Where Do I Find Everything I Need for Process Measurement and Control? OMEGA...Of Course!

CE

User's Guide

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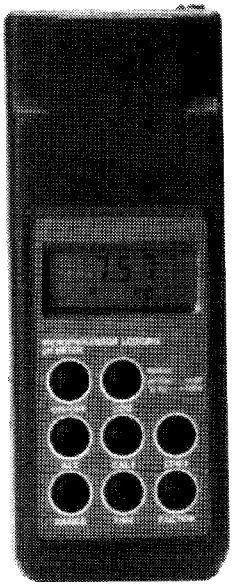
M2552/SMB0996SUN



OMEGA®
An OMEGA Technologies Company

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e-mail: info@omega.com

PHH-25, PHH-25P, PHH-931 and PHH-26
PH Meters

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It is the policy of OMEGA to comply with all worldwide safety and EMC/EMI regulations that apply. OMEGA is constantly pursuing certification of its products to the European New Approach Directives. OMEGA will add the CE mark to every appropriate device upon certification.

The information contained in this document is believed to be correct but OMEGA Engineering, Inc. accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.
WARNING: These products are not designed for use in, and should not be used for, patient connected applications.

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **25 months** from date of purchase. OMEGA Warranty adds an additional one (1) month grace period to the normal **two (2) year 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 tocontact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA 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 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. P.O. 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. 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.

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.

OMEGA is a registered trademark of OMEGA ENGINEERING, INC.

High concentrations of sodium ions interfere with readings in alkaline solutions; the pH at which the interference starts to be significant depends upon the composition of the glass. This interference is the alkaline error and causes the pH readings to be underestimated. Omega's glass formulations have the indicated characteristics.

Alkaline Error

Sodium Ion Correction for the Glass at 20-25°C		
Concentration	**pH**	**Error**
0.1 Mol L^{-1} Na^{+}	13.00	0.10
	13.50	0.14
	14.00	0.20
1.0 Mol L^{-1} Na^{+}	12.50	0.10
	13.00	0.18
	13.50	0.29
	14.00	0.40

TEMPERATURE CALIBRATION

All meters have been accurately precalibrated for temperature at the factory.

We recommend that you have your pH meter recalibrated for temperature at least once a year.

Your nearest Omega Service Center is available to quickly service your meter.

Contact your Dealer or the nearest Omega Service Center for more information.

Dear Customer,

Thank you for choosing an Omega Product.

Please read this instruction manual carefully before using the instrument.

This manual will provide you with all the necessary information for the correct use of the instrument, as well as a more precise idea of its versatility in a wide range of applications.

These instruments are in compliance with the CE directives **EN 50081-1** and **EN 50082-1**.

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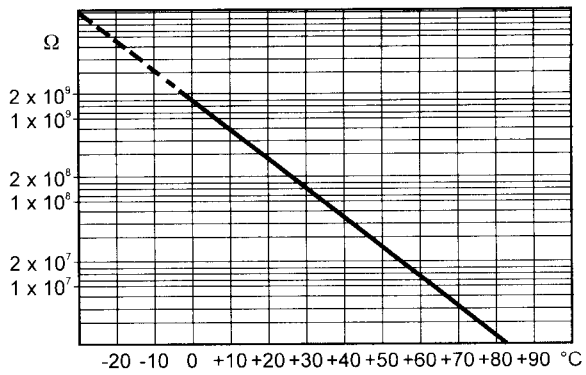
PHH-931

TEMPERATURE-RESISTANCE CORRELATION FOR OMEGA pH SENSITIVE GLASS

The resistance of glass electrodes partially depends on the temperature. The lower the temperature, the higher the resistance. It takes longer time for the reading to stabilize if the resistance is higher. In addition, the response time will suffer to a greater degree at temperatures below 10°C.



Since the resistance of the pH electrode is in the range of 200 Mohm, the current across the membrane is in the pico Ampere range. Large currents can disturb the calibration of the electrode for many hours.

For these reasons **high humidity environments, short circuits and static discharges** are detrimental for a stable pH reading.

The pH electrode's life also depends on the temperature. If constantly used at high temperatures, the electrode life is drastically reduced.

MEASUREMENT

Rinse the electrode tip with distilled water.

Immerse the tip (4 cm /1½") in the sample and stir gently for approx. 30 seconds.

For a faster response and to avoid cross contamination of the samples, rinse the electrode tip with a few drops of the solution to be tested, before taking measurements.

STORAGE

To minimize clogging and assure a quick response time, the glass bulb and the junction should be kept moist and not allowed to dry out.

Note: NEVER STORE THE ELECTRODE IN DISTILLED WATER OR DRY.

PERIODIC MAINTENANCE

Inspect the electrode and the cable. The cable used for connection to the meter must be intact and there must be no points of broken insulation on the cable or cracks on the electrode stem or bulb. Connectors must be perfectly clean and dry.

If any scratches or cracks are present, replace the electrode.

Rinse off any salt deposits with water.

For refillable electrodes:

Consult Engineering.

CLEANING PROCEDURE

Consult Engineering.

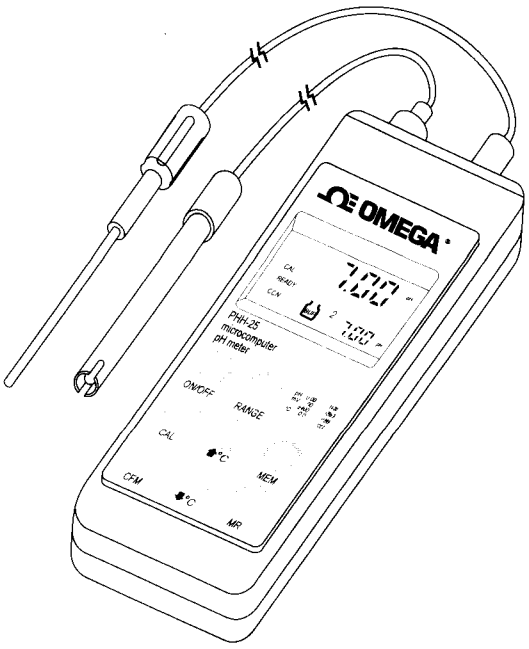
IMPORTANT: After performing any of the cleaning procedures rinse the electrode thoroughly with distilled water, drain and refill the reference chamber with fresh electrolyte (not necessary for GEL filled electrodes), and soak the electrode in Storage Solution for at least 1 hour before taking measurements.

PHH-26

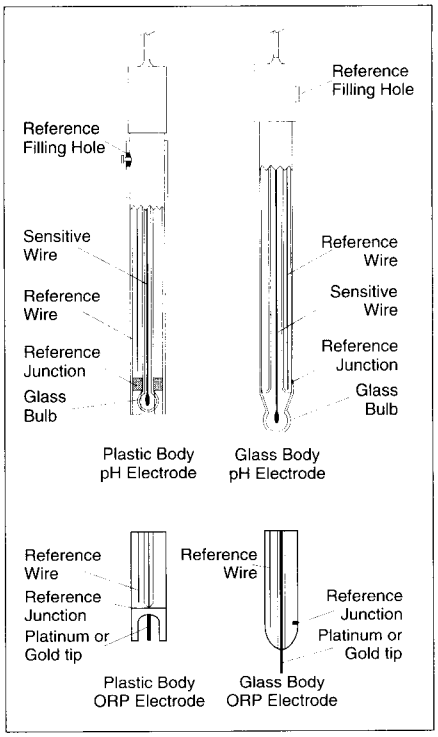
GENERAL INFORMATION

PHH-25

Portable Waterproof pH/°C Meters



ELECTRODE CONDITIONING AND MAINTENANCE



PREPARATION

Remove the protective cap.

DO NOT BE ALARMED IF ANY SALT DEPOSITS ARE PRESENT.

This is normal with electrodes and they will disappear when rinsed with water.

During transport tiny bubbles of air may have formed inside the glass bulb. The electrode cannot function properly under these conditions. These bubbles can be removed by "shaking down" the electrode as you would do with a glass thermometer.

If the bulb and/or junction are dry, soak the electrode in Storage Solution for at least one hour.

GENERAL INFORMATION

pH VALUES AT VARIOUS TEMPERATURES

Temperature has an effect on pH. The calibration buffer solutions are affected by temperature changes to a lesser degree than normal solutions.

For manual temperature calibration please refer to the following chart.

TEMP		pH VALUES				
°C	°F	4.01	6.86	7.01	9.18	10.01
0	32	4.01	6.98	7.13	9.46	10.32
5	41	4.00	6.95	7.10	9.39	10.24
10	50	4.00	6.92	7.07	9.33	10.18
15	59	4.00	6.90	7.04	9.27	10.12
20	68	4.00	6.88	7.03	9.22	10.06
25	77	4.01	6.86	7.01	9.18	10.01
30	86	4.02	6.85	7.00	9.14	9.96
35	95	4.03	6.84	6.99	9.10	9.92
40	104	4.04	6.84	6.98	9.07	9.88
45	113	4.05	6.83	6.98	9.04	9.85
50	122	4.06	6.83	6.98	9.01	9.82
55	131	4.07	6.84	6.98	8.99	9.79
60	140	4.09	6.84	6.98	8.97	9.77
65	149	4.11	6.85	6.99	8.95	9.76
70	158	4.12	6.85	6.99	8.93	9.75

For instance, if the buffer's temperature is 25°C, the display will show pH 4.01 or 7.01 or 10.01.

If the buffer's temperature is 20°C, the display will show pH 4.00/7.03/10.06.

If the buffer's temperature is 50°C, the display will show pH 4.06/6.98/9.82.

PRELIMINARY EXAMINATION

Remove the instrument from the packing material and examine it carefully to make sure that no damage has occurred during shipping. If there is any noticeable damage, notify Omega's Customer Service.

Note: Save all packing materials until you are sure that the instrument functions correctly. All defective items must be returned in the original packing materials together with the supplied accessories.

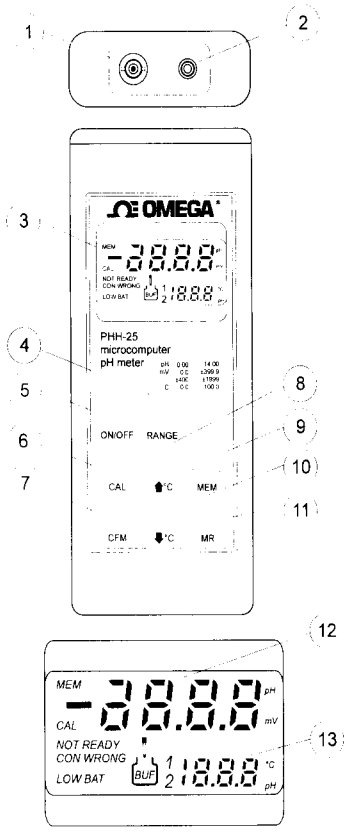
GENERAL DESCRIPTION

These water-resistant **PHH-25** is a heavy-duty pH meter designed to provide laboratory results and accuracy under harsh industrial conditions.

The **PHH-25** is a pH/°C meter with a built-in microprocessor. A large easy-to-read LCD displays the pH and temperature simultaneously. The display has graphic symbols to make the calibration procedure easy to follow. The meter has 5 memorized buffer values (4.01, 6.86, 7.01, 9.18 and 10.01), automatic buffer recognition to avoid errors during calibration and automatic temperature compensation. You can also measure ORP (Oxidation Reduction Potential) or Ion Specific. Millivolt measurements automatically switch from 0.1 to 1 mV resolution when the reading reaches 400 mV. To assure trouble free operation, the meter's circuitry has built-in protection against electromagnetic interference.

The meter comes supplied with: a combination pH electrode, temperature probe, pH 4.01 and 7.01 (30 mL each) buffer solutions, sample vessel, 1.5V AAA size batteries (4 pcs.) and a rugged carrying case.

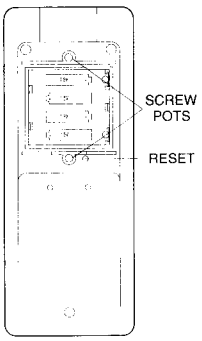
FUNCTIONAL DESCRIPTION



1) Electrode connector (BNC)
2) Temperature Probe Socket (RCA)
3) LCD Display
4) **RANGE** key to select pH or mV
5) **ON/OFF** key to turn the meter on or off
6) **CAL** key to enter or exit calibration mode
7) **CFM** key to confirm calibration
8-10) ↑°C and ↓°C keys for manual temperature setting, or selecting pH buffer values
9) **MEM** key to store pH values in memory
11) **MR** key to recall the stored value from memory
12) Primary Display
13) Secondary Display

BATTERY REPLACEMENT

When the batteries are run down "LOBAT" is displayed on the Liquid Crystal Display to warn the user.



Battery replacement must only take place in a non hazardous area using the battery types specified.

In order to replace run down batteries, simply remove the two screws on the rear cover of the instrument and replace the four 1.5V AA batteries with new ones, paying attention to the correct polarity.

A 12VDC power source can also be used to power the unit.

Note: The instrument uses the following configuration:

It is recommendable to purchase a voltage adapter which uses the proper polarity configuration (consult Engineering).

TO RESET THE METER

In case of any functional problem, reset the meter by pressing with a pencil the black button located close to the battery compartment (see the picture above).

MEMORY ORGANIZATION

Capacity: 8,000 data samples which are divided into 16 pages.

Each time a new logging period starts, it automatically starts from a new page.

If "LOGGING" is still on, and the available page is "0" the meter will overwrite the first LOT DATA in the existing memory. During logging the meter automatically returns to the oldest page in the memory and if it contains data, it will overwrite it. In this case the first log will not correspond to the oldest set of data.

It is recommended to periodically "clean" the memory. Save all data in a PC if you need to keep a record and then disconnect the batteries for approximately 1 minute. If you do this, remember to set the date and time, once the batteries have been connected again.

ATTENTION:

Data is stored in memory until the batteries are removed.

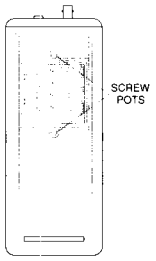
To replace batteries without loosing data, plug the adapter in and proceed with battery replacement as described on page 79. Only once the batteries have been replaced it is possible to unplug the adapter without loosing the stored data.

SPECIFICATIONS

Range pH	0.00 to 14.00
ISE	0.0 to ±399.9 mV
ORP	±400 to ±1999 mV
Temperature °C	0.0 to +100.0
Resolution pH	0.01
ISE	0.1mV
ORP	1mV
Temperature °C	0.1
Accuracy pH	±0.01
(@20°C / 68°F) ISE	±0.2mV
Temperature °C	±0.5
Typical EMC deviation	±0.01 pH ±0.1C°
Calibration	Automatic with 5 memorized standard buffers (4.01, 6.86, 7.01, 9.18, 10.01)
Offset calibration	±1 pH
Slope calibration	from 70 to 108%
Temperature Compensation	automatic or manual from 0 to 100°C (32 to 212°F)
Electrode	included
Temperature Probe	included
Input Impedance	10^{12} Ohm
Battery	4x1.5V, AAA size (alkaline batteries) 70 hours of continuous use auto-shut off after 10' of non-use
Environment	0 to 50°C (32 to 122°F); 100% RH
Dimensions	
Instrument	196 x 80 x 60mm (7.7 x 3.1 x 2.4")
Complete kit	340 x 230 x 80mm (13.8 x 9 x 3.1")
Weight	
Instrument	425 g (15 oz.)
Complete Kit	1.3 Kg (3.0 lb.)

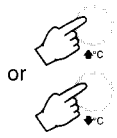
OPERATIONAL GUIDE

INITIAL PREPARATION



The meter is supplied complete with batteries. Remove the back cover, unwrap the batteries and install them while paying attention to polarity.

To prepare the instrument for use connect the pH electrode to the BNC socket on the top of the instrument. Connect the temperature probe to the RCA socket. The temperature probe can be used independently to take temperature measurements, or it can be used in conjunction with the pH electrode to utilize the meter's ATC capability. If the probe is disconnected, temperature can also be set manually with the UP and DOWN keys. To switch the instruments on, press and hold the ON/OFF key. The meter has a built-in protection against electromagnetic interference and the delayed response of the keys assures that the commands are not mistaken for stray signals.



In order to take more accurate pH measurements, make sure that the instrument is calibrated for pH before use (see page 11).

It is recommended that the electrode is rinsed thoroughly for better conditioning. For this rinsing process, it is recommended to use a liberal amount of the sample to be measured.

(e.g. Excel©, Lotus 1-2-3©). Simply open the file downloaded by the transmitter and it is possible to make any elaboration available with your software (e.g. graphics, statistic analysis).

User friendly, it offers a variety of features and has an on line help to support you throughout any situation.

For installation, you need a 3.5" drive and a few minutes to follow the instructions conveniently printed on the disk label.

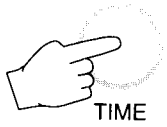
FAULT FUNCTIONS

E1	Erroneous solution used for the offset calibration For pH calibration: Make sure the buffer solution used is pH 7 and replace if necessary For temperature calibration: Make sure the water is at 0°C/32°F
E2	Erroneous solution used for the offset calibration For pH calibration: Make sure the buffer solution used is pH 4 or 10. Use fresh solutions. For temperature calibration: Make sure the hot water is at 50°C/122°F
LO BAT	Low Battery Voltage Replace the batteries.

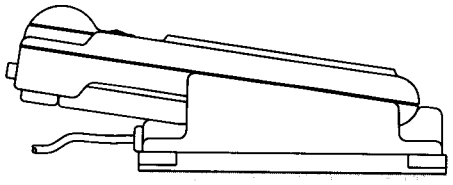
DATA TRANSFER TO PC

PHH-26 contains infrared emitting circuitry.

Set the meter to the TIME mode and simply place your data-logger on a Infrared Transmitter (ensuring that the two infrared LEDs are placed on top of each other) and the memory can then be down-loaded to your PC through the RS232 port.



During the data transfer the instrument displays the message "r 232".



Using the Infrared Transmitter, all recorded data can be fed to your Personal Computer for easy reproduction, storage or elaboration without the interference of cables or cords between the meter and the transmitter.

Data transmission from the instrument to the PC is now much easier with new Windows® compatible application software.

The transmitter allows you to use the powerful means of most spread sheet programs

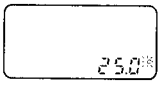
Windows® is registered Trademark of "Microsoft Co."

The pH reading is directly effected by temperature. In order for the meter to measure the pH accurately, temperature must be taken in consideration. A perfect equilibrium between the pH electrode and the sample is reached in about 15 minutes.

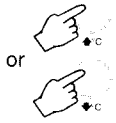
To use the meter's Automatic Temperature Compensation feature, submerge the temperature probe into the sample as close to the electrode as possible and wait for 1-2 minutes. If you know the temperature of the sample to be tested you can manually compensate for it.

If manual temperature compensation is desired the temperature probe must be disconnected from the instrument.

The display will show the default temperature of 25°C or the last recorded temperature reading. "°C" is blinking.



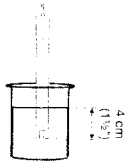
The temperature can now be adjusted with the UP and DOWN arrow keys.



ORP MEASUREMENTS

To get into "mV" mode (ORP or ISE) turn the instrument ON and press the RANGE key until the display changes to mV.

To measure the mV of a solution simply submerge the ORP or ISE electrode tip (4 cm/1½") into the sample to be tested. Allow a few minutes for the readings to stabilize.



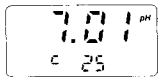
See also "Taking REDOX Measurements" section page 16.

TEMPERATURE MEASUREMENTS

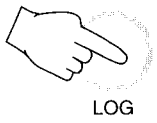
Taking a temperature measurement is very easy. Turn the instrument ON and press the RANGE key to get into temperature mode.

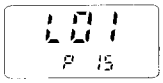
Dip the liquid/general purpose temperature probe into the sample and allow the reading to stabilize (1 or 2 minutes).

To view the pH values press the RANGE key again.



To return to the logging information press the LOG key.

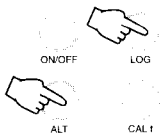




After approximately 5 minutes the display will switch off but the logging function remains active.

To reactivate the display press the ON/OFF key.

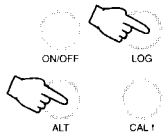
Note: Once in the logging mode, the interval cannot be changed. Exit the logging mode first (pressing the ALT and the LOG keys) before setting the new interval.

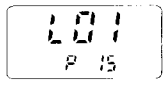


TO STOP LOGGING

To stop logging, press the ALT and LOG keys simultaneously.

The display will show the lot and page number again for a few seconds.





The running lot number can be reset by simply removing and replacing the batteries.

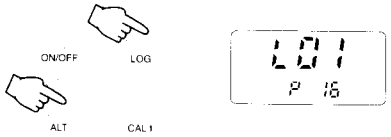
LOGGING FUNCTION

LOGGING MODE

In this mode data will be stored directly into memory for later retrival.

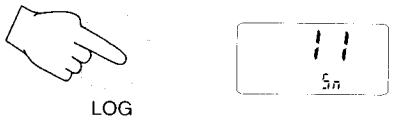
Set the appropriate logging interval (see Operational Guide section on page 56).

Press the ALT and the LOG keys simultaneously to enter the logging mode. The log number and page number will appear for a few seconds on the display to indicate the correct operational mode.



When the meter is in logging mode, "LOG" is displayed on the bottom left corner of the LCD with the time on the primary display and the logging interval on the secondary one.

During logging, press the LOG key to show the total number of data that has been logged (sample number).



To view measurements during logging press the RANGE key and the display will show the temperature.

pH CALIBRATION

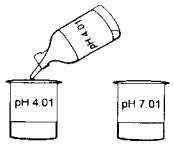
It is recommended to calibrate the instrument frequently, especially if high accuracy is required.

The instrument should be re-calibrated for pH:

a) Whenever the pH electrode or temperature probe is replaced.
b) At least once a month.
c) After testing aggressive chemicals.
d) If greatest accuracy is required.
e) Whenever the batteries have been replaced.

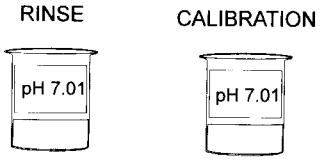
PREPARATION

Pour small quantities of pH 7.01 and pH 4.01 solution into two clean beakers.



For accurate calibration use two beakers for each buffer solution, the first one for rinsing the electrode, the second one for calibration. In this way contamination of the buffers is minimized.

To get accurate readings, use pH 7.01 and pH 4.01 if you are going to measure acid samples or pH 7.01 and pH 10.01 for alkaline measurements.

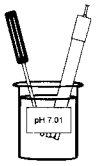


In order to calibrate **PHH-25**, there is a choice of 3 memorized standard buffers: 4.01, 7.01 and 10.01 pH.

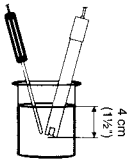
- Make sure that the meter is in pH mode.
- Remove the protective cap from the electrode and rinse it with some of the buffer calibration solution you are going to use first.

One point calibration at pH 7.01 (STANDARD):

- Immerse the pH electrode into pH 7.01 buffer solution and stir briefly.

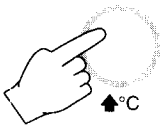


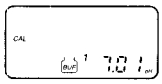
Note: the electrode should be submerged approximately 4 cm (1½") into the solution. The temperature probe should be located as close as possible to the pH electrode.



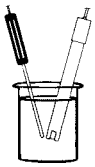
- Press the CAL key. The "CAL" and "BUF" indicators will be displayed. The secondary LCD will display "4.01".

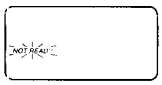
- Press the °C key twice. The secondary display will change to "7.01".



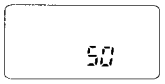


- When the electrode is submerged in the buffer solution the meter will notify the user the reading is not stable. If the readings fluctuate the LCD will blink "NOT READY".

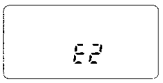




- When "50" stops blinking, indicating that the probe has stabilized, press the CFM key again to confirm the second calibration point.



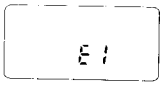
- If the input is out of the slope range, "E2" as error message will appear on the secondary display. Press the CAL key to re-calibrate the value.



If everything is satisfactory the temperature calibration is complete and the meter will resume the normal operational mode.

- When "0" stops blinking, the calibration can be confirmed. Press the CFM key to confirm the first temperature value.

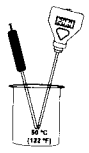
- If the value is out of the offset range, "E1" as error message will show on the secondary display. Press the CAL key to re-calibrate the value.



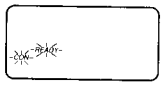
- If everything is satisfactory the secondary LCD will blink "50" expecting the second temperature measurement.

Note: If a single point calibration is required, press the CAL key to leave the temperature calibration mode now. However, it is always better to proceed as follows for a two-point calibration.

- Immerse the temperature probe in the container at 50°C (122°F). Place the probe as close as possible to the reference thermometer.



Only when the reading is stable, "READY" and "CON" will blink.



- Press the CFM key to confirm the calibration. If the reading is not close to the selected buffer, "WRONG" and "WRONG" will blink alternatively. If the reading is close to the selected buffer the meter stores the reading (and adjust the offset point). The buffer value is than displayed on the primary LCD and the secondary LCD will display "4.01".

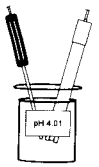
- Press the CAL key and the calibration process is ended with only the offset of the meter calibrated. For best accuracy however, it is recommended that a two point calibration is performed.

TWO POINT CALIBRATION.

A two point calibration is recommended for best accuracy. As a second point use pH 4.01 if you are going to measure acid samples (pH 7 or less), use pH 10.01 if you are going to measure alkaline samples.

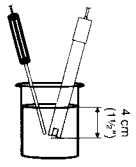
Two point calibration at pH 7.01 and pH 4.01 or pH 10.01 (STANDARD):

- Proceed as described in "One point calibration at pH 7.01" but do not end calibration by pressing the CAL key.
- After the first calibration point is confirmed, immerse the pH electrode into the second buffer solution (pH 4.01

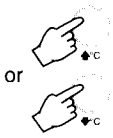


or pH 10.01) and shake briefly.

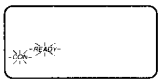
Note: the electrode should be submerged approximately 4 cm (1½") into the solution. The temperature probe should be located as close as possible to the pH electrode.



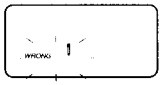
- Select the second buffer value on the secondary display by pressing the ↑°C or ↓°C key.



- When the "READY" and "CON" symbols blink on the display the reading is stable and the calibration can be confirmed.



- Press the CFM key. If the reading is not close to the selected buffer solution, "WRONG" and "WRONG" will blink alternatively. If the reading is close to the selected buffer, the slope and the offset are calibrated. The values will be stored in memory and the meter will return to the operating mode.



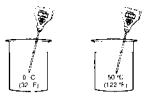
Note: the meter will automatically skip the buffer that was used for the first calibration to avoid erroneous calibration.

Note: during calibration, the secondary LCD displays the selected buffer value. By pressing the RANGE key the temperature value can be also displayed. This will allow you to check the buffer temperature during calibration.

TEMPERATURE CALIBRATION (for Technical Personnel only)

You can perform the temperature calibration as follows.

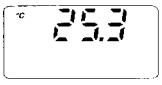
INITIAL PREPARATION



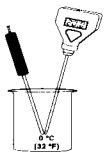
- Prepare a vessel containing ice and water and another one containing hot water (at a temperature of 50°C/122°F). Place insulation material around the container to minimize temperature changes.
- Use a calibrated thermometer with a resolution of 0.1°C as a reference thermometer.

PROCEDURE

- Turn the meter ON and press the RANGE key twice to get just the temperature reading on the display.

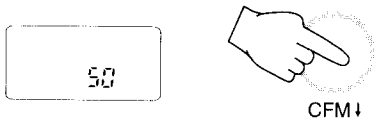


- Immerse the temperature probe in the container of ice and water. Place the probe as close as possible to the reference thermometer.

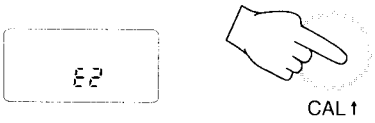


- Press the CAL key. The secondary display (lower) LCD will blink "0" for approximately 30 seconds.

key again to confirm the second calibration point.



- If the input is out of the slope range, "E2" as error message will appear on the secondary display. Press the CAL key to re-calibrate the value.



If everything is satisfactory the temperature calibration is complete and the meter will resume the normal operational mode.

TROUBLESHOOTING GUIDE

Symptoms	Problem	Solution
The meter does not work with the temperature probe	Defective ATC probe	Replace the probe
The meter fails to calibrate or gives faulty readings	Defective pH electrode	Replace the electrode
The meter is slow in responding or gives faulty readouts	The electrode is not working or the reference junction is clogged	Leave the electrode in a storage solution after cleaning the junction. If problem persists, replace the electrode
The meter does not accept the 2nd buffer solution for calibration	Defective pH electrode	Follow the cleaning procedure. If this doesn't work replace the electrode
The reading drifts	Defective pH electrode	Replace the electrode
Display reads "E1"	Out of range-pH scale	a) Check the calibration b) Assure the pH sample is in the range 0 to 14 c) Check the level of electrolyte and the state of the electrode itself
Display reads "E2"	Out of range-°C scale	Make sure the °C is within 0-100° and temperature probe is plugged
Display reads "E3"	Out of range-mV scale	Electrode not connected
Display reads "E4" "WRONG BUF 7" and/or "WRONG !"	Erroneous buffer solution used for offset cal.	Make sure the buffer solution used is pH7 and replace if necessary
	Defective electrode	Replace the electrode
Display reads "E5" "WRONG BUF 2" and/or "WRONG !"	Erroneous buffer solution used for slope cal.	Use fresh buffer solution
	Defective electrode	Replace the electrode

TAKING REDOX MEASUREMENTS

The **PHH-25** has the capability to take ORP measurements. An optional ORP electrode must be used to perform these measurements.

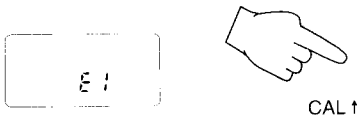
Oxidation-reduction potential (REDOX) measurements provide the quantification of the oxidizing or reducing power of the sample tested.

To correctly perform a redox measurement, the surface of the ORP electrode must be clean and smooth.

When not in use, the tip of the electrode should be kept moist and safe from any mechanical stress which might cause damage to the glass/platinum junction.

- When "0" stops blinking, the calibration can be confirmed. Press the CFM key to confirm the first temperature value.

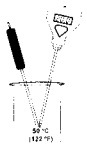
- If the value is out of the offset range, "E1" as error message will show on the secondary display. Press the CAL key to re-calibrate the value.



- If everything is satisfactory the secondary LCD will blink "50" expecting the second temperature measurement.

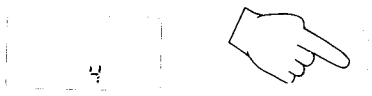
Note: If a single point calibration is required, press the CAL key to leave the temperature calibration mode now. However, it is always better to proceed as follows for a two-point calibration.

- Immerse the temperature probe in the container at 50°C (122°F). Place the probe as close as possible to the reference thermometer.



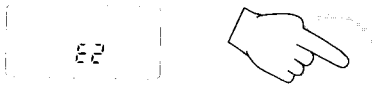
- When "50" stops blinking, indicating that the probe has stabilized, press the CFM

calibration point.



CFM↓

- If the buffer is out of the slope range, "E2" as error message will appear on the secondary display. Press the CAL key and recalibrate the value.



CAL↑

- If you cannot complete the calibration, check your electrode by following the conditioning and maintenance procedure on page 81 and repeat the calibration procedure from the beginning with fresh buffers. The pH electrode might have to be replaced if calibration cannot be successfully performed.

During calibration, the characteristics of the electrode will be memorized.

After calibration this data can be checked by pressing the FACTOR key (see operational guide on page 60).

FACTOR

This operation will display:

- date

- time

- the offset characteristic of the electrode in pH units

- the slope 1st in %

- the slope 2nd in %.

BATTERY REPLACEMENT & AUTO-OFF

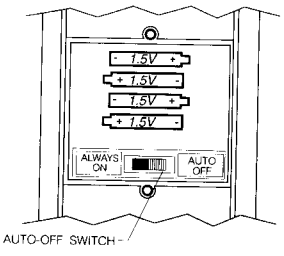
If the batteries become weak:

- the meter will display "LOW BAT".

Battery replacement must only take place in a non hazardous area using the battery types specified in this instruction manual. To replace rundown batteries, remove the two screws in the rear cover of the instrument and replace all the four 1.5V AAA batteries with new ones, paying attention to the correct polarity. Replace the cover and tighten the two screws. The meter is reset any time that the batteries are removed. In case of any functional problems, reset the meter by removing and reinstalling the batteries.

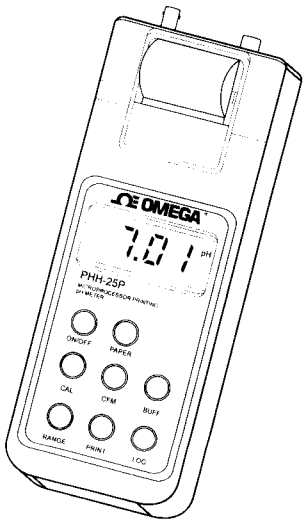
AUTO-OFF CAPABILITY

The battery compartment has an auto-off switch. To disconnect this function, turn the switch to "ALWAYS ON" position. If the switch is in the "AUTO OFF" position, the meter will shut off automatically after 10 minutes of non-use.

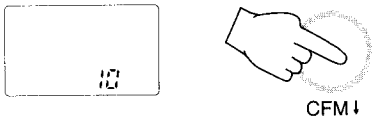


PHH-25P

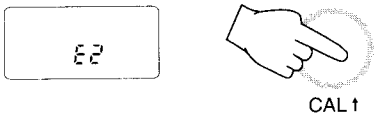
Portable Microprocessor Printing Meter



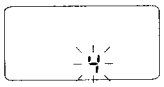
confirm the second calibration point.



- If the buffer is out of the slope range, "E2" as error message will appear on the secondary display. Press the CAL key and recalibrate the value.

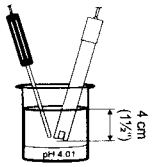


- If everything is satisfactory the secondary LCD will blink "4" (if previously was "10") or "10" (if previously was "4") expecting the third buffer.



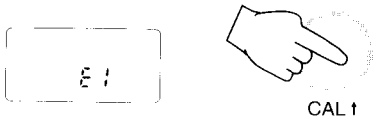
Note: if a two-point calibration is required, press the CAL key to leave the calibration mode now.

- Rinse the electrode with some pH 4.01 (or pH 10.01) solution. Dip the bottom 4 cm (1½") of the electrode in a beaker containing the third buffer.

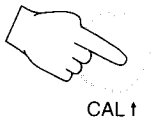


- When "4" (or "10") stops blinking, indicating that the electrode has stabilized, press the CFM key again to confirm the third

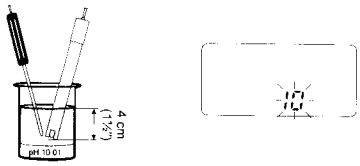
recalibrate the value.



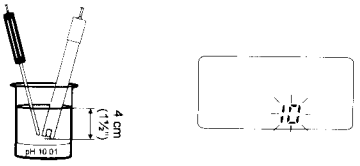
Note: If a single point calibration is required, press CAL to leave the calibration mode now. However, it is always better to proceed as follows for a two-point calibration.



- "10" can be changed to "4" (indicating pH 4.01) by immersing the electrode and the temperature probe into the pH 4.01 buffer. If you are measuring acid samples (pH 7 or less) use the pH 4.01 buffer. For alkaline samples (pH 7 or more) use pH 10.01.



- Rinse the electrode with some pH 10.01 or pH 4.01 solution. Dip the bottom 4 cm (1½") of the electrode and the temperature probe into a beaker containing the second buffer.



- When "10" (or "4") stops blinking, indicating that the electrode has stabilized, wait 30 seconds and then press CFM again to

PRELIMINARY EXAMINATION

Remove the instrument from the packing material and examine it carefully to make sure that no damage has occurred during shipping. If there is any damage, notify Omega's Customer Service.

The meter is supplied complete with:

- Combination pH Electrode
- Temperature Probe
- AA size Alkaline Batteries, four pieces
- Rugged Carrying Case.

Note: Save all packing material until you are sure that the instrument functions correctly. All defective items must be returned in its original packaging together with the supplied accessories.

GENERAL DESCRIPTION

PHH-25P is the first printing microprocessor-based portable pH/°C meter in the world.

All pH measurements are automatically compensated for temperature (ATC). The instrument housing is made of rugged, lightweight material, making it truly portable.

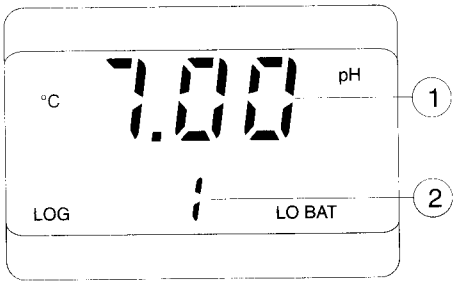
Three memorized buffers (4.01, 7.01 and 10.01 pH) and automatic buffer recognition technology make calibration simple. One or two point calibration is possible, and the meter has a stability indicator. The meters come equipped with a large, easy-to-read LCD.

Measurements can be performed with lab-grade precision in the field as well as in the laboratory without compromising accuracy.

For long term field and lab applications, this meter can be connected to a 12VDC adapter.

LCD DISPLAY FUNCTIONAL DESCRIPTION

1) Primary Display
2) Secondary Display

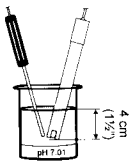


PROCEDURE

- Press the RANGE key to select the pH measurement mode.

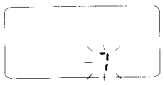

RANGE

- Rinse the pH electrode with some pH 7.01 solution or tap water. Dip the bottom 4 cm (1½") of the electrode and the temperature probe into a beaker containing pH 7.01 solution.



- Press the CAL key. The secondary (lower) LCD will blink " 7" to indicate that pH 7.01 is expected and the electrode is getting conditioned.


CAL ↑



- When the " 7" stops blinking, the calibration can be confirmed. Press the CFM key to confirm the first buffer.


CFM ↓

- If everything is satisfactory the secondary LCD will blink " 10" expecting the second buffer at pH 10.01.

- If the buffer is out of the offset range, " E 1" as error message will appear on the secondary display. Press the CAL key and

pH CALIBRATION PROCEDURE

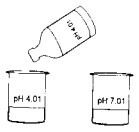
For greatest accuracy, it is recommended that the instrument is calibrated frequently.

For a faster operation, it is possible to standardize the electrode at pH 7.01 only (one point calibration), but it is always good practice to calibrate at least 2 points.

The standard calibration program of the meter, however, is prepared for 3 (maximum) buffers.

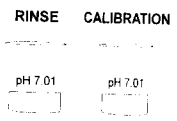
Due to electrode conditioning time the electrode must be kept immersed in the sample for a few seconds to stabilize. The meters are equipped with a stability indicator and the user will be guided step by step with easy indications on the display during the pH calibration. This will make the calibration a simple and error-free procedure.

INITIAL PREPARATION



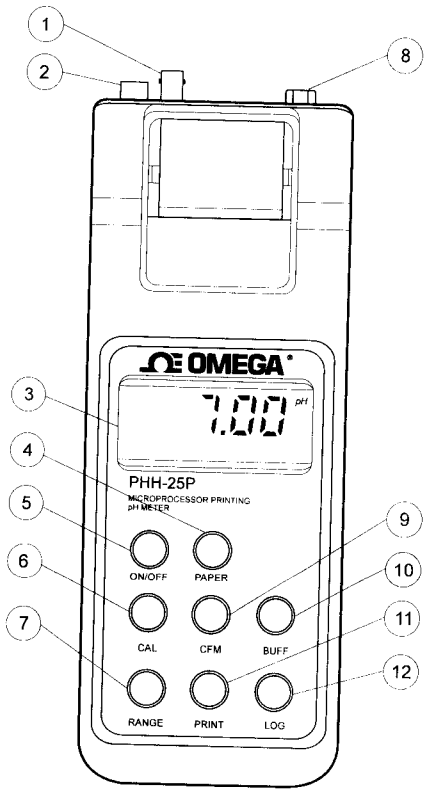
Pour small quantities of pH 7.01 and pH 4.01 and/or pH 10.01 solution into individual beakers. If possible, use plastic beakers to minimize any EMC interferences.

For accurate calibration use two beakers for each buffer solution, the first one for rinsing the electrode, the second one for calibration. By doing this, contamination between the buffers is minimized.



To get accurate readings, use pH 7.01 and pH 4.01 if you are going to measure acid samples, or pH 7.01 and pH 10.01 for alkaline measurements or perform a 3-point calibration for the entire range.

FUNCTIONAL DESCRIPTION



1) Electrode Connector
2) Temperature Probe Connector
3) LCD Display
4) **PAPER** key to move the paper up
5) **ON/OFF** key, to turn the meter on or off
6) **CAL** key to enter or exit calibration mode
7) **RANGE** key, to select the pH or the °C measurement modes
8) Power adapter plug
9) **CFM** key to confirm the calibration
10) **BUFF** key to select the second calibration
11) **PRINT** key to obtain a printout
12) **LOG** key to enter the printing mode

SPECIFICATIONS

Range	pH	0.00 to 14.00
	°C	-10.0 to 100.0
Resolution	pH	0.01
	°C	0.1
Accuracy (@20°C/68°F)	pH	±0.01, excluding probe error
	°C	±0.5, excluding probe error
Typical EMC Deviation	pH	±0.03
	°C	±0.8
Calibration		Automatic 1 or 2 points with 3 memorized buffers (4.01, 7.01and 10.01 pH)
Temperature Compensation		Automatic from -10 to 100°C (14 to 212°F) or fixed at 25°C without temperature probe
Electrode		included
Temp. probe		included
Input Impedance		10^{12} ohms
Printer		Low power impact type-belt, 14 characters per line; 38 mm plain paper
Printing Interval		5 minutes
Battery Type/Life		4x1.5V AA alkaline type. 500 hours without printing. Auto-off after 5 minutes. Power socket for 12 VDC supply.
Environment		0 to 50°C (32 to 212°F); 95% RH
Dimensions		220 x 82 x 66 mm (8.7 x 3.2 x 2.6")
Shipping Weight		Instrument: 500 g (18 oz); Kit: 1.4 kg (3.1 lb.)

TAKING TEMPERATURE MEASUREMENTS

The temperature probe that is supplied with **PHH-26** is a liquid/general purpose probe.

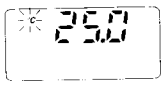
Taking a temperature measurement is very easy.

Press the RANGE key to get into the temperature mode. The temperature value and the "°C" symbol will be displayed on the primary display.

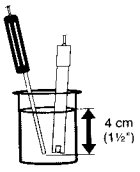
RANGE

Make sure the probe is properly connected to the meter, and take the measurement (allow 1 or 2 minutes for the temperature to stabilize).

If the temperature probe is disconnected, the meter assumes that the temperature of the solution is "25.0 °C" (default temperature) and the "°C" symbol blinks.

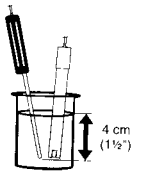


Note: When taking pH measurements, in order to have the best accuracy and proper temperature compensation, immerse the temperature probe as close as possible to the pH electrode.



Make sure that the pH electrode and the temperature probe are securely connected to the meter. If possible, use plastic beakers to minimize any EMC interferences.

To take pH measurements, simply submerge the bottom 4 cm (1½") of the electrode and the temperature probe in the solution to be tested, stir gently and allow a few seconds for the electrode to adjust and stabilize.



For greatest accuracy, it is recommended to calibrate the meter regularly (see page 64).

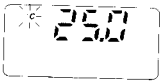
The pH reading of any sample is directly effected by temperature. In order for the meter to measure the pH accurately, it must know the temperature.

To use the meter's Automatic Temperature Compensation capability, submerge the temperature probe in the sample as close to the electrode as possible.

If the temperature probe is disconnected, the meter assumes that the temperature of the solution is 25°C (default temperature).

Press the RANGE key to show the temperature reading. If the temperature probe is disconnected the "°C" symbol will be blinking.


RANGE

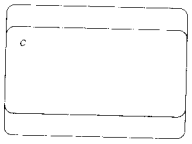


If measurements are taken successively in different samples, it is recommended to rinse the electrode thoroughly with deionized or tap water first and then with some of the sample to be tested. This procedure will minimize contamination between the samples, resulting in more accurate results.

INITIAL PREPARATION

The meter is supplied complete with batteries. Remove the back cover, unwrap the batteries and install them while paying attention to the polarity.

To prepare the instrument for use, connect the pH electrode to the BNC connector located on the top of the instrument. Then connect the temperature probe to the appropriate connector. The temperature probe can be used independently to take temperature measurements, or it can be used in conjunction with the pH electrode to utilize the meter's ATC capability. If the temperature probe is left disconnected, a default temperature of 25°C is assumed and the "C" symbol blinks.

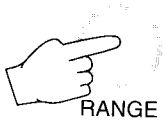


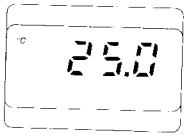
To switch the **PHH-25P** on, press the ON/OFF key.


ON/OFF

TO VIEW pH / TEMPERATURE

When the instrument is turned on the display will be in pH measurement mode. To view temperature simply press the RANGE key. If the "25.0" value with the flashing "C" symbol is shown, it indicates that the temperature probe is not connected.

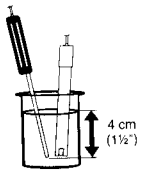

RANGE



Note: the pH value will be displayed without any symbol. The temperature value will be displayed together with the °C symbol.

TAKING pH MEASUREMENTS

To take pH measurements, simply submerge the bottom 4 cm (1½") of the electrode and the temperature probe in the reading solution to be tested, stir gently and allow for the electrode to adjust and stabilize.



For greatest accuracy, it is recommended to calibrate the meter regularly (see page 26).

The pH reading of any sample is directly effected by temperature. In order for the meter to measure the pH accurately, it must know the temperature. To use the meter's Automatic Temperature Compensation capability, submerge the temperature probe in the sample as close to the electrode as possible. If the temperature probe is disconnected, the meter assumes that the temperature of the solution is 25°C (default temperature) and the "°C" symbol blinks. Press the RANGE key to show the temperature reading.


RANGE

If measurements are taken successively in different samples, it is recommended to rinse the electrode thoroughly with deionized water or if not available tap water first and then with some of the next sample to condition the electrode before immersing it in the sample.

Press the FACTOR key again, the display will show the first slope calibration factor as:

- pH % slope 1st value
- pH 4 buffer


FACTOR

Press the FACTOR key again to display the second slope calibration factor as:

- pH slope 2nd value
- pH 10 buffer.


FACTOR

The slope characteristic of the pH electrode is directly displayed in percentage of the theoretical value of 58.17mV per pH unit at 20°C.

Press the FACTOR key again to return to normal operation.


FACTOR

TAKING pH MEASUREMENTS

Press the RANGE key to get into the pH mode. The temperature value will be displayed on the secondary display.


RANGE

TO VIEW THE pH CALIBRATION DATA

Press the FACTOR key and the meter will display the **last calibration date**, in the following sequence:

- month, day and year

Press the FACTOR key again and the meter will display the last calibration time as

- hour and minutes.

Press the FACTOR key again, the display will show the offset calibration factor as:

- pH offset value
- pH 7 buffer

The pH offset value should be between ±0.50 pH.

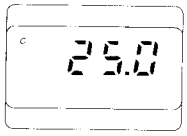
For values higher than +0.50 or lower than -0.50 pH the electrode is no longer reliable and should be replaced.

TAKING TEMPERATURE MEASUREMENTS

The temperature probe that is supplied with the **PHH-25P** is a liquid/general purpose probe.

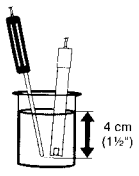
Taking a temperature measurement is very easy.

Press the "RANGE" key to get into the °C mode. The temperature value and the "°C" symbol will be displayed on the primary display.



Secure the connection of the probe to the top of the meter, and take the measurement (allow 1 or 2 minutes for the temperature to stabilize).

Note: When taking pH measurements, in order to have the best accuracy and proper temperature compensation, immerse the temperature probe as close as possible to the pH electrode.



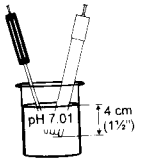
pH CALIBRATION PROCEDURE

For greatest accuracy, it is recommended that the instrument is calibrated frequently. For a faster procedure, it is possible to calibrate at 1 point (pH 7.01), but it is always a good practice to calibrate at 2 points.

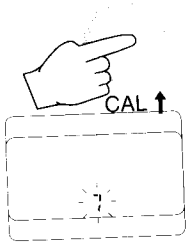
Due to electrode conditioning time the electrode must be kept immersed a few seconds to stabilize. The meter is equipped with a stability indicator and the user will be guided step by step with easy indications on the display during the pH calibration. This will make the calibration a simple and error-free procedure.

pH CALIBRATION

1. Rinse the electrode with some pH 7.01 solution or clean water. Dip the bottom 4 cm (1½") of the electrode and the temperature probe into a beaker containing pH 7.01 solution.



2. Press the CAL key. The secondary (lower) LCD will blink "7" to indicate that pH 7.01 is expected and the electrode is getting conditioned.



3. When the "7" stops blinking, the calibration can be confirmed. Press the CFM key to confirm the first buffer.

TO VIEW THE DATE/TIME/LOGGING INTERVAL/pH/TEMPERATURE

To view the time press the TIME key. This also displays the selected logging interval.

TIME

To view the date, press the UP arrow key when the LCD is displaying time.

CAL ↑

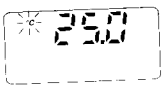
To view pH and temperature press the RANGE key (temperature will be displayed on the secondary display without decimal digit).

RANGE

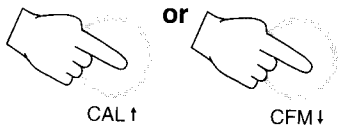
To view the temperature only (on the primary display and with decimal digit) press the RANGE key.

RANGE

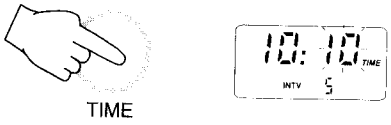
If "25.0" appears together with the blinking "°C" symbol, it indicates that the temperature probe is not connected.



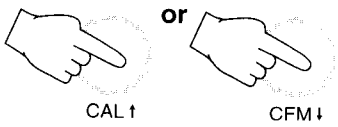
To select the hour, press the UP or the DOWN arrow keys (24 hour clock).



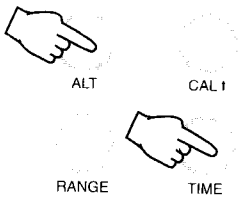
To set the hour press the TIME key once. The minutes will be blinking.



Use the UP or the DOWN keys to select the minutes.

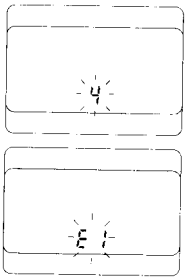


Press the ALT and the TIME keys simultaneously to leave this mode.

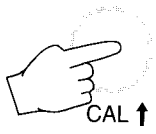


The time, date and printing interval are now set and stored in the memory. The memory is retained even when the meter is switched off.

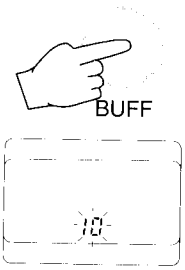
4. If everything is satisfactory the secondary LCD will blink "4" expecting the second buffer at pH 4.01. If wrong solution or electrode have been used or if the buffer is out of specifications, E1 will blink to alert the user.



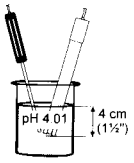
Note: If only a single point calibration is required, press CAL to leave the calibration mode. However, it is always better to proceeds as follows for a two points calibration.



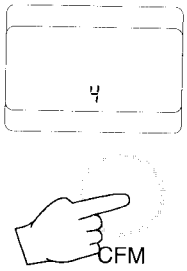
5. "4" can be changed to "10" (indicating pH 10.01) by pressing BUFF button. If you are measuring acid samples (pH 7 or less) use the pH 4.01 buffer. For alkaline solutions (pH 7 or more) use pH 10.01.



6. Rinse the electrode with distilled water or some pH 4.01 (or 10.01) solution. Dip the bottom 4 cm (1½") of the electrode in a beaker containing the second buffer.



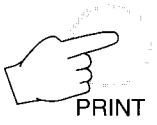
7. When "4" (or "10") stops blinking, indicating that the electrode has been stabilized, wait 30 seconds and then press CFM again to confirm the second calibration point.

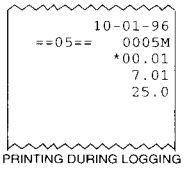


Press the RANGE key to read the temperature on the primary display.

If no keys are pressed, the meter goes to standby mode to prolong the battery life.

Note: If the PRINT key is pressed while still in recording mode, a printout is produced without affecting the running number.

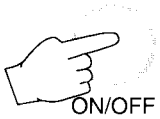




PRINTING DURING LOGGING

TO STOP RECORDING

In order to quit the recording mode, press the ON/OFF key.

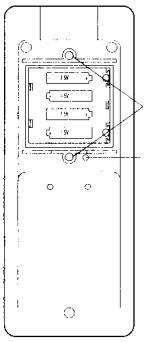


The running log number can be reset by simply removing the batteries.

OPERATIONAL GUIDE

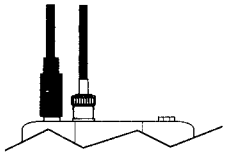
INITIAL PREPARATION

The meter is supplied complete with batteries.
Remove the back cover, unwrap the batteries and install them while paying attention to the polarity.



PROBES CONNECTION

To prepare the instrument for use, connect the pH electrode to the BNC connector located on the top of the instrument.



Connect the temperature probe to the appropriate connector.
The temperature probe can be used independently to take temperature measurements, or it can be used in conjunction with the pH electrode to utilize the meter's ATC capability.
If the temperature probe is left disconnected, the meter defaults to a temperature of "25°C" (77°F).

To switch the meter on, press the ON/OFF key.

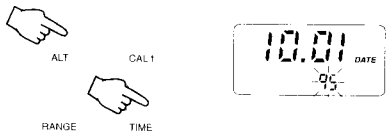
To maximize battery life, the [illegible] matically switched off after 5 minu[illegible] use. However, the meter will continue to log,

if in the logging mode, pH and temperature. To revive the display, press the ON/OFF key.

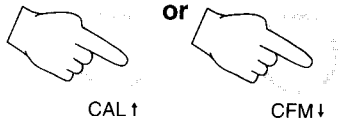
Before proceeding with pH measurements follow the calibration procedure (see page 64).

SETTING DATE/TIME/LOGGING INTERVAL

Press the ALT and the TIME keys simultaneously. The display will show the date setting. The year will be blinking.

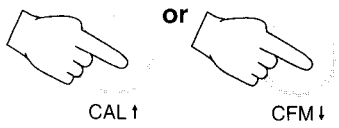


Use the UP or the DOWN arrow keys to select the year.



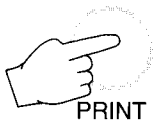
When the correct year is selected, press the TIME key once. The month will start blinking.

Select the month by using the UP or the DOWN arrow keys.

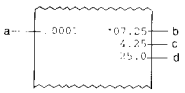


PRINTING / RECORDING

To print the measured values press the PRINT key. The printout provides the following information:

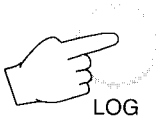


a - Running sample numbers
b - Total accumulative time
c - pH value
d - Temperature in Degrees Centigrade.

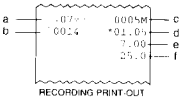


RECORDING MODE (PROGRAMMED PRINTOUTS)

Press the LOG key to enter the recording mode. The log number and page number will appear for a few seconds on the display to indicate the correct operational mode. The meter will write the first measurement taken in that moment, and will print every 5 minutes thereafter until the ON/OFF key is pressed.

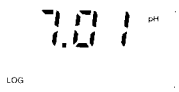


The printout provides the following information:



a - A running log number.
b - A running sample number in that particular log.
c - 5 minute printing interval indicator.
d - The total accumulative time since printing started.
e - pH value.
f - Temperature in Degrees Centigrade.

When the meter is in recording mode "LOG" is displayed on the bottom left corner of the LCD with the pH value on the primary display.



MEMORY ORGANIZATION

Capacity: 8,000 data samples which are divided into 16 pages.

Each time a new logging period starts, it automatically starts from a new page.

If "LOGGING" is still on, and the available page is "0" the meter will overwrite the first LOT DATA in the existing meter memory. During logging the meter automatically returns to the oldest page in the memory and if it contains data, it will overwrite. In this case the first log will not correspond to the oldest set of data

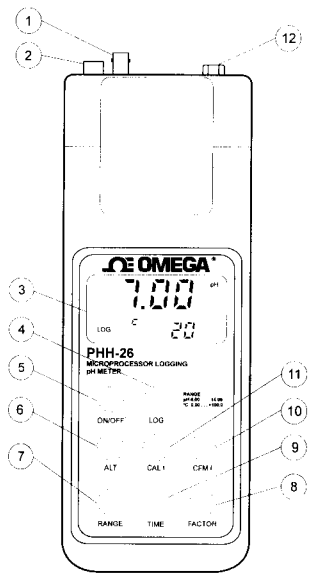
It is recommended to periodically "clean" the memory. Save data with PC if you need to keep a record and then disconnect the batteries for about 1 minute. If you do this, remember to set the date and time, once the batteries have been connected again.

ATTENTION:

Data are stored into memory until batteries are removed.

If replacement of the batteries is needed and data are not to be lost, plug the adapter in and proceed with batteries replacement as described below. Only once batteries have been replaced it is possible to unplug the adapter without loosing the stored data.

FUNCTIONAL DESCRIPTION



1. Electrode Connector (BNC)
2. Temperature Probe Connector
3. Liquid Crystal Display
4. **LOG** key, to enter the logging mode
5. **ON/OFF** key, to turn the meter on or off
6. **ALT**, alternate function key
7. **RANGE** key, to select the pH or the °C measurement mode
8. **FACTOR** key, to display calibration data
9. **TIME** key, to display time and logging interval for PHH-26
10. **CFM↓** key, to confirm the calibration reading and DOWN arrow key to scroll down
11. **CAL↑** key, to enter or exit calibration mode and UP arrow key to scroll up
12. Socket for External Power Supply

SPECIFICATIONS

		PHH-26	
Range	pH °C	0.00 to 14.00 pH 0.0 to 100.0°C	
Resolution	pH °C	0.01 pH 0.1°C	
Accuracy (@20°C/68°F)	pH °C	±0.01 pH ±0.5°C	
Typical EMC Deviation	pH °C	±0.02 pH ±0.5°C	
Calibration		Automatic 1, 2 or 3 points with pH 4, 7 and 10 buffers memorized	
Offset Calibration		±1 pH	
Slope Calibration		from 70 to 108%	
Temperature Compensation		Automatic from 0 to 100°C (32 to 212°F) or fixed at 25°C (77°F)	
Electrode		combination pH gel electrode (**included**)	
Temp. Probe		with 1 m (3.3') cable (**included**)	
Input Impedance		10^{12} Ohm	
Power Supply		4x1.5V AA size batteries 200 hours of continuous use; power socket for 12VDC adapter	
Logging Interval		1, 2, 5, 10, 15, 20, 30, 60, 120, 180 minutes	Not Available
Operating Conditions		from 0 to 50°C (32 to 122°F) 95% RH max	
Dimensions		220 x 82 x 66 mm (8.7 x 3.2 x 2.6")	
Weight		500 g (18 oz.) meter alone Kit: 1.4 Kg (3.1 lb.)	

FAULT FUNCTIONS

PHH-25P is factory programmed to automatically diagnose a fault. This is displayed with error codes on the LCD.

Error codes:

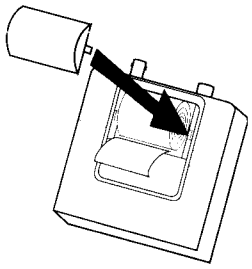
PEr 0, PEr 1, PEr 2 = Short circuit on the system, the meter should be returned for repair.

PEr 3 = Printer mechanism fault - repair needed.

PEr 4 = Printer clutch jammed - reset the printer.

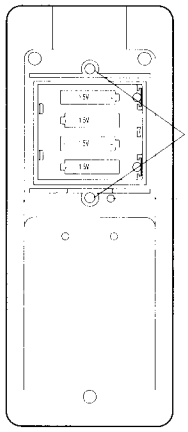
PEr 9 = Printer jammed - reset the printer.

Allow about 5 cm (2") to exit from the printer and replace the paper cover.



TO RESET PRINTER

Take the battery cover off by removing the screws. Using a pencil press the black button. This will reset the printing mechanism.



Before replacing the battery cover investigate the cause of the printer jam (e.g. the paper caught under the cover and prevented printer from advancing paper feed).

Replace the battery cover and secure screws.

PRELIMINARY EXAMINATION

Remove the instrument from the packing material and examine it carefully to make sure that no damage has occurred during shipment. If noticeable damage is found, notify Omega's Customer Service.

The meter is supplied complete with:

- Combination pH Electrode
- Temperature Probe
- 1.5V AA size Alkaline Batteries (4 pcs)
- Rugged Carrying Case.

Note: Save all packing material until you are sure that the instrument functions correctly. All defective items must be returned in the original packaging together with the supplied accessories.

GENERAL DESCRIPTION

Microprocessor-based, **PHH-26** is the first GLP portable pH meter and memorizes the last calibration data: date and time, offset and 2 slope values.

This exclusive feature allows the operator to check the status of the meter at any time by simply pressing one button.

All pH measurements are automatically compensated for temperature (ATC) when used with the supplied temperature probe.

PHH-26 also memorizes pH and temperature measurements at a user-selectable intervals (from 1 to 180 minutes).

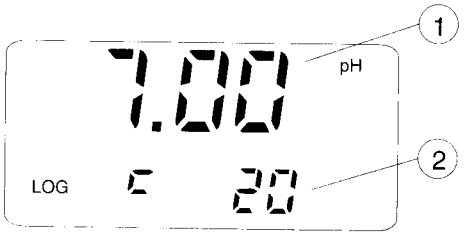
It is possible to connect the **PHH-26** to a PC through a transmitter. Data can be downloaded

in seconds through the infrared diode for storage, graphing, and other functions.

The instrument housing is made of rugged, lightweight material, weighing under 500 g (17 oz.).

Other features include automatic calibration (1, 2 or 3 point), 3 memorized buffers (pH 4.01, 7.01, 10.01), auto shut-off, low battery detection and 12VDC socket for power supply (optional, see page 79 for details).

LCD DISPLAY FUNCTIONAL DESCRIPTION



1. Primary Display (pH or temperature measurements are displayed with one or two decimal digits)
2. Secondary Display (temperature measurement is displayed without decimal digit).

PRINTER MAINTENANCE

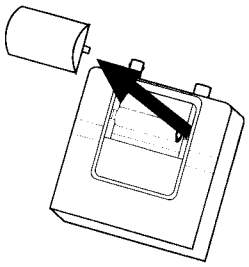
TO CHANGE THE INK CARTRIDGE

When printouts become faint, it might be necessary to change the ink cartridge. Contact Omega Engineering.

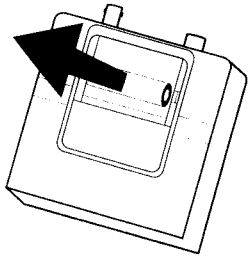
TO INSERT THE PAPER ROLL

The **PHH-25P** uses plain paper rolls 38 mm width. To insert a new roll is very easy.

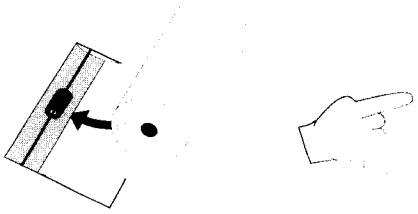
Open the paper cover pulling it gently.



Take the carton cylinder away.

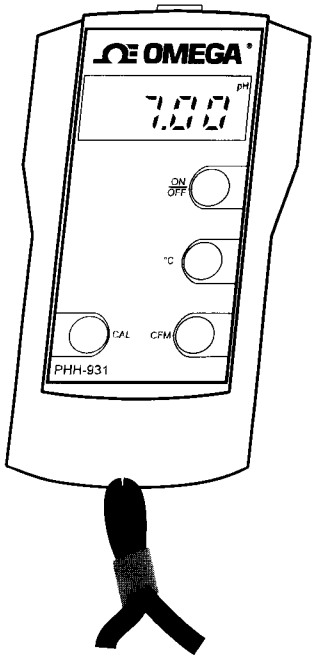


Insert the paper edge in the printer slot and feed the printer by pressing the PAPER key.



PHH-931

pH / °C Meter

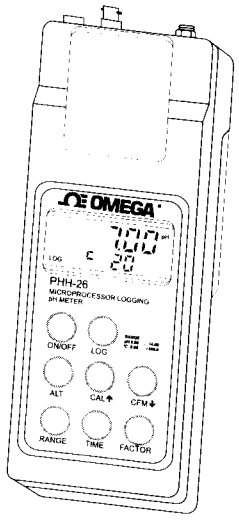


ACCESSORIES

PHA-7	pH 7.01 buffer solution
PH-SOL	Storage solution

PHH-26

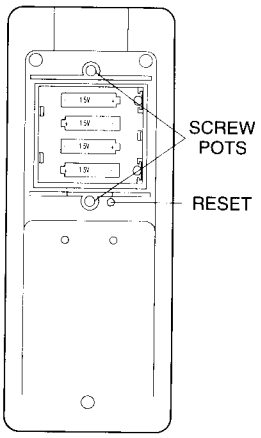
Portable Microprocessor Logging pH Meters with Last Calibration Data Storage



BATTERY REPLACEMENT

When the batteries are run down "LOBAT" is displayed on the Liquid Crystal Display to warn the user.

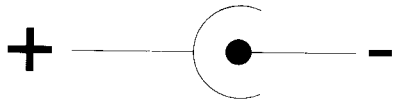
Battery replacement must only take place in a non hazardous area using the battery types specified in this instruction manual.



In order to replace run down batteries, simply remove the two screws on the rear cover of the instrument and replace the four 1.5V AA batteries with new ones, paying attention to the correct polarity.

A 12VDC power source can also be used to power the unit.

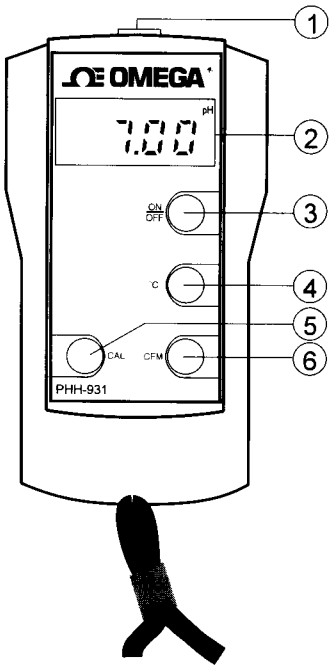
Note: The instrument uses the following configuration.



It is recommendable to purchase a voltage adapter that uses the proper polarity configuration.

Anyway, **PHH-25P** can be used with other adapters. In this case, remember to check the correct polarity of your adapter before connecting it to the meter.

FUNCTIONAL DESCRIPTION PHH-931



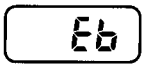
1) DIN socket for pH/°C combination electrode.
2) LCD display.
3) **ON/OFF** key, to switch the instrument on or off.
4) **°C** key. To display the measured temperature press and hold the °C key. When the key is released, the display will return to the pH reading.
5) **CAL** key, to enter the calibration mode.
6) **CFM** key, to confirm the calibration data.

BATTERY REPLACEMENT

The meter is powered by a 9V battery that is located on the rear of the instrument.

When the battery becomes weak:

- the instrument will display "Eb".

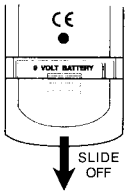


When the low battery indicator appears only a few hours of life remain. A low battery will result in loss of calibration data or unreliable measurements. It is recommended that the battery be replaced immediately.

Battery replacement should only be made in a safe area using the battery type specified in this instruction manual.

To access the battery, remove the battery cover by applying pressure in the direction indicated. Replace the old battery with a new one paying attention to the polarity.

Note: the instrument should be recalibrated after changing the battery.



DISPLAY CODES GUIDE

Δ Stability indicator

Ec Wrong buffer: Change the buffer solution;
Unfit electrode: Clean and condition the electrode.

Eb Low battery: Replace the battery.

Er Over-Range: Dry electrode, repeat conditioning.

PRELIMINARY EXAMINATION

Remove the instrument from the packing material and examine it carefully to make sure that no damage has occurred during shipment. If noticeable damage is found, notify Omega's Customer Service.

Note: Save all packing material until you are sure that the instrument functions correctly. All defective items must be returned in the original packing together with the supplied accessories.

GENERAL DESCRIPTION

PHH-931 is a hand-held pH/mV meter.

Main features are: interchangeable electrodes, simple controls on the front panel, low battery detector, large easy-to-read LCD display, simple calibration procedure, lightweight ABS plastic housing designed with single-hand use in mind.

PHH-931 is a compact, microprocessor-based **pH/°C meter** with 4-in-1 pH electrode (pH/°C electrode with built-in temperature sensor and signal amplifier). Special shockproof rubberboots are also available to prolong the life of the meter and to prevent damages due to accidental fall.

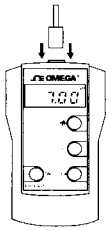
It comes supplied with: combination gel pH/°C electrode, with a built-in temperature sensor and signal amplifier, a 9 volt battery and a soft carrying case.

OPERATIONAL GUIDE

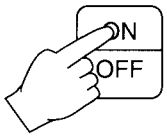
INITIAL PREPARATION

PHH-931 is supplied complete with a 9V battery. Slide off the battery compartment cover on the back of the meter, install the battery while paying attention to its polarity.

Connect the pH/°C electrode to the DIN socket on the top of the meter.

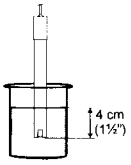


Turn the meter on by pressing the ON/OFF key.

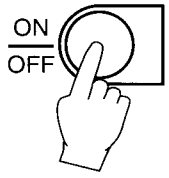


TAKING pH MEASUREMENTS

To take a pH measurement simply submerge the tip (4 cm/ 1½") of the combination pH/ temperature electrode into the sample to be tested.



Turn the instrument ON.



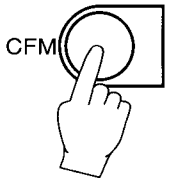
Shake the electrode briefly and allow 1 or 2 minutes for the electrode to adjust and stabilize. The display will show the pH value compensated for temperature.

- The LCD will now blink "4.01 Δ". pH 10.01 can be selected by pressing the CAL key again.

- Rinse with pH 4.01 (or 10.01) buffer solution (2nd calibration point).
- Dip the electrode into the pH 4.01 (or 10.01) buffer solution.

- Shake it briefly and wait until the "Δ" sign stops blinking (about 30 seconds).

- Press the CFM key to confirm the acceptance of the second buffer solution.



The meter is now calibrated and will return to operational mode.

TROUBLESHOOTING GUIDE

SYMPTOMS	PROBLEM	SOLUTION
The meter does not work with the temperature probe	A defective ATC probe	Replace the probe.
The meter fails to calibrate or gives faulty readings	A defective pH electrode	Replace the electrode
The meter is slow in responding or gives faulty read-outs	The electrode is not working or the reference junction is clogged	Leave the electrode in a storage solution after cleaning the junction. If problem persists, replace the electrode
The meter does not accept the 2nd buffer solution	A defective pH electrode	Follow the cleaning procedure. If this doesn't work replace the electrode
The reading drifts	A defective pH electrode	Replace the electrode
Ec	Wrong buffer Unfit electrode	Change the buffer solution. Clean and condition the electrode.
Eb	Low battery	Replace the battery.
Er	Over-Range Dry electrode	Repeat conditioning.

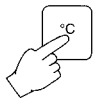
SPECIFICATIONS

	PHH-931
Range pH °C	0.00 to 14.00 0.0 to 70.0
Resolution pH °C	0.01 0.1
Accuracy pH **(@20°C/68°F)** °C	±0.01 ±0.5
Typical EMC pH **Deviation** °C	±0.30 ±1
pH Calibration	Automatic 2 points with 3 memorized standard buffers (pH 7.01, 4.01, 10.01)
Temperature Compensation	Automatic from 0 to 70°C (32 to 158°F)
Electrode	combination gel pH electrode with built-in temperature sensor and amplifier (**included**)
Battery Type **Life**	1 x 9 volt 300 hours of continuous use Auto-off after 8 minutes of non-use
Environment	0 to 50°C (32 to 122°F); 95% RH
Dimensions	143 x 80 x 38 mm (5.6 x 3.2 x 1.5")
Shipping Weight	360 g (12.7 oz.)

TAKING TEMPERATURE MEASUREMENTS

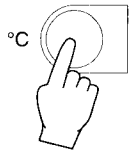
Taking a temperature measurement is very easy. Turn the instrument ON.

Make sure the pH/°C electrode is connected to the meter.



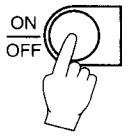
Dip the liquid/general purpose temperature probe or the pH/°C electrode into the sample and allow the reading to stabilize (1-2 minutes).

To display the measured temperature, press and hold the °C key. When the key is released, the display will return to the pH reading.



AFTER MEASUREMENTS

After measurements switch the instrument off.



pH CALIBRATION

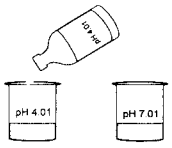
For greatest accuracy, frequent calibration of the instrument is recommended.

The instrument should be recalibrated for pH:

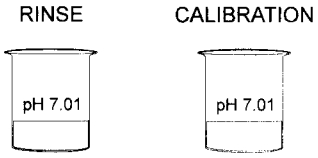
a) Whenever the pH electrode or temperature probe is replaced.
b) At least once a month.
c) After testing aggressive chemicals.
d) Where extreme accuracy is desired.
e) Whenever the batteries have been replaced.

PREPARATION:

Pour small quantities of pH 7.01 and pH 4.01 solution into two clean beakers.



For accurate calibration use two beakers for each buffer solution, the first one for rinsing the tip of the electrode, the second one for calibration. In this way contamination of the buffers is minimized.



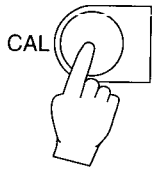
To get accurate readings, use pH 7.01 and pH 4.01if you are going to measure acid samples or pH 7.01 and pH 10.01 for alkaline measurements.

PROCEDURE FOR PHH-931

- Turn the meter on.

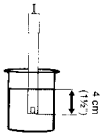
Note: the triangle "Δ" blinks whenever the electrode is not immersed in the solution.

- Press the CAL key. The display will flash "7.01 Δ" to indicate the calibration mode.



- Remove the protective cap from the electrode, rinse it with some pH 7.01 solution, then immerse the pH electrode into the pH 7.01 buffer solution; shake it briefly and wait 1 or 2 minutes for thermal equilibrium.

Note: the electrode should be submerged approximately 4 cm (1½") into the solution.

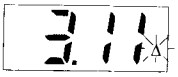


- When electrode has stabilized, the stability indicator "Δ" stops blinking.

- Press the CFM key to confirm the first buffer solution.

- If the ON/OFF key is pressed at this point, the calibration process is ended with only the offset of the meter calibrated. This is known as one-point calibration. For best accuracy, however, it is recommended that a two-point calibration is performed.

After submerging the electrode into the sample to be tested, wait until the stability indicator "Δ" stops blinking. The pH readout is temperature compensated.



In order to take accurate pH measurements, make sure that the instrument is calibrated for pH before use.

Using **refillable electrodes**: unscrew the refill hole cap to reveal the refill hole during measurement. After measurements replace the refill hole cap.

If measurements are taken in different samples successively, it is recommended to condition the electrode thoroughly to eliminate cross-contamination. When rinsing, it is recommended to use some of the sample to be measured.

TEMPERATURE COMPENSATION

The pH reading is directly effected by temperature. In order for the meter to measure the pH accurately temperature must be taken in consideration.

PHH-931 use an electrode with a built-in temperature sensor and therefore no temperature probe is needed.

The temperature can now be adjusted with the UP and DOWN arrow keys as explained below.