Cat. No. 54550-18

sension8™

Dissolved Oxygen Meter

ap/dk 9/99 1ed

TRADEMARKS OF HACH COMPANY

AccuGrow®
AccuVac®
AccuVer®
ACS-Plus™
AgriTrak™
AluVer®
AmVer™
APA 6000™
AquaCheck™
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PrepTab™
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SofCheck™
SoilSys™
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TitraStir®
TitraVer®
ToxTrak™
UniVer®
VIScreen™
Voluette®
WasteAway™
WaveCheck™
ZincoVer®

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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 Power Connection***

⚠ ***Section 2.3 Printer and Computer Connections***

⚠ ***Section 6.1 Connecting to Printers/Computers***

SPECIFICATIONS

Specifications subject to change without notice.

Oxygen Measurement:

Range	0-20 mg/L (ppm) 0-200% sat.
Accuracy	± 1% full scale
Temperature	0-50 °C

Resolution:

Oxygen Concentration	0.01 or 0.1 ppm (mg/L)
% Saturation	0.1%
Temperature	0.1 °C

Display: Custom LCD

Inputs:	**Outputs:**
5-pin shielded circular connector	RS232C

Power Requirements: 6–12 Vdc; use either Hach-supplied 115 or 230V, 50/60 Hz external power supply or a customer-provided supply with 50 mA output, 5.5-mm power plug with a 2.5 mm center post opening

Installation Category: II

Instrument drift: < 1%/day

Environmental requirements: 5 to 50 °C at 85% relative humidity, non-condensing

Meter dimensions: 15 x 25.4 x 8.37 cm (10.15 x 6 x 3.5 inches)

Enclosure: Water resistant (IP32), chemical resistant

Probe Dimensions (Model 50180):

Probe Length	150 mm
Body Diameter	12 mm
Cap	15 mm dia. x 35 mm
Cable Length	1, 3, or 15 meters
Connector	Fisher

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 Materialsicherheitsdatenblätter 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.

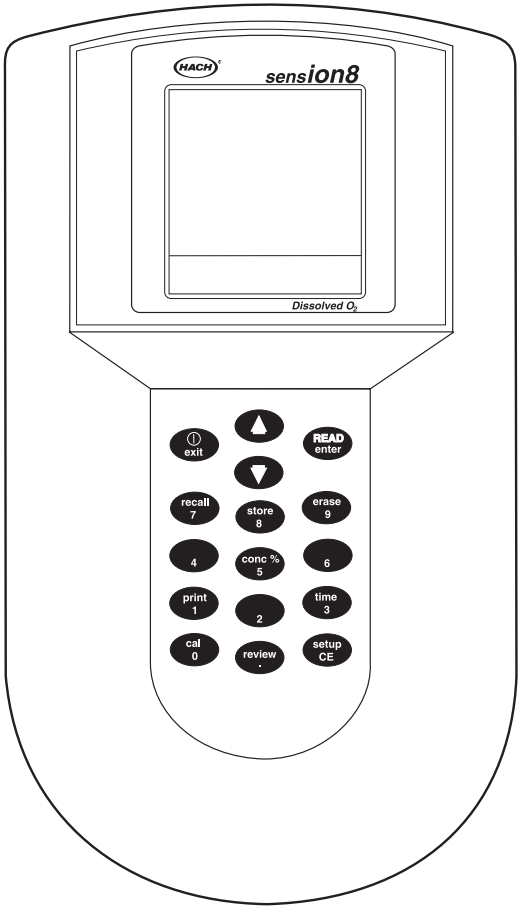
SECTION 1 INTRODUCTION

The versatile *sens**ion***™*8* Dissolved Oxygen Meter, shown in *Figure 1*, easily measures dissolved oxygen in aqueous solutions.

Important features include measurement in % saturation; autocalibration; a 99-point internal datalogging function; and altitude, barometric pressure, and salinity correction. The meter is microprocessor-controlled, has a sealed keypad, and can send data to a printer or computer.

The DO probe can also be equipped with the available BOD apparatus kit which allows it to be used in conjunction with an electromagnetic stir stand for BOD measurements.

Figure 1 *sension**8* Dissolved Oxygen Meter**



1.1 Unpacking the Instrument

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

1.1.1 Standard Accessories

- Instrument Manual
- Dissolved Oxygen Probe
- Probe-related accessories (covered in the electrode manual)
- Power adapter

1.1.2 Optional Accessories

- BOD Accessory Kit (See *Section 3.5* on page *41*.)
- 1000 mg/L Cobalt Standard
- Sodium Sulfite
- Probe Holder and Stirring Stand
- Barometer/altimeter

1.2 Keypad Description

Figure 2 illustrates the meter's keypad. *Table 1* describes the function of each key.

Figure 2 ***sension8*** **Dissolved Oxygen Meter Keypad**

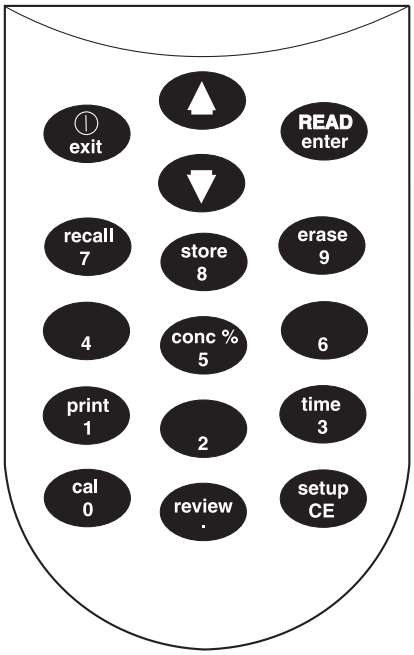


Table 1 Keys and Description

Key	Description
EXIT/POWER ON-OFF key	Turns the instrument on; turns it off from a Reading mode. Acts as a No or Cancel key when the question mark icon is illuminated. In Setup mode, backs up one step toward the Reading mode. Performs the following and returns to the most recent Reading mode: • Exits the Store, Erase, or Recall mode • Aborts a calibration • Exits a calibration review
UP and **DOWN ARROW** keys	Scroll between options in Setup mode. Scroll through data points in Store and Recall modes. Scroll between the option to print or erase one data point and the option to print or erase all data points.

Table 1 Keys and Description (Continued)

Key	Description
READ/ENTER key	Accepts numerical input. Acts as a “YES” answer when the question mark is flashing. Allows user to edit the setup when the setup number is flashing. Accepts the current Setup option when that option is flashing. Initiates a measurement when the meter has stabilized in the Display Lock Enabled mode.
RECALL key	Recalls stored sample data (from Reading mode only).
STORE key	Stores the current (displayed) measurement (from Reading mode only).
ERASE key	Erases recalled data points.
CONC% key	Toggles between dissolved oxygen concentrations displayed as % saturation and mg/L in Reading and Calibration Review modes.
PRINT key	Sends current or recalled data to a printer or a computer via the RS232 port on the docking station.
TIME key	Allows user to view the current time and date setup directly without using the Setup menu. In Recall Data and Calibration Review modes, the key toggles between the time and date of the stored measurement.
CAL key	Enters Calibration mode (from Reading mode only).
REVIEW key	Enters Calibration Review mode (from Reading mode only).
SETUP/CE key	Enters Setup mode (from Reading mode only). Clears a numeric entry when the keypad icon is displayed.

1.3 Display Fields and Icons

The display has two screens. The upper screen displays measurements or standard values, the operation mode in use, sample temperature, units, error codes, and a stable reading indicator. The lower screen displays the keys that are active.

Figure 3 shows the icons and fields displayed by the meter and *Table 2* describes each element. Some display icons are not used in this model of meter but will be displayed if the power key is held down for several seconds.

Figure 3 ***sension8*** **Display Elements**

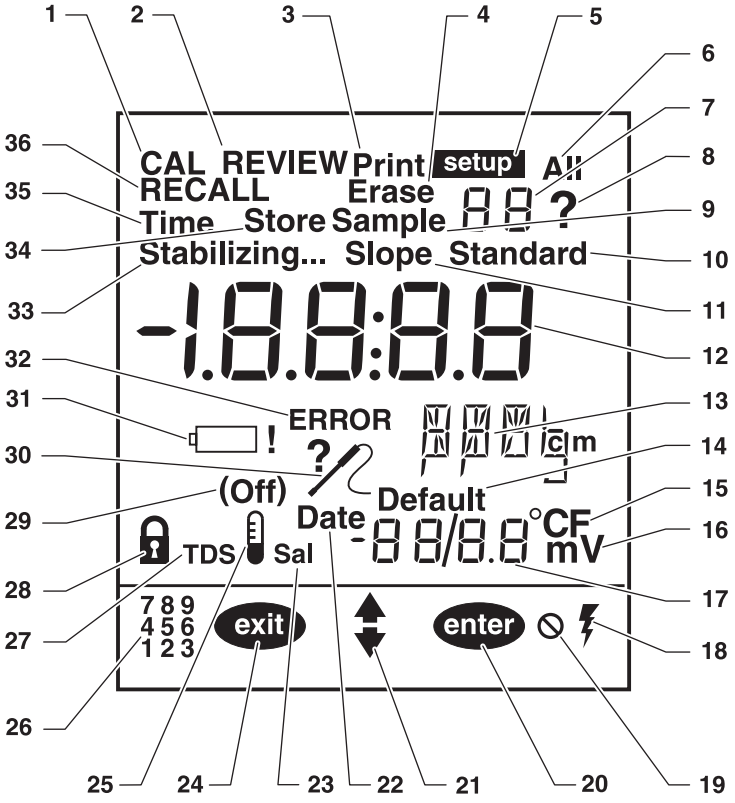


Table 2 Main Display Elements

Item No.	Description
1	Indicates meter is in Calibration mode. When the **?** is flashing, a calibration is necessary.
2	Indicates meter is in Calibration Review mode.
3	Indicates data is being sent to a printer/computer.
4	Indicates currently displayed, recalled data is being erased.
5	Indicates meter is in Setup mode.
6	Indicates all data points are being printed or erased.
7	Displays **Setup**, **Sample**, and **Standard** plus the number of the individual item when those words are displayed to the left of the number. For example, if **Sample** and **1** are displayed, the meter is displaying Sample 1.
8	Indicates calibration is necessary when display shows **Flashing ?** and **CAL**. Prompts to press the **ENTER** or **EXIT** key.
9	Indicates the meter is displaying recalled data (sample number is displayed to the right).

Table 2 Main Display Elements (Continued)

Item No.	Description
10	NA
11	NA
12	Main measurement display field.
13	Indicates measurement units (% or mg/L).
14	NA
15	Indicates the temperature units in use (choice of °C or °F).
16	NA
17	Displays temperature or month/day portion of the date.
18	NA
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	Indicates the date is being set or displayed.
23	Indicates meter is displaying sample salinity. Indicates salinity correction is being applied to dissolved oxygen measurement.
24	Indicates **EXIT** key is active.
25	NA
26	Indicates numeric key functions are active.
27	NA
28	Indicates the display is locked. Displayed with item 29.
29	Indicates Display Lock is **On** or **Off**.
30	Indicates faulty probe connection or incorrect probe attached. Usually displayed with an error code. Indicates the probe zeroing procedure cannot be completed.
31	NA
32	Indicates a meter function problem.
33	Indicates signal from sample is not yet stable when on or flashing.
34	Asks if the calibration that has been just completed or the displayed sample data should be stored. Used with **?** icon.
35	Indicates the time is being set or displayed. Used with large display.
36	Indicates meter is in recall mode and the displayed data is stored data.

1.4 Maintenance

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.

1.5 Audible Signals

The meter will beep under certain conditions:

- When a non-functional key press is made (one beep)
- When measurement stability is reached during calibration (three beeps)
- In reading mode, when the display lock is turned on and stability is reached (three beeps).

SECTION 2 INSTRUMENT SETUP

2.1 Instrument Description

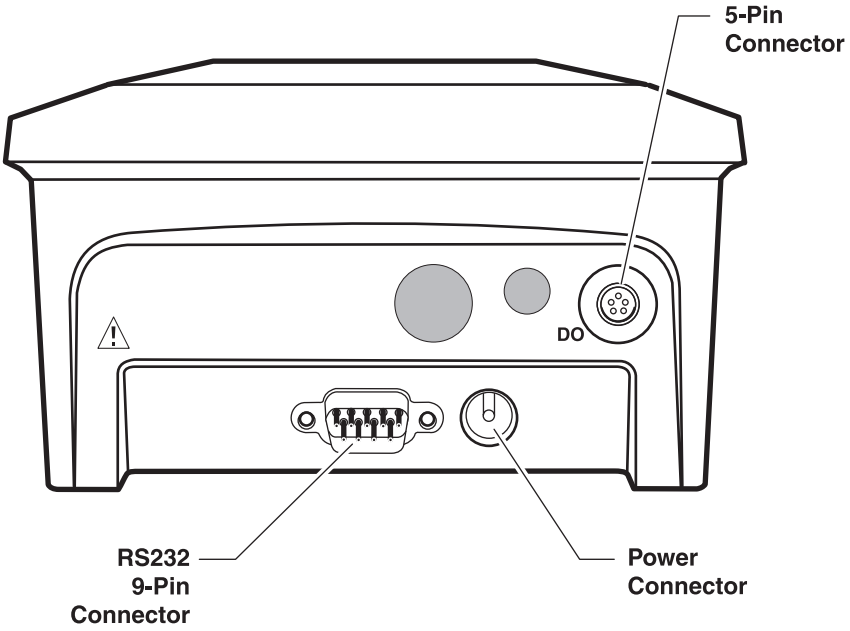
This *sens**ion**™8* Dissolved Oxygen Meter is designed for laboratory use and operates on 115/230 V ac power.

The meter measures from 0 to 20 mg/L or percent saturation and the sample temperature. Displayed dissolved oxygen values are corrected for temperature, altitude, barometric pressure, and salinity.

2.2 ⚠ Power Connection

A 115 or 230 V ac pin adapter connects the meter to line power. Plug the pin end of the adapter into the pin connector in the meter (see *Figure 4*). Then plug the adapter into the outlet.

Figure 4 *sension**8* Power and Probe Connections**



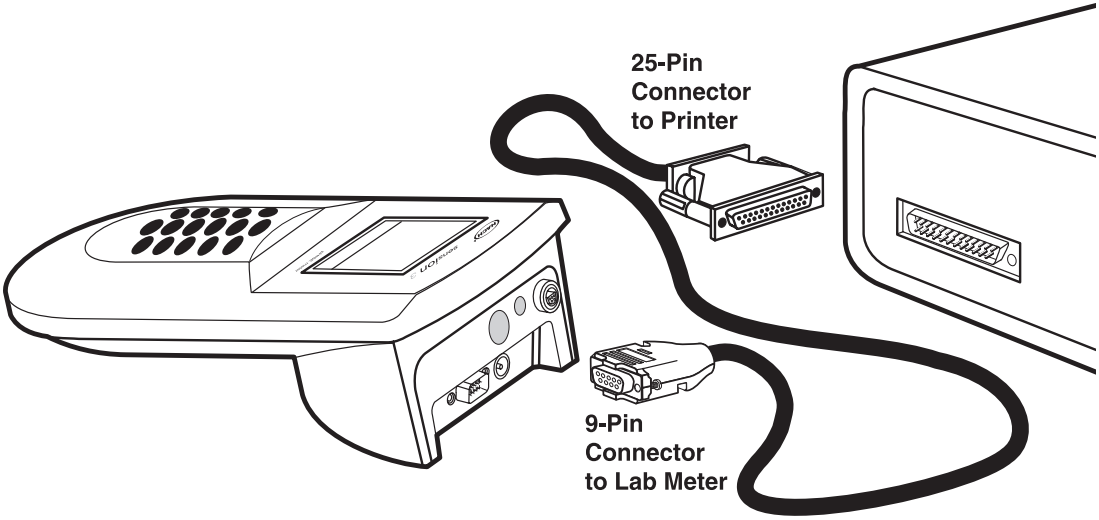
2.3 ⚠ Printer and Computer Connections

The meter can send data to a computer or printer via the 9-pin serial port (see *Figure 5*). **The printer cable and computer cable are different.** The printer cable is a 9-pin to 25-pin cable and the computer cable is a 9-pin to 9-pin cable. Be sure to use the correct cable.

The meter can print to serial printers without an adapter. For parallel printers, a converter and cable adapter are required. The Citizen PN60 printer requires a special Citizen adapter. Pressing the **PRINT** key will send the currently displayed data to the printer. The data may be either a current measurement or recalled data.

To send data to a computer, connect the 9-pin serial port on the meter to a 9-pin serial port of the computer. Press the **PRINT** key to send the currently displayed data to the computer. The data may be either a current measurement or recalled data.

Figure 5 Serial Port, 9-pin



2.4 Turning the Meter On

After plugging the meter into the wall, turn the instrument on using the **I/O/EXIT** key (located on the upper left side of the keypad). Press the key once to supply power to the instrument. The display will show the software version number, perform internal tests, then default to the Reading mode.

SECTION 3 INSTRUMENT OPERATION

3.1 Setup Menu

The Dissolved Oxygen Meter allows users to customize the display and ensure accurate results. Access Setup mode by pressing the **SETUP/CE** key located in the lower right hand corner of the keypad. The SETUP icon and a flashing **1** will appear in the upper right hand corner of the display. The flashing number indicates the setup available for adjustment. Use the up or down arrow keys to move from one setup to another.

3.1.1 Turning Display Lock Off and On

This setup feature displays continuous dissolved oxygen readings or locks the reading when the value stabilizes.

1. Press the **SETUP** key to access setup mode. A **1** will begin flashing in the upper right hand corner of the display.

2. Turn the lock function off and on by pressing the **ENTER** key. If the meter is in the continuous Read Mode, the lock function is not active and **off** will be displayed. If the lock function is active, **off** will not be displayed.

3. After selecting the desired setting, press the **EXIT** key. If the lock function has been activated, a lock icon will appear in the lower left corner of the display in the reading mode. The instrument will continue to display dissolved oxygen in % saturation or mg/L until the meter detects a stable value and locks the display.

4. To determine if the locked display value has changed, press the **READ** key.

3.1.2 Selecting Metric or English Units

This feature allows users to view the sample temperature in degrees Celsius or Fahrenheit.

- When °C is selected, the barometric pressure units are in mm Hg, and altitude units are in meters.

- When °F is selected, the barometric pressure units are in inches Hg, and altitude units are in feet.

1. To change the units, access the setup mode by pressing the **SETUP** key.

2. Press the **UP ARROW** once. A **2** will begin flashing in the upper right hand corner of the display.

3. Press the **ENTER** key to select °C or °F and press the **EXIT** key. The barometric pressure and altitude units will change automatically.

3.1.3 Selecting Measurement Resolution

This feature changes the resolution for dissolved oxygen concentrations displayed in mg/L.

1. To change the resolution, access the setup mode by pressing the **SETUP** key.

2. Press the **UP ARROW** twice. A **3** will begin flashing in the upper right hand corner of the display.

3. Press the **ENTER** key to select a resolution of 0.0 or 0.00 mg/L and press the **EXIT** key.

3.1.4 Adjusting for Sample Salinity.

This feature adjusts the displayed dissolved oxygen concentration in mg/L based on the sample's salinity.

Note: *When the* **Sal** *icon is displayed during the Read Mode, a salinity correction calculation is applied to the dissolved oxygen concentration in mg/L. The dissolved oxygen concentration in % saturation is the ratio of the displayed concentration in mg/L to the equilibrium dissolved oxygen concentration for the sample's temperature and salinity plus barometric pressure and altitude entered in the meter.*

Determine the salinity of the sample using an Electrolytic Conductivity Meter. The units for salinity are parts per thousand (0/00). See *Table 7* on page *65*.

1. After the salinity of the sample has been determined, access the setup mode by pressing the **SETUP** key.

2. Press the **UP ARROW** three times. A **4** will begin flashing in the upper right hand corner of the display. The display will show the current salinity factor and the **Sal** icon.

3. To change the salinity factor, press the **ENTER** key. The number pad icon will appear in the lower display.

4. Use the number keys to enter a salinity factor ranging from 0 to 42. Press the **EXIT** key to leave the value unchanged.

5. Press the **ENTER** key and then the **EXIT** key when the desired salinity factor has been entered. The meter will return to the Read Mode.

3.1.5 Changing the Barometric Pressure.

Changes to the Barometric Pressure feature alter displayed dissolved oxygen in the % saturation mode. These changes **do not** calibrate the Dissolved Oxygen meter or change the displayed dissolved oxygen concentration when reading in mg/L.

The Barometric Pressure setup feature is used alone or in conjunction with the Altitude Adjustment feature. The barometric pressure entry in this setup must be correctly combined with the Altitude setup for the displayed % saturation to be accurate.

Using Sea Level Equivalent Barometric Pressures
A new barometric pressure must be entered when the local barometric pressure changes. The sea level equivalent barometric pressure is obtained from weather broadcasts on radio, TV, or from local airports. The meter will automatically convert these values to the local, true pressure if the local altitude is entered in the next setup.

Note: *If using millibars (mbar), see Table 12 and Table 13 in SECTION 9 for converting mbar to mmHg or inches Hg.*

Using True Barometric Pressures
If using the true barometric pressure from a mercury barometer located near the meter, the Altitude entry must be set to 0 meters (0 feet).

When the meter arrives from the factory, the default pressure is 760 mm Hg. To change the value:

1. Access the setup mode by pressing the **SETUP** key.

2. Press the **UP ARROW** four times. A **5** will begin flashing in the upper right hand corner of the display. The current barometric pressure will be displayed.

3. To change the value press the **ENTER** key. The number pad icon will appear in the lower display.

4. Use the number keys to enter the barometric pressure. Press the **EXIT** key to leave the value unchanged. Press the **ENTER** key when the desired barometric pressure has been entered.

5. Press the **EXIT** key. The meter will return to the Read Mode. The displayed dissolved oxygen in % saturation will be adjusted according to this entry.

3.1.6 Adjusting the Altitude

Changes to the Altitude Adjustment feature alter displayed dissolved oxygen in the % saturation mode. These changes **do not** calibrate the Dissolved Oxygen meter or change the displayed dissolved oxygen concentration when reading in mg/L.

Note: *If an altitude value other then zero is entered in this setup, the meter will automatically convert the barometric pressure entry in setup 5 to a true pressure value based upon the two entries. Using true pressure in conjunction with an altitude other then zero may result in a large error in the displayed % saturation.*

The Altitude Adjustment setup feature can be used alone or in conjunction with the Barometric Pressure feature. The altitude entry must be correctly combined with the barometric pressure setup for the displayed % saturation to be accurate.

If the Barometric Pressure used in setup 5 is the true pressure for the meter location instead of the sea level equivalent, the Altitude entry in this setup must be 0 meters (0 feet).

If the current barometric pressure is not known, the meter can display % saturation based upon altitude. When the barometric pressure is not known, the altitude should be used in conjunction with a normal Barometric Pressure of 760 mm Hg. To use altitude to calculate % saturation:

1. Enter a barometric pressure of 760 mm Hg (29.92 inches Hg) as described in *Section 3.1.5 Changing the Barometric Pressure.*

2. Enter the altitude of the meter (see below). Update the altitude entry in this setup as the elevation of the meter changes.

Entering the meter altitude
When the meter is received from the factory, the default altitude is 0 meters. To change the value:

1. Access the setup mode by pressing the **SETUP** key.

2. Press the **UP ARROW** five times. A **6** will begin flashing in the upper right hand corner of the display and the current altitude entry will be displayed.

3. To change the value, press the **ENTER** key. The number pad icon will appear in the lower display.

4. Use the number keys to enter the altitude or press the **EXIT** key to leave the value unchanged. Press the **ENTER** key and then the **EXIT** key when the desired altitude has been entered.

The meter will return to the Read Mode. The displayed dissolved oxygen in % saturation will be adjusted according to this entry.

3.1.7 Setting the Time

This feature sets the clock in the instrument using military time. For example, 3:00 p.m. is entered as 15:00. To change the value:

1. Access the setup mode by pressing the **SETUP** key.

2. Press the **UP ARROW** six times. A **7** will begin flashing in the upper right hand corner of the display. The Time icon will appear. The current time entry will be displayed.

3. To change the time, press the **ENTER** key. The number pad icon will appear in the lower display.

4. Press the **EXIT** key to leave the value unchanged. Use the number keys to enter the time. Press the **ENTER** key, then the **EXIT** key when the desired time has been entered.

The meter will return to the Read Mode.

3.1.8 Setting the Date

This setup feature is used to set the date in the instrument. To change the value:

1. Press the **SETUP** key to access the setup mode.
2. Press the **UP ARROW** seven times. An **8** will begin flashing in the upper right hand corner of the display and the Date icon will appear. The current date entry will be displayed at the bottom of the display.
3. Press the **EXIT** key to leave the value unchanged. To change the value, press the **ENTER** key. The number pad icon will appear in the lower display.
4. Use the number keys to enter the date. Press the **ENTER** key after entering the desired date. Press the **EXIT** key. The meter will return to the Read Mode.

3.1.9 Setting the Year

This feature is used to set the year in the instrument. To change the value:

1. Access the setup mode by pressing the **SETUP** key.
2. Press the **UP ARROW** eight times. A **9** will begin flashing in the upper right hand corner of the display and the date icon will appear. The current year entry will appear in the main display.
3. Press the **EXIT** key to leave the value unchanged. To change the value, press the **ENTER** key. The number pad icon will appear in the lower display.
4. Use the number keys to enter the year. Press the **ENTER** key and then the **EXIT** key when the desired year has been entered. The meter will return to the Read Mode.

3.1.10 Automatic Data Transfer

This setup feature activates the meter's automatic data transfer (Print) function.

The automatic data transfer function automatically sends data through the RS232C port, depending upon the time interval selected. Time intervals are selected from the following options: 10 seconds, 30 seconds, 1 minute, 5 minutes, 20 minutes, 1 hour, 2 hours, or 6 hours.

Accessing the calibration mode or the setup mode halts automatic data transfer. Also, if the meter has been set to the Lock mode using setup 1, the meter will not send data. When the meter is in Lock mode and the **READ** key is pressed, automatic data transfer will occur at selected time intervals only until the meter stabilizes and the value in the display is locked.

To change the automatic data transfer setup:

1. Press the **SETUP** key.
2. Press the **UP ARROW** nine times. A **10** will begin flashing in the upper right hand corner of the display. The current automatic data transfer entry will be displayed.
3. Press the **EXIT** key to leave the value unchanged. To change the value, press the **ENTER** key. The flashing question mark will appear in the upper right corner of the display next to the 10. Use the arrow keys to view the time intervals for automatic data transfer.
4. Press the **ENTER** key and then the **EXIT** key when the desired automatic data transfer time interval appears in the display. The meter will return to the Read Mode.

Each time data transfer occurs, the Print icon will momentarily appear at the top of the display.

To turn off automatic data transfer:

1. Access setup 10 as described above.
2. Press the **ENTER** key.
3. When the question mark is flashing next to the 10, press the down arrow until **(off)** appears in the display.
4. Press the **ENTER** key.
5. Press the **EXIT** key. The meter will return to the Read Mode and automatic data transfer will no longer occur.

3.2 Calibrating the Meter

The *sens**ion8*** Dissolved Oxygen meter must be calibrated prior to use. Prior to calibration, the probe must be prepared and stabilized. For measurements below 1 mg/L DO, the probe should be zeroed prior to calibration. See *Section 3.3.3 Zeroing the Probe*.

The calibration may be performed in three ways:

- Calibration may be performed in a water saturated air environment with a known barometric pressure and/or altitude. See *Section 3.3.4 Calibration in Water Saturated Air*.

  OR

- Calibration may be performed using a water sample that has a known dissolved oxygen concentration in mg/L. The sample concentration is determined by another technique such as a Winkler titration. See *Section 3.3.5 Calibration to a Known Dissolved Oxygen Concentration*.

  OR

- Calibration may be performed by setting a water sample to 100% saturation. See *Section 3.3.6 Calibrating a Sample to Read 100% Saturation*.

3.3 DO Probe

3.3.1 Probe Assembly

1. Remove the membrane protector from the membrane cap without covering the hole as the protector is pulled off (*Figure 6*).

2. Hold the membrane cap in a vertical position.

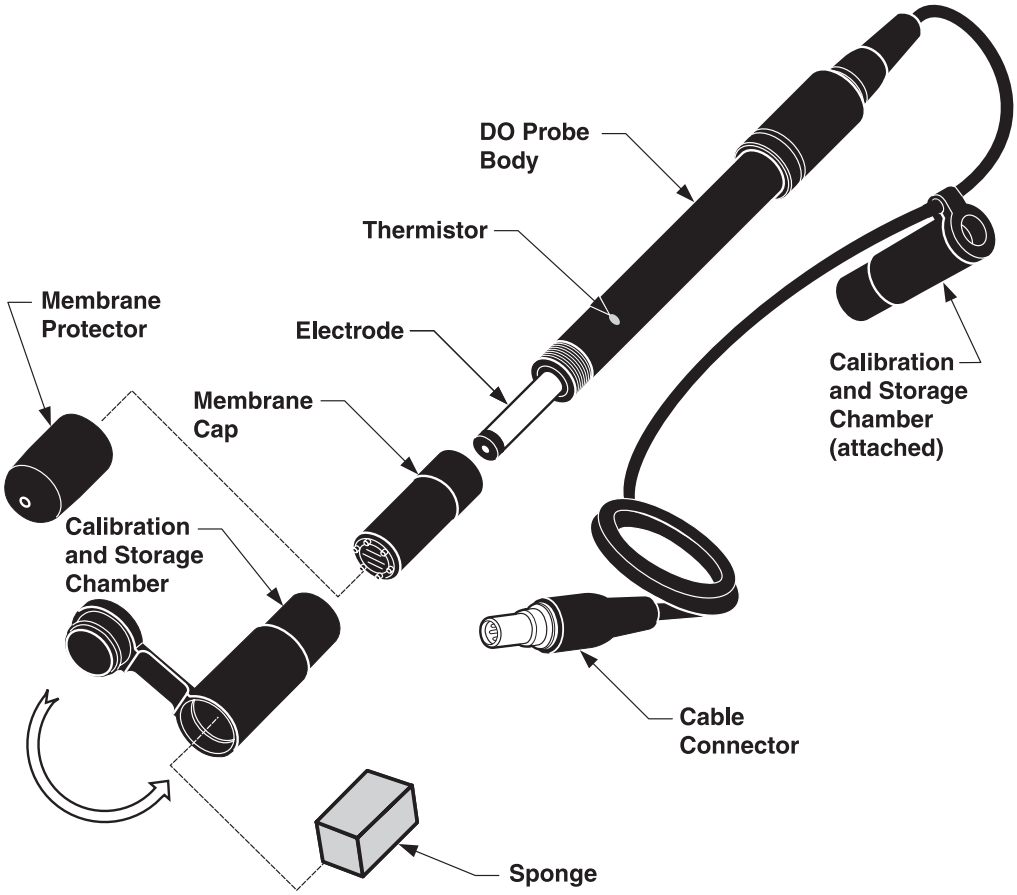
3. Fill the membrane cap about 2/3 full with Dissolved Oxygen Electrolyte Filling Solution.

4. While holding the DO probe vertically with the tip pointing down, gently screw the module cap onto the tip. Electrolyte should leak out of the threads.

Note: *If electrolyte does not leak out of the threads, air may remain inside the module cap. To ensure accurate results, repeat this procedure using more filling solution.*

5. Attach the DO probe cable connector to the input plug at the top of the meter.

Figure 6 DO Probe Assembly



3.3.2 Probe Polarization

Hach dissolved oxygen probes are continuously polarized when they are connected to the instrument. A steady reading will not be seen for 30 to 50 minutes when the probe electrolyte is new or when the probe has been unplugged for more than one hour. Interrupted connections of less than one hour will require 5 to 25 minutes before a stable reading is observed.

With the probe in the calibration and storage chamber, observe the mg/L dissolved oxygen concentration after the probe has been polarized for the appropriate period of time. Calibration may be performed when the display is stable for several minutes.

3.3.3 Zeroing the Probe

Zeroing the *sens**ion8*** Dissolved Oxygen meter is necessary only when measuring dissolved oxygen levels less than 1 mg/L or 10% saturation. When measuring in this range, zero the meter prior to calibration.

1. Measure about 150 mL of sample or deionized water into a 250-mL beaker. Add a magnetic stir bar.

2. Add 0.25 g sodium sulfite or the contents of one Silica 3 Reagent Powder Pillow to the water. Stir to dissolve the reagent.

3. Catalyze the reduction of dissolved oxygen by adding 0.1 mL of a 1000 mg/L Cobalt Standard solution to the water.

4. Place the probe in the stirring sample for at least 10 minutes. This solution is good for 30 minutes or more.

5. Press the **CAL** key. The Cal icon will appear in the upper left corner of the display, a flashing question mark will appear in the upper right corner of the display, and the keypad icon will appear in the lower left corner of the display.

6. Press the **ENTER** key three times to skip to the display showing **100%**.

7. Press the **0** key on the keypad then press **ENTER**.

8. The meter shows **Stabilizing...** while readings are taken. When the meter's zero DO criteria have been met it will return to the Read Mode. The meter will not exit the zeroing routine until the meter's zero criteria have been met.

9. When the meter cannot complete the zeroing procedure it will begin to beep and show the faulty probe icon. If the meter does not complete the zeroing procedure and exit to the Read mode, add additional sodium sulfite and cobalt standard solution to the stirring water. Otherwise, press the **EXIT** key to back up one display screen at a time and leave the calibration routine without completing the zeroing procedure.

3.3.4 Calibration in Water Saturated Air

Note: *Avoid completely filling the lower chamber with water.*

1. Secure the probe cable to the calibration and storage chamber by wrapping cable through the bottom of the chamber lid before filling with water.

2. Prepare the calibration and storage chamber by holding it under water and squeezing it a couple of times to pull a small amount of water into the lower chamber through the inlet. Alternately, open the bottom of the chamber and insert a water-soaked sponge.

3. Insert the DO probe into the calibration and storage chamber. The tip of the probe must not be flooded with water or be holding a drop of water on the membrane.

4. Allow at least ten minutes for the atmosphere in the chamber to reach a steady state.

Note: *Squeezing the lower chamber a couple of times to force water saturated air into the probe chamber will speed up stabilization.*

Note: *Keep the DO probe at a uniform temperature. When holding the probe, do not touch the metallic button on the side of the probe. The button is a thermistor that senses temperature. An inaccurate calibration will result if the temperature of the thermistor is different from the probe membrane.*

5. Press the **CAL** key located in the lower left corner of the keypad.

6. The main display will show the current value for the barometric pressure. If the meter has been moved to a different elevation or if the barometric pressure has changed, enter the new value.

7. Press the **ENTER** key. The display will show the current value for the altitude. Use the keypad to enter the altitude of the meter.

Note: *If the true barometric pressure has just been entered, the altitude has to be set to 0 meters (0 feet) or inaccurate calibration may result.*

8. When the altitude is correct in combination with the barometric pressure, press the **ENTER** key. The current value for the sample salinity (**0/00**) will be shown.

   a. Since this calibration is performed in water saturated air, set the salinity to zero.

   b. If necessary, use the keypad to enter a salinity value of **0 0/00**.

   c. Press the **ENTER** key. The display will show **100%**.

   d. Press the **ENTER** key. The stabilizing icon will appear while the meter completes the calibration.

9. When the calibration is complete, the meter will return to the Read Mode. Press the **EXIT** key during the calibration sequence to back out of the calibration routine, one screen one-at-a-time, without completing a calibration.

To obtain a printout of the calibration conditions:

1. Press the **PRINT** key on the keypad immediately after a calibration is completed. The printed value is the calculated true pressure based on the pressure and altitude entries.

3.3.5 Calibration to a Known Dissolved Oxygen Concentration

The *sens**ion8*** meter can be calibrated in a water sample of known dissolved oxygen concentration. This procedure adjusts for differences between this electrode method and an alternate method such as a Winkler titration. These differences are most prevalent in samples containing high concentrations of dissolved substances.

High concentrations of dissolved substances can be corrected for by entering a sample Salinity value. However, Salinity values

may not produce an adjustment equivalent to the value obtained by a Winkler titration because various ions affect the dissolved oxygen concentration differently.

The sample used for this calibration should be similar in temperature and atmospheric exposure to the sample used for the determination made by an alternate method.

To calibrate the meter against a dissolved oxygen concentration determined by an alternate method:

1. Place the electrode in the sample deep enough to fully cover the thermistor (metallic button) located on the side of the probe.

2. The sample must have a flow rate or stirring rate that allows for accurate probe performance. See *Section 3.4.2* on page *39*. Make sure that no air bubbles are trapped in the sensing area of the probe tip.

3. Press the **CAL** key located in the lower left corner of the keypad. The Cal icon will appear in the upper left corner of the display, a flashing question mark will appear in the upper right corner of the display, and the keypad icon will appear in the lower left corner of the display. The main display will show the current barometric pressure.

4. Press the **ENTER** key three times to skip to the display showing **100%**.

5. Use the keypad to enter the concentration of the sample in mg/L. Press the **ENTER** key. The stabilizing icon will appear while the meter completes the calibration. When the calibration is complete, the meter will return to the read mode.

6. Press the **EXIT** key during the calibration sequence to back the display screen up one at a time, then leave the calibration routine without completing a calibration.

This calibration can be performed in conjunction with sample salinity measurements. The salinity value can then be adjusted as the concentration of dissolved substances in the sample change. The adjusted salinity value will change the displayed DO

concentration in mg/L based on the values of the original calibration. To use this approach:

1. Measure the sample salinity using an Electrolytic Conductivity meter.

2. Press the **CAL** key.

3. Press the **ENTER** key twice to skip the barometric pressure and altitude entries.

4. Use the keypad to enter the sample salinity value. Press the **ENTER** key. The display will show **100%**.

5. Use the keypad to enter the DO concentration of the sample determined by an alternate technique.

6. Press the **ENTER** key. The meter will complete the calibration then return to the Read Mode.

3.3.6 Calibrating a Sample to Read 100% Saturation

The *sens**ion8*** Dissolved Oxygen meter can be calibrated to read the dissolved oxygen in a water sample as 100% saturation. Changes in the dissolved oxygen concentration of the sample should be monitored using the % saturation mode only because the concentration in mg/L will not be accurate.

1. Place the electrode in the sample deep enough to fully cover the thermistor (metallic button) located on the side of the probe.

2. The sample must have a flow rate or stirring rate that allows for accurate probe performance. See *Section 3.4.2* on page *39*. Make sure that no air bubbles are trapped in the sensing area of the probe tip.

3. Press the **CAL** key located in the lower left corner of the keypad. The Cal icon will appear in the upper left corner of the display, a flashing question mark will appear in the upper right corner of the display, and the keypad icon will appear in the lower left corner of the display. The main display will show the current barometric pressure.

4. Press the **ENTER** key three times to skip to the display showing **100%**.

5. Press the **ENTER** key. The stabilizing icon will appear while the meter completes the calibration.

6. When the calibration is complete, the meter will return to the Read Mode. Press the **EXIT** key during the calibration sequence to back out of the calibration routine, one screen one-at-a-time, without completing a calibration.

3.3.7 Calibration Review

To review the last calibration:

1. Press the **REVIEW** key on the keypad. The date and year of the last calibration will show.

2. Press the **TIME** key on the keypad to view the time of the last calibration.

3. Press the **UP ARROW**. The dissolved oxygen concentration of calibration will show.

4. Press the **CONC %** key to view the % saturation and mg/L values of calibration.

5. Press the **UP ARROW** key. The barometric pressure entry of calibration will show.

6. Press the **UP ARROW** key. The altitude entry of calibration will show.

7. Press the **UP ARROW** key. The salinity entry of calibration will show. Press the **EXIT** key to leave the calibration review.

3.4 Measuring Dissolved Oxygen

3.4.1 General Probe Operation

Follow the procedures presented below to obtain maximum performance and accuracy from your *sens**ion8*** DO system:

- Use the DO probe for aqueous applications only.
- Take extra care when handling and storing the oxygen membrane module cap.
- Do not allow the DO probe's sensing area (cap reservoir) to dry out.
- Perform the calibration procedure at the beginning of each day for maximum performance. Recalibrate the DO probe every two hours for maximum accuracy.
- The sample must have a high flow rate or must be stirred rapidly to obtain accurate results.
- Be sure any air bubbles trapped on the probe tip are dislodged before taking a reading.
- It is important to have the DO probe at a uniform temperature. Do not touch the metallic button on the side of the probe when holding it. The metallic button is a thermistor that senses sample temperature. An inaccurate measurement will result if the temperature of the thermistor is not the same as the membrane end of the probe.

3.4.2 Measurement

After the probe is properly stabilized, chemically zeroed (for measurements below 1 mg/L), and calibrated, take measurements as follows:

1. Add the weight assembly to the probe if required (3 or 15 m cable versions only).

2. If the sample salinity has been measured using an Electrolytic Conductivity Meter, enter the value in setup 4. If the meter has been moved to a different elevation or if the barometric pressure has changed, enter the new values in setups 5 and 6.

3. Insert the probe into the sample to the desired depth. The probe must be deep enough to cover the thermistor (metallic button) located on the side of the probe.

4. Agitate the probe in the sample to dislodge air bubbles from the sensing area of the probe tip.

5. Stir the sample vigorously with the probe or use a stir stand and stir bar. When measuring deep bodies of water, create sufficient flow across the probe tip by pulling on the cable to move the probe up and down. When using a stir stand and magnetic stir bar, increase the speed of the stir bar until the displayed value no longer increases with the stirring rate.

6. When the reading on the meter stabilizes, record or store the value in the meter memory.

7. Press the **CONC %** key on the keypad to change the display from concentration in mg/L to % saturation.

Note: *The displayed % saturation will be based on a meter calculation for the equilibrium dissolved oxygen concentration. The calculation uses the sample temperature, salinity, barometric pressure, altitude and measured concentration in mg/L values. Changing the entries in setups 4, 5 or 6 will alter the displayed mg/L or % saturation.*

3.4.3 Probe Storage

To store the probe between measurements, insert the DO probe tip into the calibration and storage chamber containing some water or a wet sponge.

To prepare the probe for long-term storage (see *Figure 6* on page *32*) complete the following steps:

1. Disconnect the probe from the meter.

2. Remove the batteries from the meter.

3. Remove the membrane cap assembly from the probe.

4. Rinse the anode, cathode, and membrane cap assembly with water.

5. Shake the water out of the membrane cap.

6. Use a clean lab wipe to blot the moisture from the electrode anode and cathode.

7. Thread the membrane cap assembly loosely onto the body of the probe.

8. Replace the membrane protector on the membrane cap.

3.4.4 Maintenance

Membrane cap replacement and refilling are required at scheduled intervals or whenever the membrane has been damaged or fouled. If the membrane is not damaged or fouled, the recommended time interval for replacing the electrolyte filling solution is 1–2 months.

Prior to replacing a membrane cap, rub the anode (the outer metallic stem of the probe that is visible when the membrane cap is removed) with the polishing cloth supplied with the probe. The polishing cloth will remove deposits that may decrease the performance of the probe. Polish the anode whenever the membrane cap is replaced or between membrane cap replacement if probe performance seems to have degraded over time.

3.5 Using the BOD Accessory Kit

The optional BOD Accessory Kit, which includes an overflow funnel with a built-in stirring bar, serves three purposes:

- The kit eliminates the retrieval of magnetic stirring bars from BOD sample bottles.

- The funnel provides an overflow reservoir to hold sample displaced when the DO probe is inserted in the bottle. This permits the measurement to be made without spilling the sample. When the DO probe is withdrawn, the displaced solution can drain back into the bottle.

- The funnel is designed to act as an electrode holder. This kit is designed for use with Hach Model 51970 DO probe only.

3.6 Making BOD Determinations

Use the Hach BOD Accessory Kit with a magnetic stir plate and a standard 300-mL BOD bottle.

1. Fill a standard 300-mL BOD bottle with the water sample and insert the overflow funnel.

2. Insert the DO probe into the funnel and bottle.

3. Place the BOD bottle on a magnetic stirrer so that the probe is over the center of the stir plate.

4. Start the magnetic stirrer and increase the speed until the rotor loses its cycle. Adjust until the rotor regains its cycle. Mark this point on the speed scale of the stirrer. This identifies the optimum working point. Insufficient stirring will cause low results.

Note: *If air bubbles develop below or on the probe membrane, allow the stirrer about five seconds to remove, or hold the probe at a slight angle and tap gently.*

3.7 Oxygen Utilization Rate (OUR) and Specific Oxygen Utilization Rate (SOUR) Tests

1. If running the OUR test, skip to *step 2*.

   If running the SOUR test, determine the total solids in mg/L (Hach Method 8271) *or* the volatile suspended solids in mg/L, depending on reporting requirements.

Note: *Some regulations require the sample to be at 20 °C when measured. Keep the sample aerated until the test is run.*

2. Shake or aerate the sample to ensure that it contains an adequate oxygen concentration.

3. Fill a standard 300-mL BOD bottle with the water sample and insert the overflow funnel.

4. Place the BOD bottle on a magnetic stirrer so that the probe is over the center of the stir plate.

5. Start the magnetic stirrer and increase the speed until the rotor loses its cycle. Adjust until the rotor regains its cycle. Mark this point on the speed scale of the stirrer. This identifies the optimum working point. Insufficient stirring will cause low results.

6. Insert the DO probe into the funnel and bottle. Make sure that no air bubbles form on the membrane.

7. Allow a few seconds for the reading to stabilize. The reading will continue to decrease over time. The initial quick decrease will level off and become more constant. Record the initial DO concentration.

8. Record DO manually or store the value in the meter every minute for 15 minutes or until the DO concentrations drops below 1 mg/L.

9.

a. If running the OUR test, calculate the decrease in oxygen during the test using the equation below:

$$\frac{\text{Initial reading} - \text{Final reading}}{\text{Length of test in minutes}} \times 60 \text{minutes} = \text{OUR in mg/L/hour}$$

b. For the SOUR test, first use the equation above to determine the OUR value. Second, divide the mg/L total solids or total volatile suspended solids by 1000 to determine concentration in grams per liter. Divide the OUR value by this concentration to determine mg/L/g/hour.

$$\frac{\text{OUR in mg/L/hour}}{\frac{\text{mg/L Solids determined in step 1}}{1000}} = \text{SOUR in mg/L/g/hour}$$

SECTION 4 STORING AND RECALLING DATA

4.1 Storing Measurements

The *sens**ion***™***8*** meter can store up to 99 measurement readings. Data must be stored to recall it for later review, downloading, or printing. Although the meter display will only show the temperature, data location, and dissolved oxygen value, the following information is stored (and can be downloaded or printed) for each sample:

- An asterisk (*) indicates an unstable value was stored.
- Storage location
- Sample concentration in mg/L
- Sample concentration in % saturation
- Calculated true barometric pressure
- Temperature
- Sample salinity
- Date
- Time
- Instrument serial number
- Software version

The new data is saved in the next available memory location, numbered from 1 to 99. If no memory locations higher than the current one are available, the meter will "wrap around" and choose the next available location. The user also has the option of choosing the storage location.

To store data:

1. After the measurement reading has stabilized, press **STORE**. The display will prompt **Store Sample #?** (# is the next available location). The question mark will be flashing.

2. Press **ENTER** to store the measurement reading in that location number. To store the data in another location, use the arrow keys to scroll to that location number or enter a location using the number keys. Press **ENTER.**

3. If all memory locations are full, the meter will prompt to overwrite one of the data points by displaying **Erase Sample ##?** Press **ENTER** to replace the data in that location with the current data. Press **EXIT** to return to the previous screen without replacing the data.

4. The meter will store the reading and return to Reading mode.

4.2 Recalling Stored Data

1. To recall stored data, press the **RECALL** key while in the Reading mode. The screen will display the most recently saved measurement data.

2. Use the arrow keys to scroll to the desired storage location, or press **RECALL** again to allow number entry of a storage location. The question mark will flash. Enter the number of the desired storage location. Press **ENTER** to accept the storage location or **EXIT** to escape.

3. Press the **CONC %** key to switch between the stored concentration in mg/L and % saturation.

4. Press the **ENTER** key to view the salinity.

5. Press the **ENTER** key to view barometric pressure.

6. Press the **ENTER** key to view the altitude.

7. Press the **TIME** key twice to view the time and date of the stored value.

8. When recalling is complete, press **EXIT** to return to the Reading mode.

4.3 Erasing Data

4.3.1 Erasing Single Data Points

1. To erase data, it must be recalled first. See *Section 4.2*.
2. When the desired data point is displayed, press **ERASE**.
3. The meter will display **ERASE** and **?** (flashing). Press **ENTER** to erase the data.
4. The meter will recall the next stored sample data. There are three options at this point:
   a. Press **ERASE** to erase the data.
   b. Press **EXIT** to exit Recall mode.
   c. Press an arrow key to scroll to other data points.
5. Repeat *steps 2–3* for each data point that needs to be deleted.

4.3.2 Erasing All Data Points

1. To erase data, it must be recalled first. See *Section 4.2*.
2. When the point is displayed, press **ERASE**.
3. Press the up arrow. The instrument will show **Erase** and **All** with the flashing **?**. At this point the options are:
   a. Press **EXIT** to return to the data point in Recall mode without erasing.
   b. Press the down arrow to return to the single point erase prompt.
   c. Press **ENTER** to erase all data and return to the Reading mode.
4. After all the data are erased, the meter will return to the Reading mode.

SECTION 5 MAINTENANCE

5.1 Cleaning the Probe

During normal use, rinse the probe thoroughly with deionized water between measurements. This will minimize the buildup of interfering substances on the probe element.

If the sample contains oils, grease, or fats, the probe may become coated. If this occurs, clean the probe with a strong detergent solution or dip it in a 1:1 hydrochloric acid solution. Rinse thoroughly with deionized water.

For long term storage, rinse the probe with deionized water and store dry.

5.2 Meter Maintenance

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

SECTION 6 PRINTING AND DATA TRANSFER

6.1 ⚠ Connecting to Printers/Computers

6.1.1 Connection with the RS232 Cable

The standard 9-pin RS232 connector on the meter connects with a 9-pin sub-D connector. Hach offers an RS232 9-pin to 5-pin cable (Cat. No. 48129-00).

The RS232 interface output is an 8-bit data word plus one stop bit and no parity with a baud rate of 1200. It can communicate with a serial printer or a serial port on a computer.

6.1.2 Connecting to a Printer

Connecting a serial printer to the meter requires a 9-pin to 25-pin RS232 cable (Cat. No. 49503-00). The cable provides a direct link between the instrument and the 25-pin connector used for the serial port on most serial printers. *Table 3* shows the proper pin connections for 25-pin printer cables. Using cables that do not match the pin information in the table may cause undesirable operation.

Parallel printers require a serial-to-parallel adapter. This allows use of printers that are normally used for IBM-compatible applications.

The Citizen PN60 printer requires a special printer cable that is shipped with the printer when it is ordered from Hach Company.

Table 3 Standard 9-pin to 25-pin Printer Cable

9-pin D Connector Socket		Serial Printer 25-pin D Connector, plug	
Pin	**Signal Name**	**Pin**	**Signal Name**
2	RXD	no connection	
3	TXD	3	RXD
4	DTR	no connection	
5	GND	7	GND
6	DSR	20	DTR
7	RTS	no connection	
8	CTS	20	DTR

1. Connect the RS232 cable to the meter by lining up the holes in the cable connector with the pins of the serial port.

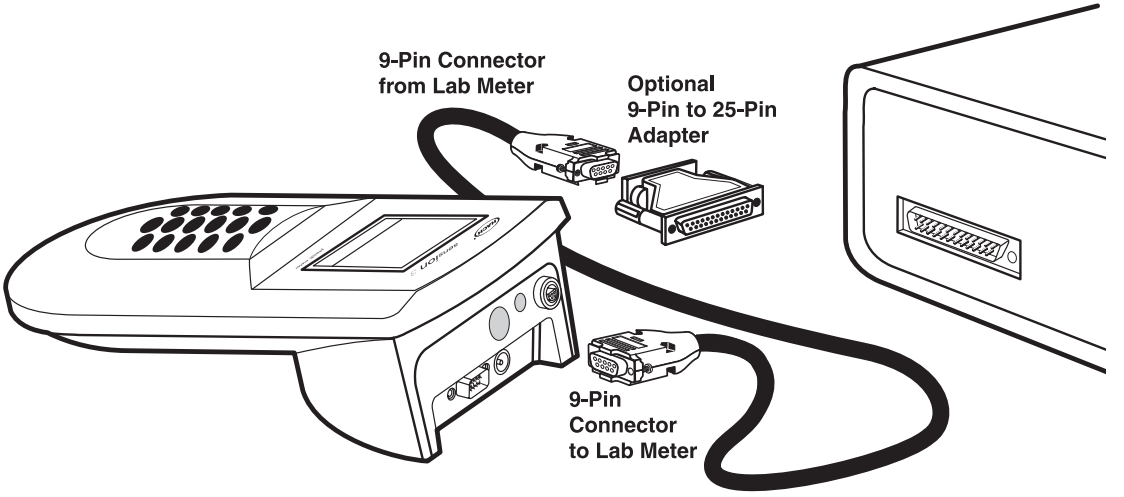
2. Connect the cable to the printer in the same manner (see *Figure 7*).

3. Once the communication link is established, press **PRINT** to send data to the computer.

Note: *For optimum performance and ESD protection, use a five-conductor shielded cable. Use a metal shell for the printer or computer terminal connector, and connect the shield of the cable to the metal shell and the sleeve (signal ground) of the RS232 plug.*

Follow the manufacturers instructions to configure the printer for compatibility with the meter.

Figure 7 RS232 Cable Connector



6.1.3 Connecting to a Personal Computer

Connect the meter to a personal computer (PC) with the computer interface cable (Cat. No. 48129-00) listed under *REPLACEMENT PARTS* on page *77*. The cable provides a direct link between the meter and the 9-pin D connector used for the serial port on most personal computers. If your computer has a 25-pin D connector, use a 9-pin to 25-pin adapter (available at most computer supply stores).

Table 4 shows the proper pin connections for 9-pin computer cables. Using cables that do not match the pin information in the table may cause undesirable operation.

Table 4 Standard 9-pin to 9-pin Computer Cable

9-pin D Connector Socket		Computer 9-pin D Connector, plug	
Pin	**Signal Name**	**Pin**	**Signal Name**
2	RXD	3	TXD
3	TXD	2	RXD
4	DTR	no connection	---
5	GND	5	GND
6	DSR	no connection	---
7	RTS	8	CTS
8	CTS	7	RTS

1. Connect the RS232 cable to the meter by lining up the holes in the cable connector with the pins of the serial port.

2. Connect the cable to the computer in the same manner (see *Figure 7*).

3. Once the communication link is established, press **PRINT** to send data to the computer.

To transfer data, the communication parameters (baud rate, data bits and parity) of the meter and the computer must match. Once the communication link is established, press **PRINT** to send data to the computer.

Use a communications software, such as HachLink™ (Cat. No. 49665-00) to collect data from the instrument. HachLink is a Windows-based application that allows a personal

computer to capture data from several Hach instruments, including the *sens**ion***™ electrochemical meters. The captured data can be stored in a text file as a spread-sheet compatible format or a free-format text. Data captured in the spreadsheet format is easily transferred into most spreadsheet programs (i.e., Excel, Microsoft Works, Lotus 123) for graphing and reporting.

To install and run Hach Data Capture, the computer and software must meet the following minimum requirements:

- IBM PC/AT or compatible with a 386SX processor (16 MHz or better)
- 4 megabytes of RAM
- Hard disk drive with 2 megabytes or more of free space
- 3 ½ inch, 1.44 megabyte floppy disk drive
- VGA graphics with 640 x 480 or higher resolution, 16 or more colors
- Mouse or other pointing device
- A 9-pin serial port (or 25-pin serial port with 9-pin adapter)
- Windows 3.1 or later
- DOS 3.3 or later

6.2 Sending Data to Printers/Computers

6.2.1 Sending Currently Displayed Data

To print or transfer a current reading:

1. Wait until the display is stable. Press **PRINT.**
2. The word **PRINT** will be briefly displayed, then the meter will return to Reading mode.
3. The printout for data that is not stored will not have a storage location number.

6.2.2 Sending Recalled Data Points

1. Recall data by following the steps in *Section 4.2* on page *46*.
2. When the desired sample data is displayed, press **PRINT**.
3. The word **PRINT** and a flashing **?** will be displayed.
4. Press **ENTER** to print the recalled data point.
5. Press **EXIT** to return to the reading mode.

6.2.3 Sending All Stored Data

1. To transfer all data, a data point must be recalled first. See *Section 4.2* on page *46*.
2. When a data point is displayed, press **PRINT**.
3. Press the **UP ARROW.** The instrument will show **Print** and **All** with the **?** (flashing). At this point the options are:
   a. Press **EXIT** to return to the next data point in Recall mode without printing.
   b. Press the **DOWN ARROW** to return to the prompt for printing single data points.

c. Press **ENTER** to print all stored data (data that is printed but not stored will not be included). The word **PRINT** will be displayed until all the data has been printed. Then the meter will return to the first recalled sample. Press **EXIT** to return to Reading mode or an arrow key to scroll to a specific data point.

6.2.4 Printed Data Format

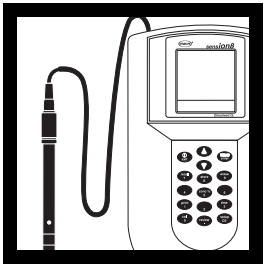
Printed data will have the following format:

Storage Location	Concentration	% Saturation	Calculated True Barometric Pressure	Temp.	Salinity	Date	Time	Serial Number	Software Version
# 1	*7.42 mg/L	100.3	25.0 inHg	69.8 °F	o/oo	01/09/00	01:42	600010	P1.03
# 2	*7.42 mg/L	100.2	25.0 inHg	69.8 °F	o/oo	01/09/00	01:42	600010	P1.03
# 3	*7.42 mg/L	100.2	25.0 inHg	69.8 °F	o/oo	01/09/00	01:42	600010	P1.03

SECTION 7 DISSOLVED OXYGEN IN WATER

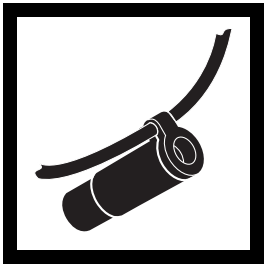
(0 to 20 mg/L)

1. Assemble the dissolved oxygen probe as described in *Section 3.3.1 Probe Assembly*.

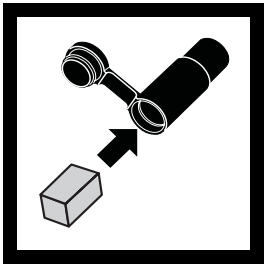


2. At least one hour before measurement, polarize the probe by connecting it to the meter. See *Section 3.3.2 Probe Polarization*.

3. Zero the *sens**ion**™8* Dissolved Oxygen meter prior to calibration when measuring dissolved oxygen levels less than 1 mg/L or 10% saturation.



4. Secure the probe cable to the calibration and storage chamber by wrapping cable through the bottom of the chamber lid before filling with water.

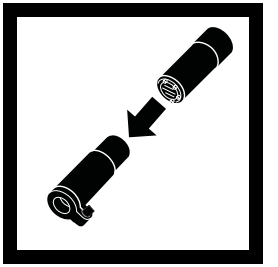


5. Prepare the calibration and storage chamber by holding it under water and squeezing it a couple of times to pull water into the lower chamber through the inlet.

Alternately, open the bottom of the chamber and insert a water-soaked sponge.

Note: *New sponges will be compressed. Add water to expand them.*

Note: *Avoid completely filling the lower chamber with water.*

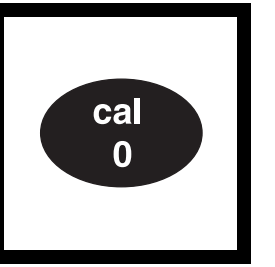


6. Insert the DO probe into the calibration and storage chamber. The probe tip must not be flooded with water or be holding a drop of water on the membrane.

7. Allow at least ten minutes for the atmosphere in the chamber to reach a steady state.

Note: *To speed up probe stabilization, squeeze the lower chamber once or twice to force water saturated air into the chamber.*

Note: *Keep the DO probe at a uniform temperature. When holding the probe, do not touch the metallic button on the side of the probe. The button is a temperature sensor. An inaccurate calibration will result if the temperature of the thermistor is different from the probe membrane.*

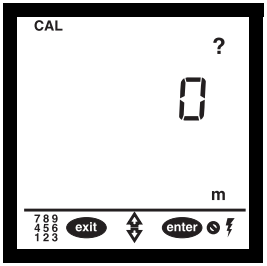


8. Press the **CAL** key.

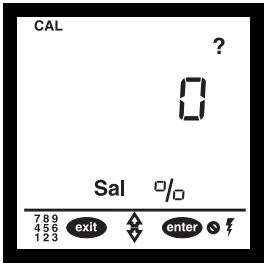
9. The main display will show the current value for the barometric pressure. If the meter has been moved to a different elevation or if the barometric pressure has changed, enter the new value. See *Table 5* on page *61*.

10. Press the **ENTER** key. The display will show the current value for the altitude. Use the keypad to enter the altitude of the meter.

Note: *If the true barometric pressure has been entered then the altitude must be set to 0 meters (0 feet) or inaccurate calibration may result.*



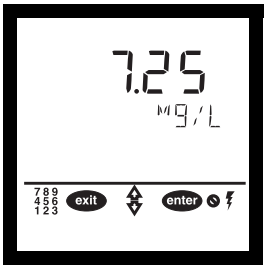
11. When the altitude is correct in combination with the barometric pressure press the **ENTER** key. The current value for the sample salinity (**0/00**) will be shown.



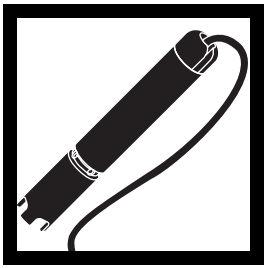
12. Since this calibration is performed in water-saturated air, set the salinity to zero. If necessary, use the keypad to enter a salinity value of **0 0/00**.

13. Press the **ENTER** key. The display will show **100%**.

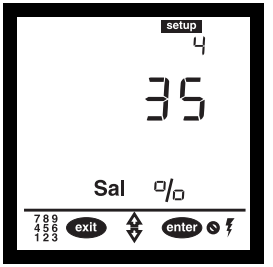
14. Press the **READ** key. The stabilizing icon will appear while the meter completes the calibration.



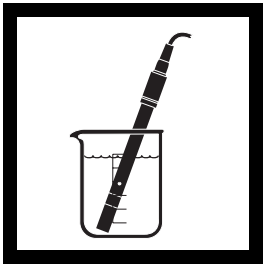
15. When the calibration is complete, the meter will return to the Reading mode. Press the **EXIT** key during the calibration sequence to back out of the calibration routine, one-screen-at-a-time, without completing a calibration.



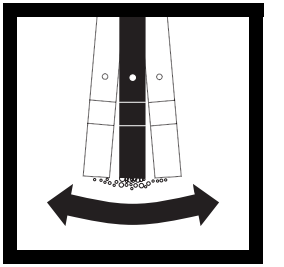
16. Add the weight assembly to the probe if required (3- or 15-m cable versions only).



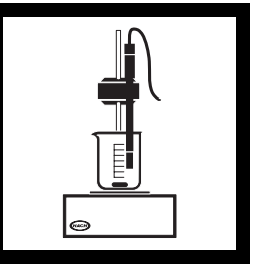
17. If sample salinity has been measured using an Electrolytic Conductivity Meter, enter the value in setup 4.



18. Insert the probe into the sample. The probe must be deep enough to cover the thermistor (metallic button) located on the side of the probe.

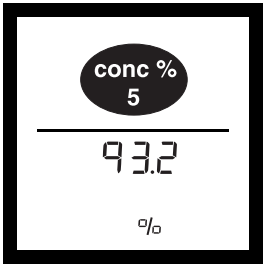


19. Agitate the probe in the sample to dislodge air bubbles from the sensing area of the probe tip.



20. Stir the sample vigorously with the probe or use a stir stand and stir bar. When measuring deep bodies of water, create sufficient flow across the probe tip by pulling on the cable to move the probe up and down.

21. When the reading on the meter stabilizes, record or store the value in the meter memory.



22. Press the **CONC %** key on the keypad to change the display from concentration in mg/L to % saturation.

Note: *The displayed % saturation will be based on a meter calculation for the equilibrium dissolved oxygen concentration. The calculation uses the sample temperature, salinity, barometric pressure, altitude and measured concentration in mg/L values. Changing the entries in setups 4, 5 or 6 will alter the displayed mg/L or % saturation.*

Table 5 Adjusting Barometric Pressure and Altitude

Enter a new barometric pressure when the barometric pressure or the altitude of the instrument changes using one of the methods below:	
Using Sea Level Equivalent	**Using True Barometric Pressure**
1. Obtain the sea level equivalent barometric pressure from TV, radio, or a local airport.	**1.** Obtain the true barometric pressure from a nearby mercury barometer or use *Table 8* on page *66*.
2. Enter this value into the meter according to *Section 3.1.5 Changing the Barometric Pressure.*	**2.** Enter this value into the meter according to *Section 3.1.5 Changing the Barometric Pressure.*
3. Enter the local altitude according to *Section 3.1.6 Adjusting the Altitude*.	**3.** Enter the altitude as **0** feet or meters according to *Section 3.1.6 Adjusting the Altitude*.

Sampling and Storage

Collect samples in 300 mL glass BOD bottles. Fill completely. Analyze immediately.

Accuracy Check

Checking Calibration Accuracy

Return the electrode to the calibration and storage chamber. The chamber should contain a wet sponge or a small amount of water. Allow at least 10 minutes for stabilization. Enter the current barometric pressure and altitude into the meter according to *Sections 3.1.5* and *3.1.6*. The meter should display **100% saturation**. If not, recalibrate the meter.

Method Performance

Precision

In a single lab using one sample at 7.45 mg/L DO and one sample at 5.10 mg/L DO, the electrode was moved between the two samples with no rinsing in between. A single operator with a single sens***ion8*** meter obtained a standard deviation of 0.03 mg/L DO.

Interferences

Oxidizing gases such as chlorine, chlorine dioxide, sulphur trioxide, and bromine can react at the cathode to produce positive interferences. Reducing gases such as hydrogen, hydrogen sulfide, sulfur dioxide, and boranes can react at the anode. After exposure to reducing gases, the user may need to clean the anode and replace the internal filling solution and membrane cap.

Summary of Method

The sens***ion8*** Dissolved Oxygen Meter responds to the dissolved oxygen concentration activity by developing an electrical current. At a constant temperature, the electric current varies linearly with the oxygen concentration of the solution. An increase in temperature will increase the oxygen diffusion through the membrane exponentially. The meter utilizes automatic temperature compensation to ensure accurate results.

SECTION 8 TROUBLESHOOTING

8.1 Error Codes

Error codes inform the user of an out-of-range value or meter problem. *Table 6* outlines the operator assistance codes available in the meter series.

Table 6

Error Code	Error Type	Possible Remedy
E-1	Data error in the non-volatile memory.	Turn off the meter, then turn it on again.
E-3	Failure to correctly store a reading.	Call Service. Meter cannot store data in at least one location, but is otherwise functional.
E-9	Failure to correctly retrieve a reading that was stored earlier.	Call Service.
E-10	Sample temperature is out of range (0 to 50 °C).	NA

Note: *To display the electric current coming from the dissolved oxygen electrode, press the* **READ** *and* **CONC %** *keys simultaneously.*

8.2 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.

SECTION 9 REFERENCE TABLES

The following tables have been provided as a reference, but are not required for use with the DO meter.

9.1 Salinity Correction Factors

Use the values in *Table 7* if the conductivity meter in use does not measure salinity. Use a conductivity meter to obtain conductivity in mS/cm at reference temperature (20 °C), then use *Table 7* to estimate the salinity correction factor (in ppt*) to the nearest whole number. Enter the salinity value from *Table 7* into the meter per setup function *Section 3.1.4* on page *24*.

This table was calculated up to the conductivity of 54 mmhos/cm from the International Oceanographic Tables**.

Table 7 Salinity Correction Factors

Conductivity in mS/cm	Salinity value*	Conductivity in mS/cm	Salinity value*	Conductivity in mS/cm	Salinity value*
5	3	20	13	35	25
6	4	21	14	36	25
7	4	22	15	37	26
8	5	23	15	38	27
9	6	24	16	39	28
10	6	25	17	40	29
11	7	26	18	42	30
12	8	27	18	44	32
13	8	28	19	46	33
14	9	29	20	48	35
15	10	30	21	50	37
16	10	31	22	52	38
17	11	32	22	54	40
18	12	33	23	—	—
19	13	34	24	—	—

*Salinity determined by the conductivity at 20 °C.

* ppt = Parts per Thousands of Salinity

** International Oceanographic Tables, Vol. I, National Institute of Oceanography of Great Britain, Womley, Godaming, Surrey, England and Uncesco, Paris 1971.

9.2 Barometric Pressure and Elevation

Table 8 is used to estimate the true barometric pressure at certain elevations. The correspondence is based on the assumption that at sea level the barometric pressure is 760 mm Hg. After determining the barometric pressure from the table or a local weather service, enter this value into the instrument (see *Sections 3.1.5* and *3.1.6*).

Note: *If the barometric pressure from Table 8 is entered in the meter, the altitude entered in combination with this value must be 0 feet.*

Table 8 Elevation Barometric Pressure

Elevation in feet	Barometric pressure in mm Hg	Elevation in feet	Barometric pressure in mm Hg
0	760	6000	613
500	746	6500	601
1000	733	7000	590
1500	720	7500	579
2000	708	8000	568
2500	695	8500	559
3000	683	9000	548
3500	671	9500	538
4000	659	10000	527
4500	647	10500	517
5000	635	11000	506
5500	624	—	—

9.3 Solubility of Oxygen in Water

Table 9 Solubility of Oxygen in Water
Exposed to Water-Saturated Air at Atmospheric Pressure (101.3kPa)

Temp. °C	Oxygen Solubility mg/L					
	Salinity:	0	9.0	18.0	27.0	36.0
0		14.62	13.73	12.89	12.11	11.37
1.0		14.22	13.36	12.55	11.79	11.08
2.0		13.83	13.00	12.22	11.49	10.80
3.0		13.46	12.66	11.91	11.20	10.54
4.0		13.11	12.34	11.61	10.93	10.28
5.0		12.77	12.03	11.33	10.66	10.04
6.0		12.45	11.73	11.05	10.41	9.81
7.0		12.14	11.44	10.79	10.17	9.58
8.0		11.84	11.17	10.54	9.94	9.37
9.0		11.56	10.91	10.29	9.71	9.16
10.0		11.29	10.66	10.06	9.50	8.97
11.0		11.03	10.42	9.84	9.29	8.78
12.0		10.78	10.19	9.63	9.09	8.59
13.0		10.54	9.96	9.42	8.90	8.42
14.0		10.31	9.75	9.22	8.72	8.25
15.0		10.08	9.54	9.03	8.55	8.09
16.0		9.87	9.35	8.85	8.38	7.93
17.0		9.67	9.15	8.67	8.21	7.78
18.0		9.47	8.97	8.50	8.05	7.63
19.0		9.28	8.79	8.34	7.90	7.49
20.0		9.09	8.62	8.18	7.75	7.35
21.0		8.92	8.46	8.02	7.61	7.22
22.0		8.74	8.30	7.88	7.47	7.09
23.0		8.58	8.14	7.73	7.34	6.97
24.0		8.42	8.00	7.59	7.21	6.85
25.0		8.26	7.85	7.46	7.09	6.73
26.0		8.11	7.71	7.33	6.97	6.62
27.0		7.97	7.58	7.20	6.85	6.51
28.0		7.83	7.45	7.08	6.73	6.40
29.0		7.69	7.32	6.96	6.62	6.30

Table 9 Solubility of Oxygen in Water
Exposed to Water-Saturated Air at Atmospheric Pressure (101.3kPa) (Continued)

Temp. °C	Oxygen Solubility mg/L				
	Salinity:	0	9.0	18.0	27.0	36.0
30.0		7.56	7.20	6.85	6.52	6.20
31.0		7.43	7.07	6.74	6.41	6.10
32.0		7.31	6.96	6.63	6.31	6.01
33.0		7.18	6.84	6.52	6.21	5.92
34.0		7.07	6.73	6.42	6.11	5.83
35.0		6.95	6.63	6.32	6.02	5.74
36.0		6.84	6.52	6.22	5.93	5.65
37.0		6.73	6.42	6.12	5.84	5.57
38.0		6.62	6.32	6.03	5.75	5.48
39.0		6.52	6.22	5.93	5.66	5.40
40.0		6.41	6.12	5.84	5.58	5.32
41.0		6.31	6.03	5.75	5.50	5.25
42.0		6.21	5.94	5.67	5.41	5.17
43.0		6.12	5.84	5.58	5.33	5.09
44.0		6.02	5.75	5.50	5.25	5.02
45.0		5.93	5.67	5.42	5.18	4.95

Table 10 Solubility of Oxygen in Water vs. Temperature and
Barometric Pressure (lower range)

Pressure							
mm Hg	550	575	600	625	650	675	700
inches Hg	21.7	22.6	23.6	24.6	25.6	26.6	27.6
Temp. °C	Oxygen Solubility mg/L						
0	10.56	11.04	11.53	12.01	12.49	12.98	13.46
1	10.27	10.74	11.21	11.68	12.15	12.62	13.09
2	9.98	10.44	10.90	11.36	11.82	12.27	12.73
3	9.72	10.16	10.61	11.05	11.50	11.94	12.39
4	9.46	9.89	10.33	10.76	11.20	11.63	12.06

Table 10 Solubility of Oxygen in Water vs. Temperature and Barometric Pressure (lower range) (Continued)

Pressure							
mm Hg	**550**	**575**	**600**	**625**	**650**	**675**	**700**
inches Hg	**21.7**	**22.6**	**23.6**	**24.6**	**25.6**	**26.6**	**27.6**
Temp. °C	**Oxygen Solubility mg/L**						
5	9.21	9.64	10.06	10.48	10.91	11.33	11.75
6	8.98	9.39	9.80	10.22	10.63	11.04	11.46
7	8.75	9.16	9.56	9.96	10.37	10.77	11.17
8	8.54	8.93	9.33	9.72	10.11	10.51	10.90
9	8.33	8.72	9.10	9.48	9.87	10.25	10.64
10	8.13	8.51	8.88	9.26	9.64	10.01	10.39
11	7.94	8.31	8.68	9.04	9.41	9.78	10.15
12	7.76	8.12	8.48	8.84	9.20	9.56	9.92
13	7.58	7.94	8.29	8.64	8.99	9.34	9.69
14	7.41	7.76	8.10	8.45	8.79	9.14	9.48
15	7.25	7.59	7.93	8.26	8.60	8.94	9.28
16	7.10	7.43	7.76	8.09	8.42	8.75	9.08
17	6.94	7.27	7.59	7.92	8.24	8.56	8.89
18	6.80	7.12	7.43	7.75	8.07	8.39	8.70
19	6.66	6.97	7.28	7.59	7.91	8.22	8.53
20	6.52	6.83	7.13	7.44	7.75	8.05	8.36
21	6.39	6.69	6.99	7.29	7.59	7.89	8.19
22	6.26	6.56	6.85	7.15	7.45	7.74	8.04
23	6.14	6.43	6.72	7.01	7.30	7.59	7.88
24	6.02	6.31	6.59	6.88	7.16	7.45	7.73
25	5.91	6.19	6.47	6.75	7.03	7.31	7.59
26	5.80	6.07	6.35	6.62	6.90	7.18	7.45
27	5.69	5.96	6.23	6.50	6.77	7.05	7.32

Table 10 Solubility of Oxygen in Water vs. Temperature and Barometric Pressure (lower range) (Continued)

Pressure							
mm Hg	**550**	**575**	**600**	**625**	**650**	**675**	**700**
inches Hg	**21.7**	**22.6**	**23.6**	**24.6**	**25.6**	**26.6**	**27.6**
Temp. °C	**Oxygen Solubility mg/L**						
28	5.58	5.85	6.12	6.38	6.65	6.92	7.19
29	5.48	5.74	6.01	6.27	6.53	6.80	7.06
30	5.38	5.64	5.90	6.16	6.42	6.68	6.94
31	5.28	5.54	5.80	6.05	6.31	6.56	6.82
32	5.19	5.44	5.69	5.95	6.20	6.45	6.70
33	5.10	5.35	5.59	5.84	6.09	6.34	6.59
34	5.01	5.25	5.50	5.74	5.99	6.23	6.48
35	4.92	5.16	5.40	5.64	5.89	6.13	6.37
36	4.83	5.07	5.31	5.55	5.79	6.03	6.26
37	4.75	4.98	5.22	5.46	5.69	5.93	6.16
38	4.67	4.90	5.13	5.36	5.60	5.83	6.06
39	4.58	4.81	5.04	5.27	5.50	5.73	5.96
40	4.50	4.73	4.96	5.19	5.41	5.64	5.87
41	4.43	4.65	4.88	5.10	5.32	5.55	5.77
42	4.35	4.57	4.79	5.01	5.24	5.46	5.68
43	4.27	4.49	4.71	4.93	5.15	5.37	5.59
44	4.20	4.41	4.63	4.85	5.07	5.28	5.50
45	4.12	4.34	4.55	4.77	4.98	5.20	5.41

Table 11 Solubility of Oxygen in Water vs. Temperature and Barometric Pressure (upper range)

Pressure							
mm Hg	**725**	**750**	**760**	**775**	**800**	**825**	**850**
inches Hg	**28.5**	**29.5**	**29.9**	**30.5**	**31.5**	**32.5**	**33.5**
Temp °C	**Oxygen Solubility mg/L**						
0	13.94	14.43	14.62	14.91	15.39	15.88	16.36
1	13.56	14.03	14.22	14.50	14.97	15.44	15.91
2	13.19	13.65	13.83	14.10	14.56	15.02	15.48
3	12.84	13.28	13.46	13.73	14.17	14.62	15.06
4	12.50	12.93	13.11	13.37	13.80	14.24	14.67
5	12.18	12.60	12.77	13.02	13.45	13.87	14.29
6	11.87	12.28	12.45	12.69	13.11	13.52	13.93
7	11.57	11.98	12.14	12.38	12.78	13.19	13.59
8	11.29	11.69	11.84	12.08	12.47	12.87	13.26
9	11.02	11.41	11.56	11.79	12.17	12.56	12.94
10	10.76	11.14	11.29	11.51	11.89	12.26	12.64
11	10.51	10.88	11.03	11.25	11.61	11.98	12.35
12	10.27	10.63	10.78	10.99	11.35	11.71	12.07
13	10.04	10.40	10.54	10.75	11.10	11.45	11.80
14	9.82	10.17	10.31	10.51	10.86	11.20	11.54
15	9.61	9.95	10.08	10.29	10.62	10.96	11.30
16	9.41	9.74	9.87	10.07	10.40	10.73	11.06
17	9.21	9.54	9.67	9.86	10.18	10.51	10.83
18	9.02	9.34	9.47	9.66	9.98	10.29	10.61
19	8.84	9.15	9.28	9.46	9.77	10.09	10.40
20	8.66	8.97	9.09	9.28	9.58	9.89	10.19
21	8.49	8.79	8.92	9.10	9.40	9.70	10.00
22	8.33	8.63	8.74	8.92	9.21	9.51	9.80

Table 11 Solubility of Oxygen in Water vs. Temperature and Barometric Pressure (upper range) (Continued)

Pressure							
mm Hg	**725**	**750**	**760**	**775**	**800**	**825**	**850**
inches Hg	**28.5**	**29.5**	**29.9**	**30.5**	**31.5**	**32.5**	**33.5**
Temp °C	**Oxygen Solubility mg/L**						
23	8.17	8.46	8.58	8.75	9.04	9.33	9.62
24	8.02	8.30	8.42	8.59	8.87	9.16	9.44
25	7.87	8.15	8.26	8.43	8.71	8.99	9.27
26	7.73	8.00	8.11	8.28	8.55	8.83	9.11
27	7.59	7.86	7.97	8.13	8.40	8.67	8.94
28	7.45	7.72	7.83	7.99	8.25	8.52	8.79
29	7.32	7.59	7.69	7.85	8.11	8.37	8.64
30	7.20	7.46	7.56	7.71	7.97	8.23	8.49
31	7.07	7.33	7.43	7.58	7.84	8.09	8.35
32	6.95	7.20	7.31	7.46	7.71	7.96	8.21
33	6.84	7.08	7.18	7.33	7.58	7.83	8.08
34	6.72	6.97	7.07	7.21	7.46	7.70	7.95
35	6.61	6.85	6.95	7.09	7.34	7.58	7.82
36	6.50	6.74	6.84	6.98	7.22	7.46	7.70
37	6.40	6.63	6.73	6.87	7.10	7.34	7.57
38	6.29	6.53	6.62	6.76	6.99	7.22	7.46
39	6.19	6.42	6.52	6.65	6.88	7.11	7.34
40	6.09	6.32	6.41	6.55	6.78	7.00	7.23
41	6.00	6.22	6.31	6.45	6.67	6.90	7.12
42	5.90	6.12	6.21	6.35	6.57	6.79	7.01
43	5.81	6.03	6.12	6.25	6.47	6.69	6.91

9.4 Pressure Conversions

Refer to *Table 12* for Pressure Converions or use the conversion factors in *Table 13*.

Table 12 Pressure in mbar, mm Hg and in. Hg

mbar	mm Hg	inches Hg	mbar	mm Hg	inches Hg
700	525.0	20.67	860	645.1	25.40
705	528.8	20.82	865	648.8	25.54
710	532.5	20.97	870	652.6	25.69
715	536.3	21.11	875	656.3	25.84
720	540.0	21.26	880	660.1	25.99
725	543.8	21.41	885	663.8	26.13
730	547.5	21.56	890	667.6	26.28
735	551.3	21.70	895	671.3	26.43
740	555.0	21.85	900	675.1	26.58
745	558.8	22.00	905	678.8	26.72
750	562.5	22.15	910	682.6	26.87
755	566.3	22.30	915	686.3	27.02
760	570.0	22.44	920	690.1	27.17
765	573.8	22.59	925	693.8	27.32
770	577.5	22.74	930	697.6	27.46
775	581.3	22.89	935	701.3	27.61
780	585.0	23.03	940	705.1	27.76
785	588.8	23.18	945	708.8	27.91
790	592.5	23.33	950	712.6	28.05
795	596.3	23.48	955	716.3	28.20
800	600.0	23.62	960	720.1	28.35
805	603.8	23.77	965	723.8	28.50
810	607.5	23.92	970	727.6	28.64
815	611.3	24.07	975	731.3	28.79
820	615.1	24.21	980	735.1	28.94
825	618.8	24.36	985	738.8	29.09
830	622.6	24.51	990	742.6	29.23
835	626.3	24.66	995	746.3	29.38
840	630.1	24.81	1000	750.1	29.53
845	633.8	24.95	1005	753.8	29.68

Table 12 Pressure in mbar, mm Hg and in. Hg

mbar	mm Hg	inches Hg	mbar	mm Hg	inches Hg
850	637.6	25.10	1010	757.6	29.83
855	641.3	25.25	1015	761.3	29.97
1020	765.1	30.12	1065	798.8	31.45
1025	768.8	30.27	1070	802.6	31.60
1030	772.6	30.42	1075	806.3	31.74
1035	776.3	30.56	1080	810.1	31.89
1040	780.1	30.71	1085	813.8	32.04
1045	783.8	30.86	1090	817.6	32.19
1050	787.6	31.01	1095	821.3	32.34
1055	791.3	31.15	1100	825.1	32.48
1060	795.1	31.30			

Table 13 Pressure Conversions

	mbar	mm Hg	inches Hg
1 mbar	1	0.75006	0.02953
1 mm Hg	1.3332	1	0.039370
1 inch Hg	33.864	25.400	1

Example:
To convert 1013.25 mbar to mm Hg, multiply 1013.25 by 0.75006. The result is 760 mm Hg.

To convert 1013.25 mbar to in. Hg, multiply 1013.25 by 0.02953. The result is 29.92 in. Hg.

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

Description	unit	Cat. No.
Barometer/Altimeter	each	27584-00
Battery, for PN60 Citizen Printer 26687-00	each	26688-00
BOD Accessory Kit		
Includes funnel and spacer for Dissolved Oxygen Probe	each	51971-00
Cable, Dissolved Oxygen Probe, 1 meter	each	51970-00
Cable, Dissolved Oxygen Probe, 3 meter	each	51970-03
Cable, Dissolved Oxygen Probe, 15 meter	each	51970-15
Calibration Storage Chamber, Dissolved Oxygen Probe	each	51974-00
Cobalt Standard Solution, 100 mg/L	100 mL	21503-42
Dissolved Oxygen Service Kit		
Includes 2 membranes, fill solution, polishing cloth, 2 sponges	each	51968-00
Filling Solution, Dissolved Oxygen	59 mL	27591-26
HachLink™, Communications Software	each	49665-00
Membranes, for Dissolved Oxygen Probe	2/pkg	51973-00
Power Cord for PN60, continental European plug	each	46836-00
Power Supply for meter, 115 V	each	51898-00
Power Supply for meter, 230 V	each	46080-00
Print Cartridges for PN60, black	2/pkg	26690-00
Printer, portable, Citizen PN60	each	26687-00
Printer Port Cable for PN60	each	26689-00
Serial Cable, 9-pin, meter to PC	each	48129-00
Silica 3 Reagent Powder Pillows (contains sodium sulfite)	100/pkg	271-69
Sodium Sulfite	454 g	195-01
Weight Assembly	each	51969-00

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

Technical and Customer Service (U.S.A. only)

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**.

International Customers

Hach maintains a worldwide network of dealers and distributors. To locate the representative nearest you, send E-mail to **intl@hach. com** or contact:

In Europe, the Middle East, or Mediterranean Africa:
Hach Europe, S.A./N.V.; Namur, Belgium
Telephone: (32)(8l) 44.71.71; FAX: (32)(81) 44.13.00

In Canada, Latin America, the Caribbean, the Far East, the Indian Subcontinent, Africa (except Mediterranean Africa), or the Pacific Basin:
Hach Company World Headquarters; Loveland, Colorado, U.S.A.
Telephone: (970) 669-3050; FAX: (970) 669-2932

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

In Canada:
Hach Sales & Service Canada Ltd.
1313 Border Street, Unit 34
Winnipeg, Manitoba
R3H 0X4
(800) 665-7635 (Canada only)
Telephone: (204) 632-5598
FAX: (204) 694-5134
E-mail: canada@hach.com

In Europe, the Middle East, or in Mediterranean Africa:
Hach Europe, S.A./N.V.
Chaussée de Namur, 1
B-5150 Floriffoux (Namur), Belgium
Telephone: (32)(8l) 44.71.71
FAX: (32)(81) 44.13.00

In Latin America, the Caribbean,
the Far East, the Indian Subcontinent,
Africa (except Mediterranean Africa) or Pacific Basin:
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.

LIMITATION OF REMEDIES: Hach shall, at its option, replace or repair nonconforming products or refund all amounts paid by the buyer. **THIS IS THE EXCLUSIVE REMEDY FOR ANY BREACH OF WARRANTY.**

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 *sens**ion***™ meters against defective materials or workmanship for three years from the date of shipment.

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 *sens**ion8***™ Dissolved Oxygen Meter has been tested and is certified as indicated to the following instrumentation standards:

Product Safety

External Power Supplies Only:

115 Vac Supply, UL Listed & CSA Certified or

230 Vac Supply, CE Marked per 73/23/EEC, VDE Listed

EMI Immunity

Instrument Tested with the external 230V, 50 Hz Power Supply:

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 61000-4-2:1995) Electro-Static Discharge Immunity (Criteria B)

IEC 1000-4-3:1995 (EN 61000-4-3:1996) Radiated RF Electro-Magnetic Field Immunity (Criteria A)

IEC 1000-4-4:1995 (EN 61000-4-5:1995) Electrical Fast Transients/Burst (Criteria B)

IEC 1000-4-5:1995 (EN 61000-4-5:1995) Surge (Criteria B)

IEC 1000-4-6:1996 (EN 61000-4-6:1996) Conducted Disturbances Induced by RF Fields (Criteria A)

IEC 1000-4-11:1994 (EN 61000-4-11:1994) Voltage Dip/Short Interruptions (Criteria B)

Additional immunity Standard/s include:
ENV 50204:1996 Radiated Electro-Magnetic Field from Digital Telephones (Criteria A)

Emissions

Instrument Tested with the external 230V, 50 Hz Power Supply:

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 Hewlett Packard, Fort Collins, Colorado Hardware Test Center (A2LA # 0905-01), certified compliance by Hach Company.

Standards include:

EN 61000-3-2 Harmonic Disturbances Caused by Electrical Equipment

EN 61000-3-3 Voltage Fluctuation (Flicker) Disturbances Caused by Electrical Equipment

Additional Emissions Standard/s Include

EN 55011 (CISPR 11), Class “B” emission limits

CANADIAN INTERFERENCE-CAUSING EQUIPMENT REGULATION, IECS-003: Class “A” emission limits. Supporting test records by Hewlett Packard, Fort Collins, Colorado Hardware Test Center (A2LA # 0905-01), certified compliance by Hach Company.

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

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

FCC PART 15: Class emission “A” limits. Supporting test records by Hewlett Packard, Fort Collins, Colorado Hardware Test Center (A2LA # 0905-01), 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. Disconnect the external power supply from the *sens**ion8*** Dissolved Oxygen Meter to verify that the meter is or is not the source of the interference.

2. Move the *sens**ion8*** Dissolved Oxygen Meter and it's power supply away from the device receiving the interference.

3. Reposition the receiving antenna for the device receiving the interference.

4. Try combinations of the above.

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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 - **http://www.hach.com**; E-mail - **techhelp@hach.com**