

CE



User's Guide



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PHB-900 Series pH Benchtop Meters



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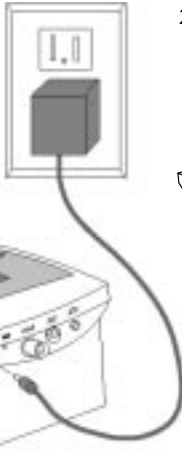
WARNING: These products are not designed for use in, and should not be used for, patient connected applications.

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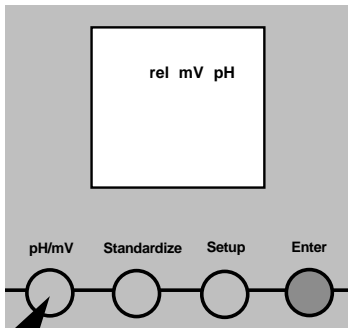
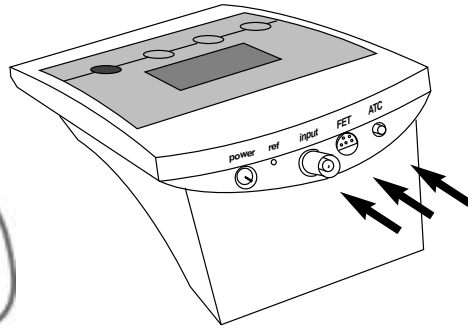
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PHB900 Series pH Meter Quick Reference

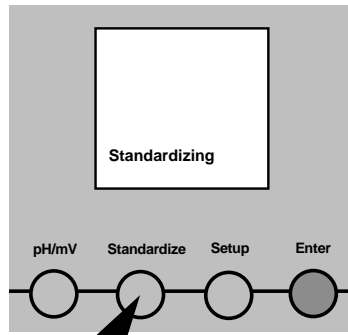
1. Connect power cable to meter power jack and to AC power source.



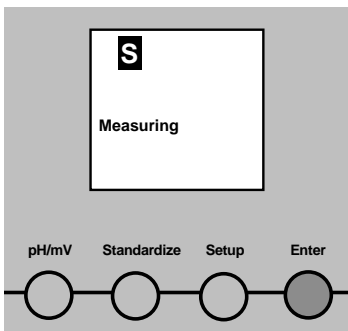
2. Connect the glass electrode to the input and ATC connectors, **or** connect the FET electrode to the FET connector.



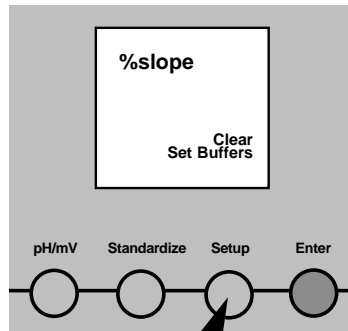
3. Press **pH/mV** until the display indicates the appropriate measurement mode.



4. Standardize the meter using up to three buffers by immersing the electrode in a buffer, then pressing **Standardize** to enter each buffer.



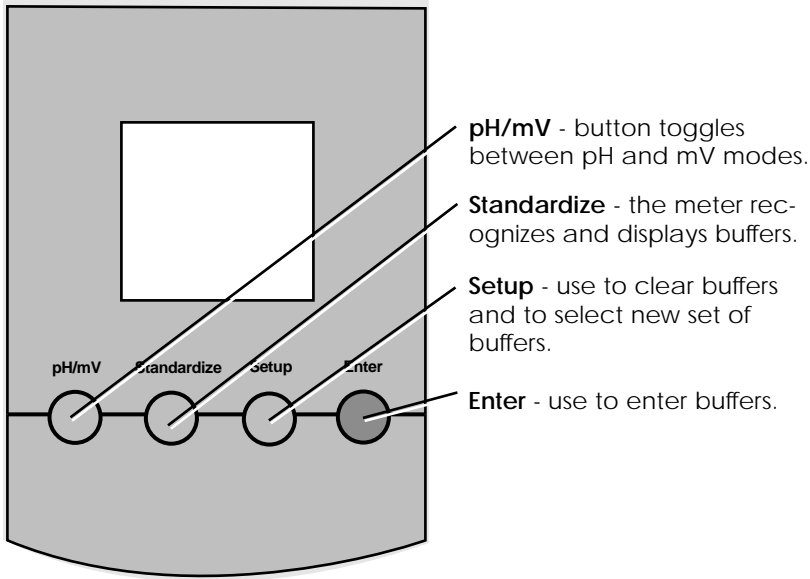
5. The display shows the current reading in pH, mV, or relative mV units.



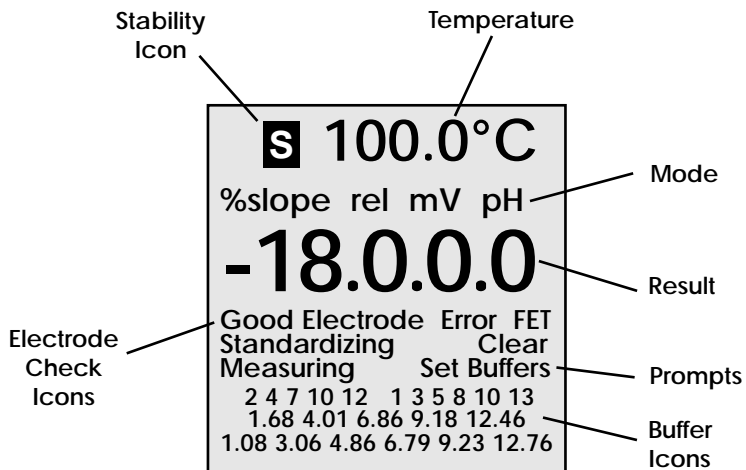
6. Press **Setup** to review electrode calibration and to clear or select buffer sets.

Getting Started

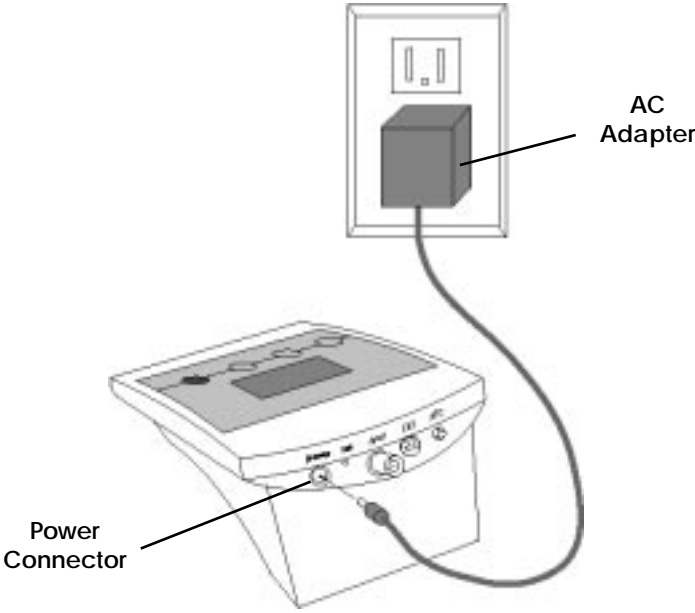
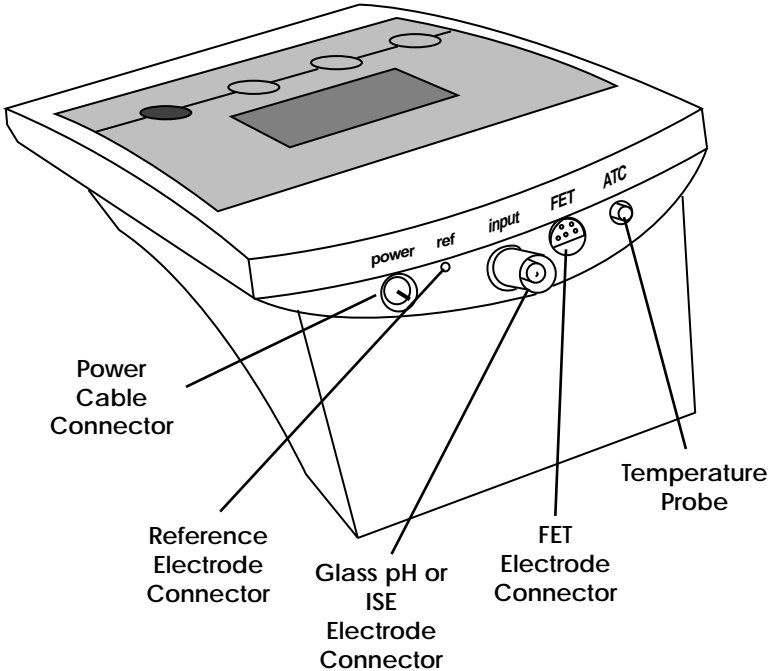
Front Panel Controls



Digital Display



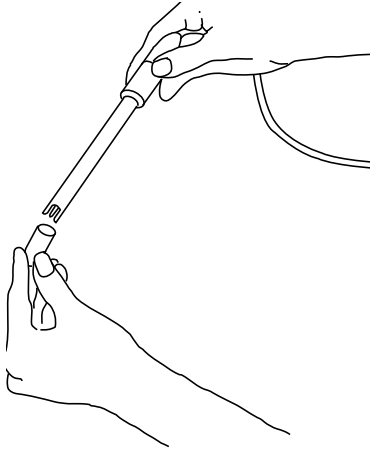
Rear Panel Connectors



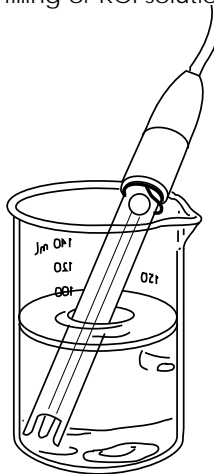
Installing and Maintaining Electrodes

This meter allows you to use two types of pH electrodes: the pH glass electrode and the field effect transistor (FET) pH electrode. If both types of electrodes are installed, the meter will read the FET electrode. **NOTE: If both electrodes are connected to the meter, do not put them in a solution together because you will get inaccurate measurements.**

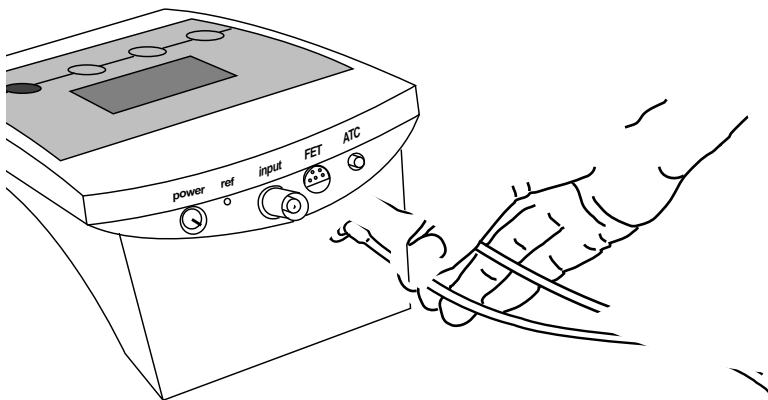
1. Remove the protective end cover from electrode.



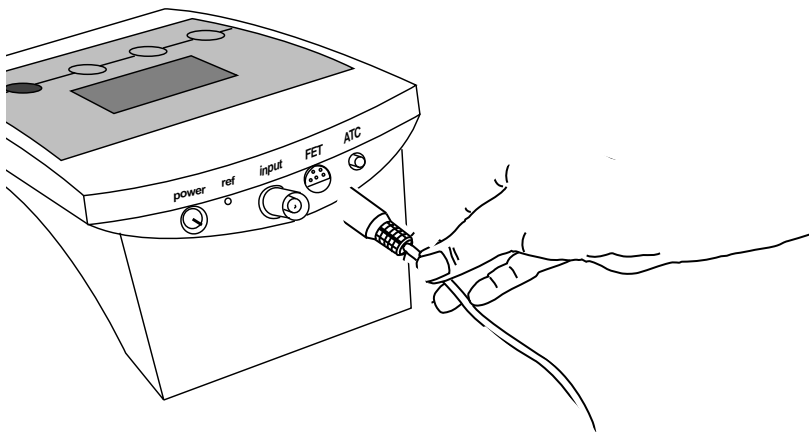
2. Before first use of your glass pH electrode, or whenever the electrode is dry, soak over-night in a filling or KCl solution.



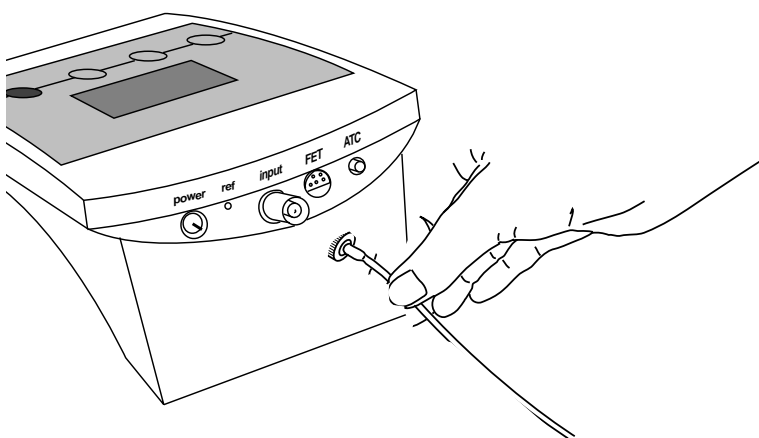
3. Remove the shorting cap on the BNC connector. Install the combination glass pH electrode by plugging it into the **input** connection (twist-lock) and the ATC connector into the **ATC** jack.



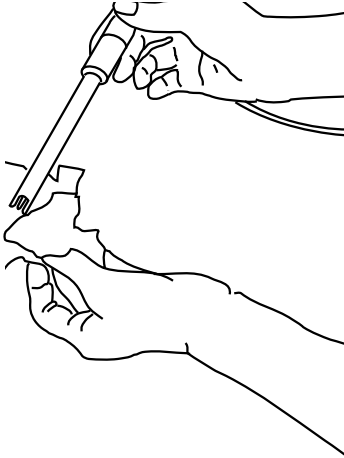
4. *Option:* Install the optional FET electrode by plugging it into the **FET** jack on the back of the meter panel. Allow the FET electrode to warm up for one minute prior to use.



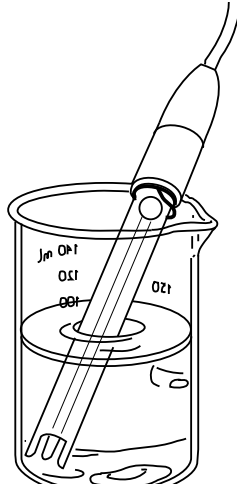
5. *Option:* Install ORP or Ion Selective Electrode pairs by removing the BNC shorting cap and plugging the BNC connector (twist-lock) into the BNC jack. If a combination electrode is not used, plug the reference electrode into the **ref** pin.



6. Rinse and blot-dry electrodes between each measurement (**do not wipe**). Rinse electrodes with distilled water or deionized water, or part of the next solution to be measured.



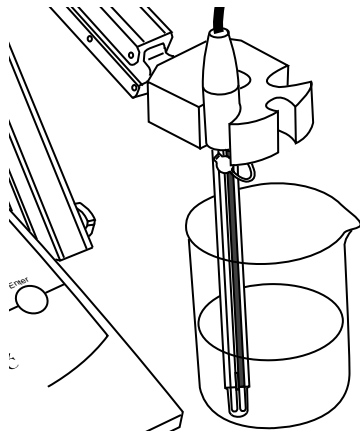
7. Store glass and FET pH electrodes in electrode filling solution or KCl solution. Always leave the filling hole open and refill with filling solution when the internal solution level gets low.



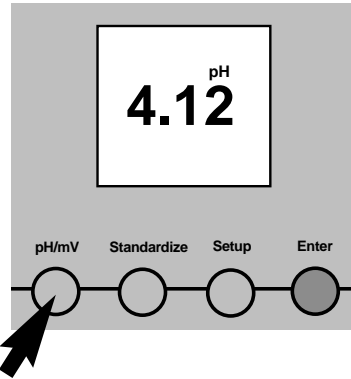
Standardizing for pH Measurement

Because electrodes vary in their response, you must standardize your pH meter and electrode to compensate for electrode variation. The more frequently you standardize, the more accurate your measurements. Standardize daily, or more often, for accurate results.

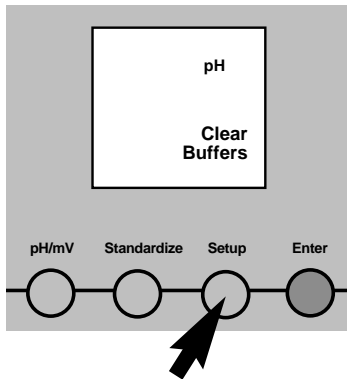
1. Immerse electrode in a buffer solution. Stir gently.



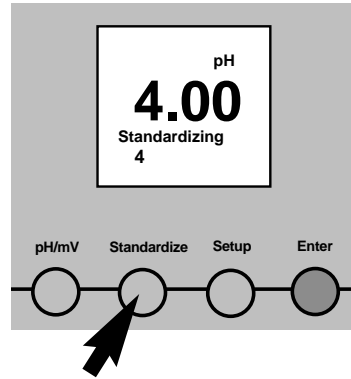
2. Press and release the **pH/mV** button until your digital display indicates pH mode. This button toggles between pH and mV modes.



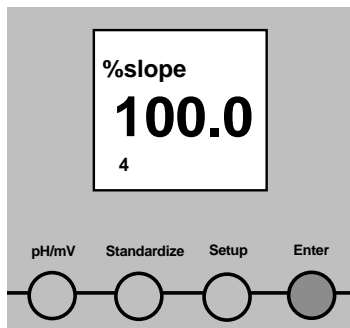
3. Clear existing buffers when doing a new 2 or 3 point standardization. Use the **Setup** button to clear existing buffers and to select a new set of buffers.



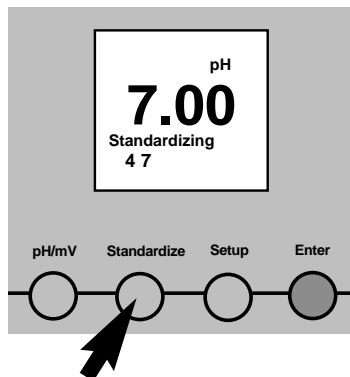
4. Press **Standardize**. The meter recognizes the buffer and flashes a buffer icon. When the signal is stable, or when you press **Enter**, the buffer is entered.



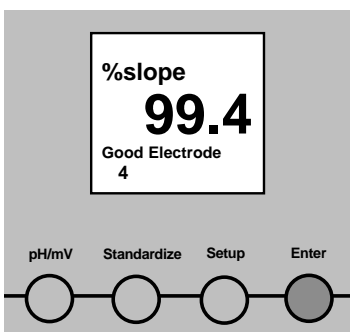
5. The meter displays the %slope of the electrode as 100.0% On entering a second or third buffer, the meter performs a diagnostic check on the electrode.



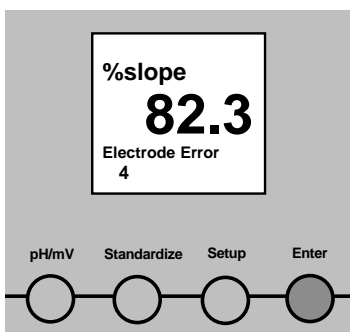
6. To enter a second buffer, place the electrode in the second buffer solution and press **Standardize** again. The meter recognizes the buffer and displays the first and second buffer icons.



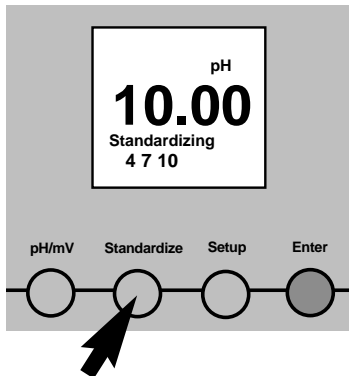
7. Next, the meter performs a diagnostic test of the electrode. The display indicates either **Good Electrode** or **Electrode Error**. The meter displays the % slope of the electrode.



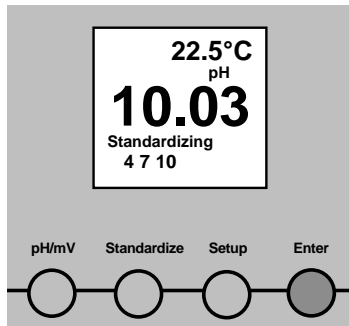
8. **Electrode Error** indicates that your electrode is not working properly. The electrode response must be between 90 and 105% slope. Measurements causing Electrode Error are not accepted, used or stored by the meter.



9. To set a third standard, place the electrode in the third buffer solution and press **Standardize**. The results will be the same as in steps 6 and 7, except the display will show three buffer icons.

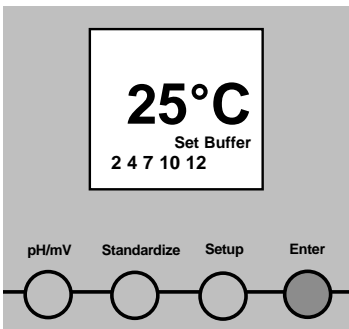


10. After entering each buffer, the *Standardizing* icon goes off and the *Measuring* icon appears on the display to indicate that the meter returns to *Measuring*.

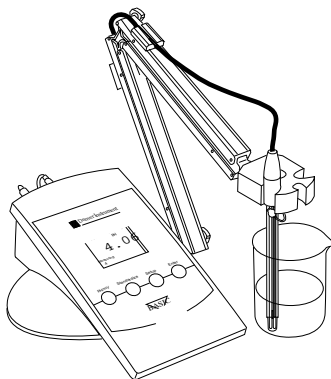


NOTE: The meter continually adjusts for temperature. Therefore, buffers may vary slightly from the nominal values because of temperature variations.

11. The first set of buffers in the meter is used at 25°C in North America and, typically, at 20°C in Europe. In pH mode, press **Standardize** and **Setup** together to show the current buffer temperature setting. Press both **Standardize** and **Setup** again to toggle between the temperature settings. Press **Enter** to select the displayed temperature setting and to return to *Measuring*.



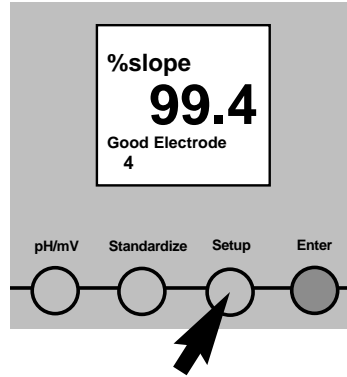
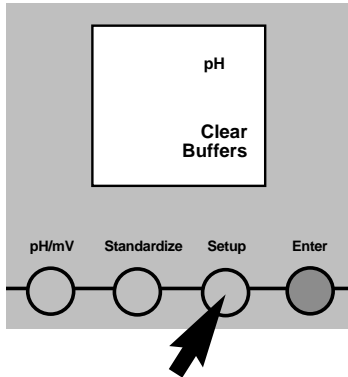
12. Standardize your meter and electrode using at least two buffers with pH values bracketing the expected pH of your samples. Stirring with a magnetic stir bar and stirrer provides faster electrode response.



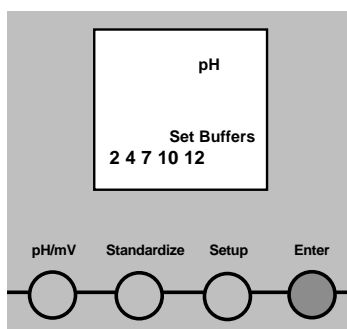
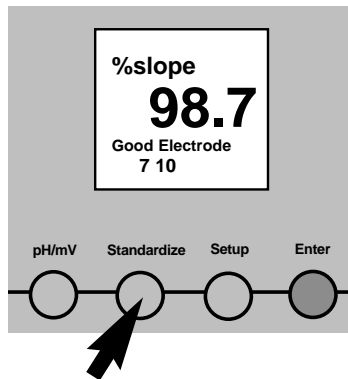
Using Setup

The **Setup** button lets you clear all the buffers that you have entered, review calibration information, or select the buffer set that you want. *NOTE: You can escape setup mode at any time by pressing **pH/mV**.*

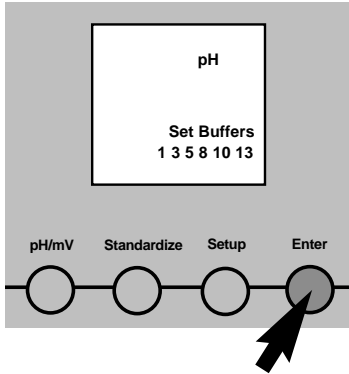
1. Press **Setup** and the meter displays a flashing *Clear Buffers* icon. Use this step only when you wish to clear all buffers you have entered. To clear all existing buffers, press **Enter**. The meter clears all buffers and returns to *Measuring*.
2. Press **Setup** again to show electrode performance. If the meter has accepted an electrode and buffers, it will display *Good Electrode*, display the slope between the first and second buffers and display the two buffer icons.



3. Pressing **Setup** again shows the electrode slope between the second and third buffers (if three buffers have been entered) and shows the second and third buffer icons.
4. Press **Setup** again to display a flashing *Set Buffers* icon and to display the first buffer set icons.

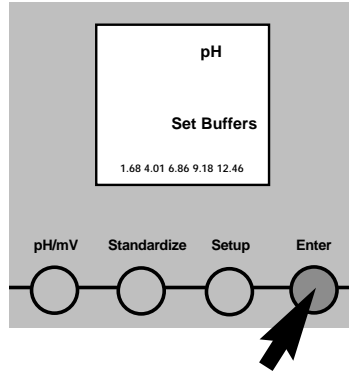


5. Press **Enter** to select the set of buffers shown on the display
or
Press **Setup** again to view the next set of buffers. Continue pressing Setup to view the third and fourth buffer sets.



6. Press **Enter** to select the displayed buffer set that contains the buffer you want to use. Press **Setup** again, or press pH/mV at any time, to return to *Measuring*.

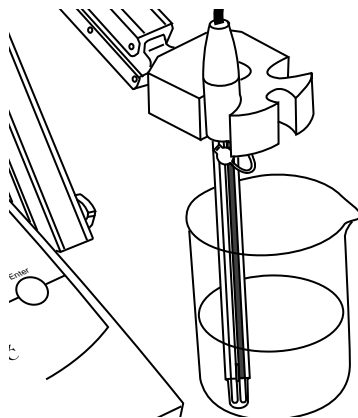
NOTE: You may mix buffers from different sets.



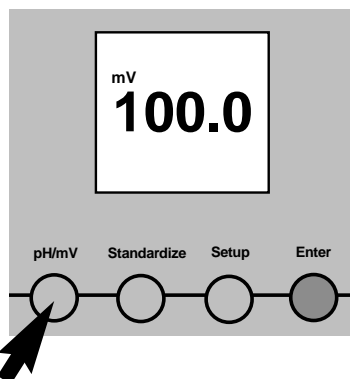
Standardizing for Millivolt Measurement (Relative Millivolts)

You will use millivolt measurement for measuring ion concentration and for measuring redox potential (also called ORP, oxidation reduction potential). You will normally use an ion selective electrode (ISE), combined with a reference electrode, to measure ion concentration. The ISE senses the ion concentration and responds with a millivolt potential. The millivolt readings are then used to calculate ion concentrations. You will normally use a platinum indicator electrode, combined with a reference electrode, to measure redox potential (ORP). ORP measurements indicate the oxidizing or reducing capability of a solution. You can use ORP values to monitor or control solutions requiring a set amount of oxidants or reductants.

1. Immerse electrode in a standard solution.

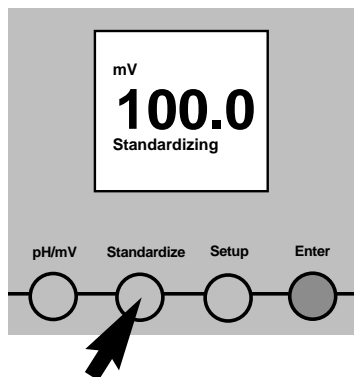


2. Press the **pH/mV** button until your digital display indicates mV mode.

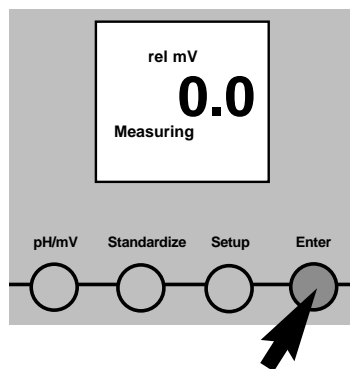


3. Press **Standardize** to enter a mV standard and read relative mV.

NOTE: Relative mV mode is not allowed with the FET electrode.

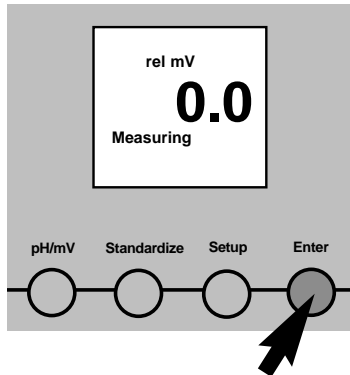
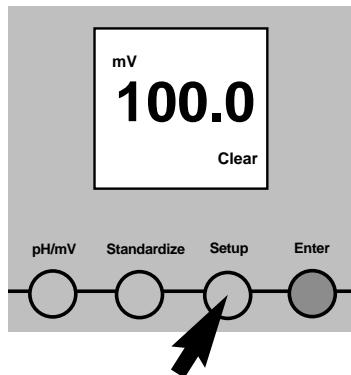


4. When the signal becomes stable, or when you press **Enter**, the current absolute mV value becomes zero relative millivolts.



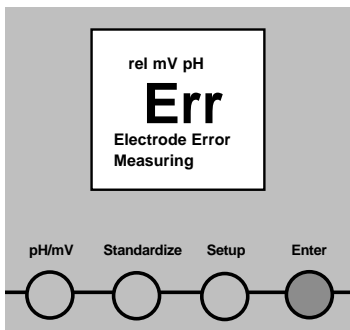
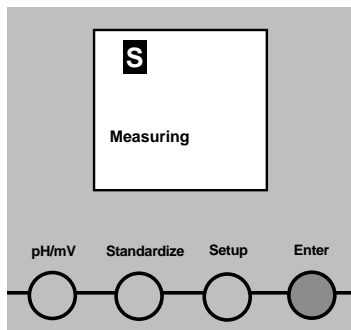
5. To clear a mV offset and return to absolute millivolt mode, press **Setup**. The meter displays a flashing *Clear* icon, and the current relative millivolt offset.

6. To clear your previous mV standard, press **Enter**. You then return to absolute mV mode.



Measuring pH or Millivolts

1. Standardize your meter. See page 10.
2. Rinse electrode and immerse in sample solution. Stir gently.
3. Press **pH/mV** until your display indicates the correct mode.
4. The display shows the current reading in pH, mV, or relative mV units. When the signal is stable, the meter displays the **S** icon. The **S** icon means the signal is changing less than 0.007 pH or 0.08 mV from the prior reading.
5. You may receive an out of range error, **Err**, if your electrode is not immersed in a solution. To correct the error, immerse the electrode in a solution.
6. Separate calibrations for the glass and FET electrodes are stored in memory. Plugging the FET in recalls it's calibration, unplugging the FET recalls the glass electrode calibration.



Understanding pH Theory

Defining pH

The measurement of pH plays an important role in identifying and controlling acidity and alkalinity levels for industry and research. pH is a measure of the acidity or alkalinity of a solution and can be represented by this equation:

$$\text{pH} = -\log [\text{H}^+]$$

with $[\text{H}^+]$ representing the concentration of hydrogen ions in the solution. pH is sometimes referred to as the power of the hydrogen ion in a solution.

By using a pH meter, you can determine exact pH levels of solutions. For example, rather than say that lemon juice is quite acidic, you can say that lemon juice has a pH of 2.4. An exact pH value can be used to control or measure acidity levels for manufacturing processes or for basic research.

pH values generally range from 0 to 14, with a pH value of 7 being the neutral point, or the value of pure water. The pH values above the neutral point represent increasing alkalinity, whereas pH values below the neutral point represent increasing acidity (Figure 1).

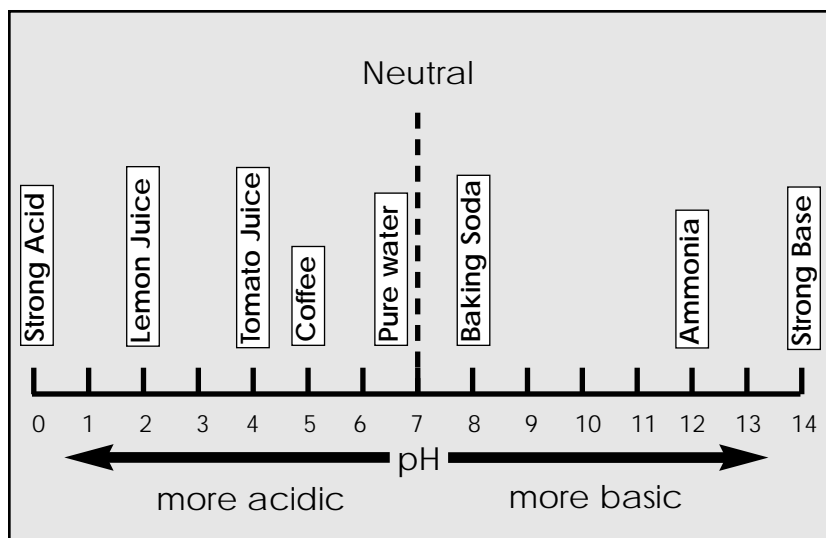
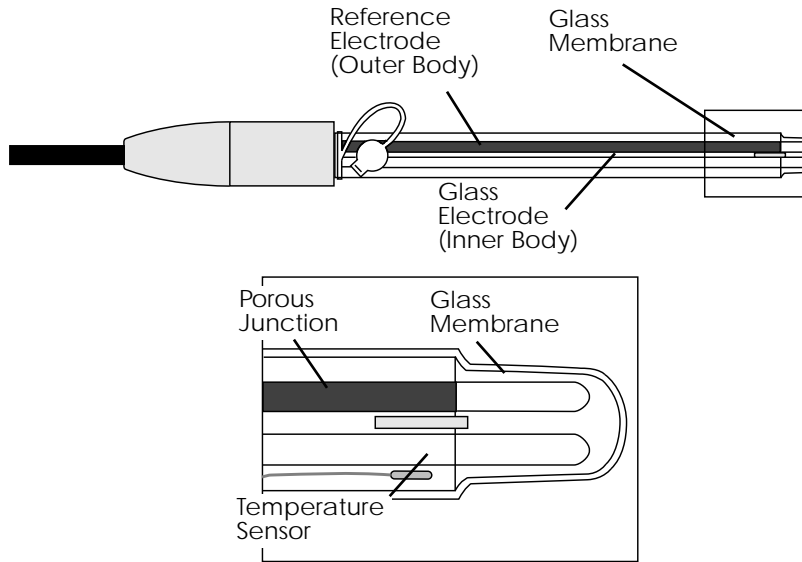


Figure 1.
pH Scale showing the relative acidity or basicity of some common substances.

Measuring pH

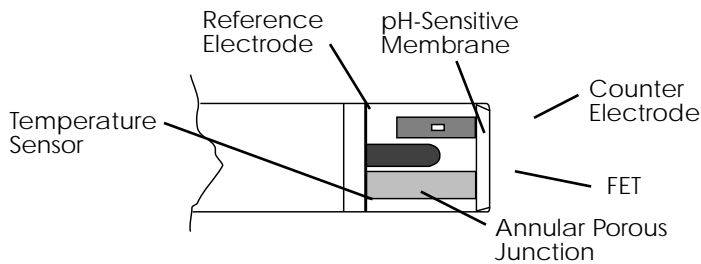
To measure pH with a conventional glass pH electrode, the meter uses a pH-sensing glass bulb electrode that is sensitive to hydrogen ions. The potential developed at the glass bulb is directly related to the pH of the solution.

The glass bulb electrode is paired with a reference electrode which completes the electrical measuring circuit and provides a stable reference point. These two electrodes are joined to create a combination electrode. The combination glass electrode is connected to the pH meter which reads the voltage, converts it to pH units, and displays the result.



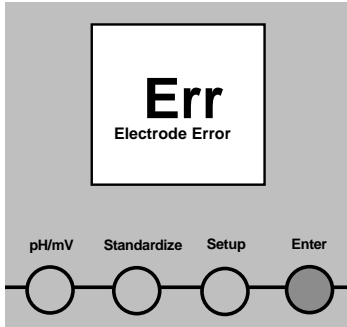
Combination Glass pH Electrode

This meter can also use a field effect transistor (FET) electrode for measuring pH. The FET uses an ion-sensitive solid state membrane attached to the transistor to measure the hydrogen ion concentration of a solution. The FET is paired with a reference electrode and counter electrode that maintain a constant potential while the FET responds to the sample.

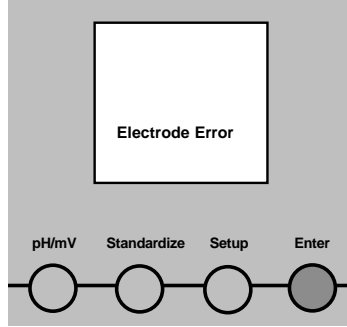


Troubleshooting

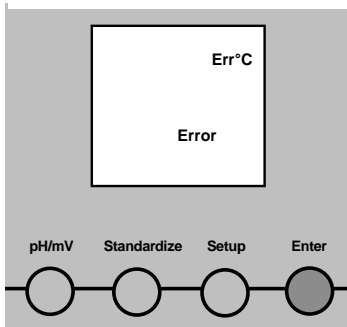
1. If the signal from the electrode is *out of range*, the display will show Err. This may happen when the electrode is not in a solution.



2. The meter will display *Electrode Error* when it detects an error in electrode response. During standardization, the message indicates that the electrode is less than 90% or more than 105% of the correct response. The *Electrode Error* message can indicate either a bad electrode or bad buffer(s).



3. If the meter detects an error in the temperature probe, the display shows *Err°C*. If you do not use a temperature probe, the meter uses the default temperature that you set to either 20°C or 25°C.

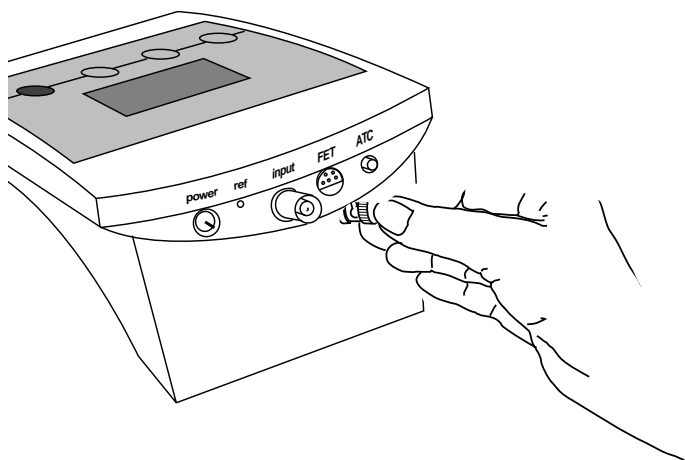


4. To test the pH electrode, place it in a good pH 7 buffer. Press **pH/mV** to use the mV mode, and note the millivolt reading. Repeat for either a pH 4 or pH 10 buffer. The electrode signal must be within the limits shown below (when temperature is near 25°C).

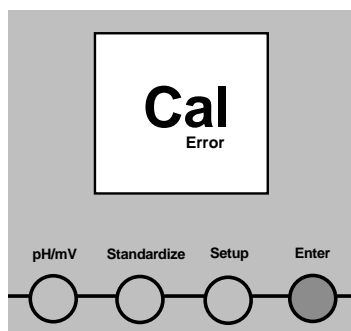
Electrode Test

pH 7	0 + 30 mV
pH 4	159 to 186 mV more than pH 7
pH10	159 to 186 mV less than pH 7

5. To test the meter for correct operation, install the BNC (input) shorting cap. Press **pH/mV** to use the mV mode, and note the mV reading. If the meter reads ± 0.5 mV, it is measuring correctly.



6. If the meter detects a loss of calibration or a hardware error during its power-up self-test, the display shows *CAL Error*. This means the mV accuracy may be reduced, but pH accuracy after standardization will be the same. Press **Enter** to continue using the meter. If recalibration is desired, contact Technical Support.



Meter Specifications

pH	-1.99 to 19.99 pH displayed to 0.01 pH accurate to 0.01 pH
mV	-1800.0 to 0.01 mV displayed to 0.1 mV accurate to 0.5 mV
Temperature	-5.0 to 105.0°C displayed to 0.1°C accurate to 0.1°C
Standardization	0, 1, 2 or 3 buffers
Auto buffer recognition	22 buffers 2, 4, 7, 10, 12 1, 3, 6, 8, 10, 13 1.68, 4.0, 6.86, 9.18, 12.46 1.09, 3.06, 4.65, 6.79, 9.23, 12.75

Auto Temperature Compensation
Automatic electrode slope correction for 90-105%
Direct reading with both a glass and FET pH electrode



WARRANTY/DISCLAIMER

MEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of 37 months from date of purchase. OMEGA Warranty adds an additional one (1) month grace period to the normal three (3) years product warranty to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit should malfunction, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of being damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

MEGA is pleased to offer suggestions on the use of its various products. However, MEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, MEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS / INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT IN ORDER TO AVOID PROCESSING DELAYS. The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR WARRANTY RETURNS, please have the following information available BEFORE contacting OMEGA:

- . P.O. number under which the product was PURCHASED,
- . Model and serial number of the product under warranty, and
- . Repair instructions and/or specific problems relative to the product.

FOR NON-WARRANTY REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. P.O. number to cover the COST of the repair,
2. Model and serial number of product, and
3. Repair instructions and/or specific problems relative to the product.

MEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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