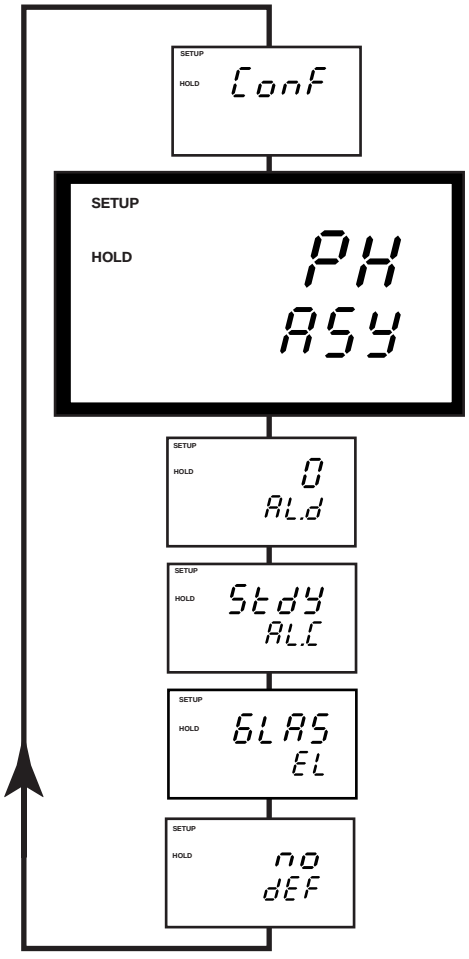
See Appendix 2 on page 65 for more details on operation in symmetrical and asymmetrical modes.

From measurement mode:

1. **Enter Advanced set-up mode.** Push the ENTER key. Press the ▲ key to scroll to security code “22”. Push the ENTER key again.
2. **Press the ▲ and ▼ keys** to scroll until the upper display shows ConF.
3. **Press the ENTER key** until the upper upper display shows the control type (pH, ORP mV or ORP %) and the lower display shows symmetrical (SY) or asymmetrical (ASY) input type. Choose ORP without the mV indicator for ORP % readings.

See bold figure at right.

4. **Press the ▲ and ▼ keys** to select the measurement units you require.
5. **Press the ENTER key** to confirm your selection.
6. Proceed to step 3 of section 6.7.2, or press the ▲ and ▼ keys together to return to measurement mode.



Notes

IMPORTANT: when using controller in symmetrical mode, be sure to connect solution ground (potential matching pin) to terminal 21. Failure to connect solution ground will result in unstable, erroneous readings.

6.7.2 Selecting the alarm time lag

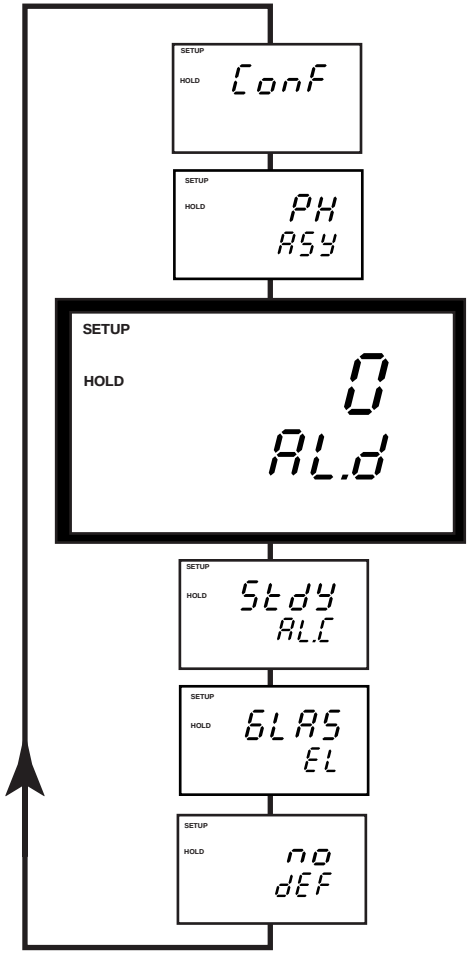
This parameter group lets you select a period of time before the alarm relay activates when your set point has been overshot. You can select from 0 to 2000 seconds.

From measurement mode:

1. **Enter Advanced set-up mode.** Push the ENTER key. Press the ▲ key to scroll to security code “22”. Push the ENTER key again.
2. **Press the ▲ and ▼ keys** to scroll until the upper display shows ConF.
3. **Press the ENTER key** until the upper display shows a numerical value (in seconds) and the lower shows AL.d.

See bold figure at right.

4. **Press the ▲ and ▼ keys** to select the length of the alarm delay (0 to 2000 seconds) you want.
5. **Press the ENTER key** to confirm your selection.
6. Proceed to step 3 of section 6.7.3, or press the ▲ and ▼ keys together to return to measurement mode.



6.7.3 Selecting steady or pulse contact for the alarm relay

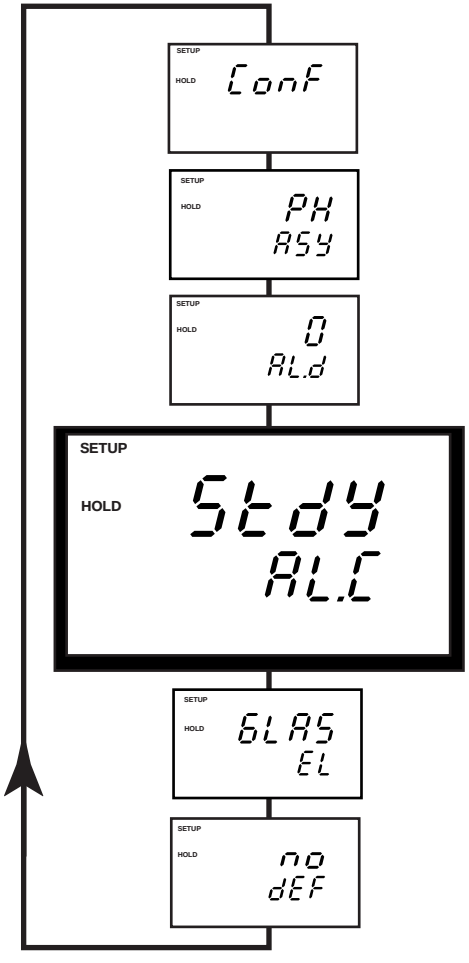
This parameter group lets you select whether the alarm contact will operate as a steady contact or a fleeting (single pulse) contact. Pulse contact closing time is 1 second.

From measurement mode:

1. **Enter Advanced set-up mode.** Push the ENTER key. Press the ▲ key to scroll to security code “22”. Push the ENTER key again.
2. **Press the ▲ and ▼ keys** to scroll until the upper display shows ConF.
3. **Press the ENTER key** until the upper display shows StdY or FLEt and the lower shows AL.C.
   —AL.C = alarm contact
   —StdY = steady contact
   —FLEt = fleeting (single pulse) contact

See bold figure at right.

4. **Press the ▲ and ▼ keys** to select steady or pulse contact.
5. **Press the ENTER key** to confirm your selection.
6. Proceed to step 3 of section 6.7.4, or press the ▲ and ▼ keys together to return to measurement mode.



6.7.4 Selecting pH sensor type

NOTE: *This parameter is blocked out in ORP mode.*

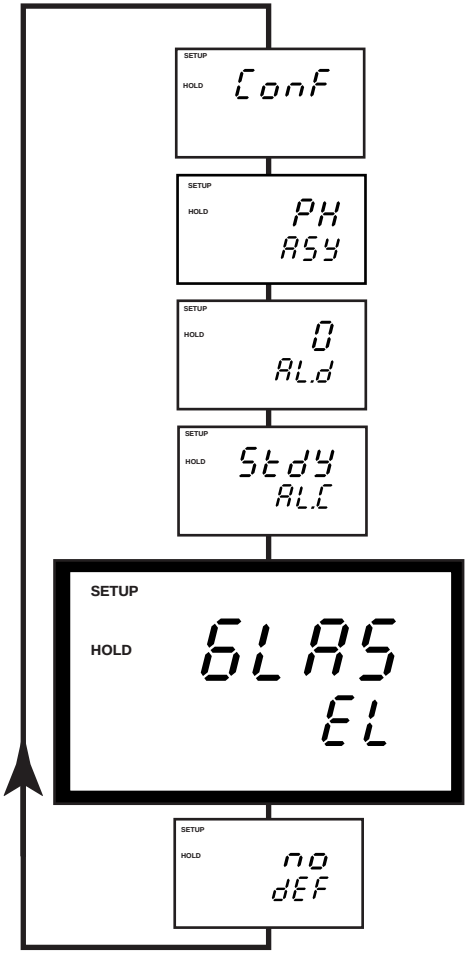
This parameter group lets you configure the controller for glass or antimony electrodes. Use an antimony electrode for systems with hydrofluoric acid content. Default is glass.

From measurement mode:

1. **Enter Advanced set-up mode.** Push the ENTER key. Press the ▲ key to scroll to security code “22”. Push the ENTER key again.
2. **Press the ▲ and ▼ keys** to scroll until the upper display shows ConF.
3. **Press the ENTER key** until the upper display shows GLAS or AnTY and the lower shows EL.
   —EL = electrode
   —GLAS = glass
   —AnTY = antimony

See bold figure at right.

4. **Press the ▲ and ▼ keys** to select glass or antimony electrode type.
5. **Press the ENTER key** to confirm your selection.
6. Proceed to step 3 of section 6.7.5, or press the ▲ and ▼ keys together to return to measurement mode.



Notes

After each changeover, the factory calibration data for slope and offset are overwritten. Be sure to recalibrate (see Section 5.1 beginning on page 19).

6.7.5 Reverting to factory default settings

Use this parameter to reset all settings to factory default. Changing from “no” to “YES” and pressing the ENTER key resets all settings to factory default. See Appendix 1 on page 64 for a listing of default settings.

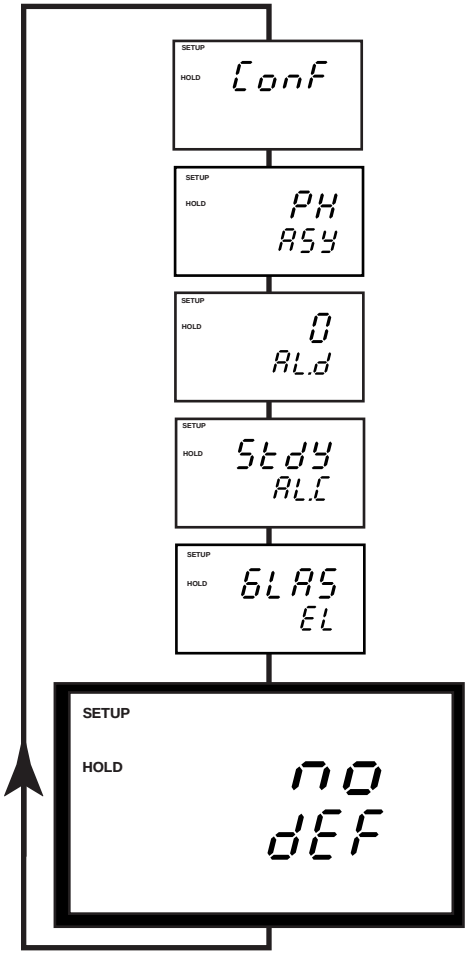
WARNING: If you select yes, all settings you have made are overwritten as a result!

From measurement mode:

1. **Enter Advanced set-up mode.** Push the ENTER key. Press the ▲ key to scroll to security code “22”. Push the ENTER key again.
2. **Press the ▲ and ▼ keys** to scroll until the upper display shows ConF.
3. **Press the ENTER key** until the upper display shows no and the lower shows dEF (default).

See bold figure at right.

4. **Press the ▲ and ▼ keys** to select yes or no.
5. **Press the ENTER key** to confirm your selection.
   - **If you selected “YES”,** pressing the ENTER key will overwrite all settings you have made and automatically return you to Measurement mode.
   - **If you selected “NO”,** pressing the ENTER key confirms your selection and returns you to advanced set up mode. Press the ▲ and ▼ keys together to return to measurement mode.



Notes

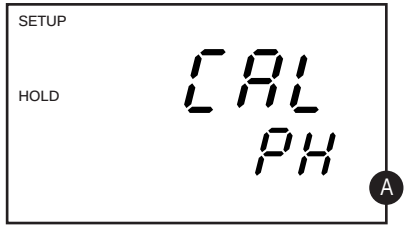
See Appendix 1 on page 64 for a chart of all factory default settings.

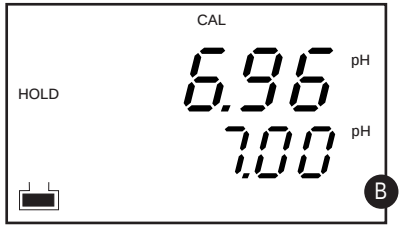
6.8 Calibration sub group

The calibration procedure in Advanced Set-up mode is identical to the procedure in Calibration mode. The only difference is that the controller will revert back to Set-Up Mode (instead of Measurement mode) after calibration is complete.

To reach Calibration mode, perform one of the following:

- **From calibration mode.** From measurement mode, press the CAL key. Press the ▲ and ▼ keys to enter Security code "11". Press the ENTER key.
- **From advanced set up mode.** From measurement mode, press the ENTER key. Press the ▲ and ▼ keys to enter Security code "22". Press the ENTER key. Press the ▲ and ▼ keys to scroll to set up mode "CAL PH".





6.8.1 pH Calibration

This unit features five preset buffer values (1.00, 4.00, 7.00, 9.00 and 10.00) for fast auto calibration. When you calibrate this instrument, you need a standard pH buffer solution that matches one of these values.

1. **Enter Calibration mode**. From measurement mode, press the ENTER key. Press the ▲ and ▼ keys to enter Security code "22". Press the ENTER key. Press the ▲ and ▼ keys to scroll to set up mode "CAL PH".

See figure A

NOTE: The upper and lower display should read CAL pH. If they read CAL OrP, see section 6.7.1 on page 49 for directions on how to switch from ORP to pH readings.

2. **Press the ENTER key** to begin calibration. The "CAL" and buffer indicator appear on the display.

   The upper display shows your present uncalibrated reading. The lower display indicates one of the preset pH buffer values.

3. **Press the ▲ and ▼ keys** to scroll the lower display to the buffer value that matches your standard solution.

See figure B

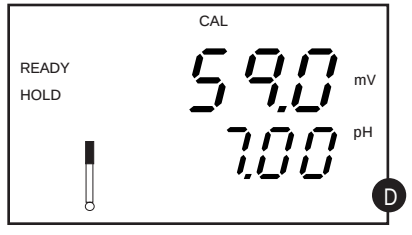
4. **Make sure the electrode is in your buffer solution**. In ATC mode, you must also immerse the temperature sensor in the buffer solution. In the symmetrically high-resistance measurement mode, you must also immerse the solution ground (potential equalization pin) in the buffer.
5. **Press the ENTER key** to confirm the buffer value. The electrode indicator and CAL indicator will both flash.
6. **Allow the electrode to stabilize.** You can press the ENTER key to enter the calibration value. If you do not press the ENTER key, the controller will automatically enter the calibration value when the electrode reading is stable.
7. If you want to calibrate the controller at a second point, repeat steps 4 through 6 with a second buffer.

See figure C

8. After calibrating to a second buffer value, this controller automatically displays slope in the upper display and offset in the lower display.

See figure D

9. If you entered the Calibration mode using the CAL key, the controller will automatically return to the measurement mode. Or, press ▲ and ▼ (escape) together to return to measurement mode.



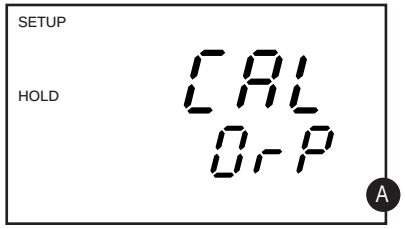
Notes

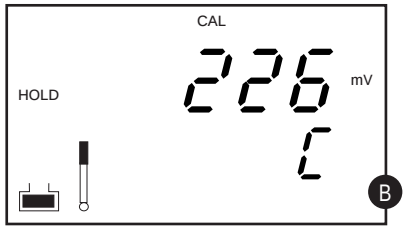
If there is a calibration error, the controller displays "ERR". If this happens, push both ▲ and ▼ (escape) to restart the calibration beginning from step 1.

When calibrating with manual temperature compensation, the controller automatically changes from the preset process temperature to the preset calibration temperature. After leaving the Calibration mode, the controller switches back to the process temperature. To set the calibration temperature and the process temperature, see section 6.3.4 on page 31.

You can view the values for electrode slope and offset without calibration—see section 4.1on page 16 for instructions. The slope and offset are re-determined after each calibration.

6.8.2 ORP Calibration





A. ORP mV calibration

1. **Enter Calibration mode**. From measurement mode, press the ENTER key. Press the ▲ key to enter Security code "22". Press the ENTER key. Press the ▲ and ▼ keys to scroll to set up mode "CAL ORP".

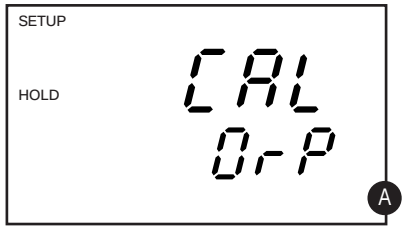
See figure A

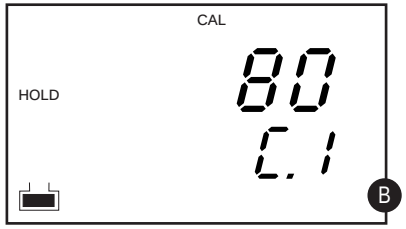
NOTE: If the upper and lower display read CAL PH, see section 6.7.1 on page 49 for directions on how to switch from pH to ORP mV readings.

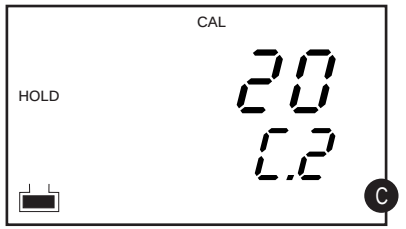
2. **Place sensor in the calibration solution.**
3. **Press the ENTER key** to begin calibration. The "CAL" indicator will appear on the display. The upper display shows the current mV output of the electrode without any offset adjustment.

See figure B

4. Determine the mV value of your solution with a meter known to be accurate.
5. **Press the ▲ and ▼ keys** to offset the mV value on the controller display to match the value of the solution you are measuring.
6. To confirm your selection and return to Advanced Set Up mode, **press the ENTER key** again.







B. ORP % Calibration

The ORP % mode lets you calibrate at two points: a low concentration sample (20%) and a high concentration sample (80%).

To calibrate your controller for ORP:

1. **Enter Calibration mode**. From measurement mode, press the CAL key. Press the ▲ key to enter Security code "11". Press the ENTER key. The display reads CAL ORP.

See figure

NOTE: If the upper and lower display read CAL PH, see section 6.7.1 on page 49 for directions on how to switch from pH to ORP %readings.

2. **Press the ENTER key** to begin calibration. The "CAL" indicator will appear on the display. The upper display will show 80. The lower display will show C1 (= calibrated value 80%).

See figure

3. **Place sensor in the high concentration sample** (relative value of 80%).
4. **Press the ENTER key** to confirm the value. The electrode indicator and CAL indicator will flash. The unit automatically adjusts its reading to match the solution value.
5. **Press the ENTER key** to calibrate at 20% (low concentration value). The upper display will show 20. The lower display will show C2 (= calibrated value 20%).

See figure

6. **Place sensor in the low concentration sample** (relative value of 20%).
7. **Press the ENTER key** to confirm the value. The electrode indicator and CAL indicator will flash. The unit automatically adjusts its reading to match the solution value. The controller returns to Advanced Set Up mode.

Notes

If there is a calibration error, the controller displays "ERR," and does not automatically return to Measurement mode. If this happens, push ▲ and ▼ at the same time (escape) to restart the calibration beginning from step 1.

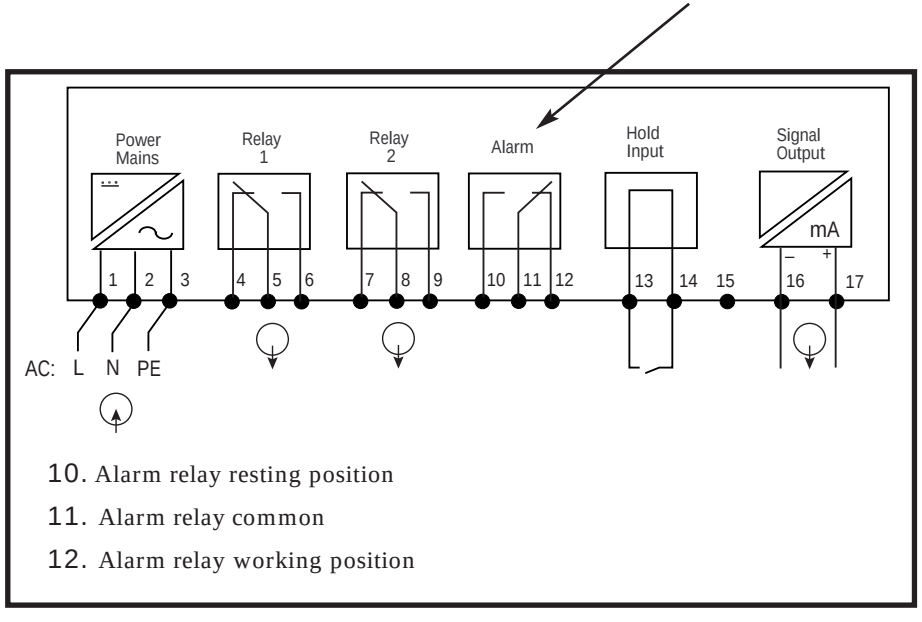
If you stop calibration after entering the first value, or if calibration is defective, the controller will use its original calibration data.

7. Alarm relay

This controller features a separate alarm relay. When the alarm is activated, the red alarm LED will light on the controller and the ERR indicator will appear on the controller display. The ATC and ERR indicators will blink if the error is due to temperature measurement. Additionally, you can hook a separate visual or audible alarm to this relay.

Delaying alarm relay action

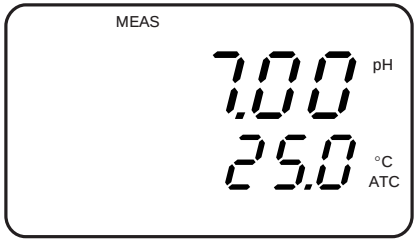
Delay relay activation by 0 to 2000 seconds (factory default is 0 seconds). See section 6.7.2 on page 51 for information on how to set an alarm delay.



10. Alarm relay resting position
11. Alarm relay common
12. Alarm relay working position

8. Taking measurements

In normal measurement mode, the display will appear as shown in the figure at right. The readings will be in pH, ORP mV, or ORP%, depending on set up mode selection—see page 49 for more information. In ORP % mode, neither the pH nor the mV indicators display.



If ATC is selected on, the ATC indicator should be lit. If manual temperature selection is chosen, the ATC annunciator will be off. When the controller is in ATC mode, and the temperature sensor wire is broken or disconnected, an error message will be displayed, plus the alarm LED indicator and relay will be activated.

9. Manual control mode

You can control devices connected to Relay A or Relay B from the front panel of this controller. Automatic mode is the mode that the controller normally enters when you switch it on. In Automatic mode, the controller's set-point values actuate the relays.

In Manual mode, you have manual control of your relays so you can prime your pump or check pump status without operating the entire system.

To enter manual mode:

1. **Press the Relay Control (auto/manu) key.** The upper display will show "000"; the lower display will show "S.Cd" to prompt you to enter the Advanced Set-up Code.
2. **Press the ▲ and ▼ keys** to scroll the upper display until it reads "22".
3. **Press the ENTER key.** The Manual indicator by the Relay Control key will light.

NOTE: Pressing ENTER at a value other than "22" will cause the controller to revert to the Measurement mode, and the relays will remain in automatic mode.

4. **Press the Relay Selection key** to select either Relay A or Relay B. The LED next to the currently selected relay (A or B) will light.

The manual control options now available will depend on the control type (on/off, pulse length, or pulse frequency) you selected set in Section 6.5.1 (see page 40).

—**If you selected On/Off control:** The upper display will read the current measured value. The lower display will show "oFF" or "on" depending on the relay status of the currently selected relay.

—**If you selected Pulse Length control:** The upper display will read the current measured value. The lower display will show the current pulse duration.

—**If you selected Pulse Frequency control:** The upper display will read the current measured value. The lower display will show the current pulse frequency.

5. **Press the ▲ and ▼ keys** to change the Relay on/off status, pulse length, or pulse frequency. The LED indicators at the right of the controller will also change between Red and Green to indicate Relay status.

NOTE: If you wish to manually change the status of both relays, press the RELAY SELECTION key at this point and repeat step 5 for the second relay. This first relay will remain under manual control while you are setting the second relay.

6. **Press the RELAY CONTROL key** to return to Measurement mode. The relays are now back under automatic control.

10. Specifications

	pH	ORP mV	ORP %	Temp.
Range	0.00 to 14.00	±1000 mV	0 to 100%	–9.9 to 125.0°C
Resolution	0.01 pH	1 mV	0.1%	0.1°C
Accuracy	±0.01 pH	±1 mV	±1 mV	±0.5°C

Number of control types three: proportional pulse length, proportional pulse frequency and on/off

Number of inputs one

Number of set points two: high and low

Output Control: 2 SPDT relays; 6A @ 110 VAC, 250 VAC max
Alarm: 1 SPDT relay; 6A @ 110 VAC, 250 VAC max
Pulse: pulse length (0.5 to 20 pulses per second) or pulse frequency (60 to 120 pulses per minute)
Current: galvanic 0-20/4-20 mA, 600 Ω max load, programmable boundaries

Hysteresis (dead band) 0.1 to 1.0 pH, 10 to 100 mV, or 1 to 10%

Relay delay 0 to 2000 seconds

Input impedance 10^6 MΩ

Electrical isolation yes, galvanically

Electrode use selectable glass or antimony (use antimony electrodes for systems with hydrofluoric acid content)

pH calibration 1 or 2 points (pH 1.00, 4.01, 7.00, 9.00 or 10.00) via keypad

Temperature sensor 100 Ω or 1000 Ω Platinum RTD, terminal strip

Password protection two level protection with up to 2/3-digit password lockout; first level gives calibration access, second level allows parameter changes

Display dual-line LCD; 4-digit upper and 3½-digit lower

Housing IP54 front; ¼ DIN size

Dimensions 3 13/16"W x 3 13/16"H x 6 15/16"D (9.6 x 9.6 x 17.5 cm)

Panel cut-out 3⅜"W x 3⅜"H (9.2 x 9.2 cm)

Operating temperature 14 to 140°F (–10 to 60°C)

Weight 1.5 lbs (0.7 kg) unit only; 2.5 lbs (1.2 kg) boxed

11. Accessories

Extra controllers

WD-35200-00 **1000 series pH/ORP controller,** 120 VAC

WD-35200-05 **1000 series pH/ORP controller,** 220 VAC

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

Semi-domed electrodes

These double-junction electrodes feature a unique surface design that provides protection from particulates while increasing flow across the junction to provide cleaning. Ceramic junction provides toughness along with steady electrolyte flow. **The graphite body probes act as a solution ground and take advantage of the controller's symmetrical mode (see page 65 for more information).** Sealed KCl / AgCl reference. Have 10-ft cable, BNC connector, and stripped ends for ATC element.

WD-35807-00 **Semi-domed bulb electrode,** epoxy body, ¾" NPT thread

WD-35807-05 **Semi-domed bulb electrode,** epoxy body, 1" NPT thread

WD-35807-10 **Semi-domed bulb electrode,** graphite body, ¾" NPT thread

WD-35807-15 **Semi-domed bulb electrode,** graphite body, 1" NPT thread

In-line/submersible electrodes

These permanently encapsulated combination electrodes have a CPVC body and ¾" NPT threads on both ends. Install in a tee fitting or on a submersion pipe for tank mounting. Sealed KCl / AgCl reference. Have 10-ft cable, BNC connector, and stripped ends for ATC element.

WD-35801-02 **In-line/submersible pH electrode;** single junction

WD-35801-08 **In-line/submersible pH electrode;** double junction

WD-35801-21 **In-line/submersible ORP electrode;** double junction, Pt band sensor

Submersible electrodes

These combination electrodes are permanently encapsulated in a 3-ft L x 1"OD ABS pipe—install in a tank. Sealed KCl / AgCl reference. Have 10-ft cable, BNC connector, and stripped ends for ATC element.

WD-35806-00 **Submersible pH electrode;** single junction

WD-35806-01 **Submersible pH electrode;** double junction

WD-35806-02 **Submersible ORP electrode;** double junction, Pt band sensor

11. Accessories, continued

pH Buffer solutions

These buffer solutions are standardized to ±0.01 pH at 25°C. They are labeled with pH vs. Temperature tables to adjust readings for accurate calibration. They are also labeled with the name and CAS number for all ingredients to conform to "Right-to-Know" requirements, and are supplied with an MSDS (Material Safety Data Sheet).

WD-00654-00 **pH 4.01,** 1 pint bottle

WD-00654-04 **pH 7.00,** 1 pint bottle

WD-00654-08 **pH 10.00,** 1 pint bottle

12. Appendix 1: Advanced set up mode default settings

Type	Parameter	Value	Remarks
OFS	pH offset	0.00 pH	Zero offset value
SET C	ATC	ATC = ON	Automatic Temperature Compensation
	Temp. offset	0.0°C	Zero temperature offset
SP1	SP1	4.00 pH	set point 1
	LO / HI trigger	LO	LO trigger mode
	Hysteresis	0.50 pH	—
	On delay time	0 seconds	—
	Off delay time	0 seconds	—
SP2	SP2	10.00 pH	set point 2
	LO / HI trigger	HI	HI trigger mode
	Hysteresis	0.50 pH	—
	On delay time	0 seconds	—
	Off delay time	0 seconds	—
Cntr	Control type	LCt / tyP	On / off control
	Relay type	dEEn	Relay de-energized in no alarm condition
rng	mA output	4-20 mA	—
	4 mA value	2 pH	4 mA corresponds to 2 pH
	20 mA value	12 pH	20 mA corresponds to 4 pH
ConF	pH / ORP units	pH / ASY	Asymmetrical pH mode
	Alarm delay	0 seconds	ALd = alarm delay = 0 seconds
	Relay mode	StdY	Relay activated mode: steady
	Probe type	GLAS	Glass electrode
	Factory default	no	Do not reset to factory default
CAL	Calibration	59.2 mV	default setting assumes 0 mV offset at 7 pH with 59.2 mV slope

13. Appendix 2: Symmetrical mode

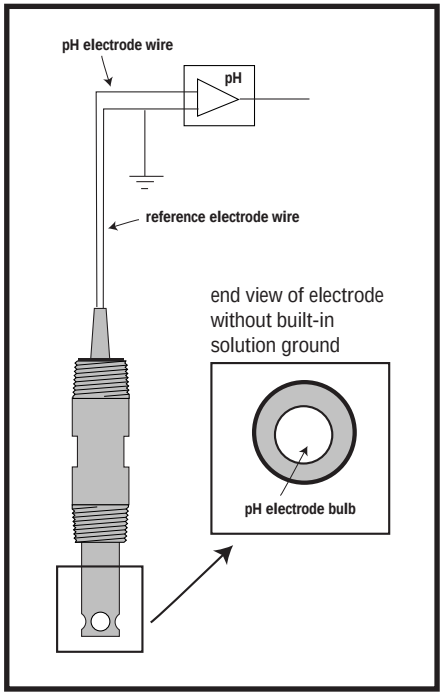
Your controller can operate in asymmetrical or symmetrical mode. See Set Up program 6.7.1 on page 49 for information on selecting the appropriate mode.

Asymmetrical mode works well in environments with where there is little or no electrical noise. When there is electrical noise, the noise acts as a common signal and is picked up by both the pH and the reference electrodes. However, since the reference electrode is grounded to the ground potential of the amplifier, electrical noise will be present only on the pH electrode. This noise is amplified along with the pH signal, which causes reading fluctuations in an electrically noisy atmosphere. Electrical noise from a DC source (as in an electroplating tank) will typically result in stable but incorrect values.

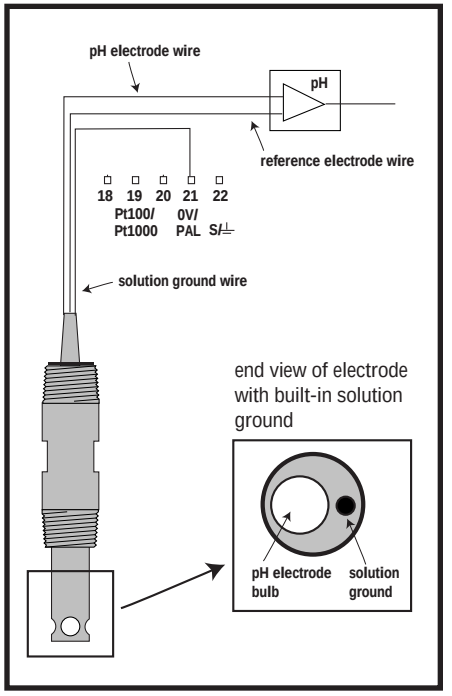
Symmetrical mode. For noisy electrical environments, the 1000 series controllers offer Symmetrical Mode operation. ***To take advantage of Symmetrical operation, you must have an electrode with a solution ground (potential matching) pin.*** If your electrode does not have a solution ground, be sure to set the controller to Asymmetrical mode.

Symmetrical mode avoids grounding the reference electrode by reconfiguring the input to a floating differential mode (see diagram below right). The electrical noise appears equally on the pH and reference electrodes, and is therefore rejected by the operational amplifier.

Asymmetrical mode



Symmetrical mode



14. Appendix 3: Jumper positions

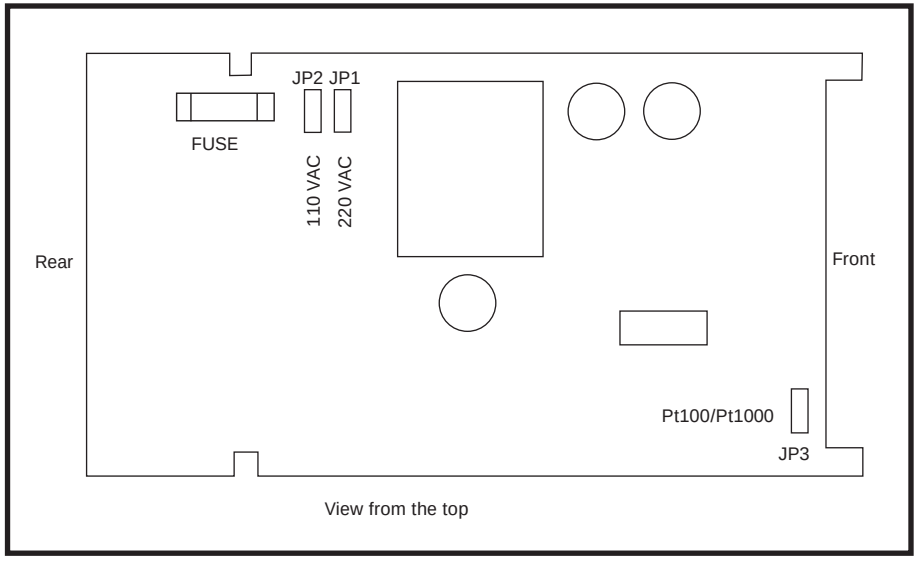
Note that there is a fuse internal to the controller. Before opening the unit, ENSURE that the power cable is physically separated from the mains supply. Replace the fuse with the recommended part specified by the manufacturer.

Jumper Positions - Internal to the controller

JP 1 Selects the input voltage 220 VAC. To switch to 110 VAC, use tweezers or needle nose pliers to remove jumper from JP1 pins to JP2 pins.

JP 2 Selects the input voltage 110 VAC. To switch to 220 VAC, use tweezers or needle nose pliers to remove jumper from JP2 pins to JP1 pins.

JP 3 Selects between Pt100 and Pt1000. To switch between Pt 100 and Pt 1000, desolder jumper and resolder jumper in new position as indicated inside controller housing. If you are not equipped to do this, please contact your OAKTON distributor for further information.



15. Warranty

OAKTON warrants this meter to be free from significant deviations in material and workmanship for a period of one year from date of purchase. OAKTON warrants this probe to be free from significant deviations in material and workmanship for a period of six months from date of purchase. If repair or adjustment is necessary and has not been the result of abuse or misuse within the warrantied time period, please return—freight prepaid—and correction will be made without charge. OAKTON alone will determine if the product problem is due to deviations or customer misuse.

Out-of-warranty products will be repaired on a charge basis.

16. Return of items

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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