Sper Scientific warrants this product against defects in materials and workmanship for a period of **five (5) years** from the date of purchase, and agrees to repair or replace any defective unit without charge. If your model has since been discontinued, an equivalent Sper Scientific product will be substituted if available. This warranty does not cover probes, batteries, battery leakage, or damage resulting from accident, tampering, misuse, or abuse of the product. Opening the meter to expose its electronics will void the warranty. To obtain warranty service, ship the unit postage prepaid to:

**SPER SCIENTIFIC LTD**  
7720 E Redfield Rd, Suite 7  
Scottsdale, AZ  85260  
WWW.SPERSCIENTIFIC.COM  
INFO@SPERSCIENTIFIC.COM

The defective unit must be accompanied by a description of the problem and your return address. Register your product online or return your warranty card within 10 days of purchase.
FIRST TIME USE

This instrument requires calibration prior to operating, or when readings are not within specifications for 100% air saturation calibration. The probe membrane can also become dry when the unit is not in use for long periods. Please refer to page 5 for the calibration procedure and page 18 for probe maintenance.

When operating the meter, press the buttons firmly for one full second to ensure proper operation.

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FUNCTION CHART

<table>
<thead>
<tr>
<th>Function Name</th>
<th>Function No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prn</td>
<td>P0.0</td>
<td>Print</td>
</tr>
<tr>
<td>CLR</td>
<td>P1.0</td>
<td>Clear</td>
</tr>
<tr>
<td>unt</td>
<td>P2.0</td>
<td>Unit</td>
</tr>
<tr>
<td>COF</td>
<td>P3.0</td>
<td>Coefficient</td>
</tr>
<tr>
<td>rdY</td>
<td>P4.0</td>
<td>Ready</td>
</tr>
<tr>
<td>Aut</td>
<td>P5.0 to P5.1</td>
<td>Automatic Shut Off</td>
</tr>
<tr>
<td>rtc</td>
<td>P6.0 to P6.6</td>
<td>Real Time Clock (rtc) Y:M:D and H:M:S</td>
</tr>
<tr>
<td>bEt</td>
<td>P7.0</td>
<td>Beta</td>
</tr>
<tr>
<td>CAL</td>
<td>P8.0</td>
<td>Calibration Data</td>
</tr>
<tr>
<td>rSt</td>
<td>P9.0</td>
<td>Reset</td>
</tr>
</tbody>
</table>
### ALTITUDE/PRESSURE CHART

<table>
<thead>
<tr>
<th>Altitude (Meter/Ft.)</th>
<th>Pressure (mmHg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (Sea level)</td>
<td>760 mmHg</td>
</tr>
<tr>
<td>152 /500</td>
<td>746</td>
</tr>
<tr>
<td>305 /1000</td>
<td>732</td>
</tr>
<tr>
<td>457 /1500</td>
<td>720</td>
</tr>
<tr>
<td>610 /2000</td>
<td>707</td>
</tr>
<tr>
<td>762 /2500</td>
<td>694</td>
</tr>
<tr>
<td>914 /3000</td>
<td>681</td>
</tr>
<tr>
<td>1067 / 3500</td>
<td>668</td>
</tr>
<tr>
<td>1219 / 4000</td>
<td>656</td>
</tr>
<tr>
<td>1372 / 4500</td>
<td>644</td>
</tr>
<tr>
<td>1524 / 5000</td>
<td>632</td>
</tr>
<tr>
<td>1676 / 5500</td>
<td>621</td>
</tr>
<tr>
<td>1829 / 6000</td>
<td>609</td>
</tr>
</tbody>
</table>

### INTRODUCTION

This meter reads dissolved oxygen (DO) for measuring water quality in labs, industrial and municipal waste water, aquariums, fish hatcheries and environmental testing.

Simultaneously displays DO readings, time, date and temperature in °C or °F. Features automatic temperature compensation (ATC), as well as salinity and altitude compensation, 99 memory points, min-max-average, hold, USB port, large backlit LCD, auto shut off and indicators for low battery and over range.

The meter comes complete with probe, replacement electrolyte fluid, syringe, 10 replacement membranes and...
**FRONT PANEL DESCRIPTION**

- **Power and Set**
- **Mode and Up**
- **Calibrate and Escape**
- **Memory and Down**
- **Hold and Recall**
- **Min/Max/Avg and Enter**

**Top View**

- DO probe connector
- IrDA port
- DC 9V Right-side
- RS232

**LCD DISPLAY DESCRIPTION**

- The primary display shows DO in % of ppm and mg/l.
- Barometric pressure is in mmHg or kPA, and Salinity is in ppt.
- The secondary display, below the primary display, shows the temperature of the reading.
- Year/Month/Date or Hour/Minute/Second are displayed interchangeably at the bottom-middle.
- HLD (Hold), Ready, CAL, MAX, MIN and AVG are displayed on the left side of the display.
- REC (Recall) is displayed at the bottom-left of the display.

**SPECIFICATIONS**

**General Specifications**

<table>
<thead>
<tr>
<th>Dimensions (approx.)</th>
<th>Meter 6 3/4&quot; x 2 3/4&quot; x 1 1/4&quot; (170 x 70 x 33 mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sensor 5&quot; x 1 1/4&quot; diameter (125 x 27d mm)</td>
</tr>
<tr>
<td></td>
<td>Cable 140&quot; to tip of sensor (3.5 meters)</td>
</tr>
<tr>
<td>Weight</td>
<td>14 oz, 397g</td>
</tr>
<tr>
<td>Operating Env.</td>
<td>32<del>122°F (0</del>50°C)</td>
</tr>
<tr>
<td>Sampling Time</td>
<td>1 Second</td>
</tr>
</tbody>
</table>

**Optional Accessories:**

- 840027 - AC Power Adaptor
- 840052 - Software Version 2.1 and above
- 840054 - USB Cable
- 840092 - Bench-Top Tripod
- 840093 - Field Tripod
- 850042 - Replacement Probe
- 850043 - Replacement Membranes and O-rings (10 each per package)
- 850044 - Replacement Electrolyte
### SPECIFICATIONS

**Range, Resolution and Accuracy**

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Type</th>
<th>Range</th>
<th>Resolution</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>D.O %</td>
<td></td>
<td>0.0 ~ 199.9%</td>
<td>0.1%</td>
<td>±1.5% of F.S.</td>
</tr>
<tr>
<td>D.O mg/L (PPM)</td>
<td></td>
<td>0.0 ~ 19.99 mg/L</td>
<td>0.01 mg/L</td>
<td>±1.5% of F.S.</td>
</tr>
<tr>
<td>Temperature</td>
<td></td>
<td>32<del>122°F, 0</del>50°C</td>
<td>±1°C/°F</td>
<td>±2°F, ±1°C</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Compensation</th>
<th>Type</th>
<th>Range</th>
<th>Resolution</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salinity</td>
<td></td>
<td>0.0~50.0 ppt</td>
<td>0.1 ppt</td>
<td>±1.5% of F.S.</td>
</tr>
<tr>
<td>Pressure</td>
<td></td>
<td>50~1499mmHg/L</td>
<td>1mmHg/0.1kPa</td>
<td>&lt;10°C of Cal.</td>
</tr>
<tr>
<td>Temperature</td>
<td></td>
<td>32<del>122°F (0</del>50°C)</td>
<td>±1°C/°F</td>
<td>±2°F, ±1°C</td>
</tr>
</tbody>
</table>

### MEASUREMENT PROCEDURES

**Air Saturation Calibration**

1. Turn on the DO meter by pressing the SET button.
2. Press the MODE button to switch the meter from either PPM or mg/L to % (percent) to perform the Air Saturation Calibration.
3. If after 15 minutes the reading is stable, there is no need to calibrate the DO meter. If the reading exceeds ±1.5% of 100% Air Saturation (100% = 20.9% O₂), perform the following calibration steps.

   - It is recommended that the probe be rinsed with deionized water or the Electrolyte solution be replaced to achieve the most accurate readings. (see page 18)

4. All new calibrations will automatically override existing calibration data. Press the CAL button to calibrate for 100% Air Saturation. The CAL symbol flashes on the display.
5. Wait for five (5) seconds or until the reading is stable, then press the ENTER button to complete the calibration.
6. If calibrated correctly, the meter will read approximately 100%.
7. If an error (ERR #) is displayed after the calibration, repeat calibration or refer to the troubleshooting section on page 20.
**MEASUREMENT PROCEDURES**

**Dissolved Oxygen (DO) Measurement**

*During laboratory measurements, the use of a magnetic agitator is recommended to ensure correct liquid velocity is achieved. This keeps errors to a minimum due to the diffusion of oxygen present in the water.*

1. Make certain the meter has been calibrated (see page 5)
2. Select your desired DO scale: mg/L or PPM.
3. The meter is now ready to measure the DO of a liquid.
4. Immerse the Probe head to a depth of between 0.5” to 12”. Automatic Temperature Compensation takes several minutes for the difference between the temperature of the probe and liquid to equalize.
5. In order to measure the DO of any liquid, the probe must come in contact with the liquid. Make sure that the velocity of the liquid is at least 0.2 - 0.3 m/s (this can be achieved by shaking the probe or probe cable) to ensure an accurate reading.
6. Salinity of the water and barometric pressure can have an effect on DO measurements. (see page 13)
7. When the reading is stable, press the **MEM** button to store the reading. (see page 7)
8. Rinse the probe head with normal tap water after each measurement.

**OPTIONAL ACCESSORIES**

- **840052** Software
- **840054** USB Cable
- **840089** Rubber Holster
- **840090** Water Resistant Instrument Pouch
- **840092** Bench-Top Tripod
- **840093** Field Tripod
- **850042** Replacement DO Probe
- **850043** Replacement Membranes & O-Rings, 10 each
- **850044** Replacement Electrolyte
### DATA OUTPUT

**IrDA Protocol**

- The meter holds up to 99 data points. The data may be transmitted via the IrDA port to a PC with an IrDA interface. The IrDA protocol is compatible with SIR (serial interface) 19200 bps, 8 data bits and no parity.

  **Data Format:** (Transmitting every second)
  
  Cxx.xxmg/l(ppm):Cxx.xx%:Txxx.xC(F):PxxxxmmHg(or xxx.xkPA):Sxx.xppt@xxx-xx-xx:xx:xx LRCCRLF

**USB Output**

- Using the optional USB cable and software (840054 & 840052 Ver 2.1 or above), connect the meter to a PC to capture real-time data, display DO readings or save data for analysis.

- Plug the USB cable to the USB port (on the right side of the meter) and connect the other end to the PC’s serial port.

- The USB transfer protocol is the same as the IrDA format shown above.

- Data stored in the DO meter’s memory can only be transferred via the IrDA port and not USB.

### MEASUREMENT PROCEDURES

**Storing DO Readings**

1. The memory counter (1-99) is displayed on the right side of the LCD in the secondary display area.

2. During general measurement, press the **MEM** button to store the current reading.

3. The measurement will be stored and the memory counter will increase by one. The DO reading and date/time will flash several times after the MEM button is pressed.

**Recall Readings**

1. Press the **HLD/REC** button for two seconds, then press the ▲ or ▼ buttons to scroll through the memory counter.

2. The REC indicator will start flashing in the bottom left corner of the LCD display.

3. Press the **HLD/REC** button again for two seconds to exit the data recall function.
MEASUREMENT PROCEDURES

Data Hold

1. Press the **HLD/REC** button to freeze the current reading.
2. **HLD** will be displayed in the upper left corner of the LCD display.
3. Press the **HLD/REC** button again to resume active measurement.

![Data Hold Image]

Data Min/Max/Avg Reading

1. Press the **HLD/REC** button for two seconds and the **REC** indicator will start flashing on the bottom left of the LCD display.
2. Press the **ENTER** button to display and cycle through the minimum, maximum and average readings stored in the current memory location.
3. **MIN**, **MAX** or **AVG** will be displayed on the left side of the LCD display.
4. Press the **HLD/REC** button for two seconds to exit this function.

![Data Min/Max/Avg Reading Image]

ERROR CODES

E1  The probe is disconnected or damaged
E2  Value underflow, calibrate the meter (see page 5)
E3  Value overflow, calibrate the meter (see page 5)
E4  Value error, replace the membrane and/or check the Electrolyte solution. (see page 18 & 19)
E17 100% Saturation Calibration error, replace the membrane, O-Ring and Electrolyte solution. (see page 8 & 19)
E21 The current temperature is not within ±10 °C of the temperature when 100% Saturation Calibration was performed.
E31 A/D error, contact Sper Scientific, Ltd.
E32 Memory error, contact Sper Scientific, Ltd.

BATTERY REPLACEMENT

The battery compartment is located on the back of the meter. When the low battery icon appears, replace all 4 batteries with new AAA heavy duty alkaline batteries. Be sure to match the polarity (−/+ ) when you insert the batteries.
TROUBLESHOOTING

Meter is on, but there is no display

1. Check and/or replace the batteries. Be sure there is good contact and that the polarity is correct.

2. Ensure that the probe is properly connected to the meter.

3. Check for air trapped under the membrane.

4. Be sure to press the **SET** button for only one second, otherwise the meter will be placed in the Function Mode.

Meter is not reading correctly

1. If there are bubbles, residue or solid particles around the electrode and/or membrane, replace the Electrolyte fluid. (see page 18)

2. If you receive error codes E3 or E17, after rinsing the probe, replace the membrane and O-ring. (see page 19)

3. Check for a significant concentration of $\text{H}_2\text{S}$, $\text{SO}_2$, $\text{H}_2$, Neon or NO in the sample. These gases can interfere with DO readings.

4. If the electrode sensor is badly discolored, replace the probe. (Contact Sper Scientific, Ltd.)

MEASUREMENT PROCEDURES

Backlight

- Simultaneously press the **HLD/REC** and the **ENTER** buttons to activate the LCD backlight. The backlight turns off automatically after 10 seconds.

FUNCTION SETTINGS

Entering Function Mode:

1. With the DO meter off, press the **SET** button for two seconds to enter the Function Mode.

2. The primary display shows the Function Name and the secondary display shows the Function Number (see page 26 for a table of all meter functions).

3. Press the ▲ or ▼ buttons to scroll through the ten functions: **Print**, **Clear**, **Unit**, **Coefficient**, **Ready**, **Automatic Shut-Off**, **Real-Time Clock**, **Beta**, **Calibration Data** and **Reset**.

4. Press **ESC** (2) button to exit Function mode.
**FUNCTION SETTINGS**

**Print Function (P0.0)**

1. The first function is the print function and will display “Prn” in the primary display and P0.0 in the secondary.

2. Press the **ENTER** button to transmit data stored in memory via the IrDa (Infrared Data Port).

   *The IrDa port must be placed at a 30° angle to properly transfer data to a PC.*

3. “Prn” flashes for several seconds and P0.1 is displayed during the transfer.

4. Press the ▲ or ▼ buttons to continue to the next desired function or press **ESC** to exit the Function mode.

   ![Print Function Diagram]

**PROBE MAINTENANCE**

**Replacing Membrane & O-Rings** (Reconditioning)

1. Unscrew the Probe Guard (I)

2. Remove the Membrane Lock Cap (H)

3. Remove and discard the Membrane (G) and O-ring (F).

4. Insert a new O-Ring (F)

5. Carefully place and center a new Membrane (G) over the Cathode/Anode Sensor (E) and then cover with the Membrane Lock Cap (H).

6. Reattach the Probe Guard (I).

7. Replace the Electrolyte solution, if required. (see page 18)

8. Let the probe stabilize for several minutes before taking a DO measurement.

   ![Probe Disassembly Diagram]

   A. Screw  
   B. Washer  
   C. O-ring  
   D. Filling Port  
   E. Cathode/Anode and Temperature Sensor  
   F. Membrane O-ring  
   G. Membrane  
   H. Membrane lock cap  
   I. Probe Guard

*The meter includes 10 membrane and 10 O-rings for use when reconditioning the probe or when the membrane is damaged and needs to be replaced.*
PROBE MAINTENANCE

Replace the Electrolyte fluid when bubbles are seen around the sensor and/or membrane, or when changing the membrane. Also, the Electrolyte fluid may need to be replaced when the meter appears to be less sensitive or when an error message indicates that measurements are inaccurate.

Rinsing & Refilling Probe

1. Remove the screw (A), washer (B) and O-ring (C) from the filler port (D) with a small Phillips screwdriver. (see diagram below)

2. Flush out the current Electrolyte solution through the filler port (D) using distilled or de-ionized water.

3. Rinse the electrode by injecting distilled or de-ionized water into the filler port (D) with the syringe provided.

4. Gently shake the probe and flush out the water.

5. Refill the probe, through filler port (D), with the Electrolyte (Kbr) solution provided and reinstall the screw, washer and O-ring.

6. Let the probe stabilize for several minutes before taking a DO measurement.

FUNCTION SETTINGS

Clear Function (P1.0)

1. With “CLR” and P1.0 displayed, press the ENTER button

2. P1.1 appears in the secondary display

3. Press the ▲ or ▼ buttons to select “y” to clear memory or “n” not to clear memory.

4. Press the ENTER button again to save the setting

5. Press the ▲ or ▼ buttons to continue to the next or desired function or press ESC (2) to exit the Function mode.

Unit Function (P2.0)

1. With “unt” and P2.0 displayed, press the ENTER button

2. “t” and P2.1 are displayed, while °C or °F are flashing.

3. Press the ▲ or ▼ buttons to select the desired temperature scale: °C or °F.

4. Press the ENTER button again to save the setting.

5. Next, ”do” and P2.2 are displayed, while ppm or mg/l flashes.
6. Press the ▲ or ▼ buttons to select ppm or mg/l.

7. Press the ENTER button to save the setting.

8. “unt” and P2.0 are displayed again.

9. Press the ▲ or ▼ buttons to continue to the next desired function or press ESC to exit the Function mode.

**Coefficient Function (P3.0)**

1. With “COF” and P3.0 displayed, press the ENTER button. *(Please read the notes on the next page before adjusting the following values.)*
   - “mmHg” and P3.1 are displayed, along with the mmHg value.
   - “kPA” and P3.2 are displayed, along with kPA value.
   - “ppt” and P3.3 are display with the ppt value.

3. Press the ▲ or ▼ buttons to adjust the value for each of the three measurements.

4. Press the ENTER button after each value.

5. When complete, “COF” and P3.0 are displayed.

6. Press the ▲ or ▼ buttons to continue to the next desired function or press ESC to exit the Function mode.

**Calibration (View Only) Function (P8.0)**

1. With “CAL” and P8.0 displayed, press the ENTER button.

2. “P8.1” calibration slope (sensor sensitivity) and the date are displayed.

3. Press the ENTER button to view the calibration temperature.

4. Press the ▲ or ▼ buttons to continue to the next or desired function or press ESC to exit the Function mode.

**Reset Function (P9.0)**

1. With “rSt” and P9.0 displayed, press the ENTER button.

2. Press the ▲ or ▼ buttons to select “y” to reset the DO meter to the factory defaults or “n” to keep the user-defined settings.

3. Press the ENTER button, then press ESC to exit the Function mode.
FUNCTION SETTINGS

Beta Function (P7.0)

1. With “bEt” and P7.0 displayed, press the ENTER button.

2. “P7.1” and the membrane temperature coefficient are displayed - the default value is 4.8.

3. Press the ▲ or ▼ buttons to adjust the value, then press the ENTER button.

4. Press the ▲ or ▼ buttons to continue to the next desired function or press ESC to exit the Function mode.

FUNCTION SETTINGS

Ready Function (P4.0)

1. With “rdY” and P4.0 displayed, press the ENTER button. The current setting will flash.

2. Press the ▲ or ▼ buttons to switch between off (OF) and on (on), then press the ENTER button.

3. When “on” is selected, “READY” will flash on the left of the LCD display during DO measurements.

4. When the reading is stable, “READY” is displayed and not flashing.

5. Press the ▲ or ▼ buttons to continue to the next desired function or press ESC to exit the Function mode.

Notes...
- **Barometric Pressure Adjustment:** For accurate readings, be sure to obtain the correct ambient barometric pressure. If the barometric pressure setting is adjusted from the default value of 760 mmHg, the calibration value in air will automatically adjust to a value other than 100%. If you do not have equipment to measure barometric pressure, you can use the Altitude Chart/Pressure chart on page 25.

- **Salinity Adjustment:** Use a salinity meter to obtain the salt concentration, then correct the salinity value.
**FUNCTION SETTINGS**

### Automatic Shut-Off Function (P5.0)

1. This function will program the meter to automatically shut off after 20, 30, 40 (default), 60, 90 or 120 minutes.

2. With “Aut” and P5.0 displayed, press the **ENTER** button.

3. The shut-off time appears in the primary display and P5.1 appears in the secondary display.

4. Press the ▲ or ▼ buttons to cycle through the shut off time values (shown above) and press the **ENTER** button to save the selected value.

5. To override the automatic shut-off function, turn the meter on by simultaneously pressing both the **SET** and **HLD** for two seconds - “nSL” is displayed.

6. Press the ▲ or ▼ buttons to continue to the next desired function or press **ESC** to exit the Function mode.

---

### Date & Real-Time Clock Function (P6.0)

1. With “rtc” and P6.0 displayed, press the **ENTER** button.

2. “P6.1” appears in the secondary display and “YMD” appears in the lower display.

3. Press the ▲ or ▼ buttons to set the 2-digit year, then press the **ENTER** button to set the month, P6.2 is displayed.

4. Continuing using ▲ or ▼ or **ENTER** buttons to set the remaining values.

5. When “rtc” and P6.0 are displayed again, press the ▲ or ▼ buttons to continue to the next desired function or press **ESC** to exit the Function mode.

- P6.1 = Year
- P6.2 = Month
- P6.3 = Day
- P6.4 = Hour
- P6.5 = Minute
- P6.6 = Second