

# Alpha pH 560

pH Controller

pH/mV/°C meter



**Thermo**

# Preface

This manual serves to explain the use of the **Thermo Scientific Alpha pH 560 Controller**. The manual functions in two ways, firstly as a step by step guide to help the user operate the instrument. Secondly, it serves as a handy reference guide. This instruction manual is written to cover many anticipated applications of the Alpha pH 560 Controller. If you have doubts in the use of the instrument, please do not hesitate to contact the nearest Authorised Distributor.

The information presented in this manual is subject to change without notice as improvements are made, and does not represent a commitment on part of Thermo Fisher Scientific.

Thermo Fisher Scientific cannot accept any responsibility for damage or malfunction of the unit due to improper use of the instrument.

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## Chapter 1

# Introduction

### Before You Begin

Thank you for purchasing the Alpha pH 560 Controller.

The construction of the pH 560 Controller employs leading edge technology and complies with safety regulations currently in force.

Notwithstanding this, improper use could lead to hazards for the user or a third-party, and/or adverse effects on the plant or other equipment. Therefore, the operating instructions must be read and understood by the persons involved before working with the pH Controller.

The instruction manual must always be stored close at hand, in a place accessible to all people working with the pH Controller.

If you have questions, which are not or insufficiently answered in this instruction manual, please contact your authorized supplier. They will be glad to assist you.

### Intended Use

Alpha pH 560 Controllers are intended solely for pH or ORP and temperature measurement, as described in this instruction manual.

Any other use, or use not mentioned here, that is incompatible with the technical specifications is deemed inappropriate. The operator is solely responsible for any damage arising from such use.

Other prerequisites for appropriate use include:

- Comply with the instructions, notes and requirements set out in this instruction manual.
- Comply with all local safety regulations concerning safety at work.
- Comply with all information and warnings in the documentation dealing with the products used together with the pH Controller (housings, sensors, etc.).
- Comply with local environmental and operational conditions.

### Safety Instructions

- The Alpha pH 560 Controller should be installed and operated only by personnel familiar with the instrument and who are qualified for such work.
- A defective pH Controller must neither be installed nor put into service.

- The Alpha pH 560 must only be operated under the specified operating conditions (see Page 36).
- The Alpha pH 560 must not be repaired by the customer.
- No modifications to the Alpha pH 560 are allowed. The manufacturer/supplier accepts no responsibility for damage caused by unauthorized modifications. The risk is borne entirely by the user.

## **Taking Out of Service**

- First disconnect the unit from the power supply and then undo all electrical connections.
- Remove the unit from the wall / panel.

## **Correct Disposal of the Unit**

When the Alpha pH 560 Controller is permanently taken out of service, obey the local environmental regulations for correct disposal or send the instrument to your local distributor, they will take care of proper disposal.

## Chapter 2

# Getting Started

### Description of Instrument

The Thermo Scientific Alpha pH 560 Controller is used for measuring pH and temperature values. The pH values can be measured using industrial combination pH sensors. The temperature values can be measured using 3-wire Pt100 / Pt1000 sensors. The Controller can be used for applications such as water treatment and controlling, galvanic-decontamination, chemical processing, food processing, clean or wastewater control and neutralization processes.

The pH Controller has many user-friendly and safety features which include:

- Push-button keypad for calibration and setup
- Built-in non-volatile memory to ensure that calibration and other information are not erased if power supply fails
- Menu-driven program that simplifies setup
- 1 or 2 point calibration with selectable USA or NIST standard pH buffer set
- Automatic temperature compensation (ATC)
- Manual temperature compensation setting without the ATC probe, with independent setting for calibration and process temperature
- High resolution ADC for precise measurement
- Large dual display LCD for easy reading with clear multiple annunciators, operational mode indicators and error indicators.
- Two switching contacts as set-point relays
- Limit (on/off) control mode
- Separately adjustable high and low set-point hysteresis (dead bands) to prevent chattering of relays around the set points
- 0 to 2000 seconds time delay adjustment on all relays – minimizes false alarms
- Backlight LCD display

## Measurement and Control System

A typical measurement system consists of:

- A pH process Controller
- A pH sensor with integrated or separate Pt100/Pt1000 temperature sensor
- An appropriate measurement cable
- An immersion, flow or process assembly
- A final control element such as pump or valve

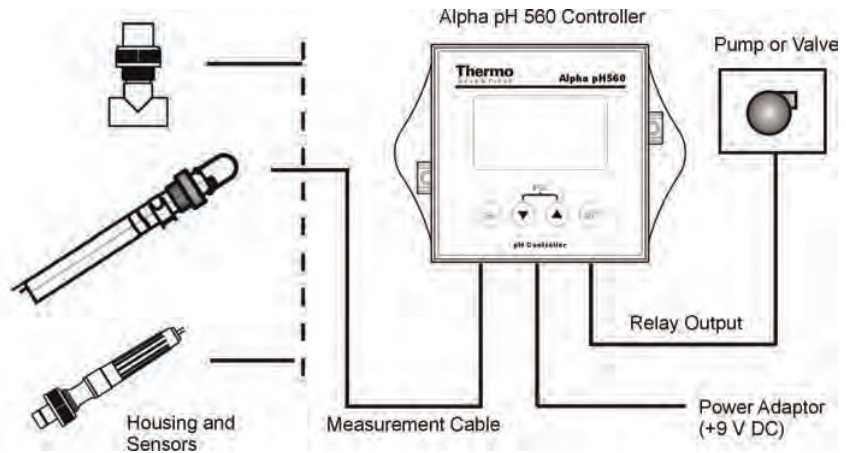


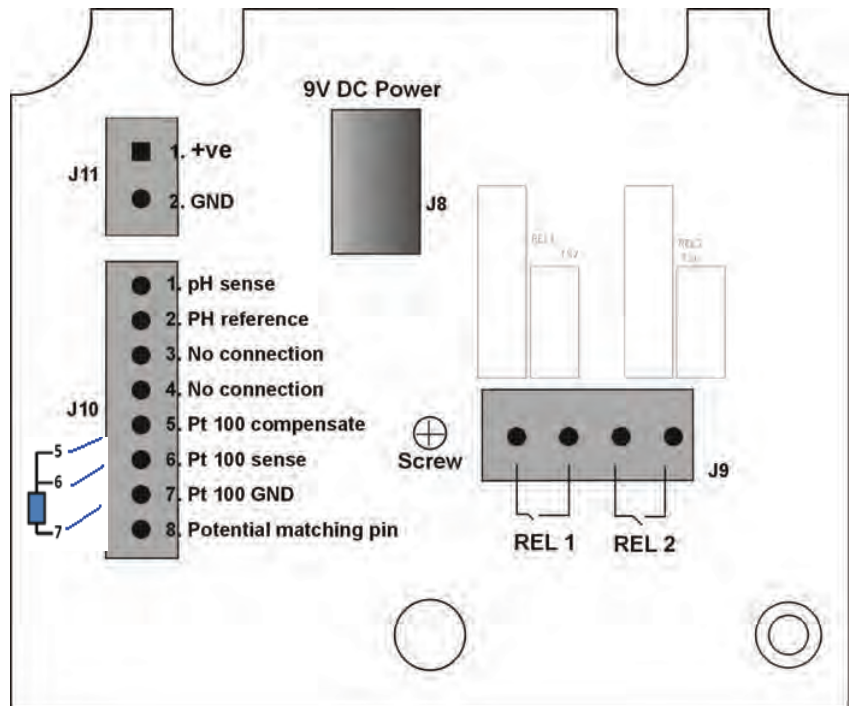
Figure 2–1. Measurement and Control System

## Connection Terminals

Remove the screws from the four corners at the back of the pH Controller. Remove the back cover. The connectors are exposed on the back PCBA as shown in the diagram below.

### Connectors:

- J11 – 24V DC power
- J8 – 9V DC power
- J9 – Relay connections
- J10 – pH electrode & Temperature probe connections (wiring has to be done in the detachable connector)



**Figure 2-2.** Outer Side of Back PCBA

## Switching Between PT100 & PT1000 Temperature Sensors

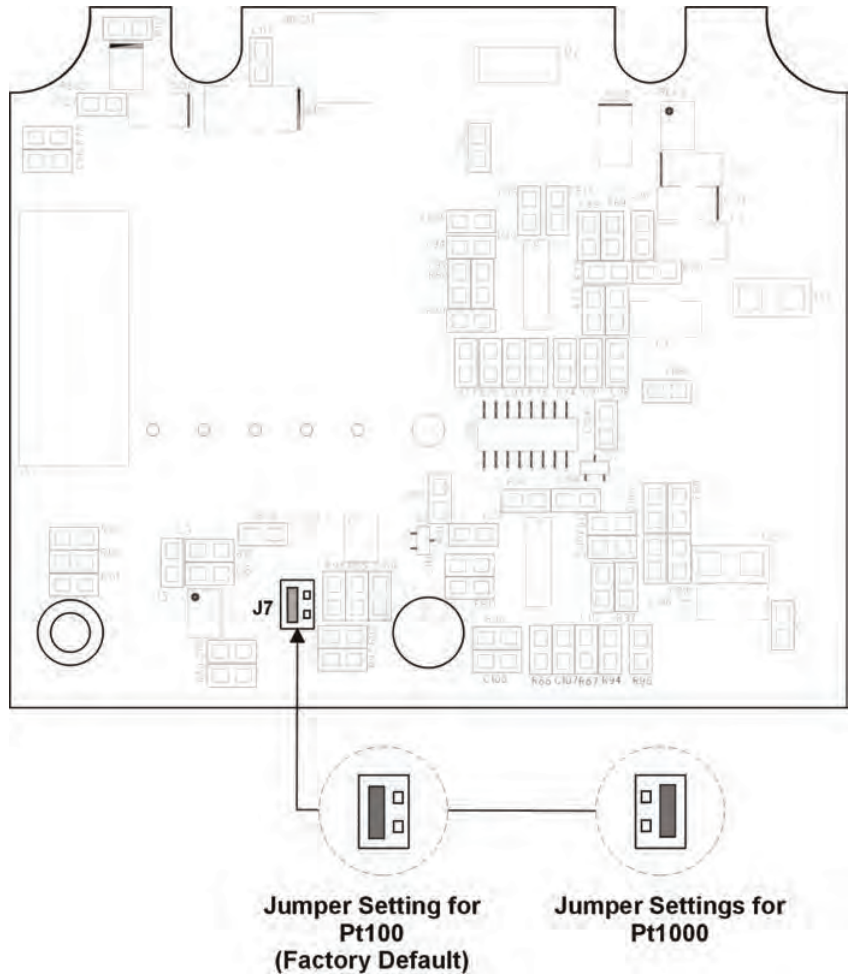
The Controller supports both Pt100 & Pt1000 (2-wire or 3-wire) temperature sensors. The default factory setting is Pt100. If you need to use Pt1000 temperature sensor, you have to change the jumper setting (J7) as described below.

### Remove Back Cover

Remove screws from the four corners at the back of the pH Controller. Remove the back cover.

### Remove Back PCBA

Remove the screw located center of the back PCBA. Detach the back PCBA from the Controller. Turn over the back PCBA. Locate J7 jumper on the inner side of the back PCBA as shown in the figure below.



**Figure 2–3.** Inner Side of Back PCBA

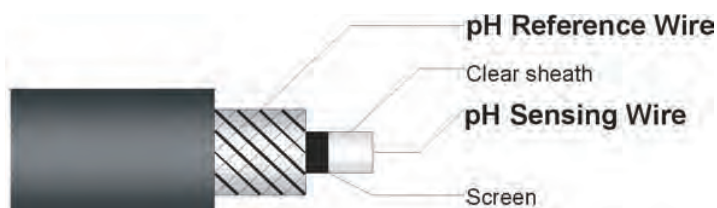
**Set Jumper J7** Set the J7 jumper to required sensor (Pt100 or Pt1000) type.

## Connecting pH/ORP Electrode

1. If the pH/ORP electrode has a BNC connector, remove the BNC connector from the cable.

**NOTE:** Oakton Instruments offers an optional 'BNC to Spade Lug adapter' (Order code: 05994-90) that can be used with pH/ORP electrode without removing the BNC connector.

2. Strip the insulation of the cable so that the bare wires are exposed enough for connection as shown in diagram below.



**Figure 2-4.** pH/ORP Electrode Cable

**NOTE:** Make sure to strip inner black layer (screen) to expose the clear sheath.

3. Connect pH sensing wire to **Pin 1** of J10 connector
4. Connect pH reference wire to **Pin 2** of J10 connector

## Connection Terminals

### Connecting Temperature Probe

For Automatic Temperature Compensated (ATC) pH readings, a 100 $\Omega$  Pt RTD temperature probe (2-wire or 3-wire) can be connected to the Controller.

#### 3-Wire Probe:

1. Connect PT100 compensate wire to **Pin 5** of J10 connector
2. Connect PT100 sense wire to **Pin 6** of J10 connector
3. Connect PT100 GND wire to **Pin 7** of J10 connector

#### 2-Wire Probe:

1. Short **Pin 5 & 6** of J10 connector using a small piece of wire.
2. Connect PT100 sense wire to **Pin 6** of J10 connector
3. Connect PT100 GND wire to **Pin 7** of J10 connector

### Connect Potential Matching Pin (PMP)

If using a pH electrode with a PMP, connect the additional wire (PMP) from the pH electrode to **Pin 8** of J10 connector. This liquid electrical reference wire is only used when the pH Controller is configured to 'Symmetrical mode of operation'. Refer page 14 for details on symmetrical mode of operation.

# Installation

## Mechanical Dimensions

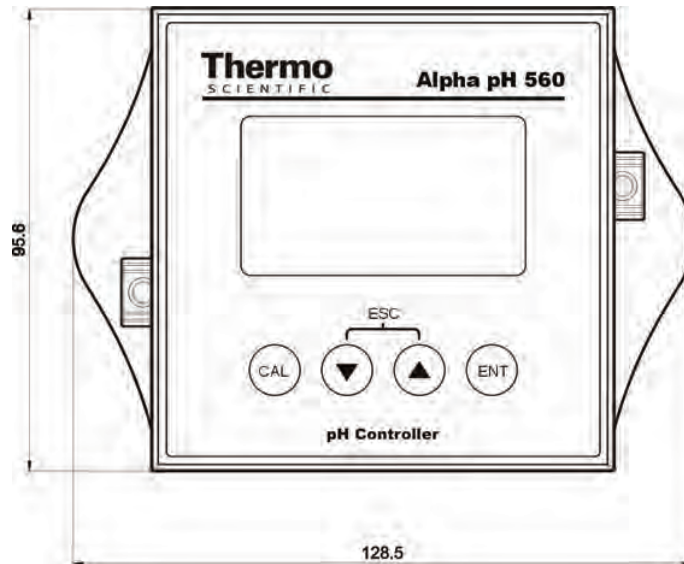


Figure 2-5. Frontal View



Figure 2-6. Side View

## Wall Mount

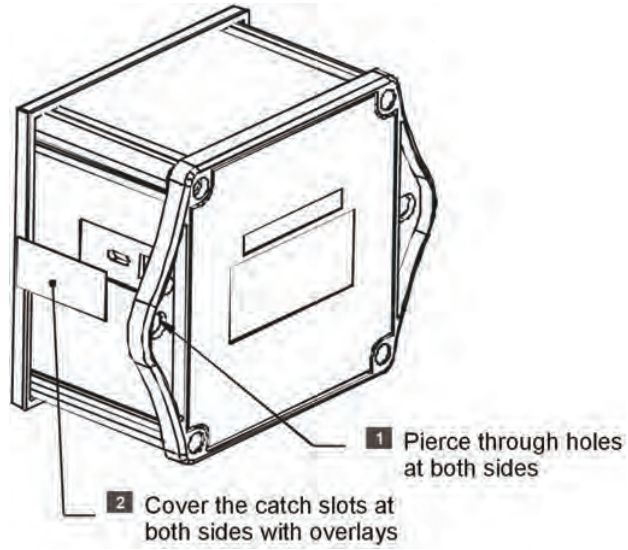


Figure 2-7.

## Panel Mount

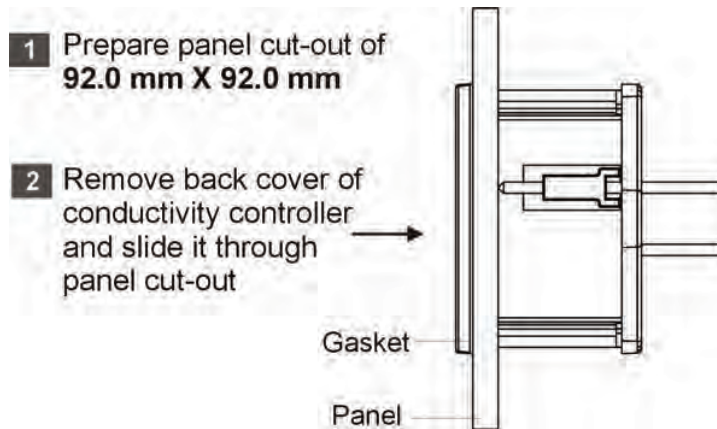


Figure 2-8.

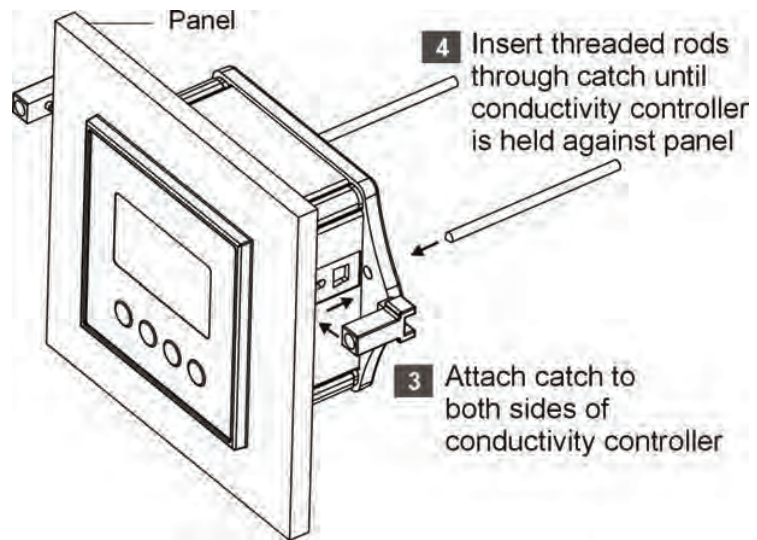


Figure 2-9.

## Display & Keypad

The Liquid Crystal Display (LCD) of Alpha pH 560 Controller has two alpha-numerical displays (Upper and a Lower).

### Display Overview

- **Upper display:** Measured pH, mV or relative mV value are displayed when the Controller is in normal operation (measurement) mode.
- **Lower display:** Measured temperature value is displayed when the Controller is in normal operation (measurement) mode. In pH Calibration mode, standard pH buffer values are displayed here: while measured mV values are displayed in the ORP Calibration mode.

The two displays indicate function names, options & settings in Setup mode. Refer page 24 for more details.

The LCD also consists of various mode indicators, status annunciators and unit of measurement indicators.

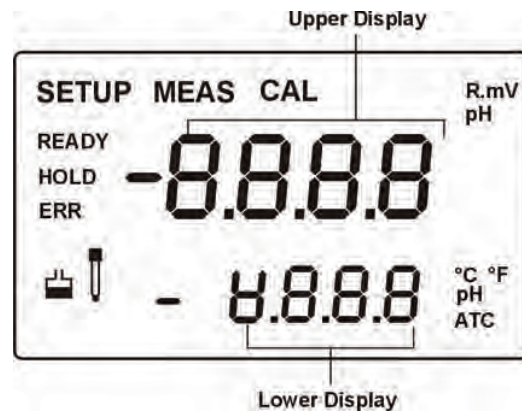




Figure 2–10. LCD Display

### Mode Indicators

<b>MEAS</b>	Measurement mode; blinks in Symmetric mode (Refer Page 14 )
<b>SETUP</b>	Setup mode (Refer Page 24)
<b>CAL</b>	Calibration mode (Refer Page16)

## Status Annunciators

<b>READY</b>	Appears when the reading is stable
<b>HOLD</b>	Appears in Setup mode and Calibration mode to indicate that the relay function is frozen
	Appears when Automatic Temperature Compensation (ATC) is enabled.
<b>ATC</b>	Not visible when Manual Temperature Compensation (MTC) is enabled. Flashes if the temperature probe is faulty in its ATC mode. (Refer Page 26)
<b>ERR</b>	Appears when an error occurs
	Electrode annunciator. Appears when viewing electrode properties or during calibration error
	Buffer annunciator. Appears in calibration mode

## Units of Measurement Indicators

<b>mV</b>	Millivolt. Appears in ORP measurement/calibration modes (Refer Page 14 & 22)
<b>R.mV</b>	Relative Millivolt
<b>pH</b>	Appears in pH measurement/calibration modes (Refer Page 14 & 17)
<b>°C</b>	Temperature in Celsius (Refer Page 26)
<b>°F</b>	Temperature in Fahrenheit (Refer Page 26)

## Key Functions

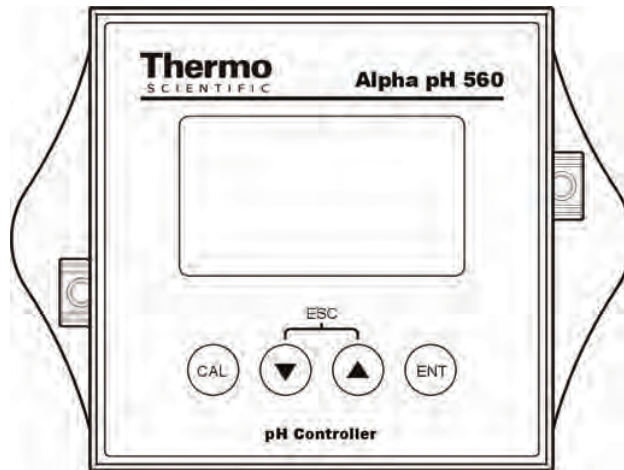






Figure 2–11.

The Liquid Crystal Display (LCD) of Alpha pH 560 Controller has two alpha-numerical displays (Upper and a Lower).

-  **CAL** Enter Calibration mode
-  **ENT** Enter Setup mode  
Access sub screens (parameters) within a group of settings in Setup mode  
Confirm (save) setup parameters and numerical values  
Start/Confirm calibration in Calibration mode.
-  Select a group of settings in Setup mode.  
Select parameters and increment/decrement numerical values in Setup and Calibration modes.
-  (When pressed continuously, speed of value increment/decrement increases)  
Returns to Measurement mode when both keys are pressed simultaneously.

## Chapter 3

# Operation

### Measurement Mode

When the pH Controller is powered on, the display shows all the LCD segments briefly, and then automatically enters into the **Measurement mode**.



**Figure 3–12.**

The mode indicator ‘**MEAS**’ at the top of the display indicates that the pH Controller is in Measurement mode; ‘**MEAS**’ blinks when in Symmetric mode. The upper alpha-numerical display shows the measured pH or mV value, while the lower display shows the temperature value. The indicator “pH” or “mV” at the upper right side of the display indicates the current measurement mode. (Refer Page **Error! Reference source not found.** for switching measurement modes)

**NOTE:** To guarantee accurate readings, the measuring system (the pH Controller and the sensor) must be calibrated regularly.

From measurement mode you can access:

- **Calibration mode** (by pressing **CAL** key)
- **Setup mode** (by pressing **ENT** key)

For more details, refer page 16 for Calibration mode and page 24 for Setup mode.)

# Menu Overview

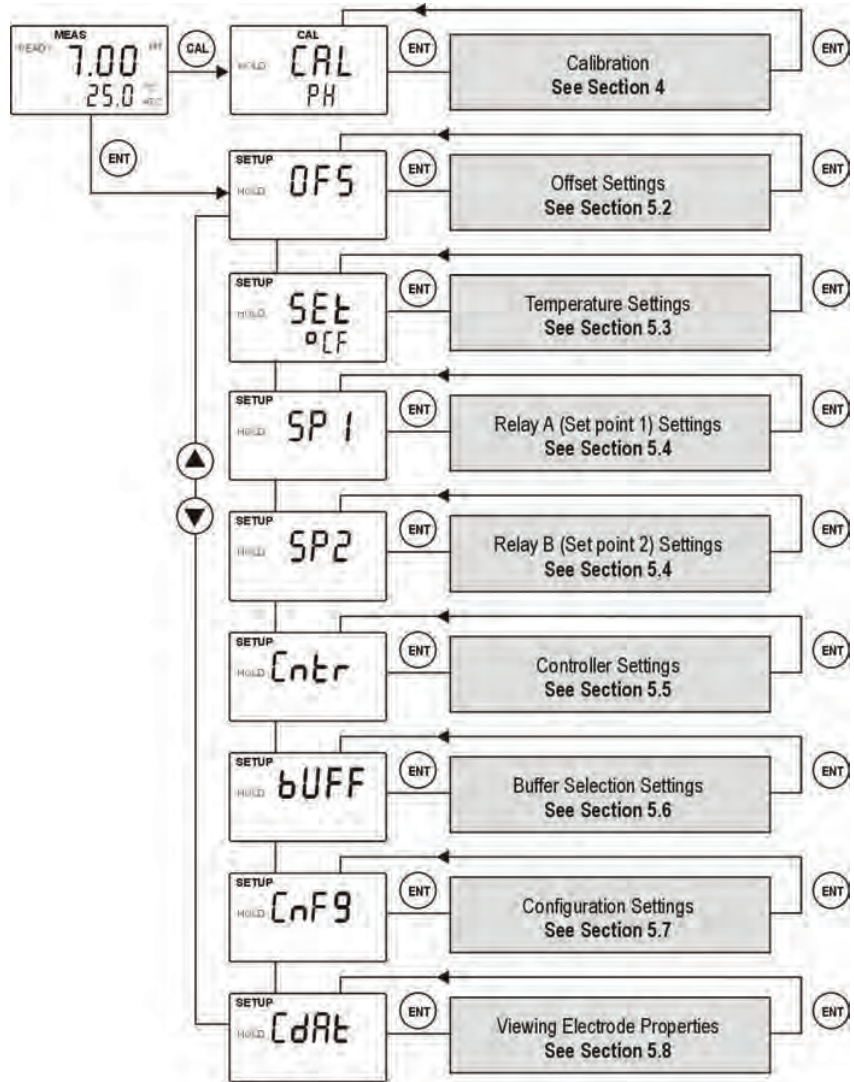


Figure 3-13.

## Chapter 4

# Calibration Mode

### Preparing the Controller & Electrode for Calibration

Before starting calibration, make sure that the pH Controller is in appropriate measurement mode (pH or ORP). When the Controller is switched on, it starts up with the measurement mode last used. For example, if the pH Controller is switched off in ORP measurement mode, it starts up in ORP mode when it is switched on. (Refer Page 5.7 for switching measurement modes)

Be sure to remove the protective electrode storage bottle or rubber cap of the electrode before calibration or measurement. If the electrode has been stored dry, wet the electrode in tap water for 10 minutes before calibrating or taking readings to saturate the pH electrode surface and minimize drift.

Rinse the electrode in de-ionized water after use, and store in electrode storage solution. If storage solution is not available, use pH 4.01 or 7.00 buffer solution.

Do not reuse buffer solutions after calibration. Contaminants in the solution can affect the calibration, and the accuracy of the measurements.

The pH Controller features two internationally recognized pH buffer standards. Select the buffer standard you require in the setup mode. (Refer Page 5.6) Available buffer options are:

- USA buffers --- pH 4.01, 1.68, 7.00, 10.01 and 12.45
- NIST buffers --- pH 4.01, 1.68, 6.86, 9.18 and 12.45

### Entering pH/ORP Calibration Mode

While in measurement mode, press the CAL key to access calibration mode. LCD indicates 'CAL PH' (when measurement mode is pH) or 'CAL OrP' (when measurement mode is ORP).

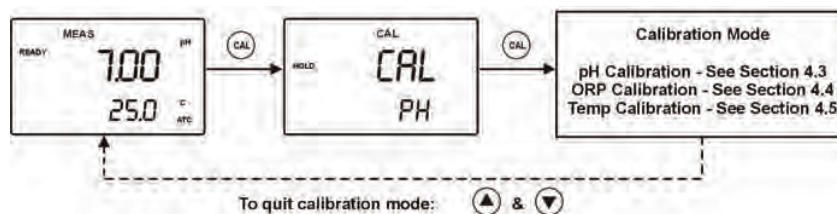


Figure 4-14. Entering Calibration Mode

## NOTES:

- To exit calibration mode at any time during calibration, Press ▲ and ▼ keys simultaneously (escape). The pH Controller returns to the measurement mode and the old calibration values remain active
- The calibration is always carried out in the units of measurement (pH or mV), selected in setup mode

## pH Calibration

The pH Controller is capable of calibration of up to 2 points using USA or NIST pH buffer standards. All new calibration values will automatically override existing calibration data. pH buffer values are referenced to 25 °C. Make sure the measurement mode is set to pH. (Refer Page 5.7 for switching measurement modes). All pH buffer values have window of up to 1 pH tolerance during calibration. Calibration error can be occurred if the measured pH value exceeds this window. If you wish to abort the pH calibration, Press ▲ and ▼ keys simultaneously and the pH Controller reverts to pH measurement mode.

## For USA Standard Buffer


Make sure that the pH Controller is set to accept USA standard buffer in the Setup mode. (Refer Page 5.6 for Buffer Selection Settings) The factory default is USA standard. It is recommended that you perform 2-point calibration at room temperature (25 °C), starting with the first buffer at pH 7.00 followed by any other buffer value. (pH 4.01, 1.68, 10.01 or 12.45).

### 1-Point Calibration:



**Figure 4–15.** USA Buffer Single-Point Calibration

- 1 From pH measurement mode **press CAL key** to enter calibration mode as described in page 16. The LCD shows 'CAL PH'. **Press ENT key** to begin calibration.

**2** Place the electrode in pH 7.00 buffer. Immerse the temperature probe in the buffer solution if ATC mode is enabled. Immerse the potential matching pin in the buffer if symmetrical mode is enabled. The buffer annunciator  appears in LCD. Lower display shows pH 7.00 (USA standard buffer). Upper display shows the current uncalibrated pH reading. Allow the reading to stabilize. LCD shows 'READY' annunciator when the reading is stable.

Press **CAL** key to confirm the reading.

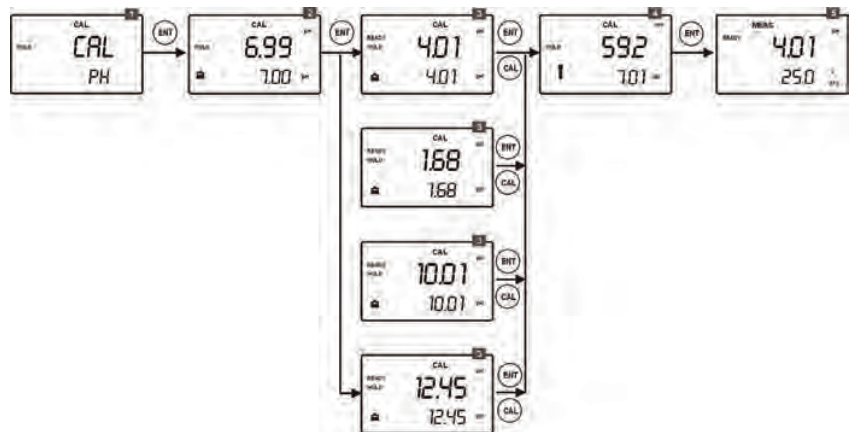
**3** The calibration is completed. The pH Controller recalculates electrode properties based on the calibration. The new slope (in mV) is shown in the upper display and pH reading at 0mV (pH7.00 ± offset) is shown in the lower display.

Press **ENT** key to exit from the calibration.

**4** The pH Controller reverts to pH measurement mode.


**Note:** Refer notes at the end of this section for additional information and possible error indicators of calibration process

**2-Point Calibration:**




**Figure 4–16.** USA Buffer 2-Point Calibration

**1** From pH measurement mode **press CAL** key to enter calibration mode as described in page 16. The LCD shows 'CAL PH'. Press **ENT** key to begin first calibration point.

- 2** Place the electrode in pH 7.00 buffer. Immerse the temperature probe in the buffer solution if ATC mode is enabled. Immerse the potential matching pin in the buffer if symmetrical mode is enabled. The buffer annunciator  appears in LCD. Lower display shows pH 7.00 (USA standard buffer). Upper display shows the current uncalibrated pH reading. Allow the reading to stabilize. LCD shows 'READY' annunciator when the reading is stable.  
**Press ENT key** to confirm the reading.
- 3** The pH Controller moves to the second calibration point. The lower display shows next standard buffer value (pH 4.01). Use **▲ and ▼ keys** to select your second buffer from one of the preset values: pH 4.01 or 1.68 or 10.01 or 12.45. Remove the electrode from the first buffer, rinse and then immerse it into the second buffer. Allow the reading to stabilize. LCD shows 'READY' annunciator when the reading is stable.  
**Press ENT key (or CAL key)** to confirm the reading.
- 4** The calibration is completed. The pH Controller re-calculates electrode properties based on the calibration. The new slope (in mV) is shown in the upper display and pH reading at 0mV (pH7.00 ± offset) is shown in the lower display.  
**Press ENT key** to exit from the calibration.
- 5** The pH Controller reverts to pH measurement mode.

#### NOTES:

- To exit from pH calibration mode without confirming calibration, Press **▲** and **▼** keys together.
- When confirming the buffer measurement, if the measured pH value is not within  $\pm 1.00$ pH from selected buffer value, the electrode annunciator  blinks and **ERR** indicator appears in the display. This error can also occur if non-standard buffers are used or the electrode has worn out. If this happens, press both **▲** and **▼** keys together to restart the calibration beginning from Step1.
- When calibrating with manual temperature compensation, the meter automatically changes from the preset 'process temperature' to the 'calibration temperature'. After leaving the

calibration mode, the pH Controller reverts back to 'process temperature'.


## For NIST Buffer

Make sure that the pH Controller is set to accept NIST standard buffer in the Setup mode. (Refer Page 16) The factory default is USA standard. It is recommended that you perform 2-point calibration at room temperature (25 °C), starting with the first buffer at pH 6.86 followed by any other buffer value. (pH 4.01, 1.68, 9.18 or 12.45)

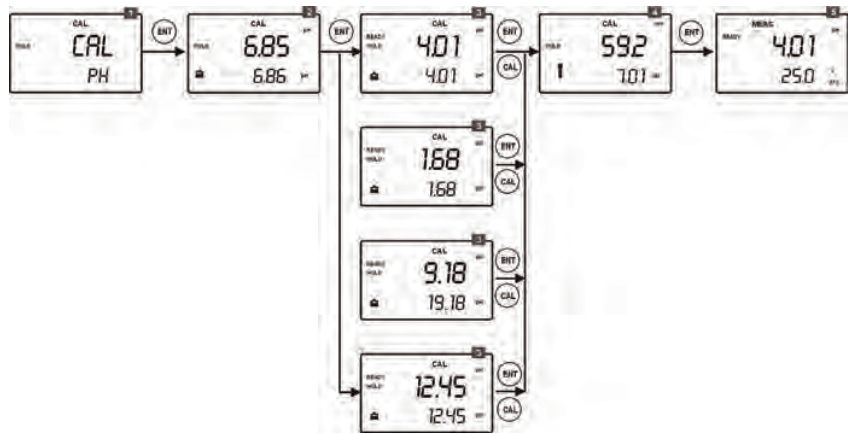
### 1-Point Calibration:




Figure 4-17. NIST Buffer Single-Point Calibration

- 1** From pH measurement mode **press CAL key** to enter calibration mode as described in page 16. The LCD shows 'CAL PH'. **Press ENT key** to begin calibration.
- 2** Place the electrode in pH 6.86 buffer. Immerse the temperature probe in the buffer solution if ATC mode is enabled. Immerse the potential matching pin in the buffer if symmetrical mode is enabled. The buffer annunciator  appears in LCD. Lower display shows pH 6.86 (NIST standard buffer). Upper display shows the current uncalibrated pH reading. Allow the reading to stabilize. LCD shows 'READY' annunciator when the reading is stable.  
**Press CAL key** to confirm the reading.
- 3** The calibration is completed. The pH Controller recalculates electrode properties based on the calibration. The new slope (in mV) is shown in the upper display and pH reading at 0mV (pH7.00 ± offset) is shown in the lower display.  
**Press ENT key** to exit from the calibration.
- 4** The pH Controller reverts to pH measurement mode.

### 2-Point Calibration:



**Figure 4–18.** NIST Buffer 2-Point Calibration

- 1** From pH measurement mode **press CAL key** to enter calibration mode as described in page 16. The LCD shows ‘CAL PH’. **Press ENT key** to begin first calibration point.
- 2** Place the electrode in pH 6.86 buffer. Immerse the temperature probe in the buffer solution if ATC mode is enabled. Immerse the potential matching pin in the buffer if symmetrical mode is enabled. The buffer annunciator  appears in LCD. Lower display shows pH 6.86 (NIST standard buffer). Upper display shows the current uncalibrated pH reading. Allow the reading to stabilize. LCD shows ‘READY’ annunciator when the reading is stable.


**Press ENT key** to confirm the reading.
- 3** The pH Controller moves to the second calibration point. The lower display shows next standard buffer value (pH 4.01). **Use ▲ and ▼ keys** to select your second buffer from one of the preset values: pH 4.01 or 1.68 or 9.18 or 12.45. Remove the electrode from the first buffer, rinse and then immerse it into the second buffer. Allow the reading to stabilize. LCD shows ‘READY’ annunciator when the reading is stable.

**Press ENT key (or CAL key)** to confirm the reading.
- 4** The calibration is completed. The pH Controller re-calculates electrode properties based on the calibration. The new slope (in mV) is shown in the upper display and pH reading at 0mV (pH7.00 ± offset) is shown in the lower display.

Press **ENT** key to exit from the calibration.

- 5 The pH Controller reverts to pH measurement mode.

#### NOTES:



- To exit from pH calibration mode without confirming calibration, Press **▲** and **▼** keys together
- When confirming the buffer measurement, if the measured pH value is not within  $\pm 1.00$ pH from selected buffer value, the electrode annunciator  blinks and **ERR** indicator appears in the display. This error can also occur if non-standard buffers are used or the electrode has worn out. If this happens, press both **▲** and **▼** keys together to restart the calibration beginning from Step1
- When calibrating with manual temperature compensation, the meter automatically changes from the preset process temperature to the calibration temperature. After leaving the calibration mode, the pH Controller reverts back to process temperature

## ORP Calibration

The pH Controller allows a single point ORP calibration. ORP calibration process is available only when the measurement mode is set to ORP. (Refer Page 32 for switching measurement modes).



Figure 4–19. ORP Calibration

- 1 From ORP measurement mode **press CAL key** to enter calibration mode as described in page 16. The LCD shows 'CAL OrP'. **Press ENT key** to begin calibration.
- 2 Place the electrode in a standard ORP solution of known OPR value. Immerse the temperature probe in the buffer solution if ATC mode is enabled. Immerse the potential matching pin in the buffer if symmetrical mode is enabled. The buffer annunciator  & electrode annunciator  appear in LCD. The upper display shows the current mV output of the electrode with offset adjustment (if any). The lower display shows the default (uncalibrated) mV output of the electrode. Allow the reading to stabilize. LCD shows 'READY' annunciator when the reading is stable.  
**Press ▲ or ▼ key** to set the upper display value to the

ORP value of the solution. Allowable range: -150mV to 150mV.

- 3** Press **ENT** key to confirm the value.
- 4** The pH Controller reverts to ORP measurement mode.

## Temperature Calibration

Calibrate temperature probe only if temperature value displayed on the pH Controller is different from that of a calibrated thermometer. Refer to page 26 for further information temperature settings.

# Chapter 5

## Setup Mode

### Enter Setup Mode

The setup mode allows you to customize the settings of the pH Controller to suite your requirements. While in measurement mode, press the ENT key to access setup mode. LCD shows 'SETUP' mode indicator and the first page of setup (OFS – offset settings). Press ▲ or ▼ key to access other pages of the setup mode.

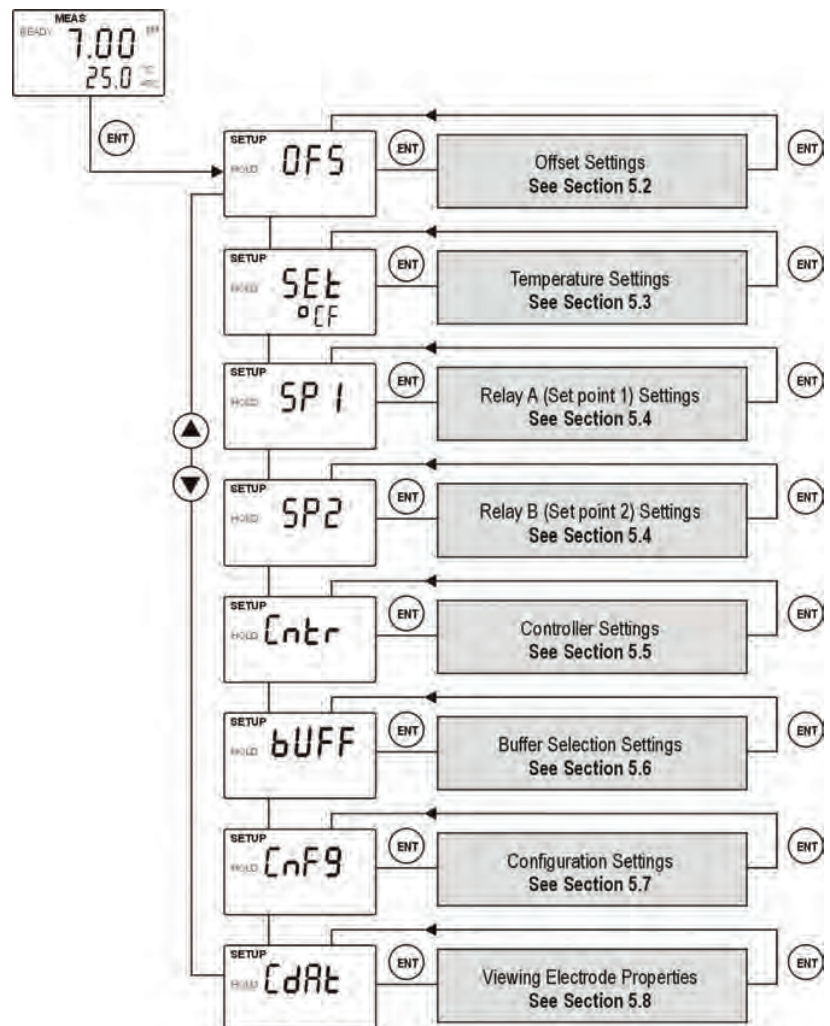


Figure 5–20. Setup Menu

**NOTE:** To exit setup mode at any time press ▲ or ▼ keys simultaneously (escape). The pH Controller returns to the measurement mode

## Electrode Offset Settings

**NOTE:** 'Electrode Offset Setting' is not available when the pH Controller is configured for ORP measurement mode. (Refer Page 32 for switching measurement modes)

In applications where continuous pH measurement is required, it may not be convenient to remove the electrode for calibration. In such cases, an on-line offset adjustment is recommended. The pH Controller allows you set an offset of up to  $\pm 2.00\text{pH}$  to compensate for errors in the pH electrode.

The pH Controller adds or subtracts the offset value from the measured pH value and displays the corrected 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 the Offset Value:

1. Take a sample from the liquid of pH measurement. Record the pH reading of the pH Controller at the time the sample was taken.
2. Measure the pH value of your sample using another calibrated pH meter having its own electrode (pH tester, hand-held meter or bench meter)
3. The difference between these two readings is the offset



**Figure 5–21.** Electrode Offset Settings

- 1** From pH measurement mode **press ENT key** to enter setup mode as described in page 24. The LCD shows the first screen of setup mode (OFS). **Press ENT key** to access electrode offset setting (OFS).
- 2** The upper display shows the last configured offset value (if any), otherwise zero. The lower display shows currently measured pH reading (including last configured offset value). Allow the reading to stabilize. LCD shows 'READY' annunciator when the reading is stable.  
**Press ▲ or ▼ key** to set the upper display to the newly calculated offset value.
- 3** As the upper display value (offset) changes, the pH

Controller adjust the lower reading automatically to suit the new offset value. Up to  $\pm 2.00$  pH offset is allowed.

Press **ENT** key to confirm the value. The pH Controller reverts to **OFS** screen.

Press **▲** or **▼** key to access other setup screens or press **▲** or **▼** key simultaneously (escape) to return to measurement mode.

## Temperature Settings

### Automatic Temperature Compensation (ATC):

The pH values other than pH 7.00 are affected by temperature. Use ATC feature of the pH Controller to compensate for pH changes when the temperature of the sample or process liquid fluctuates. Connect a separate temperature probe (Pt100/pt1000) to the pH Controller if an integrated pH/Temperature probe is not available.

### Manual Temperature Compensation (MTC):

Set the pH Controller to MTC (disable ATC) when the temperature of sample or process liquid is constant and a temperature probe is not available. If you disable ATC, the pH Controller allows you to set your **process temperature (P.°C)** and **calibration temperature (C.°C)**. This allows calibration at a different temperature other than the process temperature. Example: Setting calibration temperature of 25°C lets you calibrate using standard solutions at 25°C, even if your process temperature is different from 25°C.

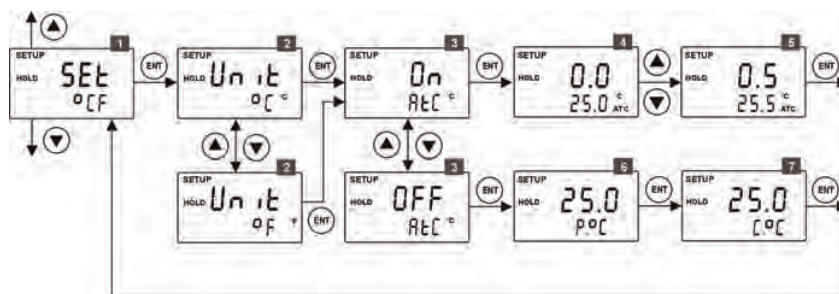


Figure 5–22. Customising Temperature Settings

- 1 From pH or ORP measurement mode **press ENT** key to enter setup mode as described in page 24. The LCD shows the first screen of setup mode (**OFS**). Press **▲** or **▼** key to select Temperature settings screen (**SET °CF**).

Press **ENT** key to access temperature settings (**SET °CF**).

- 2 **Selecting unit of measurement for temperature:** The upper display shows 'Unit' and the lower display shows the last configured unit of measurement for temperature.

Press **▲** or **▼** key to select the desired units for temperature (°C or °F). Press **ENT** key to confirm your selection.

- 3** **Enable/disable ATC:** The lower display shows 'AtC' and the upper display shows the last configured ATC selection ('On' or 'OFF').

Press **▲** or **▼** key to enable (ATC On) or disable (ATC OFF) automatic temperature compensation. Press **ENT** key to confirm your selection.

**If ATC enabled (ATC On):**

- 4** **Selecting temperature offset:** The upper display shows the last configured temperature offset value (if any), otherwise the default is zero. The lower display shows currently measured temperature reading (including last configured offset value). LCD shows 'ATC' annunciator in lower-right corner.

Place a thermometer, which is known to be accurate, in your sample or process liquid. Make sure your temperature probe is placed in the same liquid. Compare the stabilized temperature reading displayed on the monitor with the thermometer. If there is a difference between the two readings (offset), you can adjust the reading of the monitor. Press **▲** or **▼** key to adjust the lower display to the correct temperature value.

- 5** As the lower display value changes, the pH Monitor adjust the upper display reading automatically to suit the new offset value. Up to  $\pm 10$  °C/  $\pm 18$  °F offset is allowed.

Press **ENT** key to confirm the value. The pH Controller reverts to **SET °CF** screen.

**If ATC disabled (ATC OFF):**

- 6** **Setting process temperature:** The lower display shows 'P.°C' and the upper display shows the last configured process temperature. Press **▲** or **▼** key to adjust the upper display to desired process temperature. Allowable range:  $-10.0$  to  $125.0$ °C /  $14.0$  to  $257$ °F.

Press **ENT** key to confirm the process temperature.

- 7** **Setting calibration temperature:** The lower display shows 'C.°C' and the upper display shows the last configured calibration temperature. Press **▲** or **▼** key

to adjust the upper display to desired calibration temperature. Allowable range: -10.0 to 125.0°C / 14.0 to 257°F.

Press **ENT** key to confirm the calibration temperature. The pH Controller reverts to **SET °CF** screen.

Press **▲** or **▼** key to access other setup screens or Press **▲** and **▼** key **simultaneously** (escape) to return to measurement mode.

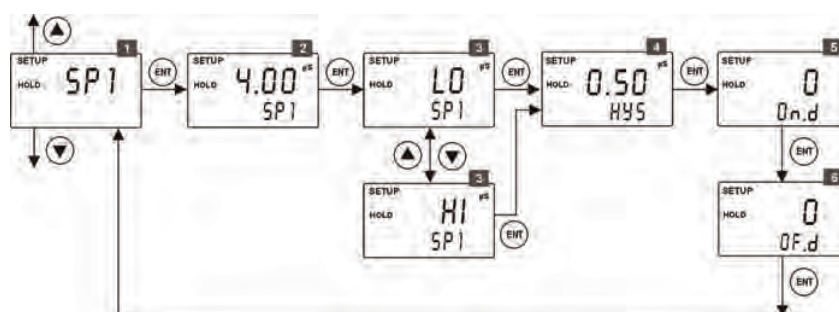
To exit from any intermediate steps, **press ▲ and ▼ keys simultaneously** (escape). The pH Controller returns to the first screen of temperature settings **SET °CF**.

## Relay A/Relay B Setting

**NOTE:** If Controller type is set to 'OFF' (Refer page 32 for Controller settings), the 'Relay A/Relay B Setting' is not available.

The SP1 settings determine the operating parameters for Relay A; while SP2 settings define the operating parameters for Relay B. Since these two settings have identical setup parameters, only SP1 is described here.

The pH Controller allows you to configure two independent sets of operating parameters for each relay (Relay A & B) for each measurement mode (pH & ORP). However, when you switch measurement modes, the relay operating parameters will be reset automatically to their default values for that particular measurement mode.



**Figure 5–23.** Setting Relays

- 1** From pH (or ORP) measurement mode **press ENT** key to enter setup mode as described in page 38 The LCD shows the first screen of setup mode (OFS). **Press ▲** or **▼** key to select relay A (Set point 1) settings screen (SP1).

**Press ENT** key to access control relay settings (SP1).

- 2** **Setting set point value:** The upper display shows the last

configured set point value, otherwise the default value. Press **▲** or **▼** key to enter the value for set point 1, at which control function of the pH Controller should activate.

Press **ENT** key to confirm your set point value.

- 3** **Select relay function:** The upper display shows the last configured relay function (**LO** = Low or **HI**=High). Press **▲** or **▼** key to select the desired function.

Press **ENT** key to confirm your selection.

**NOTE:** This parameter lets you choose the relay function. Select 'LO' to activate the relay when the pH reading undershoots the set point (SP1) or select 'HI' to activate the relay when the pH reading overshoots the set point (SP1). SP1 and SP2 can be selected as 'LO/LO', 'LO/HI', 'HI/LO', or 'HI/HI'.

- 4** **Setting hysteresis value:** The lower display shows 'HYS'. The upper display shows the last configured value, otherwise the default value. Press **▲** or **▼** key to enter the hysteresis value for set point 1. Allowable range: 0 to 1.00 pH.

Press **ENT** key to confirm your hysteresis value.

**NOTE:** Hysteresis prevents rapid relay contact switching if the pH reading is fluctuating near the set point. Refer to **Appendix IV** for a graphical representation of the hysteresis.

- 5** **Setting on-delay time:** The lower display shows 'On.d'. The upper display shows last configured on-delay value. Press **▲** or **▼** key to enter the on-delay time for set point 1. Allowable range: 0 to 2000 seconds. When the pH reading is reached the set point 1, the pH Controller delays the relay activation (switch on) by the on-delay time you set here.

Press **ENT** key to confirm your on-delay time.

- 6** **Setting off-delay time:** The lower display shows 'OF.d'. The upper display shows last configured off-delay value. Press **▲** or **▼** key to enter the off-delay time for set point 1. Allowable range: 0 to 2000 seconds. When the pH reading is reached the set point 1 plus hysteresis value, the pH Controller delays the relay deactivation (switch off) by the off-delay time you set here.

Press **ENT** key to confirm your off-delay time. The pH Controller reverts to **SP1** screen.

Press ▲ or ▼ key to access other setup screens or Press ▲ and ▼ key simultaneously (escape) to return to measurement mode.

## Controller Settings

The controller settings allow you to determine the relay type and relay status of the pH Controller.

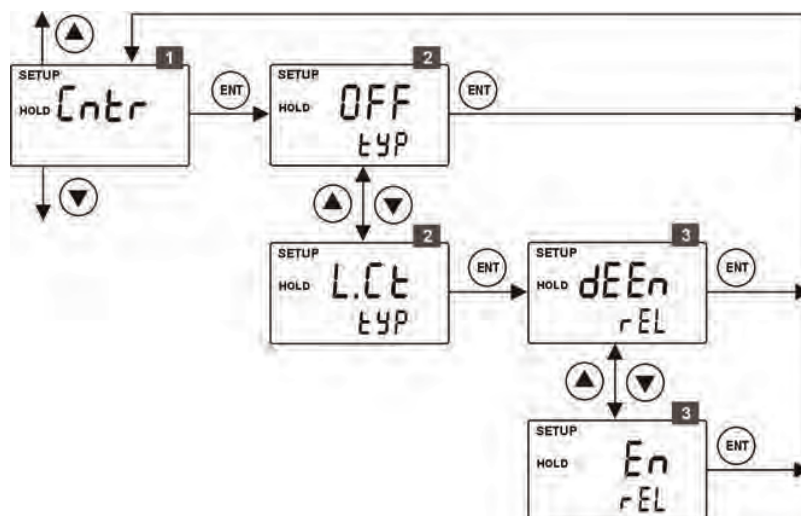


Figure 5–24. Controller Settings

- 1 From pH (or ORP) measurement mode **press ENT key** to enter setup mode as described in page 30. The LCD shows the first screen of setup mode (OFS). **Press ▲ or ▼ key** to select controller settings screen (Cntr).

**Press ENT key** to access controller settings (Cntr).

- 2 **Select the controller type:** The lower display shows 'tYP'. The upper display shows the last configured controller type. ('OFF' or 'L.Ct'). **Press ▲ or ▼ key** to select the desired controller type.

### OFF: Controller Off

Selecting 'OFF', the pH Controller stops functioning as a controller by preventing relay functions. Once the controller type is set to 'OFF', the setup mode does not show you the Relay A/Relay B settings.

### Limit value control (Controller On)

- L.Ct:** Selecting 'L.Ct', the pH Controller is set to function as a controller. When the controller type is set to 'L.Ct', the Relay A/Relay B settings are available in the setup mode for you to configure relay operating

parameters.

Press **ENT** key to confirm your selection.

If Controller type was set to Off (OFF)

The pH Controller reverts to **Cntr** screen.

If Controller type was set to On (L.Ct)

- 3** Select the relay status under Non-Alarm condition:  
The lower display shows 'rEL'. The upper display shows the last configured relay status. ('dEEn' or 'En'). Press **▲** or **▼** key to select the desired relay status.

EEn: De-energized

En: Energized

Press **ENT** key to confirm your selection. The pH Controller reverts to **Cntr** screen.

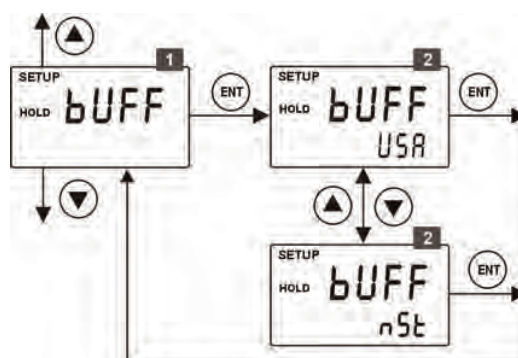
Press **▲** or **▼** key to access other setup screens or Press **▲** and **▼** key simultaneously (escape) to return to measurement mode.

## Buffer Selection Settings

**NOTE:** The buffer selection setting is only available if the Controller is configured for pH measurement mode.

This allows you to set the pH Controller to accept either USA or NIST pH buffer standard group during pH calibration.

Buffer Group	pH Buffer Points
USA	pH 4.01, 1.68, 7.00, 10.01 & 12.45
NIST	pH 4.01, 1.68, 6.86, 9.18 & 12.45



**Figure 5-25.** Buffer Selection Settings

- 1** From pH measurement mode **press ENT key** to enter setup mode as described in page 24. The LCD shows the first screen of setup mode (**OFS**). **Press ▲ or ▼ key** to select buffer settings screen (**bUFF**).

**Press ENT key** to access buffer settings (**bUFF**).

- 2** **Selecting buffer group:** The lower display shows the last configured buffer group. **Press ▲ or ▼ key** to select the required buffer group ('USA' or 'nST').

**Press ENT key** to confirm your selection. The pH Controller reverts to **bUFF** screen.

**Press ▲ or ▼ key** to access other setup screens or **Press ▲ and ▼ key simultaneously** (escape) to return to measurement mode.

## Configuration Settings

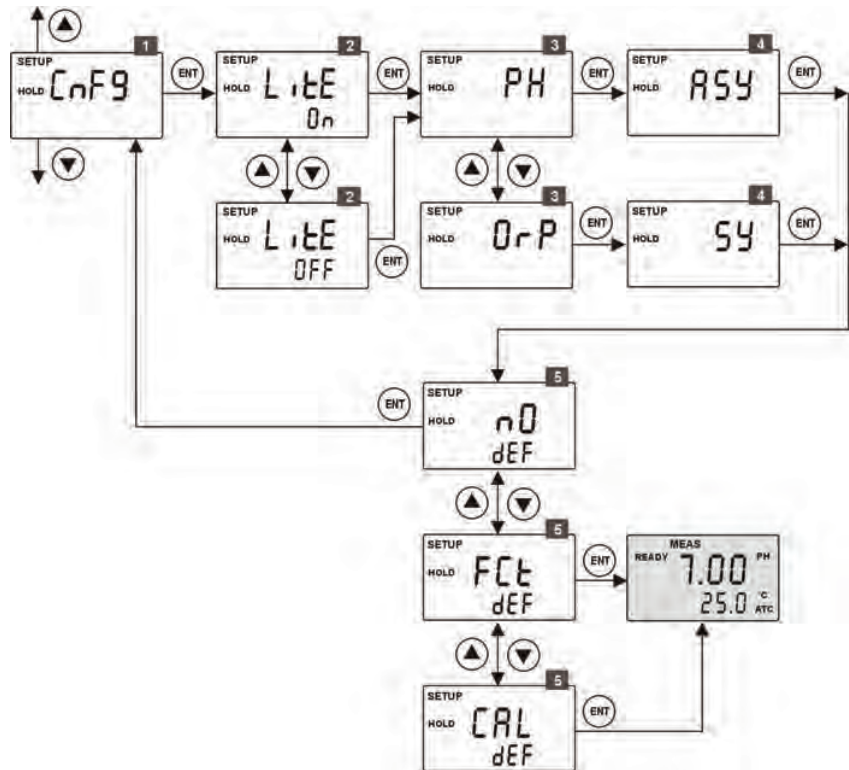
Configuration settings let you configure the pH Controller to different measurement & operation modes, enable/disable backlight of the LCD & reset the pH Controller to factory defaults.

### Asymmetrical Operation Mode (ASY):

This is the default mode of operation of the pH Controller, which is suitable for most applications where sample (or process) liquid is not interfered by adjacent electrical noise.

### Symmetrical Operation Mode (SY):

This mode of operation is recommended for applications where sample (or process) liquid is subjected to high electrical interference and therefore the pH reading becomes unstable. When the pH Controller is set to symmetrical mode, you should immerse the potential matching pin (PMP) in the sample (or process) liquid or use a pH electrode with built-in potential matching pin. The 'MEAS' indicator blinks when the pH Controller is set to Symmetric mode.



**Figure 5–26.** Configuration Settings

- 1** From pH (or ORP) measurement mode **press ENT key** to enter setup mode as described in page 24. The LCD shows the first screen of setup mode (OFS). **Press ▲ or ▼ key** to select configuration settings screen (Cnfg).

**Press ENT key** to access configuration settings (Cnfg).

- 2** **Enable/disable LCD backlight:** The upper display shows 'LitE'. The lower display shows last configured backlight selection ('On' or 'OFF').

**Press ▲ or ▼ key** to enable (LitE On) or disable (LitE OFF) backlight of the LCD.

**Press ENT key** to confirm your selection.

- 3** **Select measurement mode:** The upper display shows the last configured measurement mode ('PH' or 'OrP').

**Press ▲ or ▼ key** to select your desired measurement mode.

**Press ENT key** to confirm your selection.

**NOTE:** When the measurement mode is changed, the relay operation parameters (described in page 28) will be reset back

to their default values.

- 4 Select operation mode:** The upper display shows the last configured operation mode. ('ASY' or 'SY').

Press **▲** or **▼** key to select your desired operational mode.

Press **ENT** key to confirm your selection.

- 5 Reset to factory defaults:** The display shows 'nO dEF'.

Press **▲** or **▼** key to select:

**nO dEF:** Not default reset of the pH Controller. User configured values remain active, when confirmed by pressing **ENT** key.

**FCt dEF:** Reset all settings of the pH Controller to factory defaults, when confirmed by pressing **ENT** key.

**CAL dEF:** Reset all calibration settings of the pH Controller to factory defaults, when confirmed by pressing **ENT** key.

Press **ENT** key to confirm your selection.

If 'nO dEF' was selected, the pH Controller reverts to **Cnfg** screen. Press **▲** or **▼** key to access other setup screens or Press **▲** and **▼** key simultaneously (escape) to return to measurement mode.

If 'FCt dEF' or 'CAL dEF' was selected, the pH Controller performs the selected reset and returns to measurement mode.

Press **▲** or **▼** key to access other setup screens or Press **▲** and **▼** key simultaneously (escape) to return to measurement mode.

To exit from any intermediate steps, Press **▲** and **▼** keys simultaneously (escape). The pH Controller returns to the first screen configuration settings (**Cnfg**).

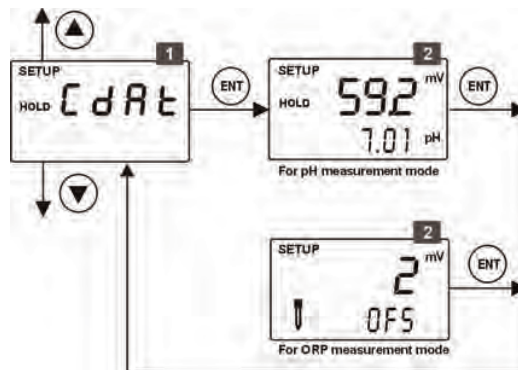
Press **▲** or **▼** key to access other setup screens or Press **▲** and **▼** key simultaneously (escape) to return to measurement mode.

To exit from any intermediate steps, Press **▲** and **▼** keys simultaneously (escape). The pH Controller returns to the first screen configuration settings (**Cnfg**).

## Viewing Electrode Properties

Each time you calibrate your pH electrode, the pH Controller recalculates slope & offset of the electrode and shown in the LCD at the end of calibration. The setup mode allows you to view slope & offset values at any time.

**NOTE:** When the measurement mode is set to ORP, only the offset value of the electrode is displayed.



**Figure 5-27.** Viewing Electrode Properties

- 1** From pH (or ORP) measurement mode **press ENT key** to enter setup mode as described in page 24. The LCD shows the first screen of setup mode (**OFS**). **Press ▲ or ▼ key** to select viewing electrode properties screen (**CdAt**).

**Press ENT key** to view electrode properties (**CdAt**).

- 2** **Electrode status:** The electrode annunciator  $\nabla$  appears in the LCD. For pH measurement mode, the slope (in mV) is shown in the upper display and pH reading at 0mV ( $\text{pH}7.00 \pm \text{offset}$ ) is shown in the lower display.

For ORP measurement mode, the offset value (in mV) of the electrode is shown in the upper display.

**Press ENT key** to quit from electrode properties screen. The pH Controller reverts to **CdAt** screen.

**Press ▲ or ▼ key** to access other setup screens or **Press ▲ and ▼ key simultaneously** (escape) to return to measurement mode.

## Chapter 6

# Technical Specifications

### Product Technical Specification

#### GENERAL SPECIFICATIONS

##### (a) pH

Measuring Range	0.00 to 14.00 pH
-----------------	------------------

Resolution	0.01 pH
------------	---------

Accuracy	± 0.01 pH
----------	-----------

##### (b) mV

Measuring Range	-1000 to 1000 mV
-----------------	------------------

Resolution	1 mV
------------	------

Accuracy	± 1 mV
----------	--------

##### (c) Temperature

Measuring range	-10.0 to +125.0 °C or +14.0 to +257 °F
-----------------	--

Resolution	0.1 °C 0.1 °F (Resolution is 0.1 °F up to 199.9 °F and 1 °F for 200 °F and above)
------------	--

Relative accuracy	±0.5 °C ±1.0 °F
-------------------	--------------------

Sensor	2 wire / 3 wire - Pt100 or Pt1000 (Jumper Selectable)
--------	---

Compensation	Automatic or Manual
--------------	---------------------

#### CALIBRATION

##### (a) pH

## Product Technical Specification

Number of calibration points	1 or 2 points
------------------------------	---------------

Number of calibration buffers	USA: 1.68,4.01, 7.00, 0.01,12.45 NIST: 1.68,4.01, 6.86, 9.18 ,12.45
-------------------------------	--

### (b) Temperature

Offset Adjustment	$\pm 10\text{ }^{\circ}\text{C}/\pm 18\text{ }^{\circ}\text{F}$
-------------------	---

### INPUT / OUTPUT

Input	Asymmetrical / Symmetrical
-------	----------------------------

Output	2 SPST Relays
--------	---------------

### DISPLAY

LCD	7 segments display with symbols for status information
-----	--

Back light	On/Off selectable
------------	-------------------

### ELECTRICAL DATA AND CONNECTIONS

pH/mV Input	Screw Terminal (3.5mm pitch)
-------------	------------------------------

Connection terminal	8-pin, 2-pin & 5-pin terminal blocks
---------------------	--------------------------------------

### OTHERS

Power Input	Universal +9 V DC Adaptor and 24V DC Supply
-------------	---

Dimensions (W x H x D)	96mm x 96mm x 66 mm
------------------------	---------------------

Weight (Estimated)	210g
--------------------	------

Ambient Temp. operating range	0 to 40 °C
-------------------------------	------------

Maximum Relative Humidity	80% up to 31 °C decreasing linearly to 50% at 40°C
---------------------------	--

## Chapter 7

# List of Accessories

### Thermo Scientific

#### Controller Replacement and Accessories

Item Description	Order Code
Alpha-pH 560 Controller	TSPHCP0560
Combination pH electrode with 5m cable	ECARTSO05B
Combination pH electrode with PMP and 5m cable	ECARGTSO05B
Combination pH electrode with PT 100, PMP and 5m cable	EC100GTSO05B
Combination pH electrode, submersible, with 5m cable	ECDA9350605B
Combination Gold ORP electrode with PMP and 5m cable	ECHTAUTSO05B
Combination Platinum ORP electrode with PMP and 5m cable	ECHTPPTSO05B

#### Calibration Solutions

Item Description	Order Code
pH 4.01 buffer solution, 480 ml bottle	EC-BU-4BT
pH 7.00 buffer solution, 480 ml bottle	EC-BU-7BT
pH 10.01 buffer solution, 480 ml bottle	EC-BU-10BT
pH 4.01 buffer sachets, 20 ml x 20 pcs.	EC-BU-4BS
pH 7.00 buffer sachets, 20 ml x 20 pcs.	EC-BU-7BS
pH 10.01 buffer sachets, 20 ml x 20 pcs.	EC-BU-10BS
pH De-ionized water rinse sachets, 20 ml x 20 pcs	EC-RIN-WT
pH sachet assortment pack – 5 each of pH 4.01, pH 7.00, pH 10.01 and de-ionized water sachets per box.	EC-AST-PK
Protein cleaning solution for pH electrode	EC-DPC-BT
Storage solution for pH electrode	EC-RE-005

**NOTE:**

- pH buffer solutions (480 ml bottle) have  $\pm 0.01$  pH accuracy at 25 °C
- pH buffer sachets are individually sealed, single use pouch containing 20 ml of fresh, contamination free calibration solution
- pH buffer sachets have  $\pm 0.01$  pH accuracy at 25°C

## Eutech Instruments

### Controller Replacement and Accessories

Item Description	Order Code
Alpha-pH 560 Controller	56717-32
pH/Temp electrode with PMP and 10-ft cable	35807-20
Platinum ORP electrode with 10-ft cable	35801-21
BNC to spade lug adapter	05994-90

### Calibration Solutions


Item Description	Order Code
pH 4.01 calibration buffer, 500 mL	00654-00
pH 7.01 calibration buffer, 500 mL	00654-04
pH 10.01 calibration buffer, 500 mL	00654-08
pH 4.01 calibration buffer solution pouches, 20/box	35653-01
pH 7.00 calibration buffer solution pouches, 20/box	35653-02
pH 10.00 calibration buffer solution pouches, 20/box	35653-03
pH De-ionized water rinse sachets, 20 ml x 20 pcs	35653-00
Assortment pack – 5 each of pH 4.01, pH 7.00 and pH 10.00 solution pouches.	35653-04
Electrode cleaning solution	00653-06
Electrode storage solution	00653-04

**NOTE:**

- To order **Oakton** accessories, contact the nearest Oakton distributor

## Chapter 8

# Troubleshooting

Problem	Cause	Solution
Power on, but no display	<ul style="list-style-type: none"> <li>a) Loose connections</li> <li>b) Incorrect output voltage of the power adaptor</li> </ul>	<ul style="list-style-type: none"> <li>a) Ensure cables make good contact</li> <li>b) Use an power adaptor with specified output voltage</li> </ul>
Unstable pH reading	<ul style="list-style-type: none"> <li>a) Dirty electrode</li> <li>b) Electrical noise interference</li> </ul>	<ul style="list-style-type: none"> <li>a) Clean electrode and recalibrate</li> <li>b) Switch to Symmetric mode</li> </ul>
Oscillating temperature readings	<ul style="list-style-type: none"> <li>a) Electrical noise interference</li> </ul>	<ul style="list-style-type: none"> <li>a) Ensure shield wire is properly connected to pin 7</li> </ul>
Slow response	<ul style="list-style-type: none"> <li>a) Dirty / Oily electrode</li> </ul>	<ul style="list-style-type: none"> <li>a) Clean electrode</li> </ul>
Blinking ATC	<ul style="list-style-type: none"> <li>a) No temperature probe connection during ATC mode</li> </ul>	<ul style="list-style-type: none"> <li>a) Ensure temperature sensing cable makes good contact</li> </ul>
Blinking electrode annunciator 	<ul style="list-style-type: none"> <li>a) Error in calibration</li> </ul>	<ul style="list-style-type: none"> <li>a) Ensure calibration standard solution is not contaminated. Ensure electrode is clean.</li> </ul>
Or (pH)	<ul style="list-style-type: none"> <li>a) pH electrode is not connected</li> </ul>	<ul style="list-style-type: none"> <li>a) Ensure electrode makes good contact with Transmitter</li> </ul>
Or (Temperature)	<ul style="list-style-type: none"> <li>a) Temperature probe is not connected when ATC enabled</li> </ul>	<ul style="list-style-type: none"> <li>a) Ensure electrode makes good contact with Transmitter</li> </ul>

## Chapter 9

# General Information

### Warranty

Thermo Fisher Scientific 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 not the result of abuse or misuse within the warranty period, please return by freight pre-paid and amendment will be made without any charge. Eutech Instrument Customer Service Dept. will determine if the product problem is due to deviations or customer abuse. Out-of-warranty products will be repaired on an exchange basis at cost.

### Return of Goods

Before returning goods for any reason whatsoever, the Customer Service Dept. has to be informed in advance. Items must be carefully packed to prevent damage during shipment, and insured against possible damage or loss. Thermo Fisher Scientific/ Oakton Instruments will not be responsible for any damage resulting from careless or insufficient packing.

### Guidelines for Returning Unit for Repair

Warning: Shipping damage as a result of inadequate packaging is the user's/distributor's responsibility. Please follow the guidelines below before shipment.

Use the original packaging material if possible when shipping the unit for repair. Otherwise wrap it with bubble pack and use a corrugated box for additional protection. Include a brief description of any faults suspected for the convenience of Customer Service Dept., if possible.

### Maintenance and Cleaning

The Alpha pH 560 Controller contains no user repairable components. Please contact Thermo Fisher Scientific or its distributor if there is any problem with the unit.

To remove dust, dirt and spots, the external surfaces of the pH Controller may be wiped with a damp, lint-free cloth. A mild household cleaner can also be used if necessary.

# Appendices

## Appendix 1 pH Buffer Values at Various Temperatures

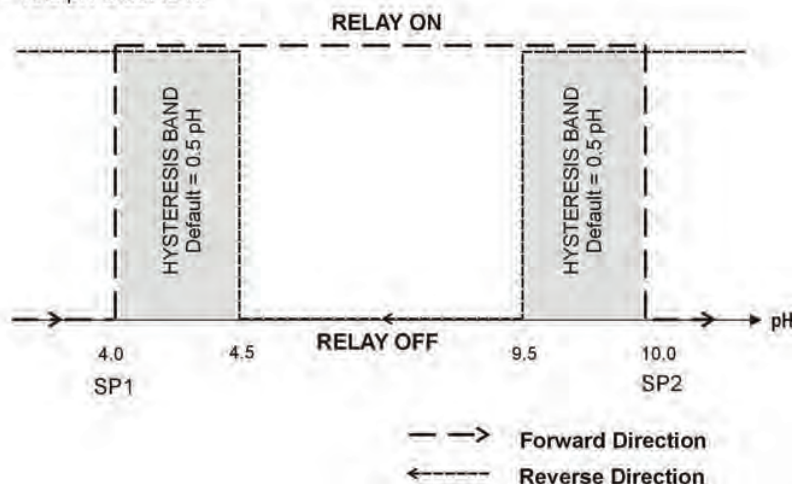
The following table shows the various pH values at different temperature of the solution during calibration.

Temperature (°C)	pH 4.01	pH 6.86	pH 7.00	pH 9.18	pH 10.01
0	4.01	6.98	7.12	9.47	10.32
5	4.01	6.95	7.09	9.38	10.25
10	4.00	6.92	7.06	9.32	10.18
15	4.00	6.90	7.04	9.27	10.12
20	4.00	6.88	7.02	9.22	10.06
25	4.01	6.86	7.00	9.18	10.01
30	4.01	6.85	6.99	9.14	9.97
35	4.02	6.84	6.98	9.10	9.93
40	4.03	6.84	6.97	9.07	9.89
45	4.04	6.83	6.97	9.04	9.86
50	4.06	6.83	6.97	9.01	9.83
55	4.08	6.83	6.97	8.99	9.81
60	4.10	6.84	6.98	8.96	9.79
70	4.12	6.85	6.99	8.92	9.76
80	4.16	6.86	7.00	8.89	9.74
90	4.20	6.88	7.02	8.85	9.73

## Appendix 2 Graphical Representation of the Function of Hysteresis

The relay of the pH Controller activates when the set-point is reached (forward direction). In the reverse direction, it does not de-activate when the value reaches the set-point. Instead, it continues to be active till the value reaches the amount set by the Hysteresis band.

SP1 = 4.0 pH & Set to LO  
SP2 = 10.0 pH & Set to HI



**Example:** You have set your high set point at pH 10.0 and your hysteresis value at pH 0.5. If your measured value overshoots pH 10.0, the pH Controller's relay activates. The actions of the external device will cause the solution's pH to drop. The relay will deactivate, when the pH value drops below 9.5 pH.

## Appendix 3 General Instructions Concerning Controller Settings

Control characteristics of pH Controller used as a limit value switch  
Used as limit value switch

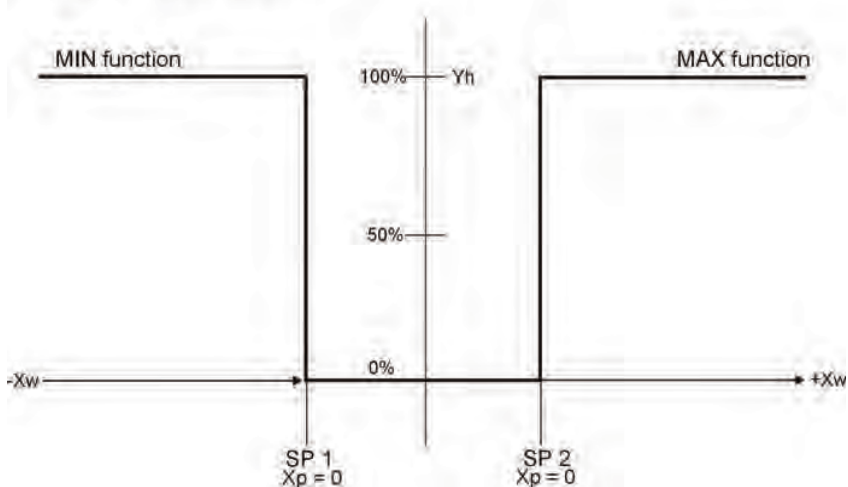


Figure 0-28.

## Appendix 4

### Abbreviations Used in LCD

Abbreviation	Description
ASy	Asymmetrical mode
AtC	Automatic Temperature Compensation
bUFF	Buffer
CAL	Calibration
C.°C	Calibration temperature
CdAt	Electrode properties
CnFg	Configuration
Cntr	Controller
dEF	Default values
dEEn	De-energized
En	Energized
FCt	Factory (defaults)
HI	High limit
HyS	Hysteresis
LitE	Backlight
LO	Low limit
OFS	Offset
OF.d	Off delay
On.d	On delay
Or	Reading is over range
OrP	Oxidation Reduction Potential
P.°C	Process temperature
PH	pH

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Abbreviation	Description
Set	Setting
SP1	1 <sup>st</sup> Set point
SP2	2 <sup>nd</sup> Set point
Sy	Symmetrical mode
tyP	Type
Ur	Reading is under range

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