



sensioTMn1

Portable pH Meter

Instruction Manual

TRADEMARKS OF HACH COMPANY

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| AmVer™ | Hawkeye The Hach Guy™ | RapidSilver™ |
| APA 6000™ | HexaVer® | Ratio™ |
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| Dr. F. Fluent™ | OptiQuant™ | Test 'N Tube™ |
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| DR/Check™ | OxyVer™ | TitraStir® |
| EC 310™ | PathoScreen™ | TitraVer® |
| FerroMo® | PbEx® | ToxTrak™ |
| FerroVer® | PermaChem® | UniVer® |
| FerroZine® | PhosVer® | VIScreen™ |
| FilterTrak™ 660 | Pocket Colorimeter™ | Voluette® |
| Formula 2533™ | Pocket Pal™ | WasteAway™ |
| Formula 2589™ | Pocket Turbidimeter™ | ZincoVer® |
| Gelex® | | |

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CERTIFICATION

Hach Company certifies this instrument was tested thoroughly, inspected, and found to meet its published specifications when it was shipped from the factory.

The *sensio*[™]*1* Portable pH Meter has been tested and is certified as indicated to the following instrumentation standards:

EMI Immunity:

Per **89/336/EEC EMC: EN 61326:1998** (Electrical Equipment for measurement, control, and laboratory use— EMC requirements) Supporting test records by Hach Company, certified compliance by Hach Company.

Standards include:

IEC 1000-4-2:1995 (EN 61000-4-2) Electro-Static Discharge (Criteria B)

IEC 1000-4-3:1995 (EN 61000-4-3:1995) Radiated RF Electro-Magnetic Field Immunity (Criteria B)

ENV 50204:1996 Radiated Electro-Magnetic Field from Digital Telephones (Criteria B)

Radio Frequency Emissions:

Per **89/336/EEC EMC: EN 61326:1998** (Electrical Equipment for measurement, control, and laboratory use— EMC requirements) Class B emission limits. Supporting test records by Criterion Technology O.A.T.S. (NVLAP #0369), certified compliance by Hach Company.

Additional Emissions Standard/s include:

EN 55011 (CISPR 11) Emissions, Class B Limits

CANADIAN INTERFERENCE-CAUSING EQUIPMENT REGULATION, IECS-003: Class A emission limits. Supporting test records by Criterion Technology O.A.T.S. (NVLAP #0369), certified compliance by Hach Company.

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

CERTIFICATION, continued

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

FCC PART 15, Class “A” Limits:

Supporting test records by Criterion Technology O.A.T.S. (NVLAP #0369), certified compliance by Hach Company.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense. The following techniques of reducing the interference problems are applied easily:

1. Remove power from the *sensioni* pH meter by removing one of its batteries to verify that it is or is not the source of the interference.
2. Move the meter away from the device receiving the interference.
3. Reposition the receiving antenna for the device receiving the interference.
4. Try combinations of the above.

SAFETY PRECAUTIONS

Please read this entire manual before unpacking, setting up, or operating this instrument. Pay particular attention to all danger and caution statements. Failure to do so could result in serious injury to the operator or damage to the equipment.

To ensure the protection provided by this equipment is not impaired, do not use or install this equipment in any manner other than that which is specified in this manual.

Use of Hazard Information

If multiple hazards exist, this manual will use the signal word (Danger, Caution, Note) corresponding to the greatest hazard.

DANGER

Indicates a potentially or imminently hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a potentially hazardous situation that may result in minor or moderate injury.

NOTE

Information that requires special emphasis.

Precautionary Labels

Read all labels and tags attached to the instrument. Personal injury or damage to the instrument could occur if not observed.



This symbol, if noted on the instrument, references the instruction manual for operational and/or safety information.



Section 2.2 on page 19, Battery Installation

SPECIFICATIONS

Specification subject to change without notice.

pH mode

| | |
|-------------------------|-----------------|
| Range | -2.00 to 19.99 |
| Resolution (selectable) | 0.001/0.01/0.1 |
| Slope range | 58 ±3 mV/decade |

Millivolt mode

| | |
|------------|---|
| Range | -2000 to 2000 mV |
| Resolution | 0.1 mV |
| Accuracy | 0.2 mV or ±0.01% of reading, whichever is greater |

Temperature mode

| | |
|------------|---|
| Range | -10.0 to 110 °C (can also display °F) |
| Resolution | 0.1 °C |
| Accuracy | ±0.3 from 0–70 °C; ±1.0 from >70–110 °C |

Display: Custom LCD

Inputs: 1 BNC; 5-pin Hach pH/temperature or Hach temperature probe; 1 pin-tip

Power Requirements: 4 alkaline AA batteries

Input Impedance: >10¹² ohms

Instrument Drift: <40 μV/°C

Input Bias Current: <±1 picoamp at 25 °C; <±4 picoamp over full range

Environmental Requirements: 0 to 50 °C at 85% non-condensing relative humidity

Dimensions: 21.2 x 8.7 x 4.2 cm (8.35 x 3.43 x 1.65 in.)

Enclosure: Waterproof (meets IP67), chemical resistant, dust proof; meter will float.



OPERATION

DANGER

Handling chemical samples, standards, and reagents can be dangerous. Review the necessary Material Safety Data Sheets and become familiar with all safety procedures before handling any chemicals.

DANGER

La manipulation des échantillons chimiques, étalons et réactifs peut être dangereuse. Lire les Fiches de Données de Sécurité des Produits (FDSP) et se familiariser avec toutes les procédures de sécurité avant de manipuler tous les produits chimiques.

PELIGRO

La manipulación de muestras químicas, estándares y reactivos puede ser peligrosa. Revise las fichas de seguridad de materiales y familiarícese con los procedimientos de seguridad antes de manipular productos químicos.

GEFAHR

Das Arbeiten mit chemischen Proben, Standards und Reagenzien ist mit Gefahren verbunden. Es wird dem Benutzer dieser Produkte empfohlen, sich vor der Arbeit mit sicheren Verfahrensweisen und dem richtigen Gebrauch der Chemikalien vertraut zu machen und alle entsprechenden Material Sicherheitsdatenblätter aufmerksam zu lesen.

PERIGO

A manipulação de amostras, padrões e reagentes químicos pode ser perigosa. Reveja a folha dos dados de segurança do material e familiarize-se com todos os procedimentos de segurança antes de manipular quaisquer produtos químicos.

This manual describes the operation and use of the Hach *sension™ I* Portable pH/mV/Temperature Meter (see *Figure 1*).

This meter features a custom digital LCD display which simultaneously shows temperature and measurement results. This meter has all the features of a simple pH meter plus a millivolt mode, IP67 waterproof design, electrode holder, ergonomic design, and automatic buffer recognition.

The electrode holder on the back of the instrument allows the user to store the electrode and meter in one convenient package when not in use. The electrode holder is designed so the user can slip a vinyl electrode cover over the electrode tip, creating a humid environment that allows the electrode membrane to remain hydrated when not in use (see *Figure 2 Electrode Holder*).

The meter is designed to be maintenance-free. If the meter gets dirty, wipe the surface with a damp cloth. Use a cotton-tipped applicator to clean or dry the connectors if they get wet.

1.1 Unpacking the Instrument

Remove the instrument and accessories from the shipping container and inspect each item for any damage that may have occurred during shipping. Verify that all items listed on the packing slip are included. If any items are missing or damaged, contact Hach Customer Service, Loveland, Colorado for instructions. Hach's toll free phone number for customers within the United States is 800-227-4224. For customers outside the United States, contact the Hach office or distributor serving you.

1.1.1 Standard Accessories

- Batteries - 4 alkaline AA (not rechargeable)
- Instrument Manual
- May include electrode and related accessories (covered in the electrode manual).

SECTION 1, continued

Figure 1 Hach *sensio*n1 Meter

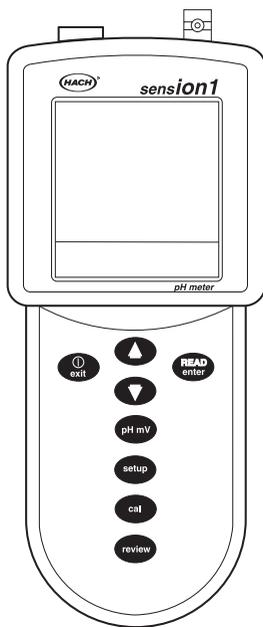
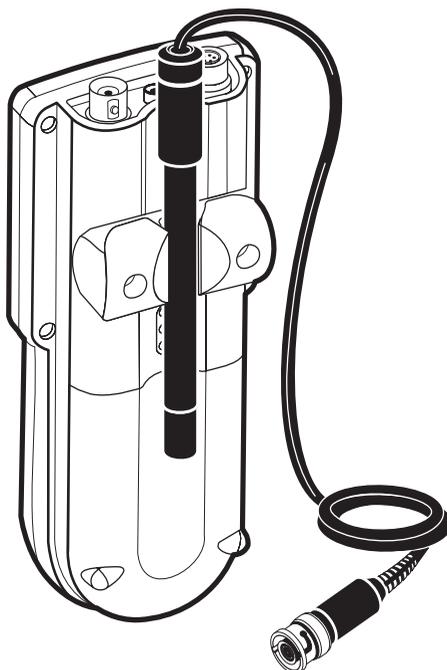


Figure 2 Electrode Holder



SECTION 1, continued

1.2 Keypad Description

Figure 3 illustrates the meter's keypad. The description and function of each key is given in Table 1.

Figure 3 *sensiOn1* Meter Keypad

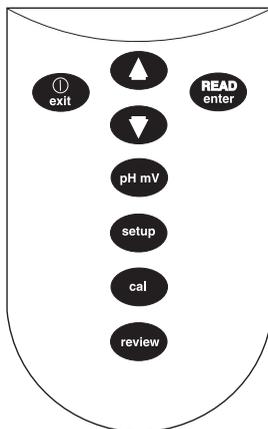


Table 1 Keys and Description

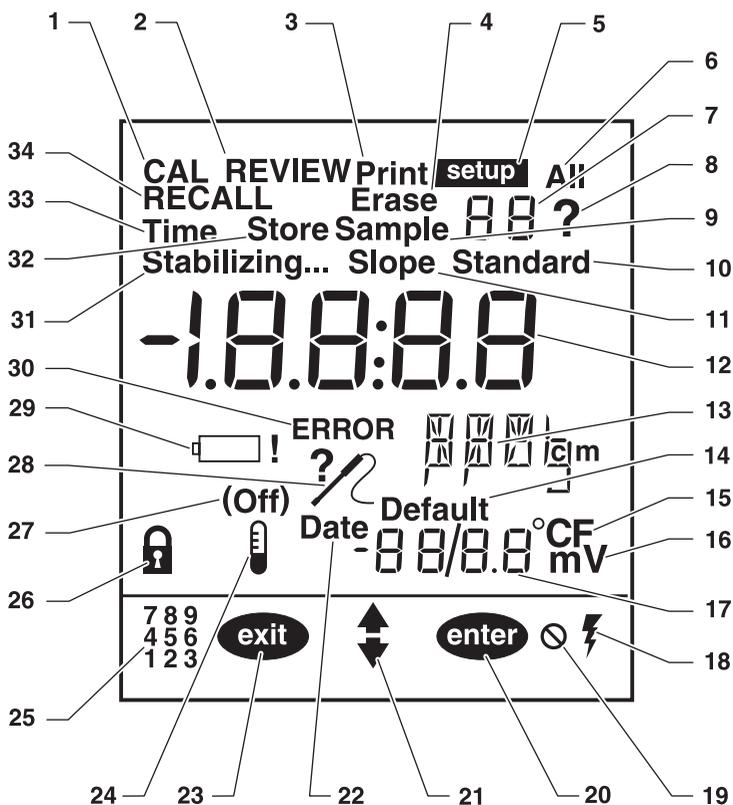
| Key | Description |
|-------------------|---|
| Exit/Power On-Off | Turns the instrument on; turns it off from the Reading mode. Acts as a NO or CANCEL key when the question mark icon is flashing. Performs the following and returns to the Reading mode: <ul style="list-style-type: none">• Exits the Setup mode• Aborts a calibration• Exits a calibration review |
| Arrow Keys | Scroll between options in Setup mode. Change the default temperature when a temperature probe is not in use. In Setup mode, back up one step toward the Reading mode. |
| READ/ENTER Key | Acts as a YES key when the question mark is flashing. Allows user to edit a setup when the setup number is flashing. Initiates a new measurement when the meter has stabilized in the Display Lock Enabled mode. |
| pH/mV Key | Toggles between pH value and mV value in Reading, Calibration, and Cal Review modes. |
| Setup Key | Enters Setup mode (from Reading mode only). |
| Cal Key | Enters Calibration mode (from Reading mode only). |
| Review Key | Enters Calibration Review mode (from Reading mode only). |

1.3 Display Fields and Icons

The display has two screens. The upper screen displays measurements or standard values, the operation mode in use, slope, sample/default temperature, pH or mV units, error codes, and indicates if the meter reading is stable. The lower screen displays the active keys.

Figure 4 shows the icons and screens displayed by the meter and Table 2 describes each element. Several icons on the display are not used by the portable pH *sension1* meter (indicated by NA in the table), but will be displayed if the power key is held down for several seconds.

Figure 4 Display Elements



SECTION 1, continued

Table 2 Main Display Elements

| Item No. | Description |
|----------|---|
| 1 | Indicates meter is in Calibration mode. If the ? is flashing, calibration is necessary. |
| 2 | Indicates meter is in Calibration Review mode. |
| 3 (NA) | Indicates data is being sent to a printer/computer. |
| 4 (NA) | Indicates recalled data that is currently displayed is being erased. |
| 5 | Indicates meter is in Setup mode. |
| 6 (NA) | Indicates all data points are being printed or erased. |
| 7 | Numerical field that displays Setup, Sample, and Standard numbers when those words are displayed with the number. If Standard and 1 are displayed, the meter is measuring Standard 1. |
| 8 | Flashing ? and CAL indicate calibration is necessary. Also a prompt to press the ENTER or EXIT key. |
| 9 | Indicates the meter is measuring a sample (sample number is displayed to the right). |
| 10 | Indicates the meter is measuring a standard (standard number is displayed above). |
| 11 | Indicates the displayed number is the electrode slope. |
| 12 | Numerical field that displays the slope and pH or mV values of standards and samples. |
| 13 | Indicates measurement units (pH or mV). |
| 14 | When Default is displayed, the meter is using the default temperature value to calculate the temperature correction for the pH value. |
| 15 | Temperature units (choice of °C or °F). |
| 16 | Indicates the value displayed in small numerical field (item 17) is in millivolts. |
| 17 | Numerical field that displays temperature value. |
| 18 (NA) | Indicates meter is using AC power (only displayed when in the docking station). |
| 19 | Indicates an inactive key has been pressed and that function is not allowed. |
| 20 | Indicates ENTER key is active. |
| 21 | Indicates arrow keys are active. |
| 22 (NA) | In Setup mode, it indicates the date is being set. |
| 23 | Indicates EXIT key is active. |
| 24 | Indicates temperature compensation is being used. |
| 25 (NA) | Indicates numeric part of the keys is active. |
| 26 | Display Lock icon. Displayed with item 27. |
| 27 | Indicates whether Display Lock setting is On or Off . |
| 28 | Faulty probe connection or incorrect probe attached. May also indicate the calibration is questionable. Usually displayed with an error code. |
| 29 | Low battery icon. Change batteries as soon as possible. |
| 30 | Indicates a meter function problem. |

SECTION 1, continued

Table 2 Main Display Elements (Continued)

| Item No. | Description |
|----------|---|
| 31 | When on or flashing, Stabilizing... indicates signal from sample is not yet stable. When it disappears, the reading is stable and may be recorded. |
| 32 | Used with ? icon. Asks if user wants to store the displayed sample data or the calibration that has been just completed. |
| 33 (NA) | Used with large display to indicate the time is being set. |
| 34 (NA) | Indicates meter is in recall mode and the data displayed is stored data. |

1.4 Audible Signals

The meter will beep under certain conditions:

- when a non-functional key press is made (one beep)
- when display lock is enabled and measurement stability is reached in reading mode (three beeps)
- any time measurement stability is reached during calibration mode, regardless of the Display Lock setting
- to signal an error condition.

2.1 Instrument Description

This durable portable *sensⁱon™1* pH/mV meter is designed for easy hand-held use when measuring samples in the field or laboratory. The meter operates on 4 alkaline batteries with an estimated battery life of at least 500 hours of continuous use.

The meter measures from -2.0 to 19.99 pH units and the sample temperature. Displayed pH values are temperature corrected using the measured sample temperature or a default temperature setting. The meter also measures and displays mV.

2.2 Battery Installation

CAUTION

Use only alkaline batteries in this product. Other types of batteries can result in safety hazards.

PRUDENCE

Utiliser seulement des piles alcalines dans cet appareil. Les autres types de piles peuvent créer des risques pour la sécurité.

ATENCIÓN

Utilice solamente baterias alcalinas en este producto. El uso de otros tipos de baterias puede causar riesgos de seguridad.

VORSICHT

Verwenden Sie in diesem Produkt nur Alkali-Batterien. Die Verwendung anderer Batterien gefährdet die Betriebssicherheit.

ATENÇÃO

Use somente baterias alcalinas neste produto. Outros tipos de baterias podem resultar em risco a segurança.

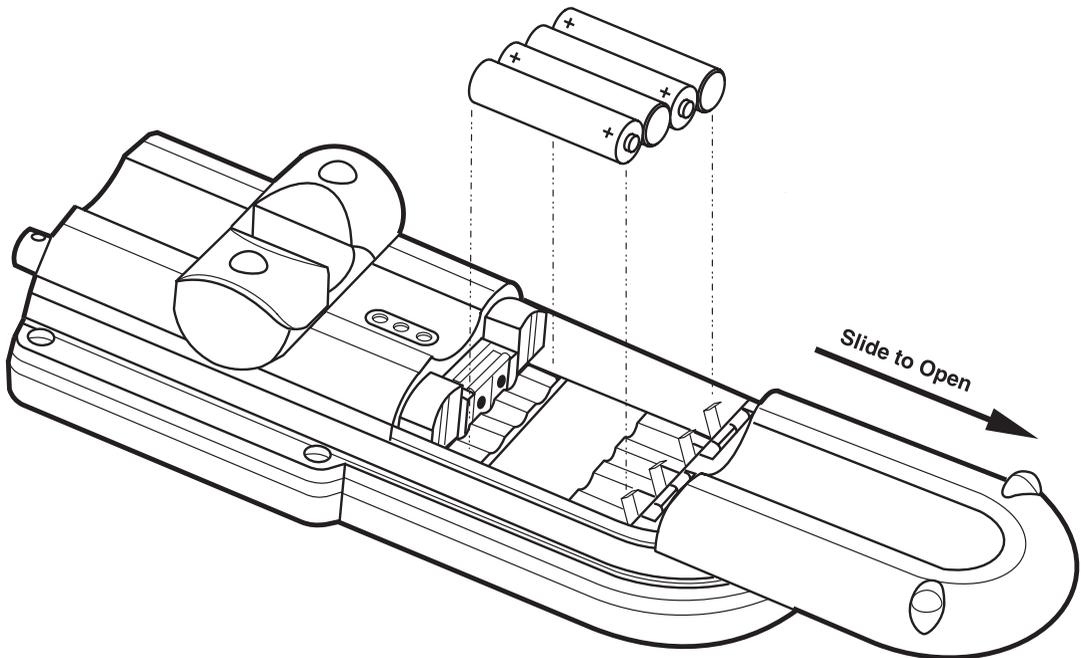
The *sensⁱon1* meter requires four alkaline AA batteries for portable operation. **Other types of batteries should not be used in the meter.** The battery compartment access panel is on the bottom of the instrument. To access the battery compartment, turn the instrument over and position the connectors away from you. Hold the instrument between your hands and use your thumbs to slide the panel towards you. See *Figure 5*.

SECTION 2, continued

When battery replacement is necessary, replace all four batteries. The position of the batteries in the instrument is important. Icons of the correct orientation are molded into the bottom of the battery compartment.

With the connectors pointing away from you, insert a battery in left-most position so the positive end faces you. Insert the other three batteries so the positive and negative ends alternate (i.e., +, -, +, -). Insertion is easiest if the battery is pushed against the spring connector first, then pressed into place.

Figure 5 **Battery Replacement**



2.3 Probe Connections

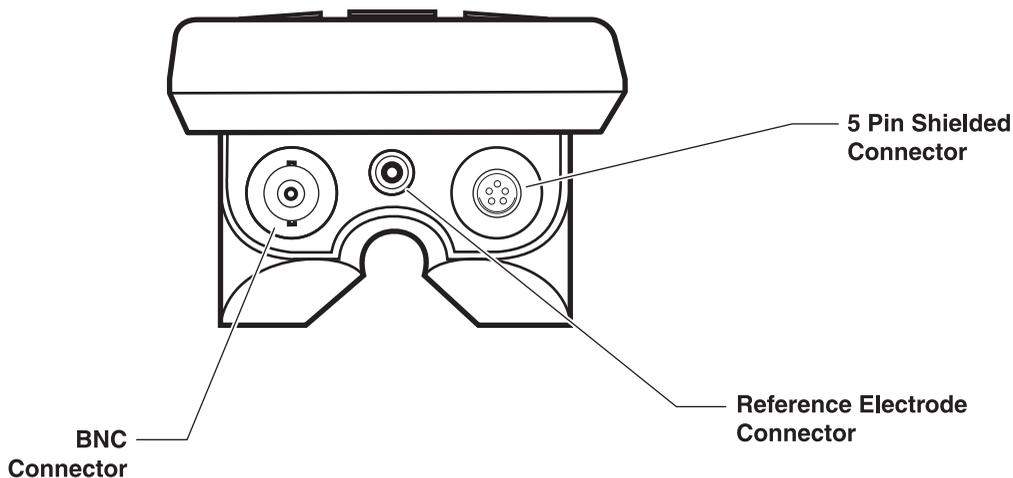
Attach electrodes with 5-pin connectors to the sensor input by lining the pins up with the holes in the meter port (see *Figure 6*). Push the electrode connector toward the instrument.

For probes with BNC connectors, slide the connector into the input. Push towards the instrument and turn clockwise to lock into position.

Electrodes may be attached to both the 5-pin and BNC connectors at the same time as long as they are **not** in contact with the same solution. To select either of the connectors for measurement, go to the **Setup 1** menu and select one.

When using half-cells, connect reference electrodes with pin tip connectors by pushing the connector straight into the center reference input. If using a combination electrode with a BNC or 5-pin connector, the reference pin-tip jack is not used.

Figure 6 Electrode Connectors



SECTION 2, continued

2.3.1 Temperature Probe Connection

Hach electrodes with the 5-pin connector have the temperature sensing unit included in the electrode probe. If using an electrode with BNC connector, connect a Hach Temperature Probe (Cat. No. 51980) to the 5-pin connector on the meter (see *Figure 6*). Or measure the temperature manually and enter the value as the default temperature using the arrow keys.

2.4 Turning the Meter On

After the batteries are installed, turn the instrument on using the **I/O/EXIT** key (located on the upper left side of the keypad). Press the key once to power the instrument up. The display will show the software version number, then move to the Reading mode.

2.5 Temperature Measurement

The meter displays temperature in the range of -10.0 to 110 °C simultaneously with sample results. If a temperature probe is properly connected, actual temperature measurements are displayed in the temperature/mV field.

The meter requires a temperature to calculate temperature-corrected pH readings. The meter uses temperature data from one of three sources:

- The temperature sensor in the sample
- The factory default setting (25 °C)
- A user-entered setting (which becomes the default)

If a temperature probe is connected properly, the meter will display the current sample temperature and will not allow the temperature to be manually set.

To manually set the temperature

When a temperature probe is not used to supply the temperature for pH temperature compensation, the temperature must be set manually or the factory default temperature (25 °C) will be used. In either case, **Default** will be displayed above the temperature.

To change the default temperature, first put the meter in Reading or Calibration mode. Press the arrow keys to increase or decrease

SECTION 2, continued

the displayed default temperature value to the desired temperature. The value adjusts in 0.1 °C (0.1 to 0.2 °F) increments.

Note: Acceptable temperatures range from -10 to 110 °C.

To change the units of temperature measurement, see *Section 3.1.3* on page 26.

2.6 Millivolt Measurements

The meter can be used to measure absolute millivolts (mV). To display a current millivolt reading, press the **pH/mV** key. The mV value is displayed with **mV** in the units field.

Absolute millivolts are displayed with 0.1 mV resolution in the range of -2000 to 2000. The millivolt mode is useful when measuring oxidation-reduction potential, performing potentiometric titrations, or preparing calibration curves. Detailed instructions for any Hach electrode are given in the electrode instruction manual. Titration instructions are included in the Hach ORP Electrode Instruction Manual, or in standard analytical chemistry texts.

2.7 Automatic Shut-off Function

The meter is equipped with an automatic shut-off feature to prolong battery life. The meter will automatically shut off 15 minutes after the last key press unless the meter is in Calibration mode. If it is in Calibration mode, automatic shutoff will occur four hours after the last key press.

Press the **I/O/EXIT** key after automatic shut-off to restore power to the instrument.

3.1 Setup Menu

The *sension™ 1* Portable pH meter has a setup menu that allows the analyst to choose options for connector choice, display lock, temperature units, automatic buffer recognition of pH 6.86 or 7.0, and the display resolution.

To access the Setup menu, press the **SETUP** key. The arrow icons will be displayed, indicating that additional options are available within the menu. Press the up or down arrow key to scroll to the desired option, then press **ENTER**. *Table 3* describes these options.

Table 3 Setup Options

| Setup Number | Option Description |
|--------------|--|
| 1 | Use BNC or 5-pin connector |
| 2 | Display lock (On or Off) |
| 3 | Temperature units (°C or °F) |
| 4 | Measurement resolution (0.0, 0.00, or 0.000) |
| 5 | Automatic buffer recognition (pH 7.00 or 6.86) |

3.1.1 Choosing the Probe Connector

This setup ensures the potential from the appropriate electrode is detected by the meter. Connect only one electrode to the meter.

1. From the reading mode, press **SETUP**.
2. The **Setup** icon and the number **1** (flashing) will be displayed. Change the connector choice by pressing **ENTER**; this toggles the selection between **BNC** and **5 pin**.
3. When the desired option is selected, press **EXIT** to return to the reading mode.

SECTION 3, continued

3.1.2 Turning Display Lock Off and On

Setup 2 is Display Lock option. This feature stops measurement reading fluctuation on the display once a stable reading is reached. The default setting is Off.

When this feature is not used, the measurement value may continue to fluctuate and **Stabilizing...** may be displayed.

1. From the reading mode, press **SETUP**.
2. The **Setup** icon and the number **1** (flashing) will be displayed. Press the up arrow once so the Setup number is **2**.
3. Change the display lock status by pressing **ENTER**; this toggles the display lock between off and on. When the display lock is disabled, the Display Lock icon and **Off** are displayed. When this feature is enabled, the Display Lock icon is displayed without **Off**. When this feature is enabled, the Display Lock icon is displayed when the stabilization criteria are met.
4. When the desired option is selected, press **EXIT** to return to the reading mode.

3.1.3 Selecting Temperature Units

1. From the reading mode, press **SETUP**.
2. The **Setup** icon and the number **1** (flashing) will be displayed. Press the up arrow until the Setup number is **3**.
3. Change the temperature unit by pressing **ENTER**; this key toggles the temperature units between °C and °F. The default is °C.
4. When the desired option is selected, press **EXIT** to return to the reading mode.

SECTION 3, continued

3.1.4 Selecting Measurement Resolution

The meter can display measurement values to tenths (0.0), hundredths (0.00) or thousandths (0.000). The default is hundredths.

1. From the reading mode, press **SETUP**.
2. The **Setup** icon and the number **1** (flashing) will be displayed. Press the up arrow three times so the Setup number is **4**.
3. Change the resolution by pressing **ENTER**; this toggles between the three resolution options.
4. When the desired option is selected, press **EXIT** to return to the reading mode.

3.1.5 Selecting Auto Buffer Recognition

The *sensioni* Portable pH Meter is designed to auto-recognize and calibrate on 4.01, 6.86 or 7.00, and 10.01 pH buffers. Buffers with pH values other than these cannot be used to calibrate the *sensioni* meter.

The only selection option for pH buffer auto recognition is 6.86 or 7.00. The default is pH 7.00. To change this option:

1. From the reading mode, press **SETUP**.
2. The **Setup** icon and the number **1** (flashing) will be displayed. Press the up arrow until the Setup number is **5**.
3. Change the buffer value by pressing **ENTER**; this toggles the between the choices 6.86 and 7.00.
4. When the desired option is selected, press **EXIT** to return to the reading mode.

3.2 Calibrating the Meter

Hach recommends a daily two- or three-point calibration using buffers that bracket the sample pH. This will verify the electrode is working properly and allow the slope value to be stored.

SECTION 3, continued

3.2.1 Performing a Calibration Using pH 4, 6.86, 7, and 10 Buffers

1. If using a probe without a temperature sensor, see *Section 2.3.1* on page 22 and *Section 2.5* on page 22 for information about obtaining and using a default temperature.
2. Prepare two pH buffers, either 4.01 and 7.00 (or 6.86), or 7.00 (or 6.86) and 10.01, according to the electrode instruction manual.

Note: Use a 6.86 or 7.0 pH buffer for the mid-range buffer. To view or change the setting for the mid-range buffer see *Section 3.1.5*.

Note: The pH values for the buffers are given for 25 °C. If the sample temperature is not 25 °C, the pH values displayed for the buffers will reflect the correct pH value for the sample temperature.

3. Press **I/O/EXIT** to turn the instrument on. From the Reading mode, press **CAL**. **CAL** and flashing ? will appear in the upper display area, along with **Standard** and **1**.
4. Press **READ/ENTER**. The temperature and pH values will be updated until a stable reading is reached.

Note: If the meter is measuring in pH mode, it automatically moves to the next calibration step when stabilization is reached (indicated by three beeps). If measuring in mV mode, the three beeps will still sound when the stabilization occurs, but **ENTER** must be pressed to accept the reading. This lets the operator control the acceptance point of the buffer.

5. When the reading has stabilized or been accepted, the standard number will change to **2**.
6. Remove the probe from the first buffer and rinse with deionized water. Place the probe in the second buffer.
7. Repeat *steps 5* and *6* for the third buffer and press **EXIT**.
8. Press **READ/ENTER**. The temperature and pH values will be updated until a stable reading is reached.
9. When the reading has stabilized or been accepted, the slope value and the **Store** and ? icons will appear. Verify the slope value is within the ranges specified in the electrode manual.

10. To save the calibration and return to the Reading mode, press **ENTER**. To exit the calibration without saving it and return to the reading mode, press **EXIT**.

3.3 Reviewing the Calibration

1. From the pH Reading mode, press the **REVIEW** key.
2. The display will show the standard number, standard pH, and temperature (view mV value by pressing **pH/mV**). Press the up arrow once.
3. The meter will continue to scroll through the standard information with each press of the up arrow key. When all the standards have been displayed, press the up arrow key again.
4. The meter will display the slope and offset of the calibration curve.
5. To exit Cal Review mode, press **EXIT**. To review any standard or slope information again, press the down arrow.

3.4 Measuring Samples

After successful calibration, the meter is ready to measure samples. See instructions in the electrode manual for more information and specific steps for using the electrode.

1. Place the electrode in the sample. Press **READ/ENTER**. **Stabilizing...** will appear, along with the sample temperature and the pH or mV reading. These values may fluctuate until the system is stable.
2. When the reading is stable **Stabilizing...** will disappear. If the Display Lock is enabled, the display will “lock in” on the pH or mV and sample temperature. If the Display Lock is off, the display will show the current reading and temperature, but the values may fluctuate.
3. Record the pH or mV value.
4. Remove the electrode from the sample, rinse with deionized water and place the electrode in the next sample. Repeat Steps 1-3 for each sample.
5. When measurements are complete, press the **I/O/EXIT** key to turn the meter off. Rinse the electrode with deionized water and blot dry. Replace the protective cap on the electrode and put the electrode in the electrode holder. To store the electrode for more than 30 days, see the electrode manual for specific instructions.

4.1 Introduction

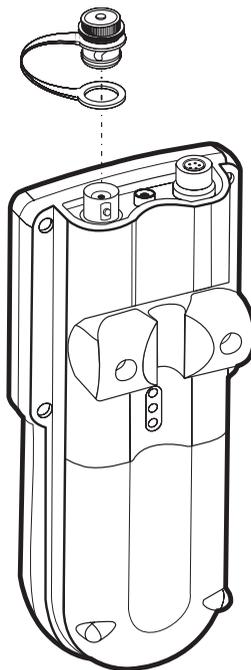
Correcting problem conditions with the *sensio*[™] electrochemical meters is limited to responding to the error message displayed. Other problems must be handled by a Hach technician at a service center. Refer to *REPAIR SERVICE* on page 38. **Do not** attempt to service the meter as there are no field-serviceable parts. Opening the meter case will void the warranty.

4.2 Shorting Test

This test detects the meter offset.

1. Turn the meter on. Connect the shorting cap to the BNC connector (see *Figure 7*). Unplug any electrodes from the 5-pin connector. Select the BNC connector from Setup 1.
2. Change the output to display in mV (press **pH/mV** to toggle between pH and mV readings). After the meter has stabilized, simultaneously press **CAL** and **ENTER**. The display should show **0.0 mV**. If it does not, contact Hach Service.

Figure 7 Attaching Shorting Cap to The BNC Connector



SECTION 4, continued

4.3 Error Codes

Error codes indicate a functional problem with the meter and/or the electrode. Error code numbers will appear in the temperature field along with other icons. *Table 4* describes the possible error codes and some possible solutions to eliminate the cause.

Table 4 Error Codes

| Error Code | Error Name & Display Icons | Description |
|-------------------|--|--|
| 2 | Cal slope error. ERROR and SLOPE will be displayed. | Calibration slope is too high or low. Ensure correct pH buffers are used. Be sure a pH probe is connected to the meter. Disconnect any probe connected to the BNC connector. |
| 3 | Cal Std Error. ERROR, ENTER, CAL and Standard will be displayed. | The value read will not work in the calibration algorithm. Ensure one buffer was not measured twice and that the correct buffers were used. If not, repeat calibration with new buffers. |

4.4 Meter Service Request Questionnaire

1. What is the complete lot code of the meter and electrode?
2. On what date was the meter purchased?
3. How long has the meter been in use?
4. What types of samples are being tested?
5. What is the temperature of the samples being tested?
6. How often is the meter being used?
7. How is the meter being stored between uses?
8. If the meter has been in use for a while, what maintenance has been performed?
9. Describe the suspected problem or failure of the meter.
10. Please have your meter, electrode, buffers/standards, and this completed questionnaire near the phone before calling technical support.



GENERAL INFORMATION

At Hach Company, customer service is an important part of every product we make.

With that in mind, we have compiled the following information for your convenience.

REPLACEMENT PARTS

REQUIRED REAGENTS

| Description | Quantity Required | | Cat. No. |
|---|-------------------|-------------|----------|
| | Per Test | Unit | |
| Buffer, Powder Pillows | | | |
| pH 4.01, color-coded red | 1..... | 15/pkg..... | 22269-95 |
| pH 7.00, color-coded yellow..... | 1..... | 15/pkg..... | 22270-95 |
| pH 10.00, color-coded blue | 1..... | 15/pkg..... | 22271-95 |
| Buffer Solutions | | | |
| pH 4.01, color-coded red | 20 mL ... | 500 mL..... | 22834-49 |
| pH 7.00, color-coded yellow..... | 20 mL ... | 500 mL..... | 22835-49 |
| pH 10.01, color-coded blue | 20 mL ... | 500 mL..... | 22836-49 |
| pH Electrode Storage Powder Pillows | | 20/pkg..... | 26573-64 |
| pH Electrode Storage Solution..... | | 475 mL..... | 50301-49 |

REQUIRED APPARATUS

| | | | |
|--|--------|-----------|----------|
| Beaker, poly, 50 mL | 1..... | each..... | 1080-41 |
| Electrode, pH combination, w/temp, 5-pin connector | 1..... | each..... | 51910-00 |
| <i>sensio</i> TM 1 Portable pH Meter | 1..... | each..... | 51700-00 |
| Shorting Cap, BNC | 1..... | each..... | 50071-00 |
| Temperature Probe, 5-pin..... | 1..... | each..... | 51980-00 |

OPTIONAL APPARATUS

| | | | |
|---|--|-----------|----------|
| Demineralizer Bottle, 177 mL..... | | each..... | 14299-00 |
| Electrode, pH, gel-filled, w/temp, 5-pin connector..... | | each..... | 51935-00 |
| Electrode, pH combination, flat end, 5-pin | | each..... | 51915-00 |
| Electrode, reference, single junction | | each..... | 50220-00 |
| Electrode, reference, double junction..... | | each..... | 50225-00 |
| Electrode Stand | | each..... | 45300-00 |
| Electrode Stand with Electromagnetic Stirrer, 115 VAC | | each..... | 45300-01 |
| Electrode Stand with Electromagnetic Stirrer, 230 VAC | | each..... | 45300-02 |
| Electrode Washer..... | | each..... | 27047-00 |
| <i>sensio</i> TM 2 Portable pH/ISE Meter | | each..... | 51725-11 |
| <i>sensio</i> TM 3 Benchtop pH Meter, 115 V, with electrode | | each..... | 51750-10 |
| <i>sensio</i> TM 3 Benchtop pH Meter, 220 V, with electrode | | each..... | 51750-11 |
| <i>sensio</i> TM 4 Benchtop pH/ISE Meter, 115 V, No. American style Plug . | | each..... | 51775-10 |
| <i>sensio</i> TM 4 Benchtop pH/ISE Meter, 230 V, European Style Plug | | each..... | 51775-11 |
| Stir Bar, $\frac{7}{16} \times \frac{3}{16}$ in. | | each..... | 45315-00 |
| Thermometer, mercury, -20 to 110 °C | | each..... | 20959-11 |

HOW TO ORDER

By Telephone:

6:30 a.m. to 5:00 p.m. MST
Monday through Friday
(800) 227-HACH
(800-227-4224)

By FAX:

(970) 669-2932

By Mail:

Hach Company
P.O. Box 389
Loveland, Colorado 80539-0389
U.S.A.

Ordering information by E-mail:

orders@hach.com

Information Required

- Hach account number (if available)
- Your name and phone number
- Purchase order number
- Brief description or model number
- Billing address
- Shipping address
- Catalog number
- Quantity

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Hach Technical and Customer Service Department personnel are eager to answer questions about our products and their use. Specialists in analytical methods, they are happy to put their talents to work for you. Call **1-800-227-4224** or E-mail **techhelp@hach.com**.

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Hach maintains a worldwide network of dealers and distributors. To locate the representative nearest you, send E-mail to **intl@hach.com** or call (970) 669-3050.

In Canada:

Hach Sales & Service Canada Ltd.; Manitoba, Canada
Telephone: (204) 632-5598; FAX: (204) 694-5134

REPAIR SERVICE

Authorization must be obtained from Hach Company before sending any items for repair. Please contact the Hach Service Center serving your location.

In the United States:

Hach Company
100 Dayton Ave.
Ames, Iowa 50010
(800) 227-4224 (U.S.A. only)
Telephone: (515) 232-2533
FAX: (515) 232-1276

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Hach Sales & Service Canada Ltd.
1313 Border Street, Unit 34
Winnipeg, Manitoba
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(800) 665-7635 (Canada only)
Telephone: (204) 632-5598
FAX: (204) 694-5134
E-mail: canada@hach.com

Other locations:

Hach Company World Headquarters,
P.O. Box 389
Loveland, Colorado 80539-0389 U.S.A.
Telephone: (970) 669-3050
FAX: (970) 669-2932

WARRANTY

Hach warrants most products against defective materials or workmanship for at least one year from the date of shipment; longer warranties may apply to some items.

HACH WARRANTS TO THE ORIGINAL BUYER THAT HACH PRODUCTS WILL CONFORM TO ANY EXPRESS WRITTEN WARRANTY GIVEN BY HACH TO THE BUYER. EXCEPT AS EXPRESSLY SET FORTH IN THE PRECEDING SENTENCE, HACH MAKES NO WARRANTY OF ANY KIND WHATSOEVER WITH RESPECT TO ANY PRODUCTS. HACH EXPRESSLY DISCLAIMS ANY WARRANTIES IMPLIED BY LAW, INCLUDING BUT NOT LIMITED TO ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

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LIMITATION OF DAMAGES: IN NO EVENT SHALL HACH BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND FOR BREACH OF ANY WARRANTY, NEGLIGENCE, ON THE BASIS OF STRICT LIABILITY, OR OTHERWISE.

This warranty applies only to Hach products purchased and delivered in the United States.

Catalog descriptions, pictures and specifications, although accurate to the best of our knowledge, are not a guarantee or warranty.

For a complete description of Hach Company's warranty policy, request a copy of our Terms and Conditions of Sale for U.S. Sales from our Customer Service Department.

Hach warrants the meter against defective materials or workmanship for three years from the date of shipment. The Docking station has a one year warranty from the date of shipment.



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FOR TECHNICAL ASSISTANCE, PRICE INFORMATION AND ORDERING:

In the U.S.A. - **Call toll-free 800-227-4224**

Outside the U.S.A. - **Contact the HACH office or distributor serving you.**

On the Worldwide Web - **www.hach.com**; E-mail - **techhelp@hach.com**
