User's Manual

Φ Series 400 and 500
pH and Electrochemistry Meters

CE

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Beckman Coulter, Inc.
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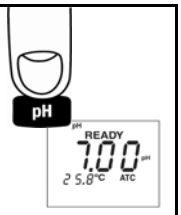
Fullerton, CA 92835

BECKMAN COULTER®

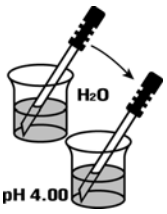
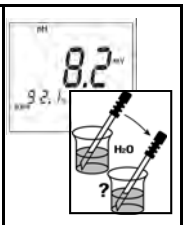
Quick Start Guide

pH Calibration and Measurement

Model pHi 410 / 450 / 460 / 470 / 510 / 550 / 560 / 570

			
Connect probe to meter.	Put probe in first calibrating buffer.	Press **ON/OFF** to turn on meter.	If necessary, press **pH** until pH icon is displayed.

			
Press **CAL**.	If necessary, press ▲ or ▼ key until display matches first buffer.	Press **ENTER** and wait until the “wait” icon stops flashing.	When complete, the next calibration buffer is shown and CAL 2 is displayed.

			
Rinse probe in deionized water and place in second calibrating buffer.	If necessary, press ▲ or ▼ key until display matches second buffer value.	Press **ENTER** and wait until the “wait” icon stops flashing.	When slope is displayed, press **pH,** rinse probe. Place in sample.

Quick Start Guide
ISE Calibration and Measurement
Model pHi 450/470/550/570

			
Connect probe to meter.	Put probe in first calibrating solution.	Press **ON/ OFF** to turn on meter.	If necessary, press **ISE** until icon is displayed.

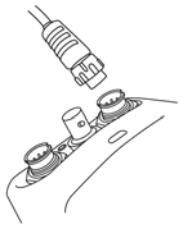
			
Press **CAL**.	If necessary, press ▲ or ▼ until display matches solution concentration value.	Press **ENTER** and wait until "wait" stops flashing.	When complete, the next calibration value is shown and CAL 2 is displayed.

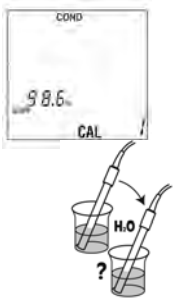
			
Rinse in deionized water; place in second cal solution.	If necessary, press ▲ or ▼ until display matches next solution value.	Press **ENTER** and wait until "wait" stops flashing.	With slope displayed, press **ISE**, rinse and place in sample.

Quick Start Guide

Conductivity Calibration

Model pHi 430/460/470/530/560/570

			
Connect probe to meter.	Put probe in first calibrating solution.	Press **ON/OFF** to turn on meter.	If necessary, press **COND** until COND icon is seen on the display.

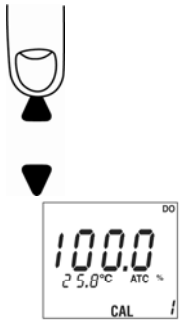
			
Press **CAL**.	The conductivity value will flash. Press ▲ or ▼ until display matches calibrating solution.	Press **ENTER**	When slope is displayed, press **COND**, rinse probe and place in sample.

Quick Start Guide

Dissolved Oxygen Calibration

Model pHi 420/470/520/570

			
Connect probe to meter.	Hold probe downward in air.	Press **ON/OFF** to turn on meter.	If necessary, press **DO** until DO icon is seen on the display.

			
Press **CAL**.	The CAL value will flash.	Press **ENTER** and wait until the “wait” icon stops flashing	When the slope is displayed, press **DO** then place in sample.

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SECTION 1: Safety Precautions and Warranty

IMPORTANT NOTICE
SAFETY PRECAUTIONS

The International safety symbol displayed above appears on this product and is a reminder to the user that all safety instructions should be read and understood prior to installation, operation, maintenance or repairs are attempted on this meter.

If the meter is used in a manner other than as described, the safety and performance of the meter can be impaired. No AC adapters, other than those specifically included or marketed to work with this unit,, have been approved for use.

如果未按上述方法使用测定仪，可能会对测定仪的安全和性能造成损害。

IF THE METER IS USED IN A MANNER OTHER THAN AS DESCRIBED, THE SAFETY AND PERFORMANCE OF THE METER CAN BE IMPAIRED.

WARRANTY

Your pHi 400 and 500 series meter is warranted to be free of manufacturing defects for three (3) years from the date of purchase. This does not include any defects that are the result of abuse or misuse of the meter. Beckman Coulter will, at their option, repair or replace your meter with a comparable unit. This is a limited warranty. You may have additional rights under your state laws. Batteries are not included in this warranty.

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

IF THE SEAL ON THE BACK OF THE METER IS TAMPERED WITH, THE WARRANTY IS IMMEDIATELY VOIDED.

SECTION 2: Specifications

Table 1: Specifications

	pH	mV	Temp.	ISE
Range	-2.00 to 19.99	Autorang-ing ± 199.9 mV to ± 1999 mV	- 5 to 105 °C 23 to 221°F	Autoranging 0.0 ppm to 1999 ppt
Resolution	0.01 pH	Autorang-ing 0.1 and 1	0.1 °C 0.1 °F	0.1 ppm 0.1 ppt
Accuracy	±0.01 pH	±1 mV	±0.5 °C	Probe dependent
Calibration	Up to five points 1.68, 4.01, 6.86, 7.00, 9.18, 10.01, 12.45	None	None	Up to five points

Conductivity	TDS	Salinity	Dissolved Oxygen	Barometric Pressure
Autoranging 0.00 to 19.99 µS 20.0 to 199.9 µS 200 to 1999 µS 2.00 to 19.99 mS 20.0 to 199.9 mS	Autoranging 0.00-9.99 ppm 10.0-99.9 ppm 100-999 ppm 1.00-9.99 ppt 10.0-99.9 ppt 100-200 ppt Will also display in mg/L 0.00-199.9 mg/l 200-1999 mg/l 2.00-19.99 g/l 20.0-50 g/l	0-42 ppt 0-4.2%	0.0% to 199.9% saturation 0 — to 19.99 ppm or mg/l Salinity Correction: Automatic Barometric Pressure Compensa-tion: Auto-matic	225-900 to mmHg or 300-1200 hPa 8.86-35.43 inHg
0.01 µS 0.1 µS 1 µS 0.01 mS 0.1 mS	0.01 ppm 0.1 ppm 1 ppm 0.01 ppt 0.1 ppt 1 ptt 0.1 mg/l 1 mg/l 0.01 g/l 0.1 g/l	0.1 ppt 1%	0.1 % 0.01 ppm or mg/l	1 mm Hg or 1 hPa 0.01 inHg
± 1% full scale or ±1 digit	± 1% full scale or ±1 digit	± 0.1 ppt (-2 to +35 °C)	± 1.5% full scale	± 1.5 hPa (+10 to +40 °C)
Up to five points	Up to five points	None (derived from con-ductivity)	Two point, user select-able to any value.	Factory calibration

SECTION 3: LCD Display

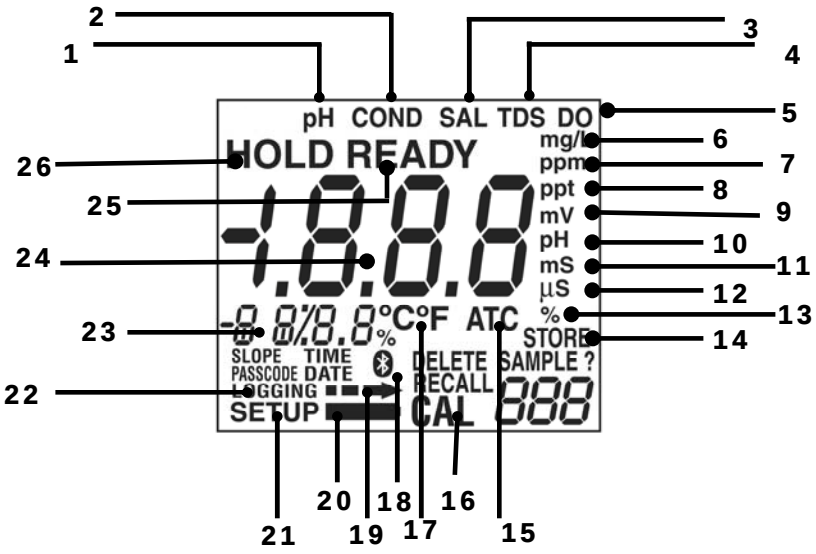


Table 2: LCD Display

Item No.	Description	pHi 410 pHi 510	pHi 420 pHi 520	pHi 430 pHi 530	pHi 450 pHi 550	pHi 460 pHi 560	pHi 470 pHi 570
1	The meter is in the pH measurement mode	•			•	•	•
2	The meter is in the Conductivity measurement mode			•		•	•
3	The meter is in the Salinity measurement mode			•		•	•
4	The meter is in the TDS measurement mode			•		•	•
5	The meter is in the DO measurement mode		•				•
6	TDS or Salinity value is in mg/L or g/L			•		•	•
7	ISE, TDS, Salinity or DO value is in ppm		•	•	•	•	•

Item No.	Description	pHi 410 pHi 510	pHi 420 pHi 520	pHi 430 pHi 530	pHi 450 pHi 550	pHi 460 pHi 560	pHi 470 pHi 570
8	ISE, TDS or Salinity value is in ppt			•	•	•	•
9	The displayed value is a mV value	•			•	•	•
10	The displayed value is a pH value	•			•	•	•
11	The Conductivity value is in mS			•		•	•
12	The Conductivity value is in µS			•		•	•
13	The Salinity or DO value is in %		•	•		•	•
14	A data point is being stored	•	•	•	•	•	•
15	The pH, Conductivity, TDS, Salinity or DO value is automatically temperature compensated.	•	•	•	•	•	•
16	The meter is in a calibration mode. Calibrating number indicates the current point of a multiple point calibration.	•	•	•	•	•	•
17	The Temperature value is in ^{o}C or ^{o}F	•	•	•	•	•	•
18	The meter is connected to Bluetooth.	•	•	•	•	•	•
19	Data is being transmitted to a PC	•	•	•	•	•	•
20	Low battery power indicator	•	•	•	•	•	•
21	Meter is in SETUP mode	•	•	•	•	•	•
22	Data is being logged	•	•	•	•	•	•
23	Temperature value	•	•	•	•	•	•
24	Main Display value	•	•	•	•	•	•
25	Stable reading (Endpoint)	•	•	•	•	•	•
26	The display is in HOLD mode	•	•	•	•	•	•

SECTION 4:
Keypad Functions

Model pHi 470 Handheld and pHi 570 Benchtop shown

Table 3: Keypad Functions

Key	Action	pHi 410 pHi 510	pHi 420 pHi 520	pHi 430 pHi 530	pHi 450 pHi 550	pHi 460 pHi 560	pHi 470 pHi 570
ON/OFF	Turns on/off meter.	•	•	•	•	•	•
pH	Displays pH.	•			•	•	•
mV	Displays mV.	•			•	•	•
ISE	Displays ISE.				•		•
TDS	Displays TDS. If no Conductivity probe is attached, TDS mode is inactive.			•		•	•

Key	Action	pHi 410 pHi 510	pHi 420 pHi 520	pHi 430 pHi 530	pHi 450 pHi 550	pHi 460 pHi 560	pHi 470 pHi 570
COND	Displays Conductivity. If no conductivity probe is attached, conductivity mode is inactive.			•		•	•
SAL	Displays Salinity. If no conductivity probe is attached, salinity mode is inactive. In DO mode with a salinity probe attached, DO is automatically compensated for salinity.			•		•	•
CAL	Puts the meter in the calibration mode for the currently displayed parameter.	•	•	•	•	•	•
DO	Displays Dissolved Oxygen.		•				•
SETUP	Enters setup mode.	•	•	•	•	•	•
CANCEL	Cancels an action.	•	•	•	•	•	•
BAR	Displays barometric pressure.		•				•
TIME	Displays the time, pressing again displays date.	•	•	•	•	•	•
STORE	Stores a reading.	•	•	•	•	•	•
RECALL	Recalls a reading.	•	•	•	•	•	•
DELETE	Deletes a stored reading.	•	•	•	•	•	•
▲ ▼	Scrolls values when in calibration mode. Used to view setup screens. Used to set numeric values during setup.	•	•	•	•	•	•
☼	Turns on the LED backlight for two minutes.	•	•	•	•	•	•
LOG	Starts or stops logging.	•	•	•	•	•	•
ENTER (HOLD)	Used to confirm values to begin calibration. Press in measurement mode to HOLD reading.	•	•	•	•	•	•

SECTION 5:
Instrument Features

Sound:
Sounds will occur as follows:

- Three short beeps any time measurement stability is reached during calibration mode, regardless of the Stabilization Lock setting.
- One short beep when stabilization is reached when in Stabilization Lock ON mode. The **READY** icon will illuminate. (NO beep if Stabilization Lock is in the OFF mode)
- Two long beeps if an error condition occurs. An error code will be displayed.
- Audible click on key tap.

Automatic Detection of Cell Constant:
(pHi 430/460/470/530/560/570)
The meter will automatically detect the cell constant of a conductivity electrode.

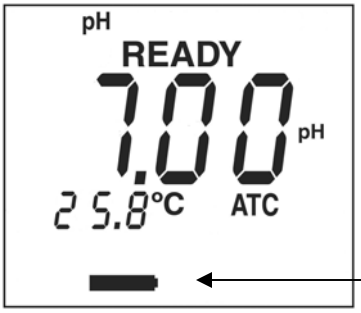
Auto Power Off:
Will automatically power off 20 minutes (default) after last key press. Auto power off is user selectable from one minute automatic shutoff to always on. When datalogging, the auto power off is disabled. During data transfer by Bluetooth the auto power off is disabled. When connected through the USB port the auto power off is disabled.

LED Display Backlight:
Display backlight goes on when the light button is pressed. The light stays on for 2 minutes after the last keystroke.

Bluetooth Wireless Communication:
Bluetooth wireless connectivity allows the viewing of real time data as well as the transfer of stored data to a PC. In addition, many functions of the instrument can be controlled remotely by a PC via Bluetooth. Bluetooth is included in the pHi 410, 420, 430, 450, 460, and 470 handheld models and the pHi 550, 560, 570 benchtop models.

USB Communication: Benchtop meters have USB connectivity capability, allowing the viewing of real time data as well as the transfer of stored data to a PC.

Low Battery Indicator:
A low battery icon will appear when approximately 25 hours of battery life remains. If the batteries are not replaced after the low battery icon appears, the batteries will be eventually be depleted to the level where the instrument cannot reliably be used without the possibility of measurement errors. When the batteries are depleted to the point that reliable measurement can no longer be made, the large display will read **bAt** and the instrument will not be useable until the batteries are replaced.



The battery icon gives about 25 hours of warning. Replace batteries soon.

*The **bat** text is shown when the batteries are too low to provide reliable measurement. The instrument is not useable until batteries are replaced.*

Section 6: Temperature and Barometric Pressure Compensation

pH Temperature Compensation: (pHi 410, 450, 460, 470, 510, 550, 560, 570)

If the meter is in the pH mode and a temperature probe is plugged in to the 3.5mm phono jack, the meter defaults to Automatic Temperature Compensation (ATC). If no temperature probe is detected it defaults to Manual Temperature Compensation at 25 °C. Manual temperature compensation values are user selectable.

Conductivity Temperature Compensation: (pHi 430/460/470/530/560/570)

Conductivity is always automatically temperature compensated using the thermistor built into the probe.
The Conductivity automatic temperature compensation coefficient is user selectable. Default is 2% per degree C.

Dissolved Oxygen Temperature Compensation: (pHi 420/470/520/570)

If the meter is in the Dissolved Oxygen mode, a dissolved oxygen probe is attached to the DO connector. The meter defaults to Automatic Temperature Compensation (ATC). All Beckman Coulter DO probes have built-in temperature sensors.

ISE Temperature Compensation:

Ion Selective Electrodes are not automatically temperature compensated.

Barometric Pressure Compensation: (pHi 420/470/520/570)

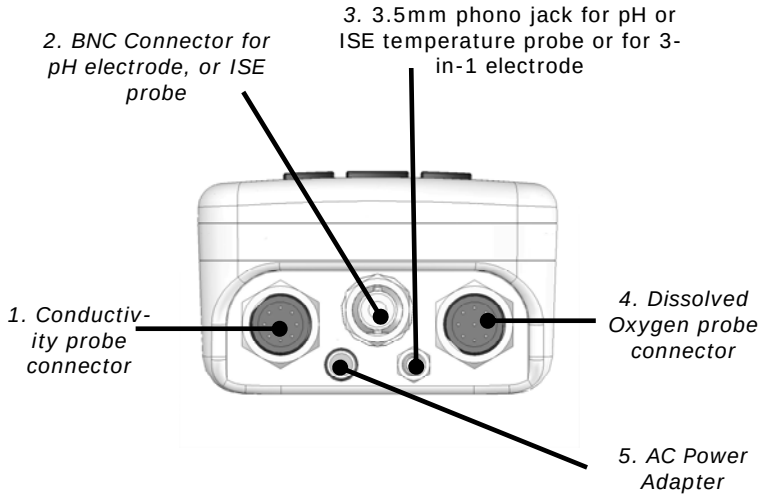
The meter has an on-board pressure transducer for automatic barometric pressure compensation of dissolved oxygen. In addition, the actual barometric pressure can be displayed in inches of mercury, millimeters of mercury or hectopascals.

Table 4: pH Temperature Compensation Tables

The table below shows the pH values of buffers at various temperatures.

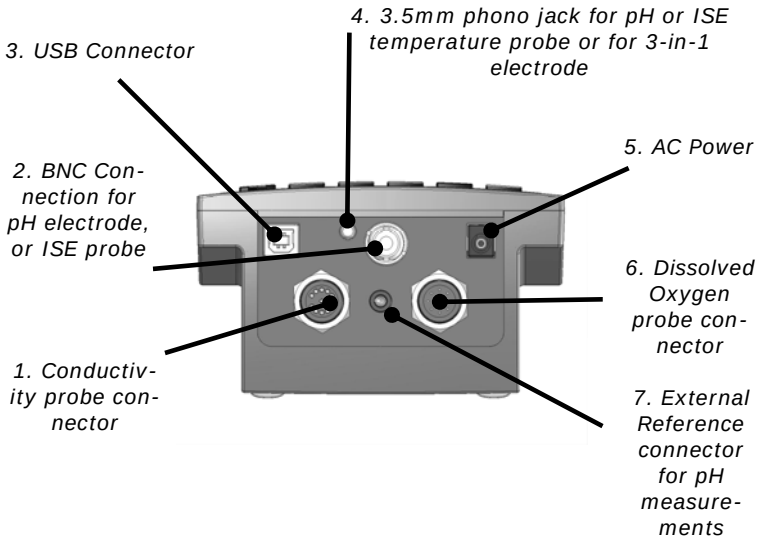
Nominal Value							
25 °C	**0 °C**	**5 °C**	**10 °C**	**20 °C**	**30 °C**	**40 °C**	**50 °C**
1.68	1.67	1.67	1.67	1.67	1.68	1.69	1.71
4.01	4.00	4.00	4.00	4.00	4.01	4.03	4.06
6.86	6.98	6.95	6.92	6.87	6.85	6.84	6.83
7.00	7.12	7.09	7.06	7.01	6.99	6.97	6.97
9.18	9.46	9.40	9.33	9.23	9.14	9.07	9.02
10.01	10.32	10.25	10.18	10.06	9.97	9.89	9.83
12.45	13.42	13.21	13.00	12.63	12.29	12.04	11.70

SECTION 7: Probes and Connections
Handheld Meters



Model pHi 470 Shown (other models may not have all the connections shown)

Probes and Connections
Benchtop Models



Model pHi 570 Shown (other models may not have all the connections shown)

Probe Connections

BNC Connector for pH:
The Model pHi 410/450/460/470/510/550/560/570 meter accepts any pH or ORP electrode with a BNC connector. Be sure that both the receptacle on the meter and the connector on the probe are clean and dry; wet or dirty connections may cause unstable readings.

BNC Connector ISE:
The Model pHi 450/470/550/570 meter accepts any Ion Selective Electrode with BNC connector. Be sure that both the receptacle on the meter and the connector on the probe are clean and dry; wet or dirty connections may cause unstable readings.

Phono Jack for BNC Probe Temperature Sensors:
The temperature sensor for BNC probes uses a 3.5 mm phono jack. When a temperature sensor is connected, the meter will Automatically Temperature Compensate (ATC) pH or ISE values.

Conductivity Probe Connector:
The Model pHi 430/460/470/530/560/570 meter accepts conductivity probes with different cell constants. The temperature sensor is built-in to the conductivity probe so a separate temperature probe is not required. If a conductivity probe is detected, conductivity measurement and calibration is enabled.

The cell constant of the conductivity probe is automatically detected. The following cell constants are recommended for the following applications: K=0.5 for general purpose; K=1 for low conductivity such as drinking water; K=10 for salinity or brackish water.

DO Probe Connector:
The Model pHi 420/470/520/570 meter accepts the Dissolved Oxygen probe. The temperature sensor is built-in to the DO probe so a separate temperature probe is not required.

Reference Probe Connector:
The Model pHi 510/550/560/570 meter accepts an external reference for pH measurements.

USB Connector:
The Model pHi 510/520/530/550/560/570 meter accepts a standard USB cable.

AC Power Connector:
All models accept an AC adapter. Use only Beckman Coulter specified adapters.

NOTE: All of the connectors on the handheld meter, including the BNC connector and the 3.5mm phono jack, are sealed to protect flooding the interior of the meter in the event of submersion. If the meter is submerged, and the rubber plug is not installed on the 3.5mm phono jack, the interior of the jack may fill with water although the interior of the meter itself remains sealed. If the 3.5mm phono jack is flooded, it must be dried immediately. Best solution is to invert the meter to allow any water to run out of the connector.

SECTION 8: USB Connectivity

All benchtop models are equipped with USB connectivity to a PC. Stored data can be uploaded to a PC, real-time measurement values can be viewed remotely on a PC, and many functions of the meter can be remotely controlled from a PC via the USB connection.

1. With the meter off, connect the USB port on the back of the meter to a USB connection on a computer using the **USB 2.0 A/B Cable** as shown below.

2. Follow your PC's software instruction guide for operation of your PC's USB connection software. USB drivers are contained on the included CD.

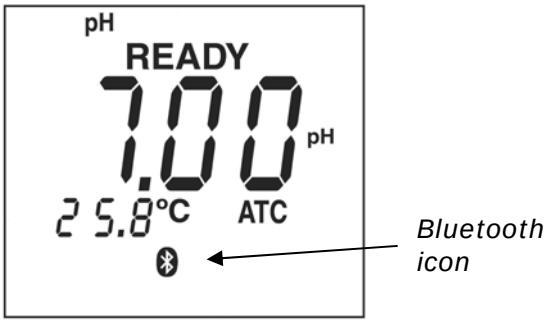
3. Turn the meter on, and open the SmartLogger II software (contained on the included CD). Click on the "Find Meter" icon to connect to the meter. Please see the SmartLogger II manual on the included CD for further SmartLogger II operating instructions.

Section 9: Bluetooth Wireless Connectivity

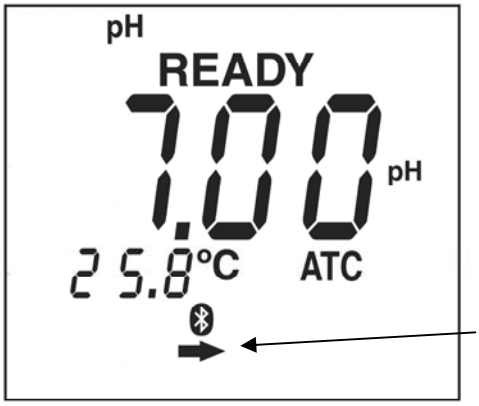
All handheld models (410, 420, 430, 450, 460, 470) and select benchtop models (550, 560, 570) are equipped with Bluetooth wireless connectivity to a PC. Stored data can be uploaded to a PC, real-time measurement values can be viewed remotely on a PC, and many functions of the meter can be remotely controlled from a PC via Bluetooth.

1. When the meter is turned on it will be in discovery mode and will seek a Bluetooth connection with a PC .
2. Follow your PC's software instruction guide for operation of your PC's Bluetooth connection software. This usually involves going to a "setup," "connect," or "Bluetooth" menu on your PC.
3. On your PC, select the option to "discover" or "add a Bluetooth device." Your PC will then ask if you want to pair with it.
4. Accept and then you will be required to ENTER a passkey or PIN. **The PIN = 1234**. Your PC will confirm successful pairing and your meter will display the Bluetooth icon. In case of unsuccessful pairing repeat steps 1 through 4.

NOTE: Go to www.BeckmanCoulter.com/pH for additional information regarding the Bluetooth capabilities of your meter.



NOTE: If you have more than one Beckman Coulter Bluetooth meter within range, each meter will identify itself with Model Number and Serial Number, for example “pHi470 SN102755”



5. Once a Bluetooth connection is established between the PC and meter, open the SmartLogger II software (contained on the included CD). Click on the "Find Meter" icon to have the software connect to the meter. Please see the SmartLogger II manual on the included CD for further SmartLogger II operating instructions

6. When the meter is communicating with the SmartLogger II software on a PC, the arrow icon flashes whenever data is being transferred.

7. Full instructions on use of the SmartLogger II Software is contained in a separate manual located on the CD included with all Beckman Coulter Bluetooth enabled meters.

Section 10: LIMS Interface

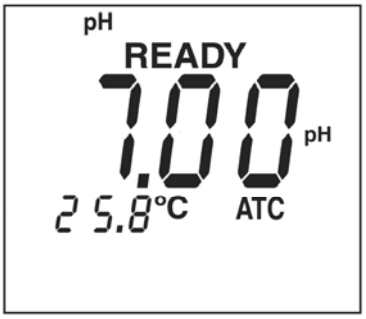
A complete list of LIMS interface commands are included on the CD accompanying this product. Please work with your technical support group to implement into your specific environment .

Section 11: pH Calibration

The meter accepts from one to five calibration points. The sequence of buffers and number of calibration points can be defined by the System Administrator.

- The meter defaults to two point calibration. To change the number of calibration points, please see page 76.

1. Press **pH** to put in pH mode.

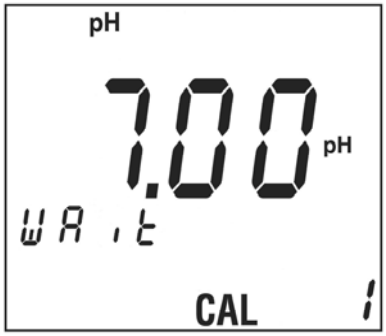


2. Place probe in first buffer solution.

   NOTE: If you wish to clear all previous calibration points, slopes and offset, press **CAL** then **DELETE**. If you wish to update a previous calibration with a single point calibration, omit this step.

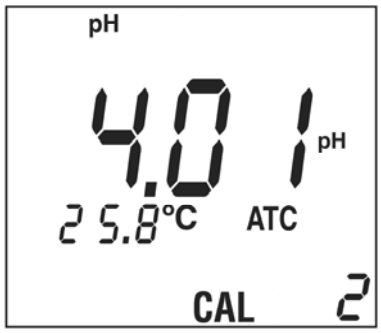
3. Press **CAL**. The **CaI** icon will begin flashing.

4. If the buffer is correct, press **ENTER**. The pH buffer value will flash until calibration is complete. If the pH buffer is incorrect, press the ▲ or ▼ key to select another buffer. Repeatedly pressing ▲ or ▼ will display the choices of available buffers 1.68, 4.01, 6.86, 7.00, 9.18, 10.01, 12.45 (if on CAL 2 or CAL 3 the meter omits the values already used in previous calibrations).



NOTE: Calibration can be aborted while the pH value is flashing by pressing the **pH** or **CANCEL** key to return to the measurement mode.

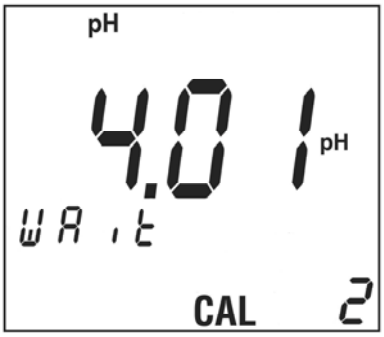
5. When calibration is complete for that buffer, meter will beep three times, and the display will show a flashing CAL 2 and the next pH buffer value (factory default is 4.01). The System Administrator can set the sequence of calibration buffers.



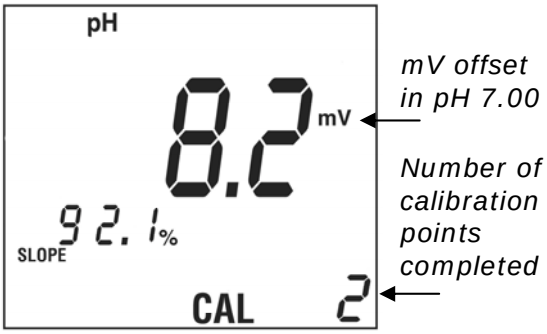
6. Rinse the probe in deionized water and place in second buffer solution.

7. Press **ENTER** if OK, or ▲ or ▼ to change value. Press **pH** to accept a 1-point calibration and return to the pH measurement mode.

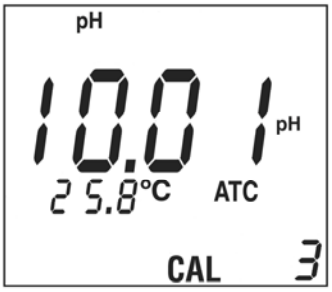
8. If **ENTER** is selected, the buffer value will start flashing until calibration is complete.



9. If the meter is set for only a two point calibration, upon completion of the second point the meter will beep three times and the display will show the slope, mV offset at pH 7.00 and number of calibration points. After reviewing the calibration data, press **pH** or **STORE** to begin reading the pH value of any solution. If the meter is setup for three or more calibration points, continue with the next step.



10. Rinse probe in deionized water and place in next buffer solution.
11. If setup for additional calibration points (up to five), press **ENTER.** If the displayed buffer value is not OK, press ▲ or ▼ to change buffer value, or press **pH** to accept just a 2 point calibration and display pH measurement mode.



12. If **ENTER** was selected in step 11, the buffer value will start flashing until calibration is complete.
13. Repeat steps 11 and 12 until the final calibration points are complete.
14. When done with the final calibration point, calibration is complete. The meter will beep three times and display the slope, mV offset at pH 7.00 and number of calibration points.
15. Press **pH** or **ENTER** to begin reading the pH value of any solution.

NOTE: The slope is defined as the change in potential when the pH reading changes by one decade (e.g. from pH 7.00 to pH 8.00). The % slope is defined as the ratio of the measured slope and the theoretical Nernst slope of 59.16 mV per decade of pH change at 25 °C. If the slope on a pH electrode is not between 85% and 102%, the meter will display Error Code E04. If the calibration is more than two points, the displayed slope is the average slope for all points. The meter will display E03 if the offset from 0.0 mV in pH 7.00 is greater than ±30 mV.

Section 12: ISE (Ion Selective Electrode) Calibration

The meter accepts up to five ISE calibration standards. The values of the concentration standards are first entered in the SETUP mode. Calibration can be aborted at any time by pressing the **CANCEL** key.

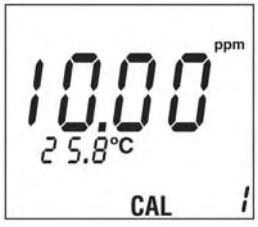
- The meter defaults to two point calibration. To change the number of calibration points, please see page 81.

1. Press **ISE** to put in the ISE mode.

2. Place probe in first calibration solution.

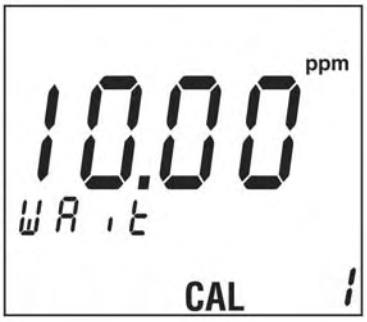
   NOTE: If you wish to clear all previous calibration points, slopes and offset, press **CAL** then **Delete**. If you wish to update a previous calibration with a single point calibration, omit this step.

3. Press **CAL**. The **Cal 1** icon will begin flashing.



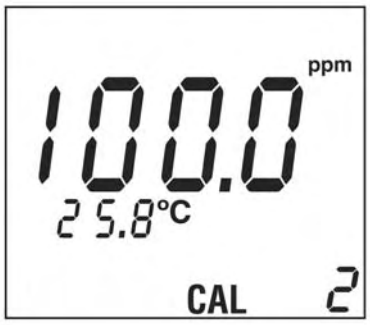
NOTE: The solution temperature will be displayed if a temperature probe is attached to the 3.5mm phono jack. However, ISE measurements are not automatically temperature compensated.

4. If necessary press the ▲ or ▼ keys to select the concentration of the ISE standard. Press **ENTER** to begin calibration.



5. When calibration of the first point is complete, the meter will beep three times, and the display will show a flashing CAL 2 and the next ISE concentration value.

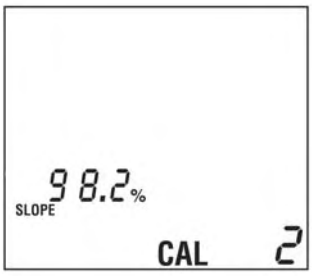
6. Rinse probe in deionized water and place probe in next calibration solution.



7. Press **ENTER** if the correct concentration is displayed, or ▲ or ▼ to change value. **NOTE:** To perform only a one point calibration and not proceed to the second point, press **ISE** or **STORE**. The meter will accept just a one point calibration and display the slope.

8. If **ENTER** is selected, the concentration value will start flashing until calibration is complete.

9. If the meter is set for only a two point calibration, upon completion of the second point the meter will beep three times and the display will show the slope and the number of calibration points. If the meter is setup for three, four or five point calibration, repeat steps 6 and 7.



10. Press **ISE** or **ENTER** to begin reading the concentration value of any solution.

NOTE: The slope is defined as the change in potential when the concentration changes by a factor of 10 (e.g. from 10 ppm to 100 ppm). The % slope is defined as the ratio of the measured slope and the theoretical Nernst slope of 59.16 mV per decade of change at 25 ^{o}C for a monovalent ion. The % slope for a monovlaent ion should be between 90 and 100 . The slope for a divalent ion should be between 45 to 50. The meter will display Error E30 if the slopes are not the same sign or not within 25% of each other. If the calibration is more than two points, the displayed slope is the average slope for all points.

SECTION 13: Conductivity and TDS Calibration

The Model pHi 430/460/470/530/560/570 meters measure Conductivity and TDS (Total Dissolved Solids). Salinity measurements are derived from conductivity.

Conductivity and TDS Calibration

The meter can be calibrated with up to five calibration points. If a calibration point is greater than 20% of a previously stored calibration point, the previously stored calibration point will be retained and a new calibration point will be saved. If the calibration point is less than 20% of a previously stored calibration point, the closest stored calibration point will be replaced. If five calibration points are already stored, the closest stored calibration point will be replaced with the new calibration data. The meter can be calibrated with either Conductivity or TDS standards. Stored calibration points can be reviewed in SETUP. All calibration data can be cleared using the Clear All Calibration Points function in SETUP .

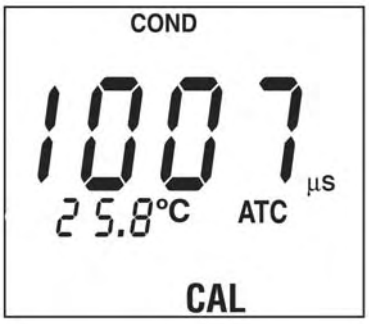
NOTE: The meter defaults to a temperature compensation coefficient of 2% per C. The coefficient is user selectable in SETUP.

NOTE: The meter automatically detects the cell constant. Calibration is automatically cleared if the conductivity probe is changed to a probe of a different cell constant.

1. Press **COND** to put in Conductivity mode or press **TDS** to put in TDS mode.
2. Place probe in first standard solution. Meter will begin reading the conductivity value.

NOTE: If you wish to clear all previous calibration points, slopes and offset, press **CAL** then **Delete**. If you wish to update a previous calibration with a single point calibration, omit this step.

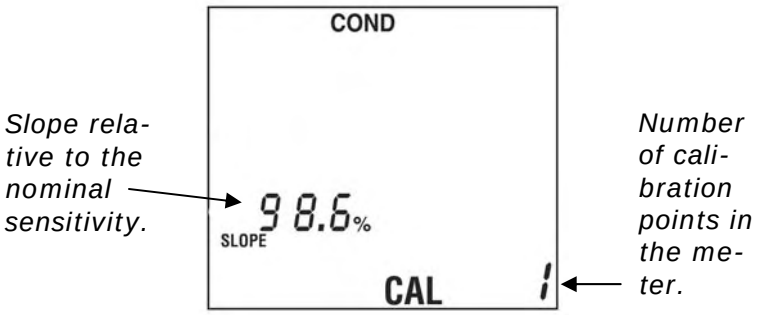
3. Press **CAL**. The main display value will begin flashing.



4. Press the ▲ or ▼ key to scroll to the value of the conductivity or TDS standard and press **ENTER.**

5. The main display and the “Wait” icon will flash. At any time during the calibration you may exit the calibration mode by pressing the **COND, TDS** or **CANCEL** button. The meter will abort the current calibration and keep the old calibration data.

6. Upon completion of the calibration, the meter will display the slope as compared to the nominal sensitivity for a probe of that cell constant and the total number of conductivity and TDS calibration points stored in the meter.



7. Press **COND** or **TDS** to begin reading the conductivity or TDS value of any solution.

8. If you wish to have multiple conductivity or TDS calibration points , repeat steps 1-5 for up to five calibration points.

NOTE: On models containing dissolved oxygen, conductivity, TDS or salinity options (models Φ 420, 430, 460, 470, 520, 530, 560, 570), you will receive either a beep or a E20/E27 error code if you access any of those functions WITHOUT an attached dissolved oxygen or conductivity probe. The meter performs probe self-checks prior to entering those measurement modes and, because the probe is not connected, it is considered an error condition. The error codes will not be present when the appropriate Beckman Coulter Dissolved Oxygen or Conductivity Probe is connected.

Section 14: Dissolved Oxygen Calibration

The Model pHi 420/470/520/570 can be calibrated for dissolved oxygen using either of two methods; the water saturated air or the water sample with known DO concentration method. Up to two calibration points can be made at any concentration. If a one point calibration is made, the meter will replace the previously stored calibration point that corresponds most closely to the new calibration point e.g. a new 100% DO single point calibration will replace the previously stored calibration point that is closest to 100% DO value. One or two point calibrations can be made in either method. Calibration and measurement units can set to % or mg/L during SETUP.

- **Water-saturated air method**. The best standard operating procedure is to use a narrow-necked bottle, such as a BOD bottle. Add a small amount of water (1 cc). Close the bottle and shake vigorously for several minutes, then insert the probe for calibration. A faster approach, though slightly less accurate, is to wet the probe membrane and hold the it in air with the sensor facing down. Either approach gives 100% saturation. The default calibration unit is %.
- **A water sample with a known dissolved oxygen concentration method.** In this method, the concentration must be determined by using a Winkler titration or other technique.

In either method, a near zero dissolved oxygen solution can be obtained by placing the probe into an oxygen scavenging solution such as 20% sodium sulfite for five minutes.

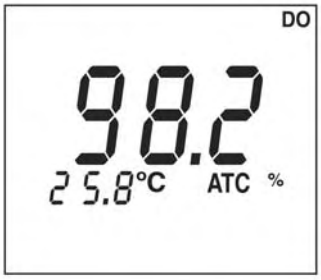
Dissolved Oxygen is dependent upon barometric pressure. The meter has a built-in barometer that will perform automatic compensation for barometric pressure.

Dissolved Oxygen is dependent upon salinity. Salinity compensation is automatic with Model pHi 470/570 if a conductivity (salinity) probe is attached; alternately, the salinity compensation factor can be manually entered in SETUP.

1. If using the water saturated air method, prepare the first standard by putting 1cc of water in a narrow necked bottle. Shake vigorously.

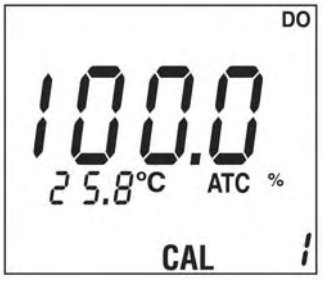
2. Blot the probe tip dry then place the probe in the bottle, or if using the quick method, wet the probe membrane with water and then hold the probe in air with the sensor facing down.

3. Press **DO** to put into Dissolved Oxygen mode. The meter will begin reading the DO value.



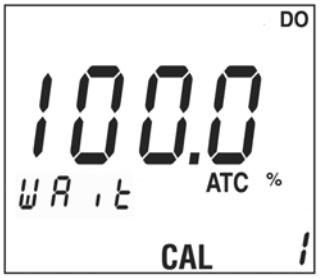
4. Place probe in first calibration solution or saturated air bottle. If you wish to clear all previous calibration points, slopes and offset, press **CAL** then **Delete**. If you wish to update a previous calibration with a single point calibration, omit this step.

5. Press **CAL**. The **Cal** icon will begin flashing.



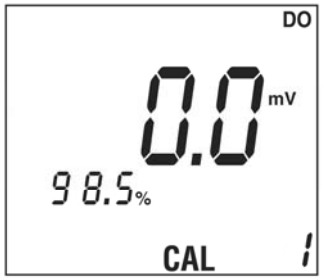
Calibration units can be %, ppm or mg/l as defined in SETUP

6. If necessary press the ▲ or ▼ keys to select the concentration of the DO standard. Press **ENTER** to begin calibration.



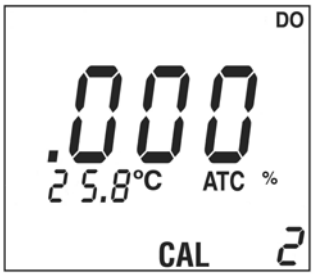
7. The DO value and the “Wait” icon will flash until calibration is complete. At any time during the calibration you may exit the calibration mode by pressing the **CANCEL** button. The meter will abort the current calibration and keep the old calibration data.

8. When calibration of the first point is complete, the meter will beep three times. If setup for one point calibration, the meter will display the slope. Press **DO** or **STORE** to go to measurement mode.



9. If the meter is setup for two point calibration, the display will show a flashing CAL 2 and the next DO concentration value defined in SETUP.

NOTE: Slope is the ratio of the actual sensor mV output compared to the nominal sensitivity of 0.0 mV at 0% saturation and 45.0 mV at 100% (100% defined as 8.2 mg/L saturation at 25 ^{o}C at 1013.25 hPa barometric pressure at 0 ppm salinity). 1 mg/L=1 ppm. The nominal slope is 8.2 ppm/45mV or 0.1822 ppm per mV.



10. Press **ENTER** to begin calibration; the DO value and the “Wait” icon will flash until calibration is complete. Upon completion the slope is displayed. NOTE: To perform only a one point calibration and not proceed to the second point, press **DO** or **STORE**. The meter will accept just a one point calibration and display the slope.

11. Press the **Bar** key to view the barometric pressure. Press **SAL** to view the measured salinity adjustment if a conductivity (salinity) probe is attached. If no conductivity probe is attached, the manual salinity compensation factor is displayed.

NOTE: On models containing dissolved oxygen, conductivity, TDS or salinity options (models Φ 420, 430, 460, 470, 520, 530, 560, 570), you will receive either a beep or a E20/E27 error code if you access any of those functions WITHOUT an attached dissolved oxygen or conductivity probe. The meter performs probe self-checks prior to entering those measurement modes and, because the probe is not connected, it is considered an error condition. The error codes will not be present when the appropriate Beckman Coulter Dissolved Oxygen or Conductivity Probe is connected.

Section 15. Stored Measurement Data

The pHi 400/500 Series meters can store up to 999 measurement readings. Data must be stored to recall it for later review, downloading or printing. The meter will store the following data for each measurement:

Stored pH and ISE Measurements

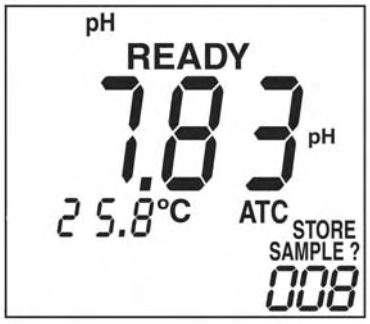
- Sample Number
- pH or ISE value
- mV value (pH)
- Sample Temperature
- Temperature Compensation (Auto or Manual value)
- Date
- Time
- Meter Serial Number
- Software Version
- Calibration Date
- Calibration Time

Stored Conductivity, TDS, Salinity or DO Measurements

- Sample Number
- Conductivity/TDS/Salinity/DO value
- Sample Temperature
- Temp. Compensation Coefficient (conductivity/TDS)
- Temperature Normalization (20 or 25 C)
- TDS Conversion Factor (TDS)
- Salinity Adjustment (DO)
- Barometric Pressure (DO)
- Date
- Time
- Meter Serial Number
- Cell Constant (Conductivity)
- Software Version
- Calibration Date
- Calibration Time

Section 16. Storing Measurements

1. While in the reading mode (pH, Conductivity, TDS, Salinity, or DO) press **STORE.** The meter will display the next available sample number. The **?** icon will be flashing.



2. To store data in this sample number press **STORE** again**.** The data will be stored in that memory location and the meter will return to the measurement mode.

3. To store data in a different sample number, use the number keys to select a different sample number. Press **ENTER** to store in this memory location. The meter will return to the measurement mode.

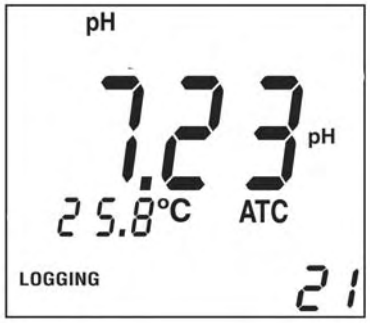
NOTE: If a sample number already contains data, or all memory locations are full, the meter will beep twice and prompt to overwrite the data point by displaying **DELETE SAMPLE?.** Press **ENTER** to overwrite the data in that location with the current data or press **CANCEL** to return to the measurement mode without overwriting the data.

Section 17. Datalogging

The Model pHi 400/500 Series meters will datalog up to 999 data points at user selectable intervals from 1 second to 1999 seconds (See SETUP functions).

NOTE: If logging titrations or other measurements where the fastest response time is required for minute changes in value, it is best to turn off stabilization lock (**READY** icon) in the SETUP mode.

1. While in the reading mode (pH, Conductivity, TDS, Salinity, or DO) press **LOG.** The meter will begin datalogging at the interval determined in the meter setup. The "LOGGING" icon will be flashing and the digits in the lower right will indicate the number of datapoints collected.



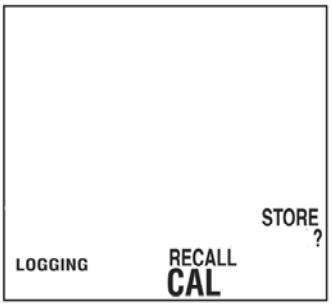
Number of datapoints logged

2. To stop logging, press the **LOG** key. To resume logging, press the **LOG** key again. To prevent the loss of data, when the logging memory is full, rather than just stop, the meter will delete every even numbered data point and will continue logging.

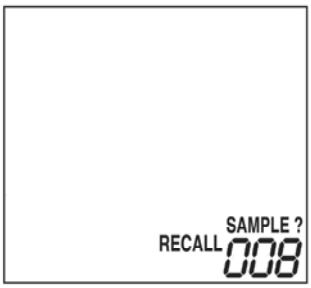
NOTE: Recalibration alarms are not active during logging. Logging is suspended during calibration and SETUP.

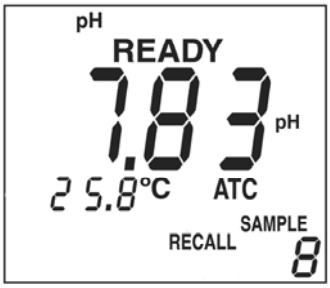
Section 18. Recalling Stored or Logged Data

1. It is possible to recall stored data or logged data. To recall stored or logged data, press the **RECALL** key while in the measurement mode.



2. Press the **STORE** key to recall stored data or press **LOG** to recall logged data.

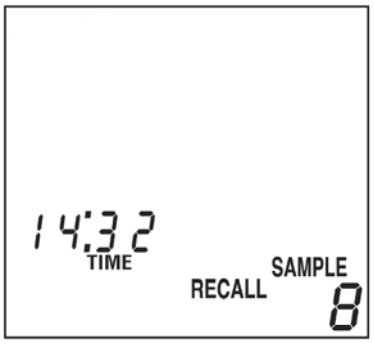




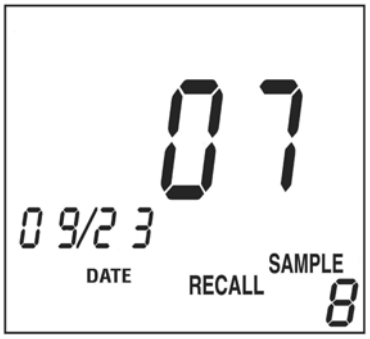
3. The number of the most recently stored data location will be displayed. To view this data, press **RECALL**. To select a different memory location, use the numeric keypad to enter the location number, then press **ENTER**.

NOTE: Unit will indicate "no" if you attempt to recall from a location in which there is no stored data point. If "no" is displayed, use the up or down arrow to scroll to a location with stored data.

4. To display the time a stored sample was taken press the **TIME** key.

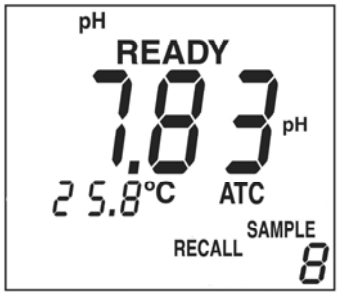


5. To display the date a stored sample was taken press the **TIME** key again. To return to the stored measurement value, press the **TIME** key again, or press **pH** (**ISE/COND/TDS/SAL/DO**) or **CANCEL** to return to the measurement mode.

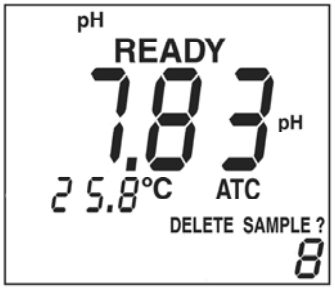


Section 19. Deleting Stored or Logged Data

1. To delete a single sample measurement, it must be recalled first. Press **RECALL** while in the measurement mode. Press the **STORE, CAL** or **LOG** key to indicate whether you wish to access stored, calibration or logged data. The number of the most recently stored data location will be displayed. To view this data, press **RECALL**. To select a different memory location, use the numeric keypad to enter the location number, then press **ENTER**. (See Section “Recalling Stored or Logged Data”). See Section 17 for a full description.

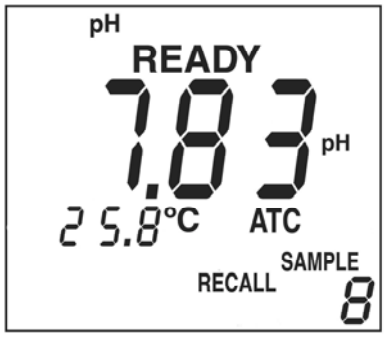


2. When the desired sample is displayed, press the **DELETE** key. The meter will display **DELETE SAMPLE ?.** Press **ENTER** to erase the data. If you do not want to delete the data press **CANCEL** or press **pH** (**ISE/COND/TDS/SAL/DO**) to return to the measurement mode.

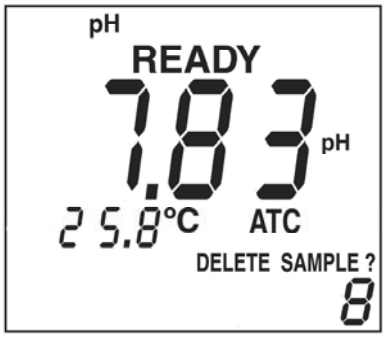


Deleting All Stored or Logged Measurements

1. To delete all sample measurements, a sample measurement must be recalled first. To recall data press **RECALL** while in the measurement mode. Press the **STORE** key or the **LOG** key to indicate whether you wish to access stored or logged data. The number of the most recently stored data location will be displayed. To view this data, press **RECALL**. (See page 44, Recalling Stored or Logged Data)

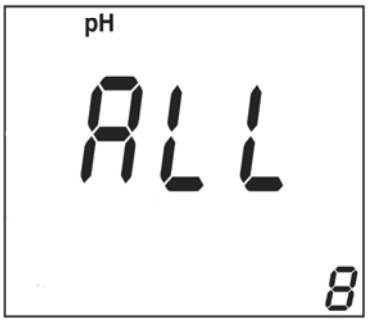


2. When a sample is displayed, press the **DELETE** key. The meter will display **DELETE SAMPLE ?**



3. Press the **0** key, then **ENTER.**

4. The meter will display an **ALL.**



5. Press **ENTER** to delete all stored samples, or press **CANCEL** to return to the recall sample screen without deleting

Section 20. Stored Calibration Data

The meter will store the last 10 calibrations.

The meter will store the following data for each calibration

Stored Calibration Data

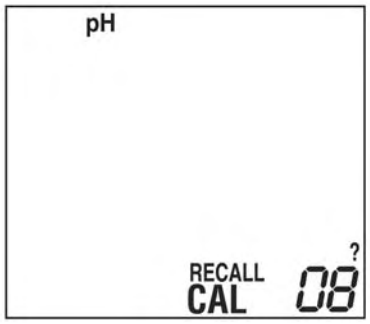
- Calibration Number
- Cal 1 value
- Cal 1 mV value
- Cal 1 Temperature
- Cal 2 value
- Cal 2 mV value
- Cal 2 Temperature
- Cal 3 value
- Cal 3 mV value
- Cal 3 Temperature
- Cal 4 value
- Cal 4 mV value
- Cal 4 Temperature
- Cal 5 value
- Cal 5 mV value
- Cal 5 Temperature
- Slope Cal 1– Cal 2
- Slope Cal 2– Cal 3
- Slope Cal 3– Cal 4
- Slope Cal 4 - Cal 5
- Cal Date
- Cal Time

Stored Instrument Data

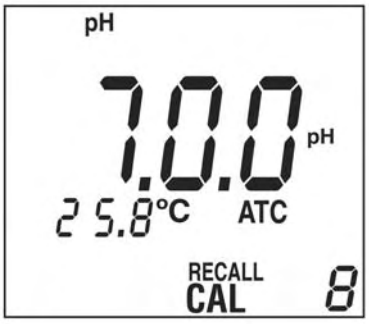
- Meter Serial Number
- Software Version

Section 21. Recalling Stored Calibrations

1. To recall pH calibration data, press **RECALL** while in the pH, COND, TDS, or DO measurement mode. Press the **CAL** key to indicate you wish to access calibration data. The number of the most recently stored calibration data location will be displayed.



2. To view this data, press **RECALL**. To select a different memory location, use the numeric keypad to enter the location number, then press **ENTER**. The first calibration point for the stored calibration will be displayed. Use the ▲ or ▼ key to scroll to view other stored calibration points.



3. To view the mV value of the stored calibration point, press **ENTER**. To view the slope of the stored calibration, press **ENTER** again. Press **RECALL** or **CANCEL** to return to viewing stored pH calibration values.

4. To view the time of a stored calibration, press the **TIME** key. Press the **TIME** key again to display the date.

5. Press **CANCEL** or the **pH (mV, ISE, TDS, SAL, DO)** key to return to the measurement mode.

SECTION 22: Setup Functions

General Navigation for setup options:

1. Press **SETUP** to start General Setup Functions or **SETUP** then **pH, COND, TDS, SAL or DO** to start Parameter Setup Functions. A passcode may be required if the System Administrator has previously set a passcode.

2. Press the ▲ or ▼ keys to scroll to the setup function you want to change.

3. Press **ENTER** to indicate you want to change this setting.

4. Press the ▲ and ▼ keys to scroll through the choices available for that setup function.

5. Press **ENTER** to store the new setting in memory.

6. Press **SETUP** to return to the measurement mode.

NOTE: Setup is disabled during calibration.

TABLE 5: SETUP FUNCTIONS

	SETUP MODE GENERAL	OPTIONS
1	Passcode Required	NO, or YES. If YES, then set four digit passcode. Default: NO.
2	pH, COND, TDS, DO Stabilization Lock	ON or OFF Default: ON
3	Temperature Units	C or F Default: C
4	Sound	ON or OFF Default: ON
5	Automatic Shutoff Time	Shutoff time in minutes. 1 to always on Enter 000 for continuously on Default: 20 min
6	Set Time	Set to current time
7	Set Date Format	mm/dd/yy dd/mm/yy Default: mm/dd/yy
8	Set Month and Day	Set to current date
9	Set Year	Set to current year
10	Datalogging Interval	1 sec to 1999 sec. Default: 10 sec
11	Clear all pH, conductivity, TDS, and DO calibration points	NO or YES Default: NO

TABLE 5: SETUP FUNCTIONS Continued

	SETUP MODE pH	**OPTIONS**
1	pH Recalibration Alarm	Never to 1999 hours Default: Never
2	pH Resolution	0.1 or 0.01 Default: 0.01
3	pH Calibration	2, 3, 4, or 5 point Default: 2 point
4	pH Method	Define calibration sequence up five buffers
5	pH Manual Temperature Compensation	User selectable Default: 25 C
	SETUP MODE ISE	**OPTIONS**
1	ISE Recalibration Alarm	Never to 1999 hours Default: Never
2	ISE Calibration	2, 3, 4, or 5 point Default: 2 point
3	ISE Method	Define calibration sequence up five concentrations
	SETUP MODE COND	**OPTIONS**
1	Conductivity Recalibration Alarm	Never to 1999 hours Default: Never
2	Conductivity/TDS Automatic Temperature Compensation Coefficient	User selectable Default: 2% per degree C

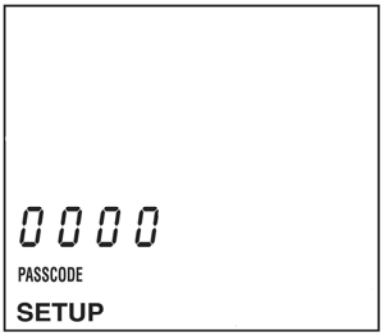
TABLE 5: SETUP FUNCTIONS Continued

3	Currently Used Conductivity Calibration Points	Displays up to five conductivity calibration points
4	Conductivity temperature normalization	20 C or 25 C Default: 25 C
5	Conductivity Probe Cell Constant	Shows cell constant value. .000 if no probe
	SETUP MODE TDS	**OPTIONS**
1	TDS Conversion Factor	User selectable 0.4 to 1.0 Default: 0.5
2	TDS units	mg/L or ppm Default: mg/L
	SETUP MODE SAL	**OPTIONS**
1	SAL units	ppt or % Default: ppt
	SETUP MODE DO	**OPTIONS**
1	DO Recalibration Alarm	Never to 1999 hours Default: Never
2	DO Measurement Units	%, mg/l or ppm Default: %
3	DO Calibration Units	%, mg/l or ppm Default: %
4	DO Calibration	1 or 2 point Default: 1 point
5	DO Method	Define calibration sequence of one or two concentrations
6	DO Barometric Pressure Units	inHg, mmHg, hPa Default: hPa
7	DO Salinity Compensation	Auto (if conductivity probe attached) or manually set to user defined value (0 to 49.9 ppt)

ENTERING A PASSCODE TO ACCESS SETUP FUNCTIONS

(IF SETUP FUNCTIONS ARE PASSCODE PROTECTED)

1. If you press the **SETUP** key and are prompted for a passcode, the meter setup functions have been protected and require a passcode to view, edit or change.

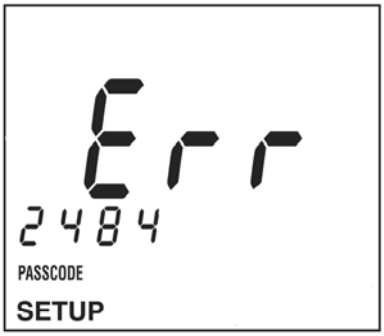


2. Use the number keys to enter the four digit passcode.

A unique passcode is set by the system Administrator.

3. Press **ENTER**

4. If the wrong passcode is entered, the meter will display **Err**. Press **CANCEL** to reenter the passcode or press the **pH (mV, ISE, TDS, COND, SAL, or DO)** key to return to the measurement



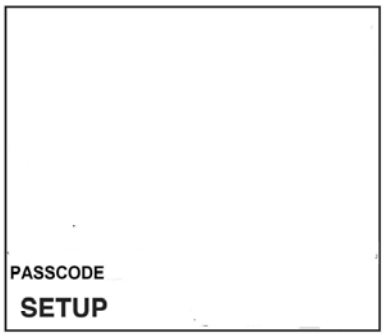
General Setup 1.
Setting up Passcode Access Control

The meter allows passcode access control for all setup functions. If a passcode are used, when the SETUP key is pressed, the operator is prompted for a passcode in order to access setup functions. This allows access to calibration methods and other functions to be controlled by authorized personnel.

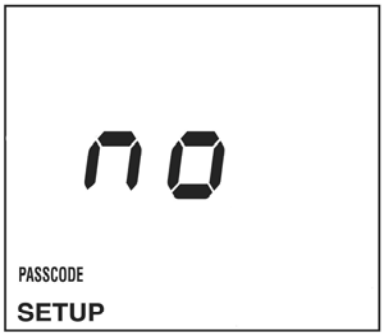
To setup passcode protection:

1. Press **SETUP** to put in the setup mode.

2. Press the ▲ or ▼ key until the passcode setup screen is displayed.



3. Press **ENTER**. The display will ask if you wish to change the passcode. Default: NO.



Pressing the ▲ or ▼ keys will toggle passcode access NO or YES

4. Press the ▲ or ▼ key to set to YES. Press **ENTER**.

5. Use the number keys to enter a passcode. When finished, press **ENTER**. Press **CANCEL** to abort without entering a passcode.

NOTE: To allow access to SETUP functions without a requiring passcode, set the passcode to 0000.

NOTE: After exiting SETUP, the passcode is not enabled for five minutes, or until the meter is turned off, then turned back on. This feature allows the System Administrator, while configuring the meter, to move quickly between the measurement modes and setup modes without repeated use of the password.

General Setup 2.
Setting Stabilization Lock ON or OFF

pH, conductivity, TDS and DO can be displayed with a Stabilization Lock mode. When a stable reading is reached, the display locks on the value and the meter ignores very slight changes in the measurement. The "Ready" icon turns on when an endpoint is reached and the Stabilization Lock is active. The display automatically unlocks after a significant measurement change is detected. When performing titrations or attempting to detect very slight changes, the Stabilization Lock should be **OFF**

Default is Stabilization Lock ON

1. Press **SETUP** to put in the setup mode.

2. Press the▲or ▼until the Stabilization Lock screen is displayed.

3. Press **ENTER**. The display will show the Stabilization Lock status.

Pressing the ▲ or ▼ keys will toggle stabilization lock ON or OFF

4. Use the ▲ or ▼ to set the Stabilization Lock mode

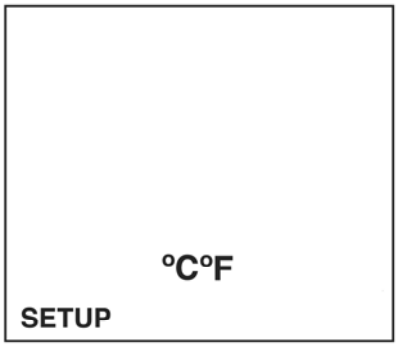
5. Press **ENTER** to save changes and return to SETUP mode. Press **CANCEL** to return to SETUP mode without saving changes.

General Setup 3.
Setting the Temperature Display to °C or °F

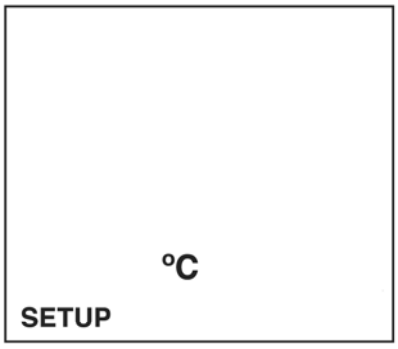
Temperature can be displayed in °C or °F **Default mode is °C**

To select temperature units:

1. Press **SETUP** to put in the setup mode.
2. Press the ▲ or ▼ until the Temperature units setup screen is displayed.



3. Press **ENTER**. The display will show the current units.



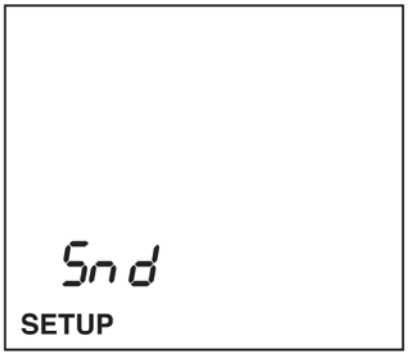
Pressing the ▲ or ▼ keys will toggle between °C and °F

4. Use the ▲ or ▼ to set the temperature units.
5. Press **ENTER** to save changes and return to SETUP mode. Press **CANCEL** to return to SETUP mode without saving changes.

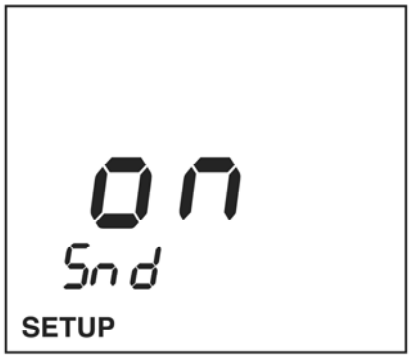
General Setup 4.
Sound ON / OFF

1. Press **SETUP** to put in the setup mode.

2. Press the ▲ or ▼ until the Sound icon is displayed.



3. Press **ENTER**. The display will show the Sound status (“ON” or “OFF”)



Pressing the ▲ or ▼ keys will toggle ON and OFF

4. Use the ▲ or ▼ to toggle ON or OFF.

5. Press **ENTER** to save changes and return to SETUP mode. Press **CANCEL** to return to SETUP mode without saving changes.

General Setup 5.
Meter Automatic Shutoff Time

The meter will shutoff automatically to conserve battery power after a predetermined period of time. Meter will beep intermittently for one minute prior to shutdown. User must power cycle for the automatic shutoff to take effect.
Range 1 minute to always on. Default: 20 minutes.

1. Press **SETUP** to put in the setup mode.
2. Press the ▲ or ▼ until the Meter Automatic Shutoff Time screen is displayed.

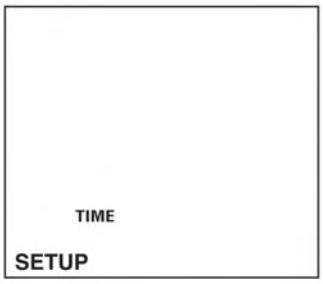
3. Press **ENTER**. The display will show the number of minutes until the meter automatically shuts off.

4. Use the numeric keypad or the ▲ or ▼ keys to set the shutoff time in minutes. Set to **000** for continuously on.
5. Press **ENTER** to save changes and return to SETUP mode. Press **CANCEL** to return to SETUP mode without saving changes.

General Setup 6.
Setting the Time

1. Press **SETUP** to put in the setup mode.

2. Press the ▲ or ▼ until the Time setup screen is displayed.



3. Press **ENTER**. The current time will be displayed in 24 hour format. The segment for the first digit will flash.

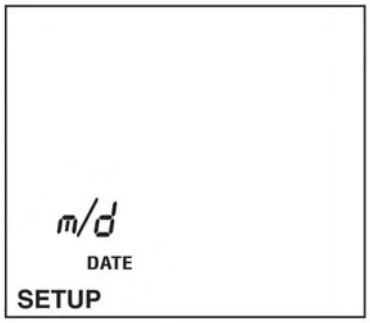
4. Use the number keys to set the time. Press **ENTER** to save changes and return to SETUP mode. Press **CANCEL** to return to SETUP mode without saving changes.

General Setup 7.
Setting the Date Format

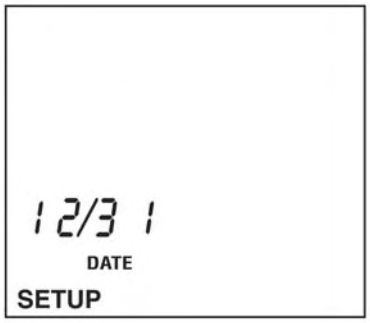
The meter can be set for mm/dd/yy format or dd/mm/yy format.

1. Press **SETUP** to put in the setup mode.

2. Press the ▲ or ▼ until the Date Format screen is displayed.



3. Press **ENTER**.



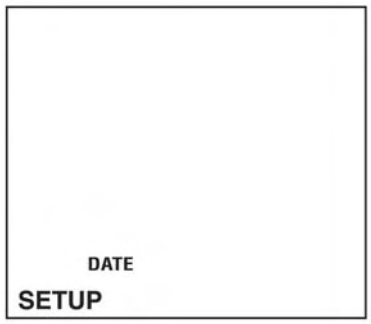
Pressing the ▲ or ▼ keys toggles month/day format (12/31) or day/month format (31/12)

4. Press **ENTER** to save changes and return to SETUP mode. Press **CANCEL** to return to SETUP mode without saving changes.

General Setup 8.
Setting the Month and Day

1. Press **SETUP** to put in the setup mode.

2. Press the ▲ or ▼ until the Date icon is displayed.



3. Press **ENTER**. The current date will be displayed. The segment for the first digit will flash.

4. Use the number keys to enter the correct digits and press **ENTER** when finished.

General Setup 9.
Setting the Year

1. Press **SETUP** to put in the setup mode.

2. Press the ▲ or ▼ until the Year icon is displayed.

3. Press **ENTER**. The current year will be displayed. The segment for the first digit will flash.

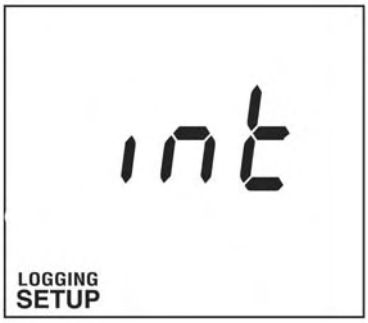
4. Use the number keys to enter the correct digits and press **ENTER** when finished.

General Setup 10.
Datalogging Interval

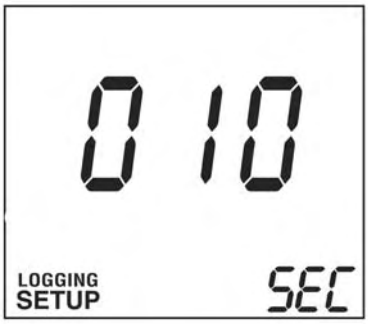
The meter will datalog up to 999 datapoints in intervals raging from 1 second to 1999 seconds. The default is 10 seconds

1. Press **SETUP** to put in the setup mode.

2. Press the ▲ or ▼ until the Datalogging Interval setup screen is displayed.



3. Press **ENTER.** The display will show the datalogging interval.

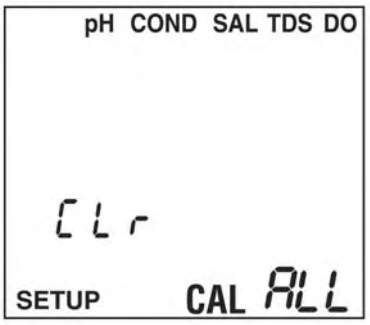


4. Use the number keys to set the datalogging interval and press **ENTER** when finished.

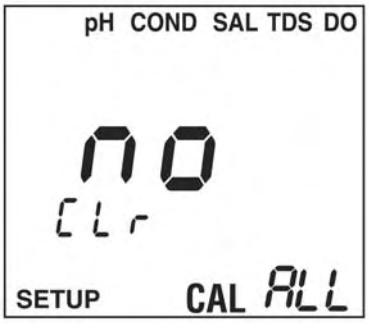
General Setup 11.
Clearing pH, Conductivity, TDS, and DO Calibration points

It is possible to clear all stored calibration points for all parameters. It is important to recalibrate the meter prior to use after clearing all calibration points.

1. Press **SETUP** to put in the setup mode.
2. Press the ▲ or ▼ until the Clear All Calibration Points screen is displayed.



3. Press **ENTER**.
4. The meter will prompt if you want to clear all calibration points. The default is “No”.



Pressing the ▲ or ▼ keys will toggle from No to YES

5. Press the ▲ or ▼ key to toggle to “Yes” and then press **ENTER** to clear. Press **CANCEL** to return to Setup mode without saving changes.

pH Setup 1.
pH Calibration Alarm

The meter allows a pH recalibration alarm to be set from 1 hour to 1999 hours. The default condition is 000 (no recalibration alarm).

To setup the calibration alarm:

1. Press **SETUP** then press **pH** to put in the pH setup mode.

2. Press the ▲ or ▼ until the pH calibration setup screen is displayed.

3. Press **ENTER**. The display will show the calibration alarm status in hours. 000 indicates the recalibration alarm is OFF.

4. Use the numeric keypad or the ▲ or ▼ to set the calibration alarm in hours.

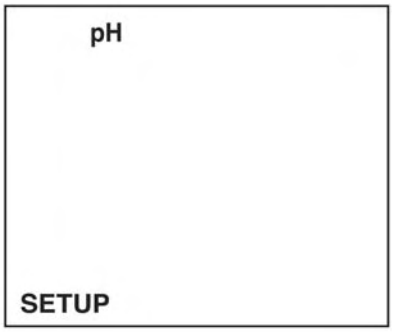
5. Press **ENTER** to save changes and return to SETUP MODE

pH Setup 2.
Setting pH Resolution: 0.1 pH or 0.01 pH

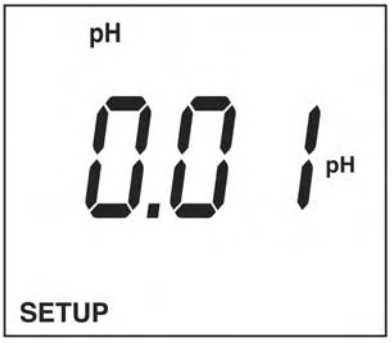
pH can be displayed in two resolutions: 0.1 pH or 0.01 pH
Stabilization lock (**READY** icon) will occur faster at 0.1 pH resolution.

To select resolution:

1. Press **SETUP** then press **pH** to put in the pH setup mode.
2. Press the ▲ or ▼ until the pH resolution setup screen is displayed.



3. Press **ENTER**. The display will show the pH resolution. Use the ▲ or ▼ to set the pH resolution.



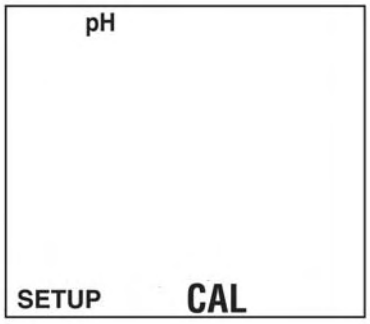
Pressing the ▲ or ▼ keys will toggle between 0.01 and 0.1 resolution

4. Press **ENTER** to save changes and return to SETUP mode. Press **CANCEL** to return to SETUP mode without saving changes.

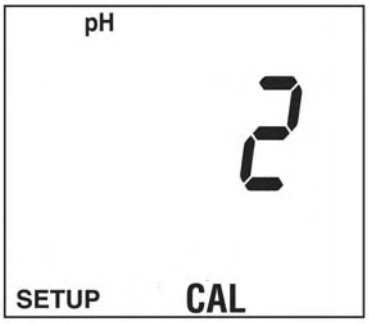
pH Setup 3.
Setting Up for 2, 3, 4, or 5 Point pH Calibration

To select number of calibration points:
Default is 2 point

1. Press **SETUP** then press **pH** to put in the pH setup mode.
2. Press the ▲ or ▼ until the pH calibration point setup screen is displayed.



3. Press **ENTER**. The display will show the current number of calibration points. Use the ▲ or ▼ to set calibration points.



Pressing the ▲ or ▼ keys will scroll between 2, 3, 5, or 5.

4. Press **ENTER** to save changes and return to SETUP mode. Press **CANCEL** to return to SETUP mode without saving changes.

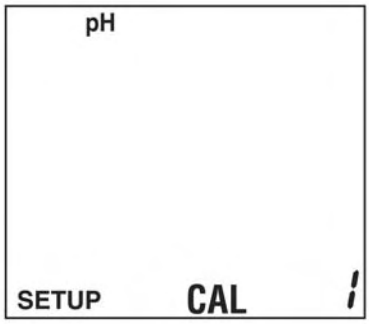
pH Setup 4.
pH Calibration Method Setup

The meter allows you to define which pH buffers are to be used, and in which order. **The default is a two point calibration pH 7.00 for the first point and pH 4.00 for the second point.**

To setup the first point of a pH calibration method:

1. Press **SETUP** then press **pH** to put in the pH setup mode.

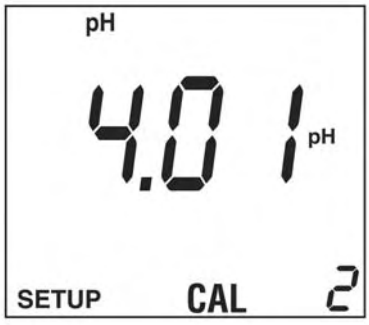
2. Press the ▲ or ▼ until the Calibration Method setup screen is displayed.



3. Press **ENTER**. The display will show the pH buffer for the first calibration point.

4. To change to another buffer value, press the ▲ or ▼ to scroll thorough the available buffers.

5. Press **ENTER** to set the first calibration buffer. The display will show the pH buffer for the next calibration point.



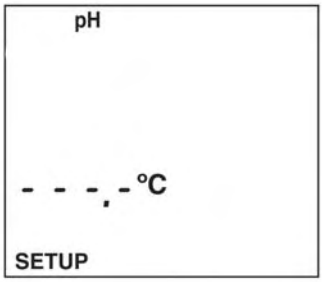
6. Repeat Steps 4 and 5 until all buffers are set. Previously selected buffers will not be displayed.

7. After pressing **ENTER** on the last calibration buffer, the change will be saved and the meter will return to the SETUP mode. Press **CANCEL** to return to SETUP mode without saving changes.

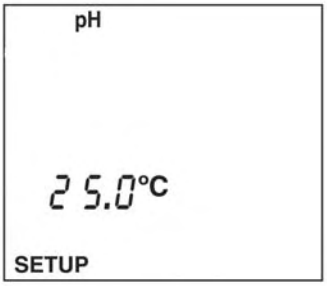
pH Setup 5.
Manual Temperature Compensation for pH Electrodes

pH electrodes are automatically temperature compensated if a temperature probe is detected in the 3.5mm phono jack. If no probe is detected, the system defaults to manual temperature compensation at 25.0 °C. Manual temp compensation is always in °C (No °F conversion is necessary).

1. Press **SETUP** then press **pH** to put in the pH setup mode.
2. Press the ▲ or ▼ until the Manual Temp screen is displayed.



3. Press **ENTER**. The display will show the Manual Temp value.



Pressing the ▲ or ▼ keys will scroll the temperature compensation value up or down.

4. Use the ▲ or ▼ to set the manual temp compensation.
5. Press **ENTER** to save changes and return to SETUP mode. Press **CANCEL** to return to SETUP mode without saving changes.

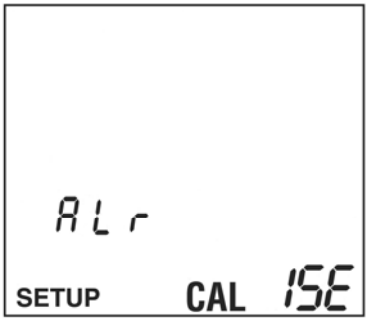
ISE Setup 1.
ISE Calibration Alarm

To setup the calibration alarm:

1. Press **SETUP** then press **ISE** to put in the ISE setup mode.

2. Press the ▲ or ▼ until the ISE calibration alarm setup screen is displayed.

The meter allows an ISE recalibration alarm to be set from 1 hour to 1999 hours. The default condition is 000 (no recalibration alarm). The setup procedure is the same as setting the pH recalibration alarm.



3. Press **ENTER**. The display will show the calibration alarm status in hours. 000 indicates the alarm is OFF.

4. Use the numeric keypad or the ▲ or ▼ to set the calibration alarm in hours.

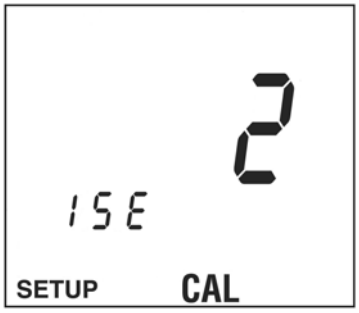
5. Press **ENTER** to save changes and return to SETUP MODE

ISE Setup 2.
Setting Up for 2, 3, 4, or 5 Point ISE Calibration

To select number of calibration points:
Default is 2 point

1. Press **SETUP** then press **ISE** to put in the pH setup mode.
2. Press the ▲ or ▼ until the pH calibration point setup screen is displayed.

3. Press **ENTER**. The display will show the current number of calibration points. Use the ▲ or ▼ to set calibration points (options are 2, 3, 4, or 5 points)



Pressing the ▲ or ▼ keys will scroll between 2, 3, 4, or 5.

4. Press **ENTER** to save changes and return to SETUP mode. Press **CANCEL** to return to SETUP mode without saving changes.

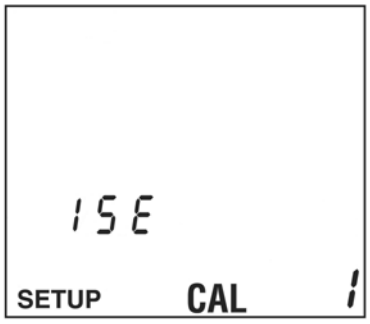
ISE Setup 3.
ISE Calibration Method Setup

The meter allows you to define which ISE standards are to be used, and in which order.

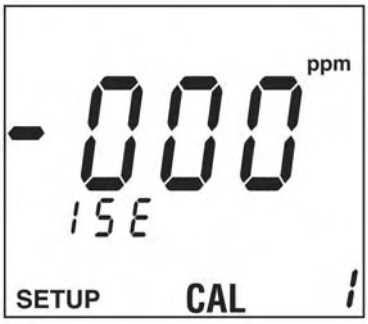
To setup the first point of an ISE calibration method:

1. Press **SETUP** then press **ISE** to put in the ISE setup mode.

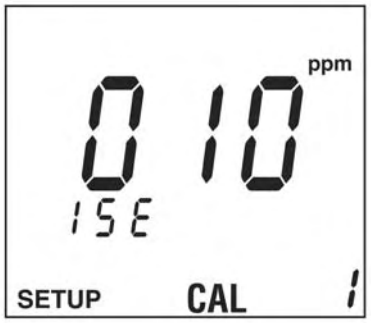
2. Press the ▲ or ▼ until the Calibration Method setup screen is displayed.



3. Press **ENTER**. The display will show the numeric entry screen.



4. Press the *"▪" (TIME)* key twice to toggle between ppm or ppt resolution. Use the ▲ or ▼ keys or the numeric keypad to enter the first ISE calibration standard.



***Before** entering any digits, pressing the "▪" (TIME) key will toggle between ppm and ppt*

5. Press **ENTER**. Repeat Step 4 for each calibration point.

NOTE: To view the currently stored calibration values, exit SETUP and go to the ISE calibration mode. All calibration values in the currently setup method can be viewed using the ▲ *or* ▼ *keys.*

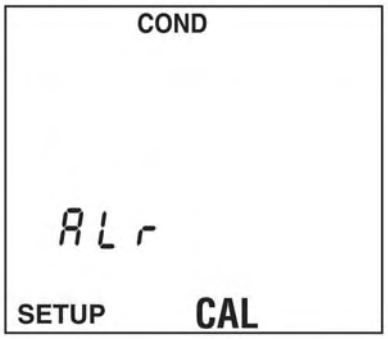
COND Setup 1.
Conductivity Calibration Alarm

The meter allows a Conductivity recalibration alarm to be set from 1 hour to 1999 hours. The default condition is 000 (no recalibration alarm). The setup procedure is the same as setting the pH recalibration alarm.

To setup the calibration alarm:

1. Press **SETUP** then press **COND** to put in the conductivity setup mode.

2. Press the ▲ or ▼ until the conductivity calibration alarm setup screen is displayed.



3. Press **ENTER**. The display will show the calibration alarm status in hours. 000 indicates the alarm is OFF.

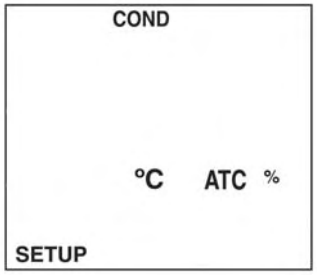
4. Use the numeric keypad or the ▲ or ▼ to set the calibration alarm in hours.

5. Press **ENTER** to save changes and return to SETUP MODE.

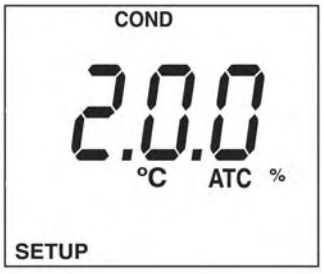
COND Setup 2.
Conductivity Temperature Compensation Coefficient

Conductivity is automatically temperature compensated.
Default is 2% per °C. The user selectable range is 0-10%.

1. Press **SETUP** then press **COND** to put in the Conductivity setup mode.
2. Press the ▲ or ▼ until the Conductivity Temperature Compensation Factor screen is displayed.



3. Press **ENTER**. The display will show the Conductivity temperature compensation factor.

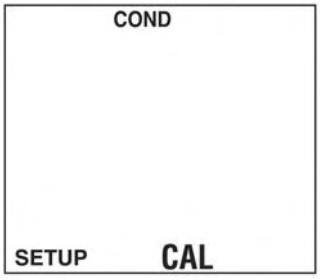


4. Use the ▲ or ▼ to set the compensation coefficient
5. Press **ENTER** to save changes and return to SETUP mode. Press **CANCEL** to return to SETUP mode without saving changes.

COND Setup 3.
Conductivity Used Calibration Points

The meter stores up to five calibration points. Stored conductivity calibration points can easily be viewed, and are displayed in order of lowest to highest conductivity value.

1. Press **SETUP** then press **COND** to put in the Conductivity setup mode.
2. Press the ▲ or ▼ until the Conductivity Calibration Review screen is displayed.



3. Press **ENTER**. The display will show the first calibration point currently being used. Press the ▲ or ▼ arrow to scroll to view other currently used calibration values.

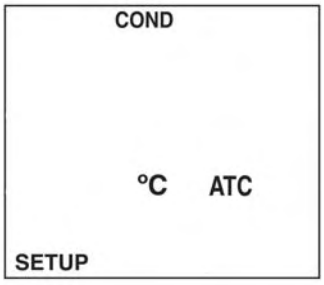
NOTE: "- - - -" will be displayed if there are no stored conductivity calibration points.

COND Setup 4.
Conductivity Temperature Normalization

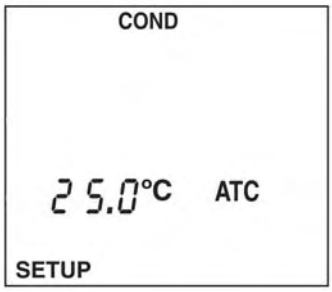
Conductivity varies greatly with temperature. The conductivity Automatic Temperature Compensation (ATC) adjusts conductivity measurements to factor out the conductivity changes in the reading caused by temperature. The readings are referenced to or "normalized" at a standard temperature. The options are 20 °C or 25 °C. The ATC will give the equivalent conductivity or TDS of a solution normalized at 20 °C or 25 °C.

Default 25 °C

1. Press **SETUP** then press **COND** to put in the Conductivity setup mode.
2. Press the ▲ or ▼ until the Conductivity Temperature Normalization screen is displayed.



3. Press **ENTER**. The display will show the Conductivity normalization value.



4. Use the ▲ or ▼ to toggle 20.0 °C and 25.0 °C

5. Press **ENTER** to save changes and return to SETUP mode. Press **CANCEL** to return to SETUP mode without saving changes.

COND Setup 5.
Conductivity Probe Cell Constant

This screen displays the cell constant of an attached conductivity probe. If no conductivity probe is attached, the display will read .000.

To view the probe constant:

1. Press **SETUP** then press **COND** to put in the conductivity setup mode.

2. Press the ▲ or ▼ until the conductivity probe constant screen is displayed.

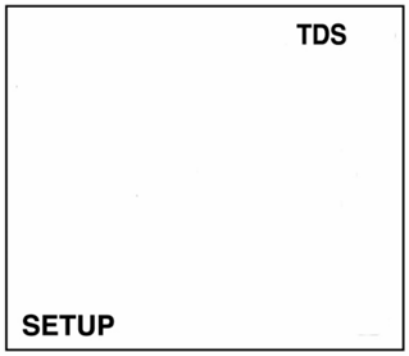
3. Press **ENTER** to return to SETUP mode.

TDS Setup 1.
Setting the TDS Conversion factor

TDS values are related to conductivity. The operator can calibrate using a TDS standard or calibrate using conductivity standards then program the meter with a conversion factor.
The conversion factor range is .40 to 1.00. **The default is .50**

To set the TDS conversion factor:

1. Press **SETUP** then press **TDS** to put in the TDS setup mode.
2. Press the ▲ or ▼ until the TDS conversion factor screen is displayed.



3. Press **ENTER**. The display will show the current conversion factor.

4. Use the ▲ or ▼ to set the conversion factor.

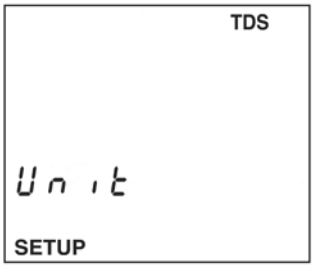
5. Press **ENTER** to save changes and return to SETUP mode. Press **CANCEL** to return to SETUP mode without saving changes.

TDS Setup 2.
Setting TDS Units: mg/L (auto ranging to g/L) or ppm (auto ranging to ppt)

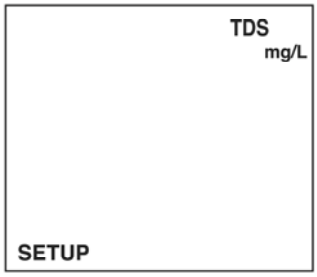
TDS can be displayed in metric units mg/L (g/L) or ppm (ppt).

1. Press **SETUP** then press **TDS** to put in the TDS setup mode.

2. Press the ▲ or ▼ until the TDS units screen is displayed.



3. Press **ENTER.** The display will show the TDS units.



Pressing the ▲ or ▼ keys will toggle between mg/L and ppm

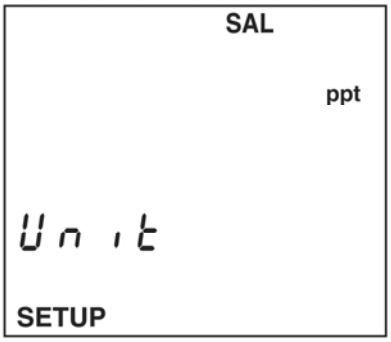
4. Use the ▲ or ▼ to set the TDS units.

5. Press **ENTER** to save changes and return to SETUP mode. Press **CANCEL** to return to SETUP mode without saving changes.

SAL Setup 1.
Setting Salinity Units: ppm (ppt) or %

1. Press **SETUP** then **SAL** to put in the salinity setup mode.
2. Press the ▲ or ▼ until the Salinity units screen is displayed.

3. Press **ENTER**. The display will show the Salinity units.



Pressing the ▲ or ▼ keys will toggle between ppt and %

4. Use the ▲ or ▼ to set the Salinity units.
5. Press **ENTER** to save changes and return to SETUP mode. Press **CANCEL** to return to SETUP mode without saving changes.

NOTE: The ppt will autoscale to ppm as required.

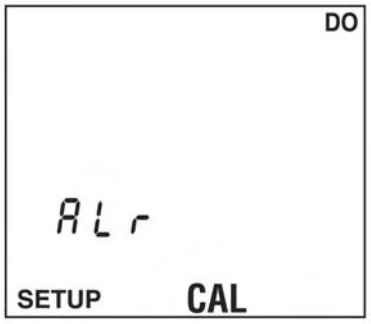
DO Setup 1.
Dissolved Oxygen (DO) Calibration Alarm

The meter allows a DO recalibration alarm to be set from 1 hour to 1999 hours. The default condition is 000 (no recalibration alarm). The setup procedure is the same as setting the pH recalibration alarm.

To setup the calibration alarm:

1. Press **SETUP** then **DO** to put in the dissolved oxygen setup mode.

2. Press the ▲ or ▼ until the DO calibration alarm setup screen is displayed.



3. Press **ENTER**. The display will show the calibration alarm status in hours. 000 indicates the alarm is OFF.

4. Use the numeric keypad or the ▲ or ▼ to set the calibration alarm in hours.

5. Press **ENTER** to save changes and return to SETUP MODE.

DO Setup 2.
Dissolved Oxygen Measurement Units

Dissolved Oxygen can be displayed in mg/L, % saturation, or ppm.

1. Press **SETUP** then **DO** to put in the dissolved oxygen setup mode.
2. Press the ▲ or ▼ until the DO units screen is displayed.

3. Press **ENTER.** The display will show the DO units.

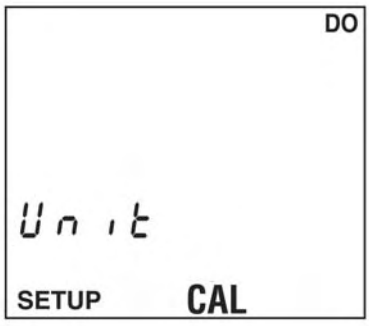
Pressing the ▲ or ▼ keys will toggle between mg/L, % and ppm

4. Use the ▲ or ▼ to set the DO units.
5. Press **ENTER** to save changes and return to SETUP mode. Press **CANCEL** to return to SETUP mode without saving changes.

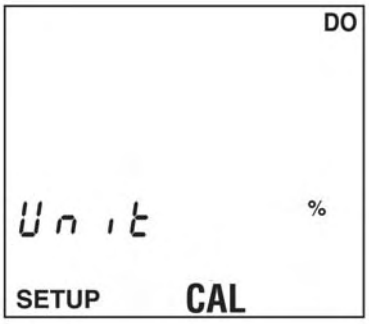
DO Setup 3.
Dissolved Oxygen Calibration Units

Dissolved Oxygen can be calibrated in metric units of mg/L, or % saturation, or ppm.

1. Press **SETUP** then DO to put in the dissolved oxygen setup mode.
2. Press the ▲ or ▼ until the DO Calibration units screen is displayed.



3. Press **ENTER.** The display will show the DO calibration units.



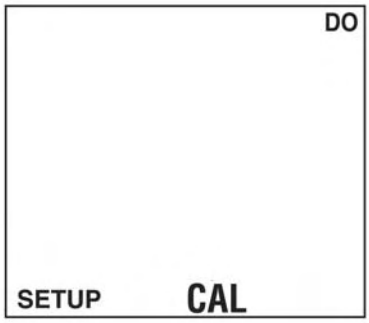
Pressing the ▲ or ▼ keys will toggle between mg/L, % and ppm

4. Use the ▲ or ▼ to set the DO calibration units.
5. Press **ENTER** to save changes and return to SETUP mode. Press **CANCEL** to return to SETUP mode without saving changes.

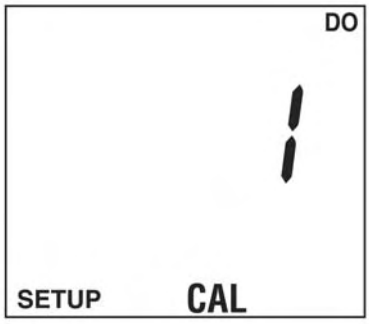
DO Setup 4.
1 point or 2 Point Dissolved Oxygen Calibration

Default is 1 point at 100% saturation (assumes a nominal slope of 47 mV from 0% to 100% at 25 °C at 1013 hPa barometric pressure with 0 ppm salinity.)
For highest accuracy always use a two point calibration.

1. Press **SETUP** then DO to put in the dissolved oxygen setup mode.
2. Press the ▲ or ▼ until the DO calibration point setup screen is displayed.



3. Press **ENTER**. The display will show the current number of Calibration points.



Pressing the ▲ or ▼ keys will toggle between 1 and 2 point

4. Use the ▲ or ▼ to set calibration points (options are 1 or 2 points)
5. Press **ENTER** to save changes and return to SETUP mode. Press **CANCEL** to return to SETUP mode without saving changes.

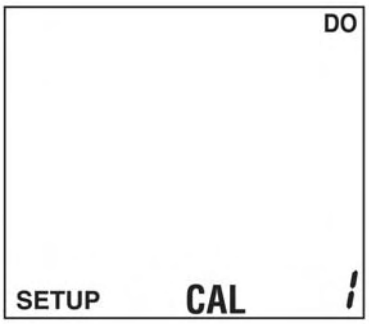
DO Setup 5.
DO Calibration Method Setup

The meter allows you to define which DO standards are to be used, and in which order.

To setup the first point of an DO calibration method:

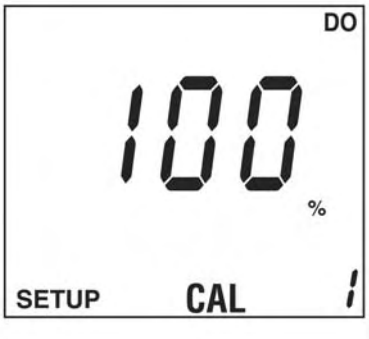
1. Press **SETUP** then **DO** to put in the DO setup mode.

2. Press the ▲ or ▼ until the Calibration Method setup screen is displayed.



3. Press **ENTER**. The numeric entry screen will be displayed.

4. Use the ▲ or ▼ keys or the numeric keypad to enter the first DO calibration standard.



5. Press **ENTER**. If the meter is setup for two DO calibration points, repeat Step 4 for the second calibration point.

NOTE: To view the currently stored DO calibration values, exit SETUP and go to the DO calibration mode. All calibration values in the currently setup method can be viewed using the ▲ *or* ▼ keys.

NOTE: If the DO calibration units are changed in SETUP (e.g. from % to ppm) the meter will automatically convert the values entered in this setup procedure to the selected units. However, the conversions are approximate. For maximum accuracy, re-enter the desired values in this procedure in the correct calibration units.

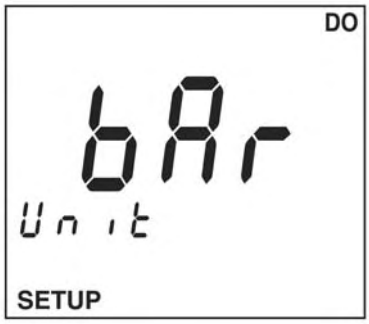
NOTE: DO calibrations are not salinity compensated. The salinity value from either an attached salinity probe or the salinity value entered in SETUP will be ignored.

DO Setup 6.
Barometric Pressure Compensation Units

Dissolved Oxygen measurements are sensitive to barometric pressure. The meter has a built-in barometer to provide automatic compensation of barometric pressure. The meter can display barometric pressure in inHg (inches of mercury), mmHg (millimeters of mercury), or hPa (hectopascals or millibars). Default: hPa

1. Press **SETUP** the DO to put in the dissolved oxygen setup mode.

2. Press the ▲ or ▼ until the Barometric Pressure Unit setup screen is displayed.



3. Press **ENTER.** The display will show the units for barometric pressure.

Pressing the ▲ or ▼ keys will toggle bewteen hPa, mmHg, and inHg

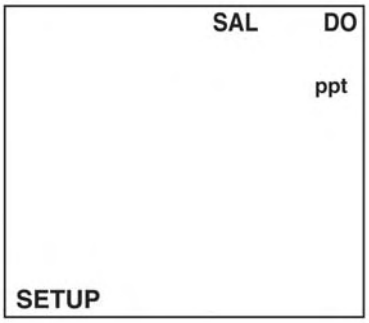
4. Use the ▲ or ▼ to set the barometric pressure units.

5. Press **ENTER** to save changes and return to SETUP mode. Press **CANCEL** to return to SETUP mode without saving changes.

DO Setup 7.
Salinity Compensation for Dissolved Oxygen – Auto or Manual

Dissolved Oxygen measurements are sensitive to the salinity of the sample. When using the meter with an attached Beckman Coulter conductivity probe in the solution, the meter will automatically compensate for salinity. If you do not have a conductivity probe attached to the meter, the salinity can be manually compensated from 0 to 49.9 ppt.

1. Press **SETUP** the DO to put in the dissolved oxygen setup mode.
2. Press the ▲ or ▼ until the DO Salinity screen is displayed.



3. Press **ENTER.** The display will show the manual salinity compensation value.

4. Use the numeric keypad or the ▲ or ▼ keys to set the salinity compensation value.

5. Press **ENTER** to save changes and return to SETUP mode. Press **CANCEL** to return to SETUP mode without saving changes.

SECTION 23: Error Codes

Some error codes, such as poor electrode condition, can be overridden by the user to allow the instrument to be used until a replacement electrode can be obtained.

1. When an error is displayed, first check to determine the cause of the error. To abort the calibration or other error causing condition, press **CANCEL** or the **pH** (COND/TDS/SAL/DO) key.

2. Overriding error codes is not recommended; however, if you are sure you want to override, press **ENTER.** Then, as a second step to override, press the ▲ arrow to toggle the display to **YES.** This indicates you wish to perform and error override. Finally, press **ENTER**.

*Pressing the ▲ or ▼ keys will toggle between **NO** and **YES.***

NOTE: It is not possible to override all errors.

NOTE: If the meter is in the Conductivity or DO mode and the meter is turned off and probes removed, when turned back on, the meter will display an error state.

ERROR CODE	CAUSE	USER ACTIONS
E03	pH electrode offset error. The mV reading in pH 7.00 buffer is greater than 0.0 mV ±30 mV	Follow electrode cleaning instructions. If error persists, replace probe. To override the error, press the **ENTER** key then select **YES** for the temporary use of a damaged electrode.
E04	pH electrode slope error. The slope is less than 85% or over 102% of 59.16 mV per pH unit	Follow electrode cleaning instructions. If error persists, replace the electrode. To override the error, press the **ENTER** key then select **YES** for temporary use of a damaged electrode.
E08	Too long to calibrate. Signal not stable during calibration.	Follow probe cleaning instructions. Disconnect stirrers and other AC power sources. Be sure calibration solution temperature is constant. If error persists, replace probe.
E14	Extremely low battery	Replace battery immediately. Meter accuracy and function may be compromised.
E15	Bluetooth Initialization Error	Return for service.
E20	Damaged Conductivity probe temperature sensor	Connect conductivity probe if probe is disconnected. If probe is connected, replace probe.

ERROR CODE	CAUSE	USER ACTIONS
E25	Dissolved Oxygen probe slope error. The slope is less than 60% or more than 140% of nominal	Replace DO probe membrane and fill solution. If error persists, replace probe. Nominal = 0.1822 ppm/mV
E26	Dissolved Oxygen probe offset error. The mV reading is more than ± 10mV from nominal.	Replace DO probe membrane and fill solution. If error persists, replace probe. Nominal = 0.0 mV at 0% saturation and 45mV at 100%
E27	Dissolved Oxygen probe temperature error.	If DO probe is attached when error code is displayed, replace probe. If no DO probe is not attached and error code is displayed, attach a DO probe.
E28	Barometric Pressure sensor error.	Return meter to factory for repair and recalibration.
E30	Ion Selective Electrode calibration error.	Slopes are not the same sign or slopes are not within 25% of each other. Probable user error. Recalibrate in correct solutions.

ERROR CODE	CAUSE	USER ACTIONS
E40	Unrecognized host command	Command received from a host PC is unrecognized. Use only valid commands.
E42	Invalid input	The value entered during SETUP is invalid. Enter a different value.
E44	No probe installed	No probe is installed for the parameter requested. Turn off the meter. Install the correct probe. Turn on the meter.

SECTION 24: Troubleshooting Guide

INDICATION	CAUSE	USER ACTION
No Display	Auto Power Off has cleared display	Press on button to turn meter back on.
	No Power	Replace AA batteries in meter.
Unstable reading	Dirty probe	Follow the probe cleaning procedures described in this manual.
	Dirty probe/ meter connectors	Clean probe contacts on probe cable connector *and* on meter with methanol and a cotton swab *and let dry completely.* Reconnect probe to meter.
	Reference junction not flowing	Follow warm buffer cleaning procedure.
	Interference from other devices	Remove other devices from solution. Unplug water baths, stirrers, etc.
	Probe is in a very low ionic strength solution	Stable reading may not be possible.
	pH or temperature of solution is changing	Stable reading not possible until pH and temperature is constant.

INDICATION	CAUSE	USER ACTION
Meter continually displays –2.00 or 19.99 with electrode attached.	Out of calibration	Carefully follow calibration instructions.
	Probe not in solution	Place probe in liquid. Gently shake probe to be sure no air bubbles are trapped on the sensor surface.
	No probe attached	Turn off meter. Attach pH probe. Turn on meter.
	Dirty probe	Follow cleaning instructions.
	Damaged probe	Replace probe.

INDICATION	CAUSE	USER ACTION
Trouble calibrating. Display does not stop flashing during calibration.	Probe sensor surfaces are dirty or probe needs reconditioning.	Follow cleaning and reconditioning instructions.
	Reference junction not flowing.	Follow warm buffer cleaning procedure.
	Buffers may be contaminated or expired.	Recalibrate with fresh buffers.
	Interference from other devices in solution, such as improperly grounded stirrers, water baths, or other devices.	Remove any other devices from solution. Unplug water baths, stirrers, or any other electrical devices near the probe.
	Battery is low.	Replace batteries if the battery icon indicates low battery power.
	If trouble persists, probe may have reached the end of its useful life and may need to be replaced.	Replace probe.

SECTION 25: Device Ratings

Power Specifications

Supply Voltage	9vDC
Current	100mA
Power Consumption	1W Backlight on, Bluetooth Active 50mW Backlight off, Bluetooth Inactive
Batteries	4- ANSI-15A or IEC-LR6 (AA Alkaline)

Environmental Specifications

Temperature, ambient	+5°C to 40°C
Humidity	Maximum relative humidity 80% for temperatures up to 31°C, decreasing linearly to 50% relative humidity at 40°C.
Altitude	Up to 2000m
Installation Categories	I or II
Pollution Degree	1 or 2 All models
Protection Rating Handheld	IP 67

SECTION 26: AC and Battery Power

The pHi 400 and 500 Series Meters are powered by either AC or batteries. Use only the AC adapter supplied by Beckman Coulter. Before using the adapter, check the voltage specified on the label to verify compatibility with the voltage in your area: 120VAC or 240 VAC. A three-wire grounded outlet is recommended.

Battery Power

All meters are battery-powered and ship with four 1.5V alkaline batteries (AA cells) included. Fully charged batteries allow for more than 200 hours of continuous operation. The system features automatic power shut-off which is fully explained in the General Setup 5 Section (Meter Automatic Shut Off).

Low Battery Indicator:

A low battery icon will appear when approximately 25 hours of battery life remains. If the batteries are not replaced after the low battery icon appears, the batteries will be eventually be depleted to the level where the instrument cannot reliably be used without the possibility of measurement errors. When the batteries are depleted to the point that reliable measurement can no longer be made, the large display will read **bAt** and the instrument will not be useable until the batteries are replaced.

Battery Replacement

CAUTION

The following procedure should be performed only by qualified personnel.

Low battery voltage is indicated by the battery status indicator on the display. Replace the batteries whenever low voltage is indicated on the display or if the display is blank when the meter is turned on.

To replace the batteries:

1. Turn the meter off and disconnect all electrodes.
2. Turn the meter upside down.
3. Use a Phillips screwdriver to unscrew the screws on battery cover.
4. Carefully remove the battery cover.
5. Remove the old batteries.
6. Check the (+) and (-) markings in the battery compartment and on the new batteries. Insert the new batteries as indicated.

   NOTE: Be careful not to touch the contacts on the battery or the battery terminals in the meter.

7. Replace the cover and secure by tightening the screw.

AC Power

Alternatively, the meters can be powered by a 9 Volts, 100mA AC adapter.

SECTION 27: Technical Support

If you experience problems with your Beckman Coulter meter that these procedures cannot resolved, call your local Beckman Coulter dealer. In the U.S., please call the toll-free Product Support Line at (800) 742-2345.

Beckman Coulter, Inc. 4300 N. Harbor Boulevard, Box 3100 Fullerton, California 92835