User Guide

Waterproof Palm pH Meter

Model PH220A

Introduction

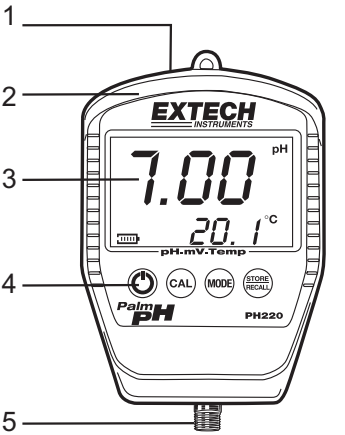
Congratulations on your purchase of the Extech PH220 waterproof pH/mV meter. This microprocessor-based device with tactile push-buttons is battery operated and ideal for field use. The PH220 simultaneously displays pH and temperature. The rubber holster which protects the meter has a magnetic backing for convenient mounting. The built-in memory (25 readings) allows STORE, RECALL, and CLEAR functionality. Careful use of this meter will provide years of reliable service.

Specifications

	Range (Resolution)	Accuracy
mV (ORP)	± 1999 mV DC (1 mV)	± 2mV
Temperature	32 to 212°F (<100°;1° >100°) 0 to 100°C (0.1°<100°;1°>100°)	± 1.0°F ± 0.5°C
pH	0.00 to 14.00pH (0.01pH)	± 0.02pH
	Note 1: Accuracy does not include pH buffer temperature coefficient Note 2: Accuracy specified from 0.02pH to 13.98pH	
Temperature Compensation	32 to 212°F (0-100°C) Automatic 'ATC'	
Power	9 volt alkaline battery	
Display	Dual LCD display for simultaneous pH and temperature readings	
Over-range or open indication	Displays "**HHH**" for over-range or open input conditions Displays "**LLL**" for under-range	
pH Calibration points	4.00, 7.00, 10.00 (1, 2, or 3 point calibration can be performed)	
Auto Power OFF	10 minutes from last key-press (can be disabled)	
Low Battery Indication	Fill bars in the battery display icon represent battery power status. The fewer the bars, the weaker the battery power.	
Dimensions / Weight	4.25 x 3.00 x 1.18" (108 x 75 x 30mm) / 4.8 oz. (135g)	
Accessories supplied with kit	Battery, suction cup holder, clip holder, stick electrode for model PH220-S, standard electrode with 39" cable for model PH220-C.	

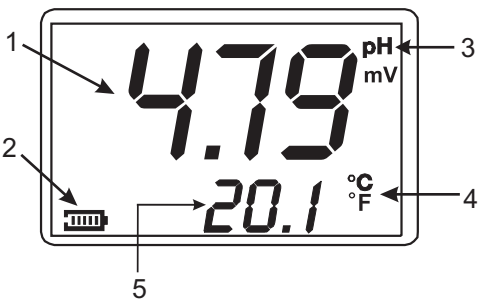
Meter Description

1. Battery Compartment (under holster)
2. Rubber Holster
3. LCD Display
4. Function buttons
5. Electrode input



Basic Display Description

1. Measurement value
2. Battery status
3. Units of measure
4. Temperature units
5. Solution temperature



Note that there are other more specialized displays that appear on the LCD that have not been included in this basic operation display description. Other display icons are used and are discussed in the appropriate sections of this manual.

Order of Operations

1. Calibrate the instrument as described later in this manual.
2. Determine the test type (pH or ORP) and carefully follow the directions for the desired test.
3. Configure the meter to display in the desired units of measure for temperature (^{o}C or ^{o}F). This is included as a step in the pH measurement instructions.
4. Pay close attention to detail, step by step instructions, and electrode cleaning/rinsing recommendations. Slight deviations in test procedures and test habits can have a significant effect on test results.

Calibration (pH only)

The sensitivity of a pH electrode degrades over time, it is very important to frequently calibrate the meter to the electrode. pH electrodes can be thought of as batteries in that they run down with time and use.

Calibration is performed using standard buffer solutions at room temperature (78°F, 25°C). Buffer solutions are solutions of a known pH that have the useful property of resisting changes in pH. These can be purchased already mixed or in capsule form and are usually available in three pH values, pH 4.00, pH 7.00 and pH 10.00.

Calibration is always performed using the pH 7.00 buffer first, followed by a second calibration. Select pH 4 buffer for the second calibration if typical measurements will be less than pH7 or use a pH 10 buffer if typical measurements will be greater than ph 7.

In order to obtain the most accurate results possible, a pH meter should be calibrated at least once each day. Note that the mV (ORP) function does not require calibration.

pH Calibration Procedure

1. Place the electrode into a 7.00 pH buffer solution. Press and hold the **CAL** button until "CAL" appears in the display.
2. The instrument automatically recognizes the solution and calibrates to that value. Note that if the solution is off by more than 1 pH unit from the 4, 7, or 10 pH buffer, or if the electrode slope is low, the instrument will assume an error and abort the calibration (End will be displayed, and the unit will return to the normal measurement mode.)
3. During calibration, the pH reading flashes on the main display.
4. When calibration is complete, the instrument automatically displays 'SA' followed by 'End' and then returns to the normal operation mode.
5. For a two or three point calibration, repeat steps 1-4. When doing a 2 or 3 point calibration, calibrate with pH 7 buffer first, then follow with pH 4 and/or pH 10.

CAL Reminder Display

When in pH measurement mode, the CAL icon will appear if a calibration has not been performed after 15 on/off cycles of the instrument. The CAL display is simply a reminder and will turn off when the pH electrode is recalibrated. The reminder does not affect function in any way.

Measuring pH

Electrodes should always be rinsed before and between samples with distilled or DI (de-ionized) water to remove all traces of storage solution, process media, or previous test solution.

1. Connect the pH electrode to the meter.
2. Turn the meter on using the on/off button . Wait for the self test ('SLF tSt') to finish.
3. Use the **MODE** button to select pH mode. The unit of measure appears on the LCD.
4. To change the unit of measure for temperature (^{o}C to ^{o}F or ^{o}F to ^{o}C), press and hold the **MODE** button for 3 seconds. The LCD reflects the current unit of measure.
5. Rinse the electrode with distilled or deionized water.
6. Place the electrode in the solution. Allow 30 seconds for the electrode/ATC to reach thermal equilibrium with the buffer solution.
7. After the measurement stabilizes, view the pH reading on the main display. An out of range reading is indicated by the display icon 'HHH'. Note that 'HHH' will also display when the electrode is disconnected from the meter.
8. When the test is complete rinse the electrode with distilled or deionized water.

Measuring ORP (millivolts mV)

1. Connect the ORP electrode to the meter.
2. Rinse the ORP electrode
3. Turn the meter on using the on/off button . Wait for the self test ('SLF tSt') to finish.
4. Use the **MODE** button to select mV mode. The display will reflect the unit of measure.
5. Place the electrode into a sample solution. When the LCD stabilizes it will read the redox potential of the sample in millivolts (mV).
6. When the test is complete rinse the electrode with distilled or deionized water.

Automatic Temperature Compensation (ATC)

The millivolt output of a pH electrode varies with temperature, and for this reason the meter must compensate for these variations to obtain accurate measurements. The PH220 automatically compensates for solution temperature changes with the electrode's built-in thermometer. The temperature compensation is active when the solution temperature deviates from room temperature. The temperature of a solution is displayed on the lower LCD line of the instrument.

Automatic Power OFF

To conserve battery power, the instrument automatically shuts off after 10 minutes of inactivity. To disable or enable this feature, follow the steps below:

- To disable: With the power on, press and hold the on/off button for 2 seconds (oFF and AtP will display). The Auto Power OFF feature is now disabled.
- To enable: With the power on, press and hold the on/off button for 2 seconds (on and AtP will display). The Auto Power OFF feature is now enabled.
- Each time the meter is turned off the Auto power OFF feature is set to the enabled mode.

Storing and Recalling Readings

This instrument has the ability to store up to 25 measurement readings. At a later time the readings can be recalled and viewed. Readings are saved even after the instrument has been turned off.

STORE Readings

The steps below cover the **STORE** process in detail:

1. Take a measurement as described earlier in this manual.
2. Momentarily press the **STORE/RECALL** button to save the reading. The reading will be held on the display (the HOLD and STORE icons will appear). In addition, the storage location (1 to 25) will briefly appear on the lower portion of the LCD.
3. Note: The temperature reading associated with the pH reading is also saved.
4. Press the **STORE/RECALL** button again to release the 'hold' feature. The instrument will then return to normal operation.
5. Note that when all 25 storage locations are filled the instrument begins writing over the previously stored data.

RECALL Readings

The steps below cover the **RECALL** process in detail:

1. Press and hold the **STORE/RECALL** button until a number appears on the main display. This number is the storage location for the most recent reading.
2. The number will switch off after 1 second and the stored reading will appear. The RECALL icon will appear and remain on the entire time the recall mode is accessed.
3. While in the RECALL mode, use the **STORE/RECALL** button to scroll through the stored readings. The most recent readings will show first (LAST IN – FIRST OUT).
4. Press and hold the **STORE/RECALL** button until the END display appears. Release the button and the instrument will return to normal operation mode.
5. Note that if there are no readings in memory, the display will show END when the user attempts to access the RECALL mode.

ERASE Readings

The steps below cover the **ERASE** (CLEAR) process in detail:

1. Press and hold **STORE/RECALL** and the **CAL** buttons simultaneously for 4 seconds.
2. The 'CLr' display will appear indicating that all readings have been erased.
3. Release the buttons to return to normal operation mode.

Temperature Offset Adjustment

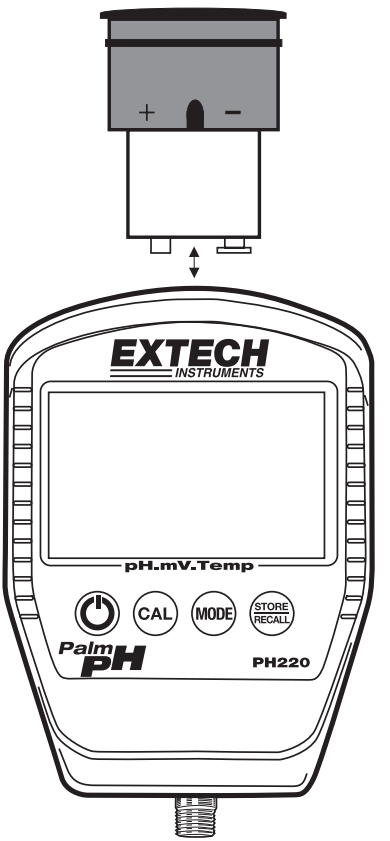
Applications may arise where it is desirable to offset the instrument's temperature display. This instrument allows a temperature display offset adjustment of ±9°F (±5°C). To do so, follow the steps below:

1. Press and hold the **CAL**, **MODE**, and **STORE/RECALL** buttons simultaneously for 6 seconds.
2. The main display will indicate the current offset. The lower display will show 't_O'.
3. Use the **CAL** button to decrease the offset value and the **MODE** button to increase it.
4. Press and hold the **STORE/RECALL** button for 2 seconds to exit this mode. The instrument will display 'SA' (save) and 'END' before returning to the normal operation mode.
5. The temperature display will now indicate the actual temperature ± the offset value.

Battery Replacement

The 9 volt alkaline battery that powers the instrument requires replacing when all battery icon 'fill bars' are depleted. To replace the battery follow the steps below:

1. Disconnect the electrode from the instrument.
2. Remove the instrument's protective jacket by pulling it over the top of the meter (ensure that the electrode is disconnected).
3. Pry the battery compartment up from the top of the meter using a screwdriver or coin at one of the two indentations (see diagram).
4. Replace the 9V battery.
5. Insert the battery compartment into the instrument until the compartment is flush with the top of the instrument. The compartment can only be fully inserted in one direction and the battery compartment is labeled as to the polarity orientation of the battery.
6. Replace the protective holster.



Electrode Maintenance and Troubleshooting

Most pH measurement difficulties are caused by the electrode. Careful handling and proper storage of the electrode will increase measurement accuracy and electrode life.

Electrodes should be rinsed to remove all traces of storage solution, process medium, or previous test solution.

Electrode Storage

The electrode should be stored in a soaker bottle or wetting cap filled with pH4 buffer. Never store an electrode in distilled or deionized water as this will cause migration of the fill solution from the electrode.

Electrode Cleaning

The type of electrode coating that occurs over time will determine the cleaning method. Soft coatings can be removed by vigorous stirring or by using a squirt bottle. Organic chemical coating (hard coatings) should be chemically removed. Only in extreme cases should the bulb be cleaned mechanically.

Troubleshooting an Electrode

Symptom	Cause	Recommendation
Long response time or reading drift	Clogged Junction	Soak in 4.07 M Potassium Chloride (KCl) @ 60^{o}C for 30 minutes.
	Strong Alkaline measurement	Soak in 0.1 M HCL overnight.
	Deteriorated Gel layer	Replace electrode.
	Protein coating on electrode surface	Soak in 1 gm Pepsin dissolved in 100ml of 0.1 m HCL for 30 minutes or as needed.
	Oil, paint, dyes, suspended solids etc. are on sensor	Rinse electrode alternately with a materials solvent and a buffer 7.00.
	Organic solvents are coating the sensor	Organic mole fraction has to be less than 50% to assure reasonable readings. Limit time of measurement. Keep probe in the 7.0 buffer between readings.
	Dehydrated membrane	Read solution for dry bulb below:
Dry Bulb	Long term storage without wetting	Soak electrode tip in wetting cap filled with 1ml 7.00 buffer for 24 to 48 hours
Static Charge	Wiping electrodes	Rinse electrode in 7.0 buffer and blot. Do no wipe electrode.
Same readings in different buffers and samples	Cracked or broken bulb	Replace electrode. Use bulb guard. Avoid plunging electrode to bottom of container and spinning bars. Wetting cap will protect bulb between tests.
Erratic LCD display	Samples have low ionic strength (lacks salt); e.g. distilled, de-ionized, boiled, lake water (high pressure)	For each 50 ml of sample add 1 drop (50uL) of SAT. KCl (No alteration in pH will occur using inert KCl).

Calibration and Repair Services

Extech offers repair and calibration services for the products we sell. Extech also provides NIST certification for most products. Call the Customer Service Department for information on calibration services available for this product. Extech recommends that annual calibrations be performed to verify meter performance and accuracy.

Warranty

EXTECH INSTRUMENTS CORPORATION warrants this instrument to be free of defects in parts and workmanship for one year from date of shipment (a six month limited warranty applies to sensors and cables). If it should become necessary to return the instrument for service during or beyond the warranty period, contact the Customer Service Department at (781) 890-7440 ext. 210 for authorization or visit our website www.extech.com for contact information. A Return Authorization (RA) number must be issued before any product is returned to Extech. The sender is responsible for shipping charges, freight, insurance and proper packaging to prevent damage in transit. This warranty does not apply to defects resulting from action of the user such as misuse, improper wiring, operation outside of specification, improper maintenance or repair, or unauthorized modification. Extech specifically disclaims any implied warranties or merchantability or fitness for a specific purpose and will not be liable for any direct, indirect, incidental or consequential damages. Extech's total liability is limited to repair or replacement of the product. The warranty set forth above is inclusive and no other warranty, whether written or oral, is expressed or implied.

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Support line (781) 890-7440

Technical support: Extension 200; E-mail: support@extech.com

Repair & Returns: Extension 210; E-mail: repair@extech.com

Product specifications subject to change without notice

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Extech Instruments Corporation, 285 Bear Hill Rd., Waltham, MA 02451

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