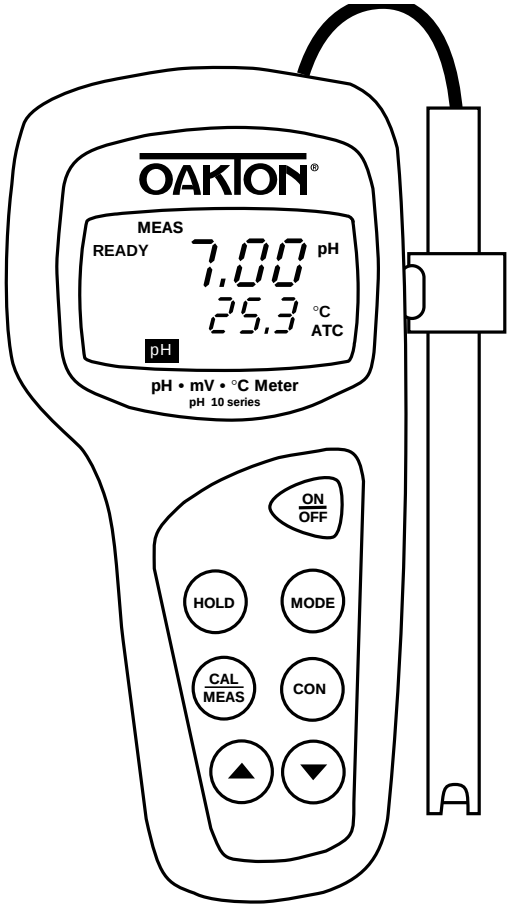
Operating Instructions

OAKTON® pH 10 series
pH/mV/°C Meter



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OAKTON®

Table of Contents

1. Introduction

Thank you for selecting an OAKTON® meter. The OAKTON® pH 10 series meters are economical, microprocessor-based meters that deliver high ±0.01 pH accuracy. They also read millivolts for taking ORP measurements. The pH 10 has many user-friendly features that are completely accessible through the water-resistant membrane keypad.

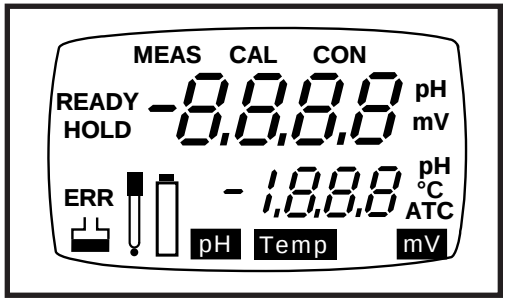
Getting started (sections 1 to 8)

To perform the basic functions of this meter, read sections 1 through 8 of this manual. These sections include basic instructions (about keypad functions, connecting the electrodes, calibration, taking readings, etc.) that will get you up and running quickly.

Maintenance, troubleshooting, etc (sections 9 to 15)

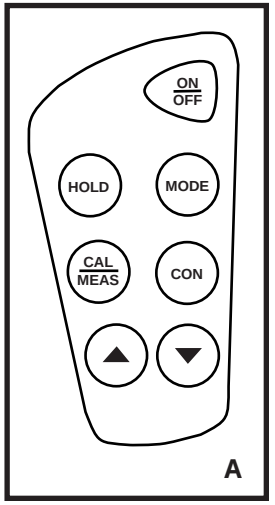
The remaining sections of the manual deal with electrode maintenance, error messages, and troubleshooting. This part of the manual also includes the Specifications, Accessories, Warranty, and Return of Items sections.

2. Display and Keypad functions



The water-resistant membrane keypad makes the instrument easy to use. Each button, when pressed, has a corresponding graphic indicator on the large liquid crystal display. The LCD has a primary and secondary display. The primary display shows the readings for pH and mV. The secondary display shows the temperature readings simultaneously with the primary display. Both the primary and secondary displays show special indicators such as error messages, measurement units, and modes of operation.

Keypad functions (see Figure A).



ON/OFF Powers the unit on and shuts the unit off. Meter directly enters measurement mode when you turn it on.

HOLD Freezes the measured readings. To activate, press HOLD while in pH or mV mode. To release, press HOLD again.

MODE Selects the parameter of measurement. pH is the default mode. Pressing MODE lets you scroll first to temperature mode, then to mV mode, then back to pH mode again.

NOTE: Temperature mode is used for temperature calibration; temperature readings are always displayed on the secondary display.

CAL/MEAS Enters CAL mode for the calibration function. You can access CAL only in the pH or temperature modes. pH buffer values are 4.01, 7.00, and 10.01. To end calibration and return to measurement mode, press CAL/MEAS again. Press OFF to end all functions. To confirm calibration, press the CON key.

▲ Use to scroll up the buffer calibration values provided by the calibration program. It will scroll one value up from the present calibration value displayed on the LCD with each key press. When the highest calibration value is reached, it will scroll around to the lowest value.

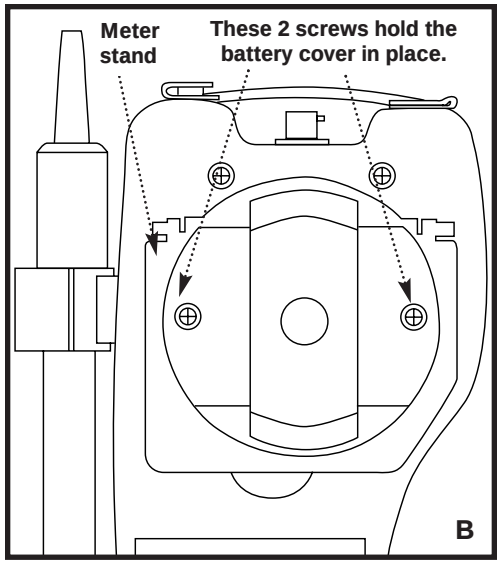
▼ Similar to ▲, except with each key press, the value scrolls one step down.

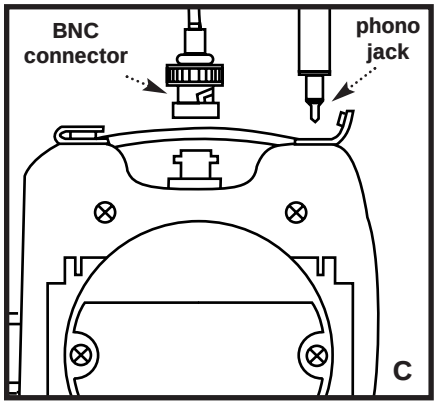
CON Press CON to confirm the calibration point. “CON” will flash on the screen.

3. Preparation

Inserting the batteries (included)

1. If the electrode cable is wound around the the cable winder, unwind it.
2. Use a Phillips screwdriver to remove the two screws holding the battery cover. See Figure **B**.
3. Lift meter stand to expose battery cover.
4. Remove battery cover.
5. Insert batteries. Make sure polarity is correct.
6. Replace the battery cover into its original position using the two screws removed earlier. Place the meter stand in the folded position.





Connecting the electrode and the temperature probe

Meter accepts any pH, ORP or ISE electrode with a BNC connector. The temperature sensor connects to the meter using a phono jack for the temperature probe.

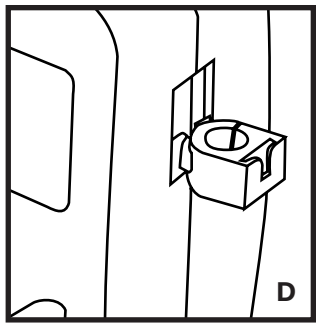
Connecting the pH electrode. Hook up the electrode to the male BNC jack on the top of the meter as shown in Figure **C**. Make sure connector is clean and dry.

Temperature probe. The temperature probe uses a phono jack to connect with the socket on the meter. Insert the jack into socket as shown in Figure **C**. If you are using an OAKTON "All-In-One" electrode, the temperature sensor is built in to the pH electrode and the one electrode cable will have both a BNC connector for pH and a phono jack for temperature.

Attaching the electrode holder to the meter

1. Place the electrode holder with the flange facing the slot on the meter.
2. Gently slide the flange of the holder in the slot (See Figure **D** at left). Make sure holder is fixed properly into the slot.

You can attach the electrode holder in different positions, as shown in Figure **E**. This flexibility facilitates one-hand operation.

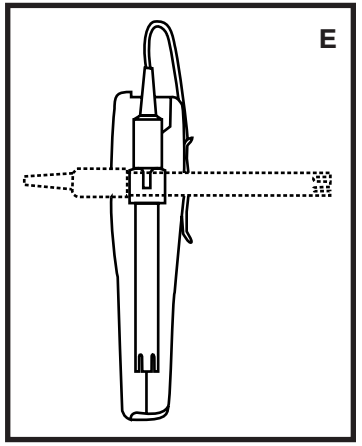


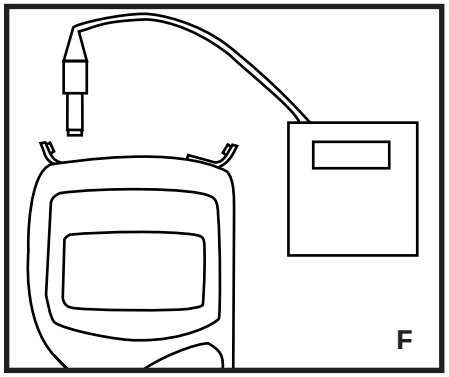
Inserting electrode into the electrode holder

The meter includes one electrode holder. Make sure to insert the electrode into the holder gently, or the electrode may break.

1. Insert the electrode into the opening of the holder until the top housing of the electrode touches the top of the holder as shown in Figure **E**. Do not force the electrode into the opening.

NOTE: If you substitute the electrode, you need to use an electrode with a 12 mm diameter. Otherwise, the electrode may not fit properly.





Connecting the AC adapter (not included; order on page 21)

1. Insert the AC jack as shown in Figure **F** at right.
2. Switch off the meter before plugging the adapter into the power source. This safety precaution protects the software in your meter.
3. Switch on the meter power.

4. pH Calibration

This instrument is capable of up to 3-point calibration to ensure accuracy across the entire range of the meter. You can perform 1-, 2,-, or 3-point calibration with standard pH buffers 4.01, 7.00 and 10.01.

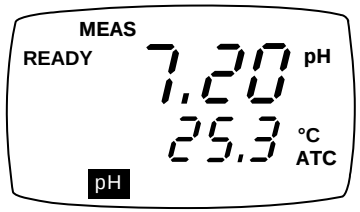
We recommend that you perform at least a 2-point calibration using standard buffers that bracket (one above and one below) the expected sample range. You can also perform a 1-point calibration, but make sure that the buffer value is close to the sample value you are measuring.

All new calibrations will over-ride existing stored calibration data.

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

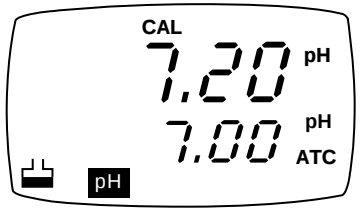
NOTE: Be sure to remove the protective rubber cap of the electrode before measurement.

1. **Select pH mode** (automatic when meter is switched on). See Figure **G**.



G

2. **Rinse the electrode thoroughly with deionized water or a rinse solution.** Do not wipe the electrode; this causes a build-up of electrostatic charge on the glass surface.
3. **Dip the electrode into the sample.** The glass bulb of the electrode must be completely immersed into the sample. Stir the electrode gently to create a homogeneous sample.



H

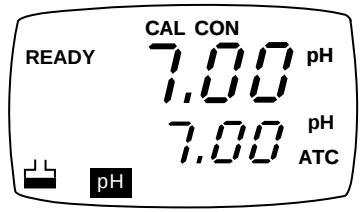
4. **Press CAL/MEAS.** The display will show CAL—see Figure **H.** The primary display will show the measured reading while the smaller secondary display will indicate the pH standard buffer solution.

   NOTE: If using a buffer other than pH 7, press the ▼ or ▲ keys to scroll up or down until the secondary display value is the same as your pH buffer value.

5. **Wait for the measured pH value to stabilize.** The READY indicator will display when the reading stabilizes.

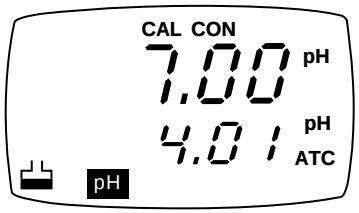
6. **Press CON to confirm calibration.** A confirming indicator flashes for one second and disappears. See Figure **I**. The meter is now calibrated at the buffer indicated in the primary display.

   The secondary display automatically scrolls to the next buffer calibration option. See FIgure **I** . If you are performing a 1-point calibration, go to step 8.



I

   NOTE: The electrode and buffer icon blink and the ERR annunciator lights up if the selected buffer value is not within ±0.50 pH from the measured pH value. These indicators also flash if the buffer used is not the same as the buffer value on the secondary display.



J

7. **Press the ▼ or ▲ key** to select the second buffer value you want to calibrate. The buffer values are shown on the secondary display (pH 4.01, 7.00, and 10.01). See Figure **J**.
8. **Follow steps 2 through 6** for additional calibration points (up to 3 values). Do not press CAL/MEAS until all calibration is completed.
9. **Press CAL/MEAS** to return to measurement mode.

5. pH Measurement

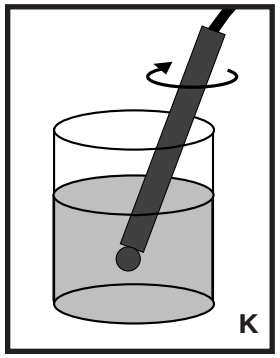
During measurement, you can hold the electrode in your hand or insert it in the electrode holder for one-hand operation.

NOTE: Be sure to remove the protective rubber cap of the electrode before measurement.

Measurement with automatic temperature compensation (ATC)

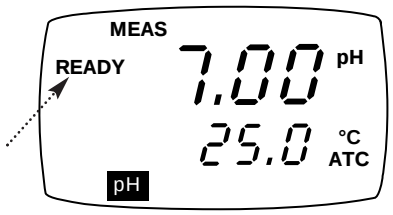
Automatic temperature compensation requires an OAKTON "All-in-One" electrode or a separate temperature probe. The ATC indicator will appear on the display to indicate ATC mode.

1. **Rinse the electrode with deionized or distilled water.** This will remove impurities that have adhered to the electrode body. If the electrode has dehydrated, soak it for 30 minutes in a 2M–4M KCl solution.
2. **Turn the meter on. Make sure the meter is in the Measurement Mode** (MEAS indicator shows on the top center of the LCD). If the meter is not in the measurement mode, press the CAL/MEAS key until the MEAS indicator shows on the top center of the display.
3. **Dip the "All-in-One" electrode (or electrode and temperature probe) into the sample.** The glass bulb of the electrode must be completely immersed into the sample. Stir the electrode gently to create a homogeneous sample. See Figure **K.**
4. When the reading stabilizes, **the READY indicator will display.** See Figure **L**.



K

The READY indicator appears on the top left corner of the display when the reading is stable within a range of ±0.01 pH (±0.8 mV < 400 mV; ±1.2 mV > 400 mV). The reading is held until the variation of the reading exceeds the specified range, and then the READY display vanishes. Therefore, the READY indicator assures you of stable readings.

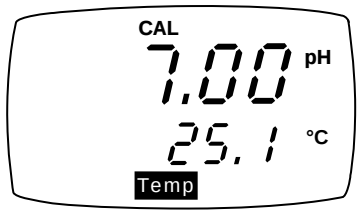


L

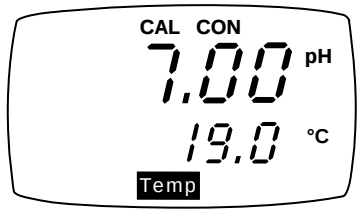
Measurement with manual temperature compensation

These meters allow you to compensate for temperature effects even without a temperature probe attached to the meter. However, you will need an external thermometer to check the temperature of your sample.

1. **Rinse the electrode with deionized or distilled water.** This will remove impurities that have adhered to the electrode body. If the electrode has dehydrated, soak it for 30 minutes in a 2M–4M KCl solution.
2. **Turn the meter on. Make sure the meter is in the Measurement Mode** (MEAS indicator shows on the top center of the LCD). If the meter is not in the measurement mode, press the CAL/MEAS key until the MEAS indicator shows on the top center of the display.
3. **Dip the electrode into the sample.** The glass bulb of the electrode must be completely immersed into the sample. Stir the electrode gently to create a homogeneous sample.
4. **Check the temperature of your sample** using an accurate thermometer.
5. **Press the mode key** until the TEMP indicator appears at the bottom of the display.
7. **Press the CAL/MEAS key.** The CAL indicator appears at the top of the display. See Figure **M**.
8. **Press the ▲ or ▼ key to adjust the temperature on the lower display.** Scroll in the temperature value noted in step 4.
9. **Once you have selected the correct temperature, press the CON key.** A confirming indicator (CON) flashes on the display for one second, then disappears. See Figure **N**.



M



N

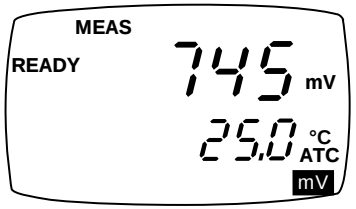
10. When the reading stabilizes, **the READY indicator will display.**

The READY indicator appears on the top left corner of the display when the reading is stable within a range of ±0.01 pH (±0.8 mV < 400 mV; ±1.2 mV > 400 mV). The reading is held until the variation of the reading exceeds the specified range, and then the READY display vanishes. Therefore, the READY indicator assures you of stable readings.

6. mV measurement

The pH 10 series meter allows you to read the absolute mV output of your pH, ORP or Ion Selective Electrode (ISE). For ORP or ISE electrodes contact your OAKTON distributor.

1. **Connect your ORP or Ion Selective Electrode** as shown in section 3
2. **Rinse the electrode with deionized or distilled water.** This will remove impurities that have adhered to the electrode body. If the electrode has dehydrated, soak it for 30 minutes in a 2M–4M KCl solution.
3. **Turn the meter on. Make sure the meter is in the Measurement Mode** (MEAS indicator shows on the top center of the LCD). If the meter is not in the measurement mode, press the CAL/MEAS key until the MEAS indicator shows on the top center of the display.
4. **Press the MODE key until the mV indicator appears** in the lower right corner of the display.
5. **Dip the electrode into the sample.** The glass bulb of the electrode must be completely immersed into the sample. Stir the electrode gently to create a homogeneous sample.



O

6. When the reading stabilizes, **the READY indicator will display.** See Figure **O**.

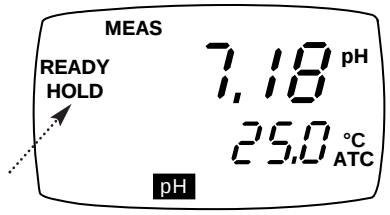
NOTE: The pH 10 series meter does not have a relative mV mode. We have other meters that can take relative mV readings—contact your OAKTON distributor for information.

7. HOLD feature

This feature lets you freeze the value of the pH or mV reading for a delayed observation. HOLD can be used any time when in MEAS mode.

1. To hold a measurement, **press the HOLD key** while in measurement mode. "HOLD" will appear on the display. See Figure **P**.
2. To release the held value, **press HOLD again**. Continue to take measurements.

NOTE: This meter will hold a reading for up to 20 minutes, because it features automatic shutoff after 20 minutes to conserve batteries.

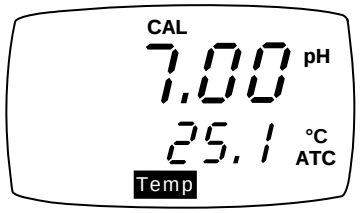


P

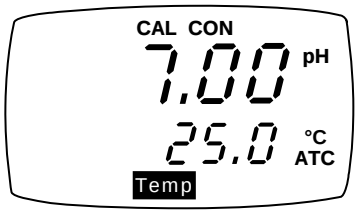
8. Temperature calibration

1-point temperature calibration

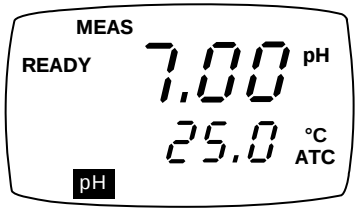
1. **Connect ATC probe** (or temperature connector of the "All-in-One" electrode) to the phone jack. The ATC annunciator will appear at the right-hand side of the LCD.
2. **Press the MODE key** to select temperature mode (Temp).
3. **Press the CAL/MEAS key** to enter calibration mode. The primary display shows the measured pH value and the secondary display shows the temperature. See Figure **Q**.
4. **Dip the "All-in-One" electrode into a solution of known temperature** (i.e. a temperature bath). Allow some time for the temperature probe to stabilize.
5. **Scroll up or down with the ▼ and ▲ keys** to set the correct temperature value (i.e. the temperature of the temperature bath). You can adjust the reading in increments of 0.1°C. Note that the current input reading can only vary ±5°C from the reading originally displayed on the meter.
6. Once you have selected the correct temperature, **press the CON key.** A confirming indicator (CON) flashes on the display for one second, then disappears. See Figure **R**.
7. **Press the CAL/MEAS key** to return to pH measurement mode. See Figure **S**.



Q



R



S

2-point temperature calibration

In most cases 1-point temperature calibration will give you accurate temperature measurement and compensation. If you notice inaccurate measurements at high or low temperatures after 1-point calibration, perform the following procedure.

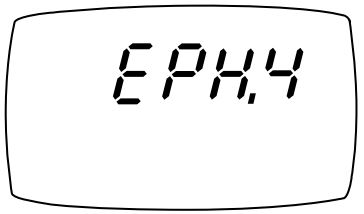
A. Preparing Temperature Baths

1. **Prepare two temperature baths** for temperature calibration.
2. **Set the temperature of the baths.** Using a good reference thermometer, preferably certified, set one bath at 0°C ±3.0°C and the second bath at 77-80°C .

NOTE: Make sure to set the baths within the pH electrode operating temperature. For the epoxy-body All-in-One probe (included with meter), do not set the high temperature bath above 80°C. If you are using a glass-body All-in-One electrode or a separate electrode and metal ATC probe, set bath to 90.0°C ±3.0°C.

B. Entering 2-point Calibration Mode

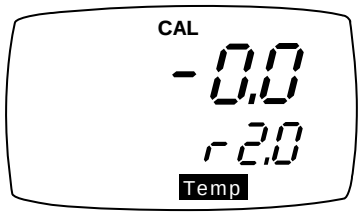
1. **Attach the temperature probe** or electrode to the meter.
2. **Turn the meter off.**
3. Press the CAL/MEAS key.
4. Without releasing the CAL/MEAS key, press the ON/OFF key.
5. **When the LCD lights up, release the ON/OFF key.**
6. **Wait for 2 seconds, then release the CAL/MEAS key.** The upper display will show "EPH.3" or "EPH.4" (depending on the software version number). The meter is now in 2-point Calibration Mode. See Figure **T**.
7. **Press the CON key three times** to enter temperature low point calibration.



T

C. Temperature Low Point Calibration

The primary display will show "0.0" and the secondary display will show "r2.0". See Figure **U**.

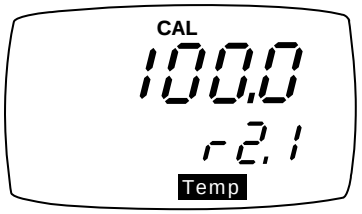


U

1. **Insert the temperature sensor** or electrode with built-in temperature sensor into the low temperature bath.
2. **Press the ▼ and ▲ keys** to set the primary display temperature to match the low temperature bath's temperature.
3. **Press the CON key to store the selected value.** The display will show the A/D value for the temperature. This value appears as a number on the display.
4. **Press the CON key** to store the A/D value when the number stabilizes.

D. Temperature High Point Calibration

The primary display will show "100.0" and secondary display will show "r2.1". See Figure **V**.



V

1. **Insert the temperature sensor** or electrode with built-in temperature sensor into the high temperature bath.

NOTE: To avoid breaking the electrode with temperature shock, allow your electrode to reach room temperature before putting it in a high temperature bath.

2. **Press the ▼ and ▲ keys** to set the primary display temperature to match the high temperature bath's temperature.
3. **Press the CON key** to store the selected value. The display will show the A/D value for the temperature. This value appears as a number on the display.
4. **Press the CON key** to store the A/D value when the number stabilizes.. The meter displays all LCD segments.
5. **Press the ON/OFF key** to switch off the meter.

9. Electrode care and maintenance

Because your pH electrode is susceptible to dirt and contamination, clean it every one to three months depending on the extent and condition of use.

Storage

For best results, keep the pH bulb wet. Store the pH bulb in the protective rubber cap filled with electrode storage solution. Or, you can store the electrode in a pH 4 buffer with 1/100 part of saturated KCl. Other pH buffers are also suitable for storage, but NEVER use distilled water.

After measuring

1. Rinse the electrode and reference junction in deionized water,
2. Store the electrode as recommended above in "Storage," or as recommended by the manufacturer.

To reuse the electrode

Rinse the liquid junction with deionized water and tap dry (never wipe dry).

NOTE: If this does not restore the electrode to normal response, see "Reactivating the electrode" below.

Electrode cleaning

Salt deposit: dissolve the deposit by immersing the electrode in tap water for ten to fifteen minutes. Then thoroughly rinse with distilled water.

Oil/grease film: wash electrode pH bulb gently in some detergent and water. Rinse electrode tip with distilled water.

Clogged reference junction: heat a diluted KCl solution to 60-80°C. Place the sensing part of the electrode into the heated solution for about 10 minutes. Allow the electrode to cool in some unheated KCl solution.

Protein deposits: prepare a 1% pepsin solution in 0.1M of HCl. Set the electrode in the solution for five to ten minutes. Rinse the electrode with distilled water.

Reactivating the electrode

If stored and cleaned properly, your pH electrode should be ready for immediate use. Sluggish response, however, might be caused by a dehydrated bulb. Immerse the electrode in a pH 4 buffer solution for 10 to 30 minutes to rehydrate the bulb. If this fails, the electrode requires reactivation.

Never touch or rub the glass bulb. Contact builds up an electrostatic charge.

Electrode Reactivation: For glass bodied electrodes only!

WARNING: This procedure should only be attempted by qualified persons proficient with the safe handling of dangerous chemicals. Provide proper containers, fume hoods, ventilation, and waste disposal. Safety goggles and protective clothing must be worn while performing this procedure. If possible, replace the electrode instead of performing this reactivation procedure.

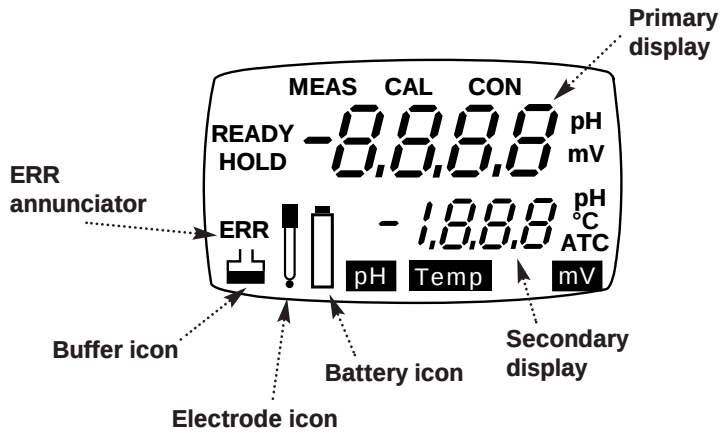
1. Dip or stir the electrode in freon or alcohol for 5 minutes.
2. Leave the electrode in tap water for 15 minutes.
3. Dip and stir the electrode in concentrated acid (such as HCl or H_2S0_4) for five minutes.
4. Repeat step 2.
5. Dip and stir in strong base (NaOH) for five minutes.
6. Leave for 15 minutes in distilled or de-ionized water.
7. Now test with standard calibration buffer solutions to see if the electrode yields acceptable results.

You may repeat steps 3 through 7 up to three times. If electrode response does not improve, then your electrode is no longer functioning. Replace with a new electrode. Call your OAKTON distributor for more information.

10. Error messages

LCD Display	Indicates	Cause	Solution
ERR annunciator	Wrong keypad input	Wrong input in selected mode	Release key. Select valid operations depending on mode.
Electrode and buffer icon blink, ERR Annunciator is ON.	Calibration error	Wrong buffer used during calibration	Check if right buffer selected. Key in correct buffer value or use fresh buffer solution.
		Bad electrode	Change electrode
Battery Icon is lit up	Low battery	Battery power is low	Replace batteries with a fresh set as soon as possible.
”Or” or "ur" in secondary display	Temperature error	Faulty ATC element	Replace “All-in One” or ATC probe
Err 1 in primary display	Memory write error	Hardware failure	Turn meter off and then on. Return if necessary. *
Err 2 in primary display	Memory Checksum error	Hardware failure	Turn meter off and then on. Return if necessary. *
Err 3 in primary display	ADC error	Hardware failure	Turn meter off and then on. Return if necessary. *
Err 4 in primary display	Keypad error	Fault in keypad	Turn meter off and then on. Return if necessary. *

See "Return of Items", page 22.



11. Troubleshooting

Problem	Cause	Solution
Power on but no display.	a) Batteries not in place. b) Batteries not in correct polarity (+ and –). c) Weak batteries.	a) Insert batteries. b) Re-insert batteries in correct polarity. c) Replace batteries or attach optional AC adapter.
Unstable reading.	a) Electrode not deep enough in sample. b) insufficient reference electrolyte in electrode b) Broken electrode. c) External “noises” or induction caused by nearby electric motor. d) Dirty electrode.	a) Place electrode deeper in sample. b) Fill electrode with reference electrolyte (if electrode is refillable). b) Replace electrode. c) Remove or switch off interfering motor. d) Clean electrode. Reactivate, if needed.
Slow response.	a) Dirty electrode.	a) Clean electrode. Activate, if needed.

12. Specifications

Mode	pH	Temperature	mV
Range	0.00 to 14.00	0.0 to 100.0°C	–1999 to 1999 mV
Resolution	0.01 pH	0.1°C	0.01 mV from –399.9 to 399.9 mV; 1 mV outside this range
Accuracy	±0.01 pH	±0.5°C	±0.2 mV from –399.9 to 399.9 mV; ± 2 mV outside this range
Calibration	Up to 3 buffers	Offset 0.1°C	Offset up to ±2000 mV
Temperature Compensation	ATC or manual, 0 to 100°C	—	—

pH slope range: 80% to 120%

ATC function: 0 to 100°C

Automatic shutoff: after 20 minutes

Display: Dual LCD

Inputs: BNC, phono jack

Input impedance: 10 ^ 12

Instrument drift: < 50 µV/°C

Input bias current: 50 pA max at 25°C

Operating Temperature: 0 to 50°C (32° to 122°F)

Power: 4 x 1.5 V AAA batteries (50 hrs); 9 V, 500 mA AC adapter (optional).

Dimensions: 7.5"L x 3.5"W x 1.96"H (meter only); 9.2"L x 8.5"W x 2.75"H (with kit).

Weight: 0.65 lb (meter only); 5 lbs (with kit)

13. Accessories

WD-35614-00	Additional pH/mV/°C (pH 10 series) meter with pH electrode
WD-35615-07	AC adapter, 110 VAC. Shpg wt 1.25 lbs (0.57 kg)
WD-35615-08	AC adapter, 220 VAC. Shpg wt 1.25 lbs (0.57 kg)
WD-35801-00	Replacement electrode, 5.75"L x 0.47" OD (12 mm). Shpg wt 0.5 lb (0.23 kg)
WD-35615-05	Replacement temperature probe, 316 SS, polypropylene cap, 3" cable. Shpg wt 0.15 lb (0.07 g)
WD-35801-71	“All-in-One” combination pH/temperature probe, single junction, sealed, 5.75"L x 0.47" OD (12 mm). Shpg wt 0.5 lb (0.23 kg)
WD-35801-13	ORP electrode, epoxy body, single junction, 5.75"L x 0.49" OD (12.5 mm). Shpg wt 0.5 lb (0.23 kg)
WD-35653-01	pH Singles calibration pouches; pH 4.01 buffer pouches, 20/box, 1 lb/0.46 kg
WD-35653-02	pH Singles calibration pouches; pH 7.00 buffer pouches, 20/box, 1 lb/0.46 kg
WD-35653-03	pH Singles calibration pouches; pH 10.00 buffer pouches, 20/box, 1 lb/0.46 kg
WD-35653-00	pH Singles; rinse water pouches, 20/box, 1 lb/0.46 kg
WD-35653-04	pH Singles assortment pack; five each of pH 4.01, 7.00, 10.00, and rinse water pouches, 1 lb/0.46 kg
WD-00654-00	pH 4.01 calibration buffer; 1 pint, 1.3 lbs/0.59 kg
WD-00654-04	pH 7.01 calibration buffer; 1 pint, 1.3 lbs/0.59 kg
WD-00654-08	pH 10.01 calibration buffer; 1 pint, 1.3 lbs/0.59 kg

Contact your OAKTON® distributor for ordering information and for a complete selection of pH and ORP electrodes, solutions, holders, and accessories.

14. Warranty

OAKTON warrants this product to be free from significant deviations in material and workmanship for a period of one year from date of purchase. If repair or adjustment is necessary and has not been the result of abuse or misuse within the one year period, please return—freight prepaid—and correction will be made without charge. OAKTON alone will determine if the product problem is due to deviations or customer misuse.

Out-of-warranty products will be repaired on a charge basis.

15. Return of items

Authorization must be obtained from our Customer Service Department before returning items for any reason. When applying for authorization, please include data regarding the reason the items are to be returned. For your protection, items must be carefully packed to prevent damage in shipment and insured against possible damage or loss. We will not be responsible for damage resulting from careless or insufficient packing. A restocking charge will be made on all unauthorized returns.

NOTE: We reserve the right to make improvements in design, construction, and appearance of products without notice.

For your reference, please note in this space below the name of your shipment reference number and your purchase order number.

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OAKTON®