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**PHH-60/80MS
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WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, 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 having been 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 in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

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CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "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, OMEGA 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:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. 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. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA'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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The information contained in this document is believed to be correct, but OMEGA accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

NOTES

	Page
Section 1 Unpacking	2
Section 2 General Description	3
Section 3 Setting Up the Meter	4
Installing the Battery	4
Section 4 Setting up the Electrodes	5
Section 5 Calibrating the Meter	6
pH Mode	6
Conductivity Mode	7
Section 6 Operating Procedure	8
Section 7 pH Electrode Care	9
Section 8 pH Electrode Replacement	10
Section 9 Conductivity Electrode Care	11
Section 10 Cond. Electrode Replacement ..	12
Replacement Electrodes & Accessories.	12
Section 11 Maintenance	13
Section 12 Table of pH values	14
Section 13 Specifications	15

Unpacking

Remove the Packing List and verify that you have received all equipment, including the following (quantities in parentheses):.

- 1 soft carrying case
- 1 9V alkaline battery
- 1 wire brush
- 1 bottle of buffer solution (pH 7.00)
- 1 package of detergent powder (may be labeled "ALCONOX")
- 1 Operator's Manual

The carrying case contains the following:

- 1 small screwdriver
- 1 PHH-60 MS or PHH-60 TDS
PHH-80 MS or PHH-80 TDS

If you have any questions about the shipment, please call the OMEGA Customer Service Department.

When you receive the shipment, inspect the container and equipment for signs of damage. Note any evidence of rough handling in transit. Immediately report any damage to the shipping agent.

NOTE

The carrier will not honor damage claims unless all shipping material is saved for inspection. After examining and removing contents, save packing material and carton in the event reshipment is necessary.

Specifications

pH

Range:	0 to 14
Accuracy:	±0.01 pH
Temperature Compensation:	Automatic 0° to 70°C

Conductivity

Range:	PHH-60MS/TDS: 0 to 19,990 µmhos/ppm PHH-80MS/TDS: 0 to 1,999; 0 to 19,990; 0 to 199,900 µmhos/ppm
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Resolution:	PHH-60MS/TDS: 10 ppm or 10 µmhos PHH-80MS/TDS: 1 ppm or 10 µmhos 10 ppm or 10 µmhos 100 ppm or 100 µmhos
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Accuracy:	±2% of span
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Temperature Compensation:	Automatic 0° to 50°C
Power:	9V alkaline battery
Dimensions:	6.25" x 1.25" x 2.25" (158.75 x 31.75 x 57.15 mm)
Weight:	9.5 oz (269 g) Instrument only 21 oz (595 g) Shipping

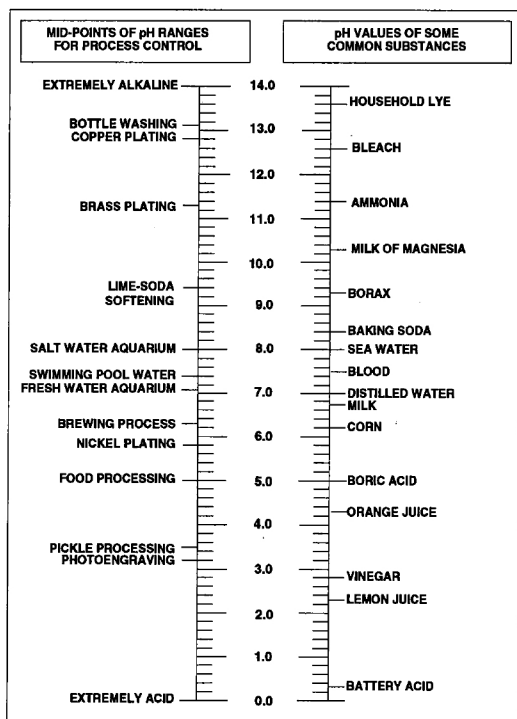


Figure 5. pH Values Common Industrial and Household products

General Description

The OMEGA PHH-60 and PHH-80 meters feature both pH and conductivity measurements in one handheld instrument. The PHH-60 measures pH from 0 to 14 and conductivity from 0 to 19,990 μmhos or ppm. The PHH-80 extends the conductivity capability to 199,900 μmhos or ppm. While in use, the electrodes fold out and lock into a 90° or 180° position. When testing is completed, the electrodes fold back into the instrument case. Recessed switches control all functions and an easy-access panel reveals adjustments for pH calibration and slope, and zero and span for conductivity.

Parts of the Meter

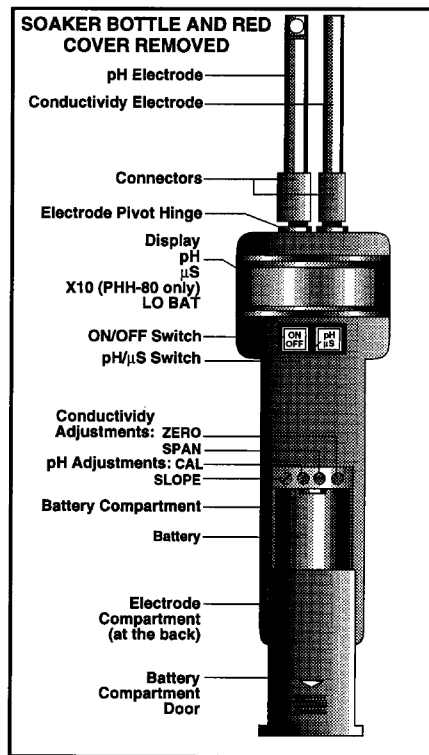


Figure 1. Parts of the Meter

Setting Up the Meter

Installing the Battery (Fig 2)

Carefully remove the meter from the carrying case making sure you don't lose the small screwdriver.

To install/change the battery, do the following:

1. Insert your thumb in the recessed area of the battery compartment door and pull it away from the display.
2. Snap the 9V alkaline battery into the battery clip.
3. Place the battery clip/battery assembly at the top of the battery compartment.
3. Replace the battery compartment door and snap into place.

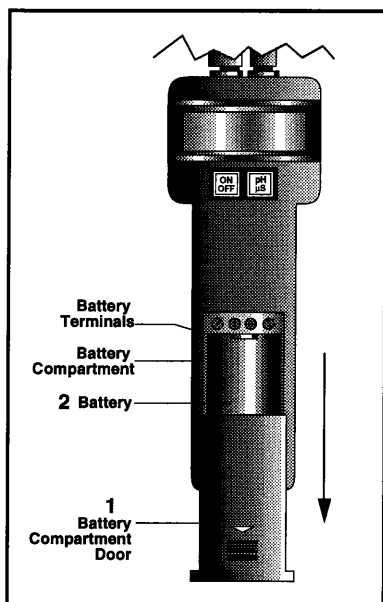


Figure 2. Installing the Battery

Maintenance

Handling

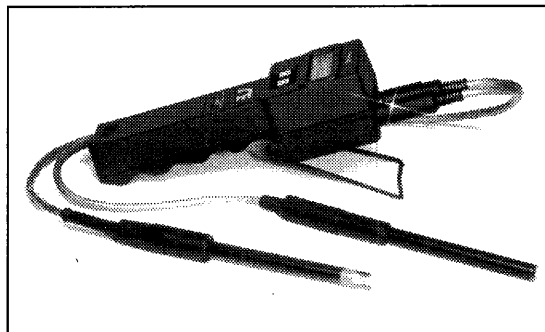
DO NOT lay instrument on display with wet electrode since the liquid may enter the instrument case through the base of the electrode creating a short or circuit board damage. Shake the instrument vigorously after each use to remove ALL water from the side of the pH electrode and inside of the conductivity electrode.

Cleaning

Both electrodes are equipped with protective caps. The bottle on the pH electrode protects the glass bulb inside the plastic sleeve from contamination and prevents it from drying out. The red cap on the conductivity electrode prevents fluid from entering the electrode when only pH is being measured and reduces the need for cleaning. Clean both electrodes before storing to prevent build-up of sediment and to assure long life.

Tilt Stand

The vinyl coated wire tilt stand folds flat against the meter handle, or can be completely removed and later snapped back in place. It is particularly useful for benchtop applications with electrode cable extensions.



5. Twist the brush and scrub up and down for 20 to 30 seconds.
6. Rinse the electrode thoroughly in distilled or deionized water.
7. Clean the brush with tap water and rinse it with distilled or deionized water after using.

Replacement Electrodes and Accessories for Model PHH-60MS, PHH-60TDS, PHH-80MS, PHH-80TDS

PHE-8200	Replacement pH stick electrode
PHE-8236	pH Electrode on 36" cable
CDE-8200A	Replacement conductivity stick electrode
CDE-8236A	Conductivity electrode on 36" cable
PHEC-60	pH extension cable, triaxial connectors
CDEC-60	Conductivity extension cable, mini-din connectors
PHE-8200-BNC	Triaxial to BNC adapter. Enables use of conventional pH electrodes with BNC connections where precise automatic temperature compensation is not required. The ATC element is encapsulated in this adapter.

Setting Up the Electrodes

When you are ready to take your measurement(s), you must first remove the protective covers (caps) that are in place for storage. The pH electrode has the soaker bottle in place to protect the glass bulb inside the plastic sleeve and prevent the electrode from drying out. The red cover (cap) covers the conductivity electrode, preventing fluid from entering the electrode when only pH is being measured and reduces the need for cleaning.

Setting Up the pH Electrode (Fig 3)

To remove the soaker bottle,

1. Extend the electrode pair to the 90° position.
2. Hold part of the electrode shaft and the white cap with one hand.
3. With the thumb and forefinger of the other hand loosen the bottle a couple of turns and slide the bottle and cap off carefully.

To put the bottle back on the electrode shaft, reverse the process stated above.

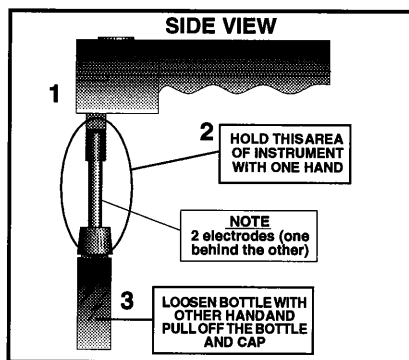


Figure 3. How to Loosen Bottle

Setting Up the Conductivity Electrode

To remove the cap, merely pull it off the electrode shaft.

Calibrating the Meter

The meter is factory calibrated prior to shipping. However, since the electrode outputs change with age and condition it is important to calibrate with fresh pH buffers and known conductivity solutions prior to each use. Zero and span adjustments interact during calibration. Repeat calibration sequence at least two times or until readings stabilize. Rinse electrode in a separate tap water container before dipping the electrode in pH7 solution to avoid contamination. Cross contamination of calibration standards will cause the appearance of "drift" in the instrument.

pH Mode

For best results, calibrate pH with a buffer that is within 3 pH units of the test sample.

1. Rinse the pH electrode in tap water. DO NOT USE DISTILLED WATER
2. Insert in a fresh pH7 buffer solution.
3. Slide back the battery compartment door to the first stop, exposing the adjustment potentiometers (pots). Refer to Figure 1.
4. Adjust the CAL pot until the display reads 7.00.
5. Remove electrodes, rinse in tap water and insert in a pH4 buffer solution.
6. Adjust the SLOPE pot until the display reads the correct value.
7. Repeat calibration sequence until the reading stabilizes.

Note: Difficulty in calibrating the pH electrode might be an indication that it's time for the pH electrode to be replaced. See the section on pH Electrode Replacement on page 9.

Conductivity Electrode Care/Replacement

CAUTION:

DO NOT ATTEMPT TO "UNSCREW" the Conductivity Electrode.

DO NOT LET THE CONNECTOR COME IN CONTACT WITH SOLUTIONS. A wet connector will "short out" the conductivity reading. A corroded connector will lead to faulty readings in the future.

The conductivity electrode needs to be kept clean and free of deposits and other types of build-up. Use the detergent powder supplied in the plastic bag for cleaning the electrode.

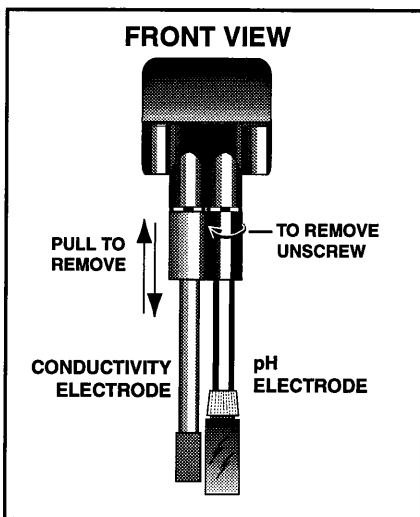
OMEGA Engineering offers replacement "stick" electrodes on 36" cable, and 36" extension cables for use with the PHH-60 and PHH-80.

The Conductivity Electrode is attached to the meter with a Four Pin Mini DIN connector (similar to connectors often used for computer accessories). This electrode can be "unplugged" from the meter by pulling straight off.

1. Unplug the conductivity electrode from the meter for easier handling.
2. Mix a convenient amount of cleaning solution using the detergent powder. Use a mixing ratio that is 30 grams of powder to 3 liters of water (the bag contains 14 grams).
3. Dip the brush into the cleaning solution.
4. Insert the brush into the conductivity electrode approximately 1½" taking care to clean both conductance rings. One ring is located at the bottom of the electrode and the other is located approximately 1" up from the bottom, above the blue collar.

electrode on the OMEGA PHH-60 and PHH-80 meters use a unique element for automatic temperature compensation and a special waterproof, gold-plated triaxial connector. These electrodes are not intended for use on other pH instruments. OMEGA Engineering offers a triaxial to BNC adapter (part number PHE-8200-BNC in Accessories Section) which enables the use of conventional pH electrodes that have BNC connectors with the PHH-60 and PHH-80 meters.

To replace the electrode, unscrew the triaxial connector counterclockwise as indicated in Figure 4. Install a new electrode by turning clockwise.



**Figure 4. How to Unscrew the
pH Electrode**

Conductivity Mode

1. Rinse electrodes thoroughly by agitating in distilled or deionized water.
2. Wipe off conductivity electrode and allow it to dry.
3. When dry, conductivity should read "0" in air.
4. Adjust ZERO pot if reading is incorrect. If the conductivity electrode does not zero, it may indicate dried solids on the sensor. Clean with a mild detergent solution (provided with unit).
5. Immerse electrode in a known conductivity solution. Choose a conductivity calibration solution that is near the range of the samples to be measured. Adjust SPAN pot to desired conductivity value.
6. Rinse electrodes and return to storage compartment.



Operating Procedure

The 9 volt battery should already be installed (page 4).
The electrode covers should already be removed (page 5).

1. Turn on the instrument by pressing the ON/OFF switch once.

"-1" and the unit of measure will momentarily appear and then a second number with the unit of measure is displayed. The display should show which parameter is being measured (for example, pH, μS (micro-siemens), or $\mu\text{S} \times 10$ or ppm (parts per million)). Only the 200K range utilizes the $\times 10$ annunciator on the PHH-80. 20K and 2K range are direct readings. Overrange conductivity is indicated by "1" on the display in the far left corner.

2. Calibrate the meter before using the instrument. Refer to the previous section.
3. Immerse electrodes in solution to be measured. For proper operation, immerse electrodes to half their length.
4. Agitate electrodes briefly (to mix the sample) and observe the reading.
5. To change parameters, press the pH/ μS switch one time. The range sequence on the PHH-80 is pH-200K-20K-2K.
6. Rinse the electrodes thoroughly and replace pH soaker bottle and conductivity cover before folding into storage compartment (at the back); fill the bottle with a small amount of pH4 buffer or pH7 buffer.
7. Remove the battery when the instrument is to be stored for a long period of time.

pH Electrode Care

pH Electrodes must be kept moist. The pH electrode was shipped stored in a soaker storage bottle. The storage solution contained in the bottle is a potassium chloride solution. Do not be alarmed if white crystals form at the end of the electrode. It is simply potassium chloride. Rinse with water to dissolve the crystals before using the electrode.

For storage, place the electrode back in the soaker bottle. If the potassium chloride solution evaporates or is lost, simply use pH buffer 4.0 or pH buffer 7.0 supplied for storage. DO NOT use distilled or deionized water as this will drastically reduce the electrode lifespan.

If the pH electrode should dry out, soak the electrode up to 2 hours in pH buffer 4.0 solution. If the electrode is left dry for an extended period of time, rinse in a 10% KCl solution for 10 seconds. Rinse with tap water and store in a warm KCl solution overnight. This may regenerate the pH electrode.

pH Electrode Replacement

Even with the best of care, pH Electrodes do not last forever. As with batteries or light bulbs, exactly how long a pH Electrode will provide satisfactory performance depends largely on each user's application as well as the care taken in use and storage. Inaccurate or unstable pH readings, drift, slow response, and difficulty in calibration are usually indication that the pH electrode has exceeded its useful life.

Replacement electrodes are available from OMEGA Engineering. (Part number PHE-8200 and PHE-8236. See the section on "Replacement Electrodes and Accessories" on page 12). The pH