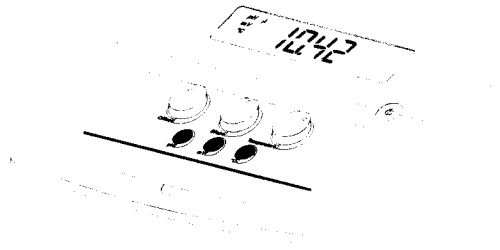


Instruction Manual

PHB-209

Bench-top pH Meter



omega.com[®]
ΩOMEGA[®]

ISO 9001
CERTIFIED
CORPORATE QUALITY
STAMFORD, CT

ISO 9002
CERTIFIED
CORPORATE QUALITY
MANCHESTER, UK

CE

These Instruments are in
Compliance with the CE Directives



OMEGAnet® Online Service www.omega.com	Internet e-mail info@omega.com
---	-----------------------------------

USA: One Omega Drive, Box 4047
Stamford CT 06907-0047
ISO 9001 Certified
TEL: (203) 359-1660 FAX: (203) 359-7700
e-mail: info@omega.com

Canada: 976 Bergar
Laval (Quebec) H7L 5A1
TEL: (514) 856-6928 FAX: (514) 856-6886
e-mail: info@omega.ca

For immediate technical or application assistance:
USA and Canada: Sales Service: 1-800-826-6342 / 1-800-TC-OMEGA®
Customer Service: 1-800-622-2378 / 1-800-622-BEST®
Engineering Service: 1-800-872-9436 / 1-800-USA-WHEN®
TELEX: 996404 EASYLINK: 62968934 CABLE: OMEGA

Mexico: En Español: (001) 203-359-7803 / FAX: (001) 203-359-7807
e-mail: espanol@omega.com / info@omega.com.mx

Benelux: **Servicing Europe:**
Postbus 8034, 1180 LA Amstelveen, The Netherlands
TEL: +31 (0)20 3472121 FAX: +31 (0)20 6434643
Toll Free in Benelux: 0800 0993344
e-mail: sales@omegaeng.nl

Czech Republic: Rudé armády 1868, 733 01 Karviná 8
TEL: +420 (0)59 6311899 FAX: +420 (0)59 6311114
Toll Free: 0800-1-66342 e-mail: info@omegashop.cz

France: 11, rue Jacques Cartier, 78280 Guyancourt, France
Tel: +33 (0)1 61 37 26 00 FAX: +33 (0)1 30 57 54 27
Toll Free in France: 0800 466 342 e-mail: sales@omega.fr

Germany/Austria: Daimlerstrasse 26, D-75392 Deckenpfronn, Germany
Tel: +49 (0)7056 9398-0 FAX: +49 (0)7056 9398-29
Toll Free in Germany: 0800 639 7678
e-mail: info@omega.de

United Kingdom: One Omega Drive, River Bend Technology Centre
ISO 9002 Certified
Northbank, Irlam, Manchester
M44 5BD United Kingdom
Tel: +44 (0)161 777 6611
Toll Free in United Kingdom: 0800-488-488
FAX: +44 (0)161 777 6622 e-mail: sales@omega.co.uk

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.

Dear Customer,

Thank you for choosing an Omega Engineering 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 precise idea of its versatility in a wide range of applications.

This instrument is in compliance with **CE** directives EN 50081-1 and EN 50082-1.

TABLE OF CONTENTS

PRELIMINARY EXAMINATION	4
GENERAL DESCRIPTION	4
FUNCTIONAL DESCRIPTION	5
SPECIFICATIONS	6
OPERATIONAL GUIDE	7
PH CALIBRATION	9
PH VALUES AT VARIOUS TEMPERATURES	11
ELECTRODE CONDITIONING & MAINTENANCE	12

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 Customer Service.

Each meter is supplied complete with:

- **PHE-209** plastic-body combination double-junction refillable pH electrode with BNC connector and 1m (3.3') cable
- Instruction Manual
- 12VDC adapter

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

GENERAL DESCRIPTION

PHB-209 bench-top pH meter is designed for simplicity of use.

It features a large easy-to-read liquid crystal display (LCD) and user friendly keyboard.

The pH calibration is made simple through the easy-to-operate front panel knobs for offset and slope adjustment.

A front knob is provided for easy manual temperature compensation of the pH reading.

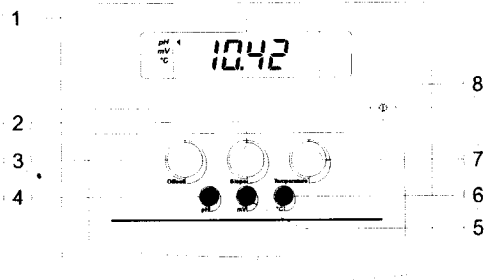
PHB-209 can also measure ion concentration (ISE) and ORP (Oxidation Reduction Potential) in the mV range.

The range selection (pH, mV or °C for temperature compensation) is made simple through the front membrane keyboard.

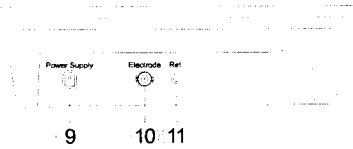
The large LCD is provided with arrows that quickly and clearly indicate the selected range.

FUNCTIONAL DESCRIPTION

Front Panel



Rear Panel



- 1) Liquid Crystal Display (LCD)
- 2) pH slope adjustment knob
- 3) pH offset adjustment knob
- 4) pH range selection key
- 5) mV range selection key
- 6) °C range selection key
- 7) Temperature setting knob
- 8) ON/OFF switch
- 9) Power adapter socket
- 10) BNC electrode connector
- 11) Electrode reference socket

SPECIFICATIONS

Range	pH	0.00 to 14.00
	mV	±1999
Resolution	pH	0.01
	mV	1
Accuracy (@20°C/68°F)	pH	±0.01
	mV	±1
Typical EMC Deviation	pH	±0.03
	mV	±2
Calibration	Manual, at 2 points through offset and slope knobs	
Temperature Compensation	Manual from 0 to 100°C (32 to 212°F)	
Electrode (included)	PHE-209 plastic body, combination, double junction refillable pH electrode with BNC and 1m (3.3') cable	
Input Impedance	10 ¹² ohm	
Power	12 VDC adapter	
Environment	0 to 50°C (32 to 122°F); 0-95% RH not condensing	
Dimensions	240x182x74 mm (9.4x7.1x2.9")	
Weight	approx. 1.0 Kg (2.2 lb.)	

OPERATIONAL GUIDE

Power connection

Plug the 12VDC adapter into the power supply socket (#9 in functional description).

Note: make sure the main line is protected by a fuse.

Electrode connection

For combination pH or ORP electrodes (with internal reference) connect the electrode's BNC to the socket provided (#10 in functional description).

For an electrode with a separate reference, connect the measuring electrode's BNC to the BNC socket (#10 in functional description) and the reference electrode's jack to the socket provided (#11 in functional description).

Note: to prevent damage to the electrode, remove the pH electrode from the solution before turning the meter off.

If the meter is OFF, detach the electrode from the meter before immersing the electrode in the storage solution.

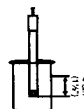
TAKING pH MEASUREMENTS

Make sure that the instrument has been calibrated for pH before taking pH measurements.

- Switch the instrument on by pressing the ON/OFF switch.



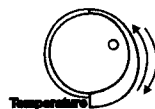
- Immerse the electrode tip (4 cm/1 1/2") into the sample and shake briefly.



- Take the temperature of the solution with a glass thermometer (e.g. 25°C).



- Press the °C key to display temperature setting on the LCD and adjust the temperature knob to display the temperature of the sample.



- Press the pH key to display the pH measurement.



- The display shows the pH value of the test solution compensated for temperature.

If measurements are taken in different samples successively, it is



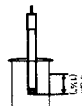
recommended that the electrode be rinsed thoroughly for better conditioning and to eliminate cross-contamination of the sample.

For the rinsing process, it is recommended to use a liberal amount of the next solution to be measured.

TAKING ORP MEASUREMENTS

PHB-209 has the capability to take ORP measurements, using an ORP electrode.

- Connect the ORP electrode to the meter and submerge the tip (4 cm / 1½") into the sample to be tested.



Note: ORP measurements are taken without temperature compensation.

- Press the mV key to enter the mV mode. Allow a few minutes for the reading to stabilize.



- The display will indicate the mV value (positive or negative).



AFTER MEASUREMENTS

- Press the ON/OFF switch again to switch the instrument off.

pH CALIBRATION

IMPORTANT

The instrument's pH range should be re-calibrated:

- When the meter is new.
- Whenever the pH electrode is replaced.
- At least once a month.
- After use in aggressive chemicals.
- After cleaning procedure and changing the reference electrolyte.
- For greatest accuracy.

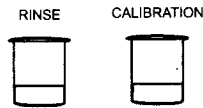
INITIAL PREPARATION

Pour small quantities (up to 4cm / 1½" level) of pH 7 and pH 4 or pH 10 solution into clean beakers. If possible use plastic beakers to minimize any EMC interferences.



If you are measuring in the acid range, use pH 4 as second buffer; if you are measuring in the alkaline range, use pH 10 as second buffer.

For accurate calibration, use two beakers for each buffer solution; the first for rinsing the electrode, the second



for calibration. In this way, contamination of the buffer is minimized.

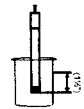
Note: the electrode should be submerged approximately 4 cm (1½") into the solution.

PROCEDURE

- Switch the instrument on by pressing the ON/OFF switch.



- Rinse and immerse the pH electrode in pH 7 buffer and shake briefly. Wait 1 or 2 minutes for the reading to stabilize.



- Note the temperature of the buffer solution using a glass thermometer (e.g. 20°C).



- Press the °C key to select temperature setting.



- Adjust the Temperature knob until the LCD shows the noted temperature.



- Press the pH key to select pH measurement.

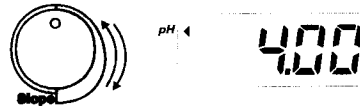


- Wait 1-2 minutes and adjust the OFFSET knob until display shows the pH value at the noted temperature (see the pH versus temperature chart).



- Rinse and immerse the pH electrode in pH 4/pH 10 buffer and shake briefly.

- Wait 1-2 minutes and adjust the SLOPE knob until display shows the pH value at the noted temperature (see the pH versus temperature chart).



- The pH calibration is now complete.

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		pHVALUES		
°C	°F	4	7	10
0	32	4.01	7.13	10.32
5	41	4.00	7.10	10.24
10	50	4.00	7.07	10.18
15	59	4.00	7.04	10.12
20	68	4.00	7.03	10.06
25	77	4.01	7.01	10.01
30	86	4.02	7.00	9.96
35	95	4.03	6.99	9.92
40	104	4.04	6.98	9.88
45	113	4.05	6.98	9.85
50	122	4.06	6.98	9.82
55	131	4.07	6.98	9.79
60	140	4.09	6.98	9.77
65	149	4.11	6.99	9.76
70	158	4.12	6.99	9.75

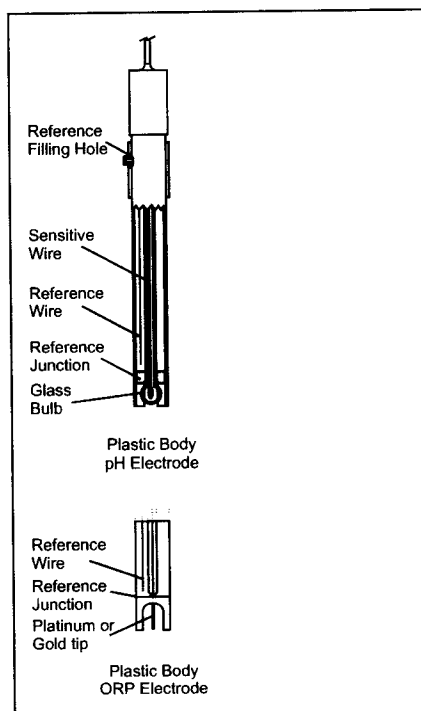
For instance, if the buffer temperature is 25°C, the display should show pH 4.01, 7.01 or 10.01 at pH 4, 7 or 10 buffers, respectively.

At 20°C, the display should show pH 4.00, 7.03 or 10.06. The meter reading at 50°C will then be 4.06, 6.98 or 9.82.

ELECTRODE CONDITIONING AND MAINTENANCE

Note: to prevent damage to the electrode, remove the pH electrode from the solution before turning the meter off.

If the meter is OFF, detach the electrode from the meter before immersing the electrode in the storage solution.



PREPARATION

Remove the protective cap.

DO NOT BE ALARMED IF SALT DEPOSITS ARE PRESENT. This is normal with electrodes and they will disappear when rinsed with water.

During transport tiny bubbles of air may form inside the glass bulb affecting proper functioning of the electrode. These bubbles can be removed by "shaking down" the electrode as you would do with a glass thermometer.

If the bulb and/or junction is dry, soak the electrode in storage solution for at least one hour.

For refillable electrodes:

If the filling solution (electrolyte) is more than 2½ cm (1") below the fill hole, add 3.5M KCl Electrolyte Solution for double junction or 3.5M KCl + AgCl Electrolyte Solution for single junction electrodes.

For a faster response, unscrew the fill hole screw during measurements.



MEASUREMENT

Rinse the electrode tip with distilled water. Immerse the tip (bottom 4 cm / 1½") in the sample and stir gently for a few 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.

Replace the solution in the protective cap with a few drops of storage solution or, in its absence, filling solution.

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

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:

Refill the reference chamber with fresh electrolyte. Allow the electrode to stand upright for 1 hour.

Follow the storage procedure above.

CLEANING PROCEDURE

General Soak in general cleaning solution for approximately ½ hour.

TROUBLESHOOTING

Evaluate your electrode performance based on the following.

- **Noise** (Readings fluctuate up and down) could be due to:
 - **Clogged/Dirty Junction:** Refer to the Cleaning Procedure above.
 - **Loss of shielding** due to low electrolyte level (in refillable electrodes only): refill with fresh electrolyte solution.
- **Dry Membrane/Junction:** Soak in storage solution for at least 1 hour.
- **Drifting:** Soak the electrode tip in warm (approx. 50-60°C) electrolyte solution for one hour and rinse the tip with distilled water. Refill with fresh electrolyte solution.
- **Low Slope:** Refer to the cleaning procedure above.
- **No Slope:** Check the electrode for cracks in glass stem or bulb and replace the electrode.
- **Slow Response/Excessive Drift:** Soak the tip in cleaning solution for 30 minutes, rinse thoroughly in distilled water and then follow the Cleaning Procedure above.

WARRANTY

WARRANTY/DISCLAIMER

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

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

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

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

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

OMEGA is a registered trademark of OMEGA ENGINEERING, INC.

© Copyright 2002 OMEGA ENGINEERING, INC. All rights reserved. This document may not be copied, photocopied, reproduced, translated, or reduced to any electronic medium or machine-readable form, in whole or in part, without the prior written consent of OMEGA ENGINEERING, INC.

**Where Do I Find Everything I
Need for Process Measurement
and Control?**

OMEGA...Of Course!

Shop online at www.omega.com

TEMPERATURE

- Thermocouple, RTD & Thermistor Probes, Connectors, Panels & Assemblies
- Wire: Thermocouple, RTD & Thermistor
- Calibrators & Ice Point References
- Recorders, Controllers & Process Monitors
- Infrared Pyrometers

PRESSURE, STRAIN AND FORCE

- Transducers & Strain Gages
- Load Cells & Pressure Gages
- Displacement Transducers
- Instrumentation & Accessories

FLOW/LEVEL

- Rotameters, Gas Mass Flowmeters & Flow Computers
- Air Velocity Indicators
- Turbine/Paddlewheel Systems
- Totalizers & Batch Controllers

pH/CONDUCTIVITY

- pH Electrodes, Testers & Accessories
- Benchtop/Laboratory Meters
- Controllers, Calibrators, Simulators & Pumps
- Industrial pH & Conductivity Equipment

DATA ACQUISITION

- Data Acquisition & Engineering Software
- Communications-Based Acquisition Systems
- Plug-in Cards for Apple, IBM & Compatibles
- Datalogging Systems
- Recorders, Printers & Plotters

HEATERS

- Heating Cable
- Cartridge & Strip Heaters
- Immersion & Band Heaters
- Flexible Heaters
- Laboratory Heaters

**ENVIRONMENTAL
MONITORING AND CONTROL**

- Metering & Control Instrumentation
- Refractometers
- Pumps & Tubing
- Air, Soil & Water Monitors
- Industrial Water & Wastewater Treatment
- pH, Conductivity & Dissolved Oxygen Instruments