EXTECH INSTRUMENTS

USER GUIDE

pH/mV/Temperature Meter

Model OYSTER-10



Introduction

Congratulations on your purchase of Extech's Oyster Series splash-proof meter. This microprocessor-based device with tactile buttons simultaneously displays pH or mV and Temperature (^{o}C/^{o}F selectable).

The device can store 25 labeled readings for recall at a later time. The Oyster 10 is battery operated, portable, and includes a hinged display that can be adjusted to any viewing angle. In addition, the neck-strap offers hands-free operation.

Advanced features include diagnostic displays, MIN/MAX readings, audible alerts, 5-point buffer recognition, & Auto/Manual temperature compensation.

This instrument is shipped fully tested and calibrated and, with proper use, will provide years of reliable service. Please visit the Extech Instruments website (www.extech.com) to check for the latest version of this User Guide. Extech Instruments is an ISO-9001 certified company.

Meter Description

1. LCD Display
2. Battery compartment (9V battery)
3. Function buttons (Power, Up/Down, Max/Min, pH/mV, Store/Recall)
4. AC Adapter input (117VAC)
5. RTD Temperature probe input (3.5mm phono jack)
6. BNC style pH/mV electrode input
7. Neck-strap loop (2)



pH Overview

pH is a unit of measure (ranging from 0 to 14pH) indicating the degree of acidity or alkalinity of a solution. pH tests are the most commonly performed measurements in water quality testing, using the hydrogen ion activity of a solution to determine acidity or alkalinity. Solutions with a pH less than 7 are considered acidic, solutions with a pH higher than 7 are known as bases, and solutions with a pH of exactly 7 are considered neutral.

The pH scale is logarithmic, so, for example, if sample A is 1 pH less than Sample B, this means that Sample A is 10 times more acidic then Sample B. A difference of 1 pH represents a ten-fold difference in acidity.

ORP/REDOX Overview

ORP stands for **O**xidation **R**eduction **P**otential and represents the oxidizing or reducing nature of a solution. The overall "reactive" tendency of a solution can be determined from ORP measurements. ORP testing is becoming more common in waste-water and water treatment measurement regimens. The unit of measurement for ORP is mV.

Calibration and Operation

pH Calibration (ORP does not require calibration)

Before accurate measurements can be made, it is necessary to perform a **3-point calibration** of the meter with its electrode. Calibrate to a pH 7 buffer first, followed by a pH 4 (or 1.68) buffer and then a pH 10 (or pH 12.45) buffer. The meter automatically recognizes the buffers listed in the table below and calibrates itself to the buffer's pH value.

1. Connect the pH electrode to the meter's BNC connector input.
2. Open the top half of the meter to an appropriate viewing position.
3. Power the meter with the **POWER/CAL** button.
4. Place the electrode into a buffer solution.
5. Press and hold the **CAL** key until the CAL display icon appears.
6. During calibration, 'CAL' is shown on the display followed by 'SA' (saved).
7. When calibration is complete, the meter automatically displays 'END' and returns to the normal operation mode. Repeat steps 1-5 as necessary. Note that it is not necessary to turn the meter off and then back on again to calibrate each reference.

Error Message Note: The meter will display 'E13' if a calibration step fails. Try the calibration again if 'E13' is displayed. The most common reason for the error is inaccurate or stale buffer solutions.

pH reading	Range of measurement
1.68	0.00 to 1.68
4.00	1.68 to 6.50
7.00	6.50 to 7.50
10.00	7.50 to 12.45
12.45	12.45 to 14.00

Electrode note: Since pH electrodes can vary in performance, this meter displays an electrode's slope in %. For example, if two electrodes (one new and one moderately used) are calibrated in the same pH 4 solution they'll both display pH 4 on the meter. This is because the meter will accept one pH value for a range of measurement values as shown in the table above (in this case, any reading between 1.68pH and 6.50pH will be accepted as 4pH calibration). The meter then displays the slope % for the electrode under test. If the slope % is below 75% or above 125%, the electrode must be replaced. A slope of 100% is ideal.

pH Measurement and Temperature Compensation

1. Use the **pH/mV** button to select the pH mode. The unit of measure appears on the LCD.
2. Connect the pH electrode to the meter and place the sensor end in the solution under test.
3. For automatic temperature compensation, connect the temperature probe to the meter (display will read ATC) and place the sensor end in the solution about 1/3 of the way below the solution surface. The temperature reading of the solution appears on the bottom of the LCD. When the temperature of a sample differs from a buffer solution temperature, allow enough time for the electrode to stabilize to the sample's temperature.
4. For manual temperature compensation, a temperature sensor is not connected to the meter. (MANUAL is displayed). A manual thermometer will be needed to determine the solution temperature first.

   Adjust the meter's temperature display with the **up/down** buttons so that the displayed temperature matches the temperature of the solution.
5. To change the unit of measure for temperature (C to F or F to C), turn the unit OFF then complete the following steps. Press and continue to hold the **pH/mV** button and then press and hold the **Power** button. Release the **pH/mV** button first then release the **power** button. The LCD reflects the unit of measure.
6. Read the pH measurement on the main display. An out of range reading is indicated by dashes (-----).
7. When the test is complete, unplug the electrode and rinse it in distilled water.
8. Place approx. 1 ml of pH 4 solution in the wetting cap before replacing it.

mV (ORP) Measurements

1. Note that calibration is not required for mV (ORP) measurements.
2. Use the **pH/mV** button to select the mV mode. The display will reflect the unit of measure.
3. Remove the wetting cap from the ORP electrode and connect the cable via the BNC meter connection.
4. Rinse the ORP electrode and place it into a sample solution. When the LCD stabilizes it will read the redox potential of the sample in millivolts.
5. When sampling is complete, unplug and rinse the electrode. Place a small portion (1ml) of distilled water in the wetting cap. Place the cap over the electrode.

25-Reading Measurement Storage

1. Press the **STORE/RECALL** button to store the current reading. Press each time a reading is to be stored.
2. If an attempt is made to store more than 25 readings, the stored readings (starting with the first reading) will be overwritten.
3. To recall readings, press and hold the **STORE/RECALL** button until the 'RECALL' icon appears on the LCD. Use the up/down arrow buttons to scroll through the stored readings. Note that 'NULL' is displayed if there are no readings in memory.
4. To exit this mode, press and hold the **STORE/RECALL** button until the 'RECALL' icon disappears.
5. To clear the contents of the memory press and hold the **up** and the **down** arrow buttons while powering the meter on until the 'CLr' icon appears on the LCD. All 25 locations will be erased.

Note: Readings are stored in non-volatile memory (saved when the meter is turned off).

MAX/MIN Display

1. The meter memorizes the highest (MAX) and lowest (MIN) readings when prompted.
2. Press and hold the MAX/MIN button until both the **MAX** and **MIN** icons appear on the LCD. The meter will now begin keeping track of the MIN and MAX readings.
3. To view MAX/MIN values, press the MAX/MIN button again; the meter automatically displays the highest and lowest readings in succession and then returns to the MAX/MIN recording mode.
4. To exit the MAX/MIN mode, press and hold the MAX/MIN button until the **MAX** and **MIN** icons disappear.
5. To clear the MAX/MIN memory, cycle the meter power.

External Temperature Offset Adjustment

The Offset Adjustment is used to fine tune the temperature reading of the external temperature probe. This procedure is for the external probe only when ATC is active.

1. Place the temperature probe into a known temperature and note any temperature reading error.
2. Simultaneously Press and Release the ▲and ▼buttons, 0.0 will appear on the LCD temperature reading
3. .Press the ▲ or ▼ button to set the display equal to the error value determined in step 1.
4. Press the STORE button to save the offset value into memory,
5. Test the temperature probe in the know temperature source to verify the correction was proper and the adjustment made in the correct direction.

pH Electrode Model 60120B Operation

The Following information applies to the Epoxy Body, Sealed Reference Combination pH Electrode Model 60120B.

Electrode Considerations

1. The 60120B pH electrode is recessed in the polymer body allowing it to rest against the bottom of a beaker without damaging the glass bulb. This eliminates the need for electrode holders and allows the probe to be used as a stirring rod. This sealed reference design eliminates the need for adding filling solutions (minimizing "dry-out") and can be used in up to 100 psig systems without external pressurization.
2. The Electrode should remain in its bottle or cap until used.
3. If bubbles are seen in the bulb area, hold the electrode by its cap and shake downwards until bubbles disappear.
4. To improve speed of response, vigorously stir the electrode in the sample, buffer, or rinse solution.
5. After exposure to a sample, buffer, or rinse solution, shake the electrode with a snap motion to remove residual drops of solution.
6. Use part of the sample/buffer to be tested next as a rinse solution whenever possible.
7. When calibrating, use a buffer as close as possible to the expected pH of the sample.
8. Keep buffers and samples at the same temperature to avoid temperature effects.
9. pH readings stabilize at various rates; allow time for readings to stabilize.
10. Electrodes deteriorate over time. If accuracy falls to 10% (slope), the electrode should be cleaned. If no improvement is observed, replace the electrode.

Electrode Calibration and Cleaning

Refer to the earlier section ‘Calibration and Operation’ for calibration details. Refer to the section below ‘Maintenance and Troubleshooting’ for details on electrode cleaning.

Electrode Storage

The electrode can be stored in the soaker bottle or wetting cap. For the storage bottle, slide the cover onto the electrode, replace the O-ring, and insert electrode into the bottle firmly tightening the cap. Ensure that the bottle or cap is filled with a pH 4 buffer solution.

Specifications

	Range (Resolution)	Accuracy
mV	± 1000 mV DC (1 mV)	± 2mV
Temperature	32.0 to 212.0°F (0.0 to 99.9°C)	+ 0.8°F (0.5°C)
pH	0.00 to 14.00pH (0.01pH)	± 0.02pH
Temperature Compensation	32 to 212°F (0-100°C) AUTO or MANUAL modes	
Power	9 volt battery or optional AC adapter	
Display	Dual LCD display for simultaneous pH or mV and temperature readings. LCD viewing angle: 90° to 180°	
Over-range Indication	Displays " ---- "	
Power	9 volt battery or optional AC adapter	
Auto Power OFF	After 10 minutes of inactivity	
Low Battery Indication	Battery icon appears on LCD	
Operating Temperature	41ºF to 104ºF (5ºC to 40ºC)	
Storage Temperature	- 4°F to 140°F (-20°C to 60°C)	
Operating Humidity	Max 80% up to 87ºF (31ºC) decreasing linearly to 50% at 104ºF (40ºC)	
Storage Humidity	<80%	
Operating Altitude	7000ft. (2000meters) maximum	
Dimensions / Weight	3.75 x 4.25 x 2" (96 x 108 x 45mm) / 12 oz (340g)	

Maintenance and Troubleshooting

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.

Battery Replacement

Install a new battery when the low battery indicator appears on the LCD.

1. Open the calibrator's lid as far as possible.
2. Open the battery compartment using a coin at the arrow indicator.
3. Replace the battery and close the cover.

Battery Safety Reminders

- Please dispose of batteries responsibly; always observe local, state, and federal regulations with regard to battery disposal.
- Never dispose of batteries in a fire. Batteries may explode or leak.
- Never mix battery types. Always install new batteries of the same type.

Troubleshooting the Meter

Meters are the least likely cause of pH measurement problems. To rule out the meter check the following:

1. Check the 9V battery and replace it if necessary.
2. When using the AC adaptor for power, check that the line cord is firmly connected to the meter.
3. Replace the existing electrode connector with optional BNC shorting plug (shorts the ground ring to the center pin of the meter's BNC jack) and check the following:
   a) Set the measurement mode to pH. The LCD reading should be stable.
   b) Adjust the calibration control for an LCD reading of 7.00.
   c) Change to the mV measurement mode. The LCD should read 0 mV.
   d) Note that an out of range reading is indicated by dashes (-------).

Troubleshooting an Electrode Problem

Symptom	Cause	Recommended Solution
Long response time or reading drift	Clogged Junction	Soak in 4.07 M Potassium Chloride (KCl) @ 60°C for 30 minutes. Replace electrode if necessary.
	Strong Alkaline measurement	Soak in 0.1 M HCL overnight
	Deteriorated Gel layer of pH sensing membrane	Replace electrode
	Protein coating on electrode surface	Soak in 1 gm Pepsin dissolved in 100ml of 0.1 m HCL for 30 mins. or as needed
	Oil, paint, dyes, suspended solids on sensor	Rinse electrode alternately with materials solvent (briefly) then a buffer 7.00
	Organic solvents are coating 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. A wetting cap will protect bulb between measurements.
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 by inert KCL.

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