



Operation Manual

SKU: PM1000

**Microcomputer Based
pH/ORP/Temperature
Benchtop Meter**

PM1000

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GENERAL INTRODUCTION

Thank you for selecting the PM1000 meter. The PM1000 is a precision tool that measures pH, mV and temperature. A built-in microprocessor stores, calculates and compensates for all parameters related to pH determinations including pH electrode temperature characteristics, electrode slope deviations and buffer solutions.

This meter has a waterproof IP54 case. The mechanical keys are highly reliable with tactile and audio feedback. It is powered by six AAA-size alkaline batteries or with a UL approved AC adapter (OUTPUT:DC9V). The meter also displays a "BAT" message when the batteries are in need of replacement. Re-calibration is not required when power is restored.

The front of the meter has a large LCD that displays pH or mV and temperature simultaneously along with user prompts and mode indicators. The unit prompts the user through calibration and measurement procedures.

An AUTOLOCK feature for both pH and mV measurements enables the unit to automatically sense the end point and "LOCK" the display to indicate the end point value of a measurement. AUTOLOCK and user prompts help eliminate most errors in determining pH and mV values, resulting in precise, repeatable and error-free measurements. The PM1000 can also be used in non-AUTOLOCK mode.

The model PM1000 is available with pH and ORP probes. Other features include single or dual or three point calibration, electrode offset recognition, electrode slope recognition, electrode efficiency display, built-in buffer coefficients, automatic or manual temperature compensation, long battery life, and 50/60Hz AC noise rejection. This meter is user-friendly for laboratory application.

INITIAL INSPECTION

Carefully unpack the unit and accessories. Inspect for damages made in shipment. If any damage is found, notify your **Sensorex** representative immediately. All packing materials should be saved until satisfactory operation is confirmed.

POWER INPUT

The model 6177 can be powered by an 115V or 230VAC adaptor as well as 6 "AAA" alkaline batteries. Check the label on the AC

adaptor supplied with the instrument to make sure that the AC line voltage is correct. If the wrong AC adaptor is supplied, notify your **Sensorex** representative immediately.

INSTALLING THE BATTERIES

To insert the batteries into the meter, follow the procedure outlined below.

1. Use a Phillips screw driver and unlock the battery cover by turning the screw driver in the counter clockwise direction. After unlocking the screw, take off the battery cover (Fig.1)
2. Replace the old batteries with new ones and install each in the correct polarity position.
3. Put the battery cover back on the instrument. Use a Phillips screw driver and turn the screw in the clockwise direction to lock the battery cover.

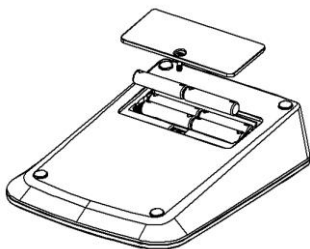


Figure 1: Battery compartment

DISPLAY & KEYS FUNCTIONS

A. Display

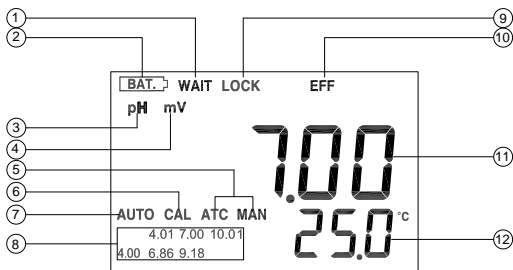








Figure2: Active LCD screen

<p>1. WAIT- This will be displayed when the unit is still waiting for a stable reading or end point sensing.</p>	<p>7. AUTO AUTOLOCK mode indicator.</p>
<p>2. BAT- Low battery indicator.</p>	<p>8. Buffer selection This indicator will flash if the unit is not yet calibrated. This indicator will remain light-up if the unit has been calibrated.</p>
<p>3. pH Unit and mode indicators.</p>	<p>9. LOCK- This will indicate that the reading is frozen during AUTOLOCK mode.</p>
<p>4. mV Unit and mode indicators.</p>	<p>10. EFF- This will be displayed if the user is viewing the efficiency of the electrode. It is recommended to use a new electrode when the efficiency value is less than 75%.</p>
<p>5. ATC/MAN- ATC indicator will be displayed if a temperature probe is connected otherwise the MAN indicator will be displayed.</p>	<p>11. MAIN DISPLAY- For pH, mV and probe efficiency values</p>
<p>6. CAL This will be displayed when the unit enters into the calibration mode.</p>	<p>12. SECONDARY DISPLAY- For temperature in °C display</p>

B. Keys

	<p>On/Off- Press and hold this key for 3 seconds to power on and shut off the meter.</p>
	<p>Mode- Selects display mode. Pressing this key changes the display sequentially to display pH-AUTO, mV-AUTO, pH and mV. The calibration values will not be affected by changing the display modes. In "pH calibration", press "Mode" key to exit calibration mode.</p>

	<p>Clear- Press to clear the unit when error signal appears. Clears all calibration values stored in the internal memory. During normal use the key will not be activated unless pressed and held for 2 seconds to prevent accidentally erasing stored memory. When the “Clear” key is pressed, all segments of the LCD will be on. After about 2 seconds the unit will enter the pH-AUTO mode. The “AUTO” and “CAL” will be on and one of the buffers in the pre-selected buffer set will start to flash. This means that the unit must be calibrated again before use.</p>
	<p>Up/Down- The two keys are used to manually enter the temperature values. They have no effect on the unit when operating in ATC mode.</p>
	<p>Stand/Slope- The “Stand” and “Slope” keys are used for pH calibration of the unit. Pressing and holding the Stand key while turning on the power, will change the buffer set.</p>
	<p>Mea. / Eff.- This key is used to bring the unit out of the AUTO condition when operating in the pH-AUTOLOCK or mV-AUTOLOCK mode. Press and hold this key for 5 seconds, The LCD will display the efficiency of the electrode.</p>

OPERATIONAL PROCEDURES

A. Buffer Set Selection

The PM1000 meter has two buffer sets: 7.00, 4.01, 10.01pH and 6.86, 4.00, 9.18pH. The meter is factory pre-set at 7.00, 4.01 and 10.01pH.

To change the buffer set, turn off the unit, then press and hold the “Stand” key while turning on the unit again.

[**Note:** There is no need to repeat this procedure every time the unit powers up unless one decides to change the buffer settings.]

B. pH Calibration

The PM1000 uses one, two or three point calibration.

[**Note:** If the unit uses two or three point calibration, the first point must be 6.86/7.00, and the second point can either be 4.00/4.01 or 9.18/ 10.01.]

a. **Calibration with an ATC/Temp probe in the pH-AUTOLOCK mode.**

1. Turn the unit on. Press "**Clear**" key for 2 seconds, all LCD elements will light up. The meter clears all calibration values stored in internal memory.
2. Connect the pH electrode to the BNC connector and the ATC/Temp probe to the ATC/Temp connector of the unit: "ATC" icon will light up. "pH" icon and "AUTO" icon will light up. One of the buffer in the pre-selected buffer set will start to flash.
3. Rinse the pH and ATC/Temp probes in distilled water then immerse them in the first buffer solution. Allow temperature reading to stabilize, then press and hold "**Stand**" key for 5 seconds to calibrate. The "WAIT" icon will flash until the unit detects a stable reading. Once the unit calibrates the first point, the selected buffer remains light up while the remaining two buffers start to flash. The unit is ready to be sloped at the second buffer.

[**Note:**

If the first buffer solution is 7.00 or 6.86, at this moment, press the "**Mode**" key. The unit will exit the calibration mode. Single point calibration is complete.

If the first buffer solution is 4.00, 4.01, 9.18 or 10.00, at this moment, the unit will automatically exit the calibration mode. Single point calibration is complete.]

4. Rinse the pH and ATC/Temp probe in distilled water and immerse them in the second buffer solution (either 4.00/4.01 or 9.18/10.01). Allow temperature reading to stabilize, then press "**Slope**" key to calibrate. The "WAIT" icon will flash until the unit detects a stable reading. Once the unit calibrates the second point, the selected two buffers light up and the remaining buffer starts to flash. The unit is ready to be sloped for the third buffer.

[**Note:** At this moment, press the "**Mode**" key. The unit will exit the calibration mode. Dual point calibration is complete.]

5. Rinse the pH or pH/ATC probe in distilled water and immerse it in the third buffer solution (either 9.18/10.01 or 4.00/4.01). Allow temperature reading to stabilize, then press "**Slope**" key to calibrate. The "WAIT" icon will flash until the unit detects a stable reading. Once the unit calibrates the third point the unit will automatically exit the calibration mode. Three point calibration is complete.
 6. The unit calculates and compensates for the pH electrode slope deviation corresponding to the values of the three calibration buffers. After calibration, press and hold "**Mea./Eff.**" key for about 5 seconds to display the new electrode efficiency.
- b. Calibration with manual temperature compensation in the pH-AUTOLOCK mode.**
1. Turn the unit on. Press "**Clear**" key for 2 seconds, all LCD elements will light up. The meter clears all calibration values stored in internal memory.
 2. Connect the pH electrode to the BNC connector of the unit, "MAN" icon will light up. "pH" icon and "AUTO" icon will light up. One of the buffers in the pre-selected buffer set will start to flash.
 3. Rinse the pH probe in distilled water and immerse it in the first buffer solution. Adjust the temperature reading to that of the first buffer using the "**up**" or "**down**" keys (0.0 to 60.0 °C). Then press and hold "**Stand**" key for 5 seconds to calibrate. The "WAIT" icon will flash until the unit detects a stable reading. Once the unit calibrates the first point, the selected buffer remains lit up while the remaining second buffer starts to flash. The unit is ready to be sloped at the second buffer.
- [Note:**
If the first buffer solution is 7.00 or 6.86, **press the "Mode"** key and the unit will exit the calibration mode. Single point calibration is complete.
If the first buffer solution is 4.00, 4.01, 9.18 or 10.00, the unit will automatically exit the calibration mode. Single point calibration is complete.]
4. Repeat steps 4~6 of "**Calibration with an ATC/Temp probe in the pH-AUTOLOCK mode**" for dual and three point calibration.
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c. **Calibration with an ATC/Temp probe in the pH NON-AUTOLOCK mode.**

1. Turn the unit on. Press "**Clear**" key for 2 seconds, all LCD elements will light up. The meter clears all calibration values stored in internal memory.
2. Connect the pH electrode to the BNC connector and the ATC/Temp probe to the ATC/Temp connector of the unit: "ATC" icon will light up. Press "**Mode**" key to select "pH" mode. "pH" icon is on. One of the buffers in the pre-selected buffer set will start to flash.
3. Rinse the pH or pH/ATC probe in distilled water and immerse in the first buffer solution. Allow temperature reading to stabilize, then press and hold the "**Stand**" key for 5 seconds to calibrate, The unit immediately calibrates the first point, The selected buffer remains lit up while the remaining two buffers start to flash. The unit is ready to be sloped at the second buffer.

[Note:

If the first buffer solution is 7.00 or 6.86, at this moment, Press the "**Mode**" key, the unit will exit the calibration mode. Single point calibration is complete.

If the first buffer solution is 4.00, 4.01, 9.18 or 10.00, at this moment, the unit will automatically exit the calibration mode. Single point calibration is complete.]

4. Rinse the pH and ATC/Temp probe in distilled water and immerse them in the second buffer solution (either 4.00/4.01 or 9.18/10.01). Allow temperature reading to stabilize, then press "**Slope**" key to calibrate. The unit immediately calibrates the second point, the other buffer solution will flash. The unit is ready to be sloped at the third buffer.

[Note: At this moment, press the "**Mode**" key, the unit will exit the calibration mode. Dual point calibration is complete.]

5. Rinse the pH and ATC/Temp probe in distilled water and immerse them in the third buffer solution (either 9.18/10.01 or 4.00/4.01). Allow temperature reading to stabilize, then press "**Slope**" key to calibrate. The unit immediately calibrates the third point and the unit will automatically exit the calibration mode. Three points calibration is complete.
6. The unit calculates and compensates for the pH electrode slope deviation corresponding to the values of the three calibration buffers. After calibration, press and hold "**Mea./Eff.**"

key for about 5 seconds to display the new electrode efficiency.

d. Calibration with manual temperature compensation in the pH NON-AUTOLOCK mode.

1. Turn the unit on. Press “**Clear**” key for 2 seconds, all LCD elements will light up. The meter clears all calibration values stored in internal memory.
2. Connect the pH electrode to the BNC connector of the unit, “MAN” icon will light up. Press “**Mode**” key to select “pH” mode. “pH” icon is on. One of the buffers in the pre-selected buffer set will start to flash.
3. Rinse the pH probe in distilled water and immerse it in the first buffer solution. Adjust the temperature reading to that of the first buffer using the “**up**” or “**down**” keys (0.0 to 60.0 °C) before pressing “Stand” key. Then press and hold “**Stand**” key for 5 seconds to calibrate. The unit immediately calibrates the first point, the selected buffer remains light up while the remaining two buffers start to flash. The unit is ready to be sloped at the second buffer.

[Note:

If the first buffer solution is 7.00 or 6.86, press the “**Mode**” key and the unit will exit the calibration mode. Single point calibration is complete.

If the first buffer solution is 4.00, 4.01, 9.18 or 10.00, at this moment, the unit will immediately exit the calibration mode. Single point calibration is complete.]

4. Repeat steps 4~6 of “**Calibration with an ATC/Temp probe in the pH NON- AUTOLOCK mode**” for dual and three point calibration.

C. pH Measurements

To take pH measurements, the pre-selected buffer solution set must light up, indicating the unit is Single point or dual-point or three-point calibrated and ready for measurements. If buffer solution set flashes, perform a pH calibration before taking measurements.

a. Measurement with an ATC/Temp probe in the pH-AUTOLOCK mode.

1. Connect the pH electrode to the BNC connector and the ATC/Temp probe to the ATC/Temp connector of the unit. The “ATC” icon will light up.

2. Press “Mode” key until “pH” icon and “AUTO” icon light up.
3. Rinse the pH electrode and ATC/temp probe with distilled water and immerse in the sample to be measured. Remove any air bubbles trapped around the probe by shaking or stirring the probe.
4. Press the “Mea.” key. The “WAIT” icon will start flashing. The unit is waiting for a stable reading. The display will track the pH value as sensed by the pH electrode and the ATC/Temp probe.
5. When the “WAIT” icon disappears, the reading is then “LOCK” and will not respond to further changes from the sample. The pH value shown is the pH value of the sample at the displayed sample temperature.

[Note: For samples that are inherently unstable, the unit will not AUTOLOCK. In this case, use the pH NON- AUTOLOCK mode for measurements.]

b. Measurement with manual temperature compensation in the pH-AUTOLOCK mode.

1. Connect the pH electrode's BNC connector to the BNC connector of the unit. The “MAN” icon will light up. Set unit to display the sample temperature by pressing the up and down keys(0.0 to 100.0°C).
2. Repeat steps 2~5 of “**Measurement with an ATC/Temp probe in the pH- AUTOLOCK mode**”.

c. Measurement with an ATC/Temp probe in the pH NON-AUTOLOCK mode.

1. Connect the pH electrode to the BNC connector and the ATC/Temp probe to the ATC/Temp connector of the unit. The “ATC” icon will light up.
2. Press “Mode” key until “pH” icon lights up.
3. Rinse the pH electrode and ATC/temp probe with distilled water and immerse in the sample to be measured.
4. Allow sufficient time for the display to stabilize. The instrument will display the pH value of the sample at the displayed sample temperature.

d. Measurement with manual temperature compensation in the pH NON-AUTOLOCK mode.

1. Connect the pH electrode to the BNC connector of the unit. The “MAN” icon will light up. Set unit to display the sample temperature by pressing the up and down keys(0.0 to 100.0 °C).
2. Repeat steps 2~4 of “**Measurement with an ATC/Temp probe in the pH NON- AUTOLOCK mode**”.

D. Temperature Measure

The PM1000 can measure temperature independently with the ATC/temp probe without using the pH electrode. Place the ATC/temp probe in the sample. The unit will display the measured temperature.

E. mV Measurements

a. Measurement in the mV-AUTOLOCK mode.

1. Connect the optional combination ORP electrode to the BNC connector of the unit.
2. Press “Mode” key until “mV” icon and “AUTO” icon light up.
3. Rinse electrode with distilled water and immerse it in sample to be measured.
4. Press the “Mea.” key. The “WAIT” icon will start flashing. The unit is waiting for a stable reading. The display will track the mV value as sensed by the ORP electrode
5. When the “WAIT” icon disappears, the reading is then “LOCK” and will not respond to further changes from the sample. The mV value is the sample reading.

[Note: For samples that are inherently unstable, the unit will not AUTOLOCK. In this case, use the pH NON- AUTOLOCK mode for measurements.]

b. Measurement in the mV NON-AUTOLOCK mode.

1. Connect the optional combination ORP electrode to the BNC connector of the unit.
 2. Press “Mode” key until “mV” icon lights up.
 3. Rinse electrode with distilled water and immerse it in sample to
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be measured.

4. Allow sufficient time for the display to stabilize. The instrument will display the mV value of the sample.

pH BUFFERS

The temperature coefficient of pH calibration buffers 4.01, 6.86, 7.00, 9.18 and 10.01 are stored inside the instrument. The buffers used to calibrate the instrument must exhibit the same temperature characteristics as the stored values.

Temperature coefficient of the pH buffers

°C	4.00	6.86	9.18	4.01	7.00	10.01
0	4.01	6.98	9.46	4.01	7.11	10.32
5	4.00	6.95	9.39	4.01	7.08	10.25
10	4.00	6.92	9.33	4.00	7.06	10.18
15	4.00	6.90	9.28	4.00	7.03	10.12
20	4.00	6.88	9.23	4.00	7.01	10.06
25	4.00	6.86	9.18	4.01	7.00	10.01
30	4.01	6.85	9.14	4.01	6.98	9.97
35	4.02	6.84	9.10	4.02	6.98	9.93
40	4.03	6.84	9.07	4.03	6.97	9.89
45	4.04	6.83	9.04	4.04	6.97	9.86
50	4.06	6.83	9.02	4.06	6.97	9.83
55	4.07	6.83	8.99	4.08	6.97	9.80
60	4.09	6.84	8.97	4.10	6.98	9.78

[Note: The actual reading of the instrument can differ from the values shown by $\pm 0.01\text{pH}$.]

ERROR DISPLAYS AND TROUBLESHOOTING

Main Display	Possible cause(s)	Corrective Action(s)
"Er1"	<ol style="list-style-type: none"> 1. "Stand" was pressed before the electrode and ATC/Temp probe settled to within ± 1.5 pH of the buffer value. 2. pH electrode offset is greater / less than ± 1.5 pH units. 3. pH electrode is faulty. 	<ol style="list-style-type: none"> 1. Press "Clear" key, Allow sufficient time for the electrode and ATC/Temp probe to stabilize, then re-press "Stand" key to start the calibration procedure. 2. Replace the buffer and /or the pH electrode. Press "Clear" key to recalibrate meter. 3. Replace electrode.
"Er2"	<ol style="list-style-type: none"> 1. "Slope" was pressed before the electrode and ATC/Temp probe settled to within 30% of the buffer value. 2. Buffer 4.00, 4.01, 9.18 and 10.01 is not correct. 3. pH electrode slope is off by more than 30% of ideal slope. 	<ol style="list-style-type: none"> 1. Allow sufficient time for the electrode and ATC/Temp probe to stabilize, re-press "Slope" key to continue the calibration procedure. 2. Check if the correct buffer is used. 3. Replace the buffer and /or the pH electrode. Press "Clear" key to recalibrate meter.
"Er3"	<ol style="list-style-type: none"> 1. Temperature is out of 0.0 to 60.0°C range. 	<ol style="list-style-type: none"> 1. Bring the buffer temperature within range.
"over" / "undr"	<ol style="list-style-type: none"> 1. Measured pH is out of the 0.00 to 14.00 pH range. 2. Measured mV is out of -1999.9 to 1999.9 mV range. 3. Measured temperature is out of 0.0 to 100.0°C range. 	<ol style="list-style-type: none"> 1. Bring sample pH into the correct measuring range. 2. Bring sample ORP into the correct measuring range. 3. Bring sample temperature into the correct measuring range.

[Note: If the meter still does not perform normally after the above measures are taken, contact your **Sensorex representative.]**

SPECIFICATIONS

Display	Range	Resolution	Accuracy
pH	-2.00 to 16.00 pH	0.01 pH	±0.01 pH
mV	-1999.9 to 1999.9 mV	0.1mV	±0.05%FS ±1digit
Temperature	0.0 to 100.0 °C	0.1 °C	±0.2°C

pH buffer recognition	pH 7.00, 4.01, 10.01 or pH 6.86, 4.00, 9.18
pH Temperature compensation	AUTO/MAN 0.0°C to 100.0 °C
pH Buffer Temperature range	0°C to 60.0°C
pH Electrode Offset recognition	±100 mV at pH 7.00 or +108.3/-91.7mV at pH6.86
pH Electrode Slope recognition	±30% at pH 4.00, 4.01, 9.18 and 10.01
Input impedance	>10 ¹² Ω
Temperature sensor	Thermistor, 10 kΩ at 25°C
Power	6X1.5V AAA Batteries or 115/230 AC adapter
Calibration Back-up	EEPROM
Audio Feedback	All Touch Keys
End Point Sensing & Hold	Yes
Display (pH /mV : Temp)	22mm : 14.5mm high LCD
Ambient Temperature Range	0 to 50 °C
Relative Humidity	up to 90%
Case	IP54
Dimensions (W x D x H)	150mm x 210mm x 45mm
Weight	430 grams

WARRANTY

Sensorex warrants this product to be free from significant deviations in material and workmanship for a period of 1 year from date of purchase. If repair or adjustment is necessary and has not been the result of abuse or misuse, within the year period, please return-freight-prepaid and the correction of the defect will be made free of charge. If you purchased the item from our **Sensorex** distributors and it is under warranty, please contact them to notify us of the situation. **Sensorex** Service Department alone will determine if the product problem is due to deviations or customer misuse.

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

RETURN OF ITEMS

Authorization must be obtained from one of our representatives before returning items for any reason. When applying for authorization, have the model and serial number handy, including data regarding the reason for return. For your protection, items must be carefully packed to prevent damage in shipment and insured against possible damage or loss. **Sensorex** will not be responsible for damage resulting from careless or insufficient packing. A fee will be charged on all authorized returns.

NOTE: Sensorex reserves the right to make improvements in design, construction and appearance of our products without notice.

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