OMEGA

ENGINEERING, INC.

An OMEGA Group Company

MODEL PHH-65D

Digital pH Meter

Operator's Manual

pH METER

1.0 INTRODUCTION

The PHH-65D digital field portable pH meter is housed in a rugged plastic carrying case and allows pH and oxidation-reduction potential (ORP) measurements to be taken directly at the sampling site. The pH meter has ½ inch high LCD display with temperature compensation and two point calibration.

2.0 SPECIFICATIONS

Specifications	Digital Field Portable pH Meter
Readout:	0.5" LCD
Operating Modes:	pH mV
pH Measurements:	
Range(s):	0-14 pH
Sensitivity:	0.01 pH
Accuracy:	0.01 pH
Temperature Compensation:	Manual, 0-100°C
Millivolt/Redox Measurements:	
Ranges:	± 1999 mV (Auto-polarity)
Accuracy:	1 mV
Input Impedance:	$>10^{10}$ Ohms
Connectors:	BNC Redox
Power:	DC/AC (rechargeable)
Size:	12 ¼"W X 4 ½"H X 8"D
Weight:	4 lbs. (1.80 Kg)

3.0 PRELIMINARY SET-UP

3.1 Remove and inspect carton for the following items:

- **a.** Field portable pH meter
- **b.** Support Rod
- **c.** Detachable electrode support
- **d.** pH 4.00, pH 7.00, and pH 10.00 buffer solutions and rack
- **e.** Batteries and battery charger
- **f.** Operation Manual

3.2 The instrument should be used in a location with adequate ventilation and freedom from vibration. The instrument should be located on a relatively flat, dry surface and close proximity to high voltage wires or transformers should be avoided.

3.3 Make certain that the front knob is turned OFF

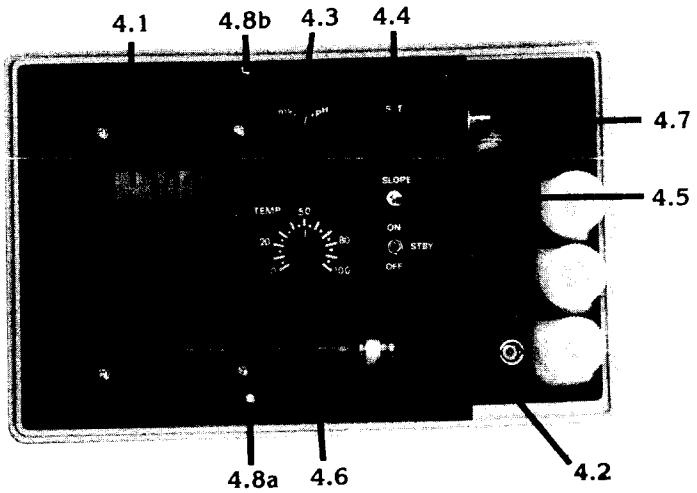
3.4 Plug the unit into the appropriate outlet (the field pH meter is available in both 110 VAC and 220 VAC models). To assure a full battery charge, the unit should be allowed to charge at least overnight.

3.5 Attach the pH or ORP probe into the BNC connector. pH or ORP probes with U.S. standard connections will require an adaptor.

3.6 To decrease breakage, the electrode should then be placed in the electrode holder and attached to the support rod. The electrode holder can then be raised or lowered for sample measurement.

3.7 The instrument can now be calibrated and used. See section 5.0 for pH calibration procedures. Turn the front switch ON for use.

4.0 FRONT PANEL



4.1 Digital Read-Out–½" LCD display

4.2 ON/OFF/STBY
ON: Full power available to meter
OFF: Power to instrument is OFF
STBY: Standby — power is available to the electronics but no input signal is accepted.

4.3 mV/PH
mV: Millivolt - meter will display millivolt input from ORP or pH electrode.
pH: Meter will display pH input from pH electrode.

4.4 SET–Calibration knob used for first point in two point calibration — usually pH 7.0 buffer

4.5 SLOPE–Calibration screw used for second point in a two point calibration — usually pH 4.0 or pH 10.0 buffer

4.6 TEMP–Temperature compensation knob — when this knob is set to the sample temperature, the pH readings are temperature compensated.
Note: All temperature settings are in degrees centigrade.

4.7 BNC Connector–The connector for the BNC fitting of an ORP or pH electrode.

4.8 a&b: Front Panel Screws–Two screws that fasten front panel to carrying case. Screws must be completely removed and panel lifted out to gain access to the rechargeable batteries.

5.0 STANDARD pH CALIBRATION

5.1 Prepare pH 4.00, pH 7.00, and pH 10.00 buffers by dissolving one buffer capsule per 100 ml of deionized or distilled water. After dissolution, the buffers should be properly stored in clearly labeled, tightly capped containers. Commercially prepared buffers can also be used.

5.2 Place pH electrode in sufficient pH 7.00 buffer to immerse probe tip. Adjust manual temperature compensation knob to room temperature, 25°C. For the most accurate results, the buffers should be used at 25°C.

5.3 Select the pH mode.

5.4 Use the SET knob to adjust the readout to exactly pH 7.00.

5.5 Rinse the electrode with distilled water and carefully blot dry using tissue paper.
Caution: Do not wipe electrode. This can cause static electrical charges and can result in faulty readings.

5.6 Immerse the probe in a second standard buffer, either pH 4.00 or pH 10.00. Allow time for equilibration.

5.7 Use the slope screw to adjust the readout to read exactly 4.00 or 10.00 depending on the second buffer used.

5.8 Rinse electrodes and blot dry.
The meter is now ready for use in the pH mode.

NOTE: The calibration of a pH meter is not permanent. It should be performed on a regular basis and any time the pH reading response becomes slow or erratic.

6.0 ELECTRODE CARE

Many electrode problems can be eliminated with reasonable care. Proper storage and use decreases down time and provides maximum benefits.

Storage

6.1 Gel and refillable electrodes should be stored in an acidic solution with a low salt content. Commercial soaking solutions are available or you can make your own by mixing a lM KCl solution adjusted to pH 4.0.

6.2 Electrode storage in a field unit is more difficult due to the horizontal storage. To assure proper hydration of the pH bulb, the electrode should always be stored wet in the solution described above. The easiest way to accomplish this is to store the electrode using the plastic cap or soaking bottle that accompanies the new electrode when shipped.

Use

6.3 Electrodes should always be used in a vertical position.

6.4 Electrodes should be rinsed between samples with distilled or deionized water. **NEVER** wipe an electrode — to remove excess water, just blot the end of the electrode with a lint free paper. Wiping electrodes can cause spurious readings due to static charges.

6.5 The level of filling solution in refillable electrodes should be kept at least ⅔ full. The filling hole should be open during use.

6.6 pH electrodes are fragile. A proper electrode holder should be used to provide support and aid in raising and lowering the probe into solutions.

7.0 THEORY OF pH MEASUREMENT

7.1 Color Methods

Over the years, researchers have discovered dyes and chemicals that will change color at prescribed pH values. Litmus paper is a good example of a commonly used indicator. In an alkaline solution, the paper turns blue and in acid solution, the paper wiii turn pink. But there are two major drawbacks with the use of indicators. First is the difficulty of detection in highly colored or turbid solutions and second is chemical interferences with the indicator, invalidating the test. With the invention of the pH probe and meter, scientists were able to eliminate these drawbacks as well as increase the precision of pH measurements.

7.2 Instrument Methods

There are three components of pH measurement. The measuring electrode, the reference electrode, and the pH meter.

Instrumental pH measurement can be performed relatively fast and with a high degree of precision.

a. Measuring Electrode

The key to the pH measuring system is the glass bulb at the end of the measuring electrode. This glass bulb is manufactured from a special glass which is very sensitive and highly selective to hydrogen ions. The pH measurement is then a function of a voltage charge across the bulb which is directly related to the hydrogen ion concentration.

b. Reference Electrode

A second electrode, the reference electrode, is then required to complete the electrical circuit between the measuring electrode, through the meter, into the sample being measured. The reference electrode completes this circuit by very, very slow seepage of KCl ($K^+ + Cl^-$), into the sample through a porous junction. Clogging of this junction can cause erratic and incorrect pH readings.

c. **Combination Electrode**
Combination electrodes are electrodes which contain both a measuring and a reference electrode in one probe.

d. **pH Meter.**
The input signals from the electrodes are displayed on the pH meter. A direct reading of the voltage input is displayed when the meter is set on the millivolt scale. For the more common pH usage, the meter converts the voltage input from the electrodes to a unit of pH which is displayed when the meter is set on the pH scale.

8.0 TROUBLESHOOTING

8.1 Symptom

Meter exhibits no response

Action

a. Check battery power
Plug the attached recharger into the appropriate power outlet (110 VAC or 220 VAC depending on model ordered) for at least 24 hours to insure full battery charge. Recheck function. If there is still no response, then replace batteries.

b. Change batteries
1. Turn meter OFF.
2. Remove the front panel screws.
3. Carefully remove front panel and turn over.
4. The batteries are located underneath the right side of the front panel.
5. Replace the 9V NiCd battery. Make sure the battery is replaced in the same position as the old battery.
6. Plug the recharger into the appropriate outlet and recharge for 24 hours.
7. Recheck function. If there is still no response, continue.

c. Check millivolt function of the pH meter.
1. Turn selection knob to mV (millivolt). Place electrode in fresh pH 7.0 buffer. Meter should read ± 15mV.
2. Place electrode in fresh pH 4.0 buffer. Meter should read + 177 mV.
3. Place electrode in fresh pH 10.0 buffer. Meter should read −177 mV.

Conclusion

If pH meter responds correctly in mV mode this pinpoints the fault to the pH board. The pH meter needs to be serviced.

If the pH meter does not respond, you may have a faulty pH meter or faulty electrode. Proceed to next step.

d. Check pH circuitry of the pH meter:
1. Turn selection knob to the pH meter.
2. Open paper clip to U shape or use a piece of wire. Note: this procedure does **not** pose any electrical risk.
3. Insert one end of wire or opened paper clip into BNC connector center hole and touch other end to the outside raised cylindrical metal ring.
4. This should result in a stable needle reading which can be deflected more than 3 pH units using the SET knob.

Conclusion

If the pH meter responds correctly when shorted, the meter is in good working order and the problem is probably a faulty electrode. Go to the next step.

If the pH meter does not respond correctly when shorted, the meter is faulty and requires repair.

e. Check for faulty electrode.
1. If a faulty electrode is suspected, replace with a new or other working electrode and recheck pH function.
2. If another electrode is unavailable, a new electrode should be ordered.

8.2 Symptom

Unable to standardize meter

Action

a. Check temperature knob to verify correct setting.

b. Open a new bottle or make a fresh batch of standard buffer and recheck standardization.

c. Check electrode for physical defects.

1. Visually check electrode for cracks or other abnormalities. A cracked or damaged electrode should be replaced.
2. Visually check electrode for low filling solution or excess KCL crystals. Filling solution should be at least 2/3 full, bulb and filling hole should be free of excess KCL crystals.

Conclusion

If no defects are seen, go to next step.

d. Clean the electrode to eliminate a clogged reference junction.

1. Immerse the tip of the electrode into concentrated NH_4OH for 10-15 minutes.
   Caution: NH_4OH is very caustic and should be used in a hood.
2. Rinse the electrode.
3. Soak in pH 4.0 buffer for 10-15 minutes.
4. Recheck calibration.

Conclusion

If cleaning does not result in improved performance, the meter could be at fault. Go to 8.1-C.

8.3 Symptom

pH readings are unstable, slow, erratic, or drift.

a. Check the sample.

1. A changing sample temperature.
   Allow sufficient time for a sample temperature to stabilize.
   Note: Vigorous stirring on an uninsulated stirring motor can lead to small but significant sample temperature changes.
2. A non-uniform sample.
   pH "zones", which result in erratic or drifting readings, can be eliminated by gentle stirring using an insulated stirring motor.
3. A very low or very high ionic strength sample.
   These readings can take a long time to stabilize.
4. A sample that is incompatible with the pH electrode.
   When measuring pH of special solutions such as HF, strong oxidizing solutions, or solutions that contain elements that can poison an electrode be certain that you are using the correct electrode.

b. Check electrode for physical defects. (See 8.2-C).

c. Clean the electrode. (See 8.2-D).

d. Check the pH meter. (See 8.1-C).

9.0 PARTS LIST

The following parts can be ordered individually to aid in maintenance and repair. For price, please call OMEGA Engineering Customer Service Department at (203) 359-1660.

AC/DC (110/220)

5K BALL BEARING POT	634-0502-10
2K COMP POT	634-0202-40
2K LOCKING POT	634-0202-30
TOGGLE SWITCH	742-2032-10
ROTARY SWITCH	746-1024-10
BATTERY HOLDER	567-1290-00
BNC	738-3110-00
PROBE CLIP	559-1006-00
BATTERY STRAP	538-0100-21
*CIRCUIT BOARD	600-0047-01
9V BATTERY	706-0022-00
16 PIN CONNECTOR	731-1316-10
BATTERY SNAP	733-9005-00
PORTABLE BOX	520-0102-00
PROBE HOLDER ASSEMBLY	610-0106-00
ROD	532-0011-00
BOTTLE RACK	538-0046-03
**110 V CHARGER	702-8113-10
**220 V CHARGER	702-0504-20

*No circuit board components are available separately.

**Make certain to order the correct charger for your meter.

OMEGA® ... Your Source for Process Measurement and Control

TEMPERATURE

- ☐ Thermocouple, RTD & Thermistor Probes & Assemblies
- ☐ Connector Systems and Panels
- ☐ Wire: Thermocouple, RTD and Thermistor
- ☐ Calibrators and Ice Point References
- ☐ Recorders, Controllers and Process Monitors
- ☐ Data Acquisition Modules and Data Loggers
- ☐ Computer Sensor Interface

PRESSURE/STRAIN

- ☐ Transducers
- ☐ Strain Gauges
- ☐ Load Cells
- ☐ Pressure Gauges
- ☐ Instrumentation

FLOW

- ☐ Rotameters
- ☐ Flowmeter Systems
- ☐ Air Velocity Indicators
- ☐ Turbine/Paddlewheel Systems
- ☐ Vortex Meters and Flow Computers

pH

- ☐ Electrodes
- ☐ Benchtop/Laboratory Meters
- ☐ Controllers
- ☐ Calibrators/Simulators
- ☐ Transmitters

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