User's Manual

EXTECH
INSTRUMENTS
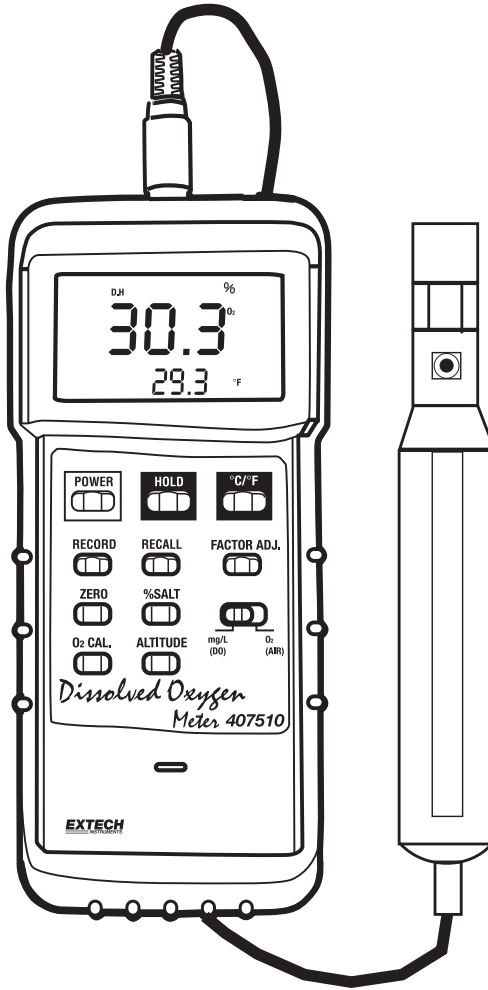
Heavy Duty Dissolved Oxygen Meter

Model 407510

Introduction

Congratulations on your purchase of Extech's Heavy Duty Dissolved Oxygen / Temperature Meter which simultaneously displays Dissolved Oxygen, Oxygen in air, and Temperature. Units of measure are mg/l for Dissolved Oxygen, % for Oxygen in air, and $^{o}C/^{o}F$ for temperature. Oxygen is measured with a remote sensor that also contains a thermistor for measuring temperature. Advanced features include RS 232 PC serial interface, data hold, auto shut off, and Min/Max/Avg recording.

Specifications

General Specifications

Circuit	Custom one-chip LSI microprocessor circuit
Display	Dual function 0.5" (13 mm) 1999 count LCD w/ contrast adjust
Measurements	Dissolved O_2: mg/l (milligrams per liter); Oxygen in air: %; Temperature: °C/°F
Data hold	Data hold key freezes displayed reading
Sensor Structure	Remote Polarographic Dissolved Oxygen Sensor
	Temperature sensor: Precision thermistor
Data recording	Min/Max/Avg readings stored for later recall
Auto power off	Meter turns off after 10 minutes
Sample rate	0.4 Sec (approx.)
Data Output	RS 232 PC serial interface
Operating conditions	Temperature: 32 to 122 °F (0 to 50 °C); Humidity: < 80% RH
Battery power	9V alkaline battery
Power Consumption	Approx. 6.6 mA DC
Weight	0.74 lbs. / 335 g (including batteries & probe)
Dimensions	Main instrument: 7.1 x 2.8 x1.3" (180 x 72 x 32mm)
	Probe: 4.9" x 0.8" length/diameter (125 x 20mm)
Accessories	Carrying case, 9V battery, and 5 membranes
Optional accessories	Membranes, data acquisition software & RS232 interface cable

Electrical Specifications

Measurement	Range	Resolution	Accuracy
Dissolved Oxygen	0.0 - 19.9 mg/L	0.1mg/L	$\pm$ 0.4 mg/L
Oxygen in air	0 - 100% O_2	0.1 % O_2	$\pm$ 0.7% O_2
Temperature (probe only)	32 to 122 ^{o}F	$0.1^{o}F/C$	$\pm1.5\ ^{o}F$
	0 to 50 ^{o}C		$\pm$ 0.8 ^{o}C
Compensation adjustments	Temperature (automatic)	32 to 122 ^{o}F (0 to $50^{o}C$)	
	Salt	0 to 39% (1% = ppt)	
	Altitude	0 to 3900 meters	

Meter Description

1   LCD Display
2   POWER ON/OFF key
3   Data HOLD key
4   °C/°F selection key
5   LCD Contrast Adjust
6   RECORD key
7   RECALL key
8   Factor adjust key
9   Probe top
10 Sensor body
11 Sensor plug
12 Sensor jack
13 RS-232 output jack
14 Battery cover (rear)
15 Altitude compensation key
16 O_2 Cal key
17 Zero key
18 O_2 calibration key
19 % Salt key
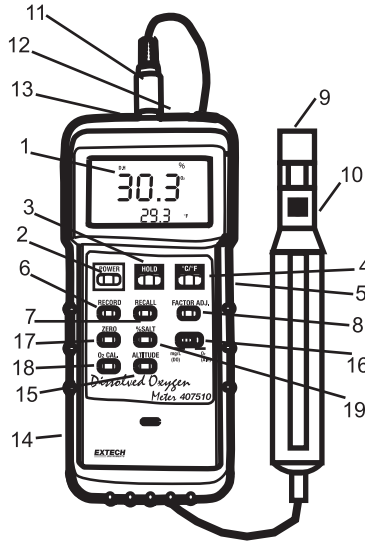
Calibration

For first time use or after long periods (several days) of non-use, calibrate the instrument using the following steps. The procedure should be performed in an open, well-ventilated area.

1. Ensure that the sensor is DISCONNECTED from the meter.
2. Turn ON the meter.
3. Slide the O_2/DO selector to the O_2 position.
4. Press the zero key to null the meter (the display should indicate "OO").
5. Connect the DO sensor to the top of the meter.
6. Allow the meter to stand for at least five minutes until the display stabilizes.
7. Press the O_2 Cal key and the display will indicate approx. 20.9 (typical O_2 in air).

Dissolved Oxygen (DO) Measurements

Measurement Preparation

Before taking measurements, perform the calibration described above if necessary. In addition, perform the % SALT and ALTITUDE compensation adjustments as described below:

% SALT Compensation

Slide the O_2/DO switch to the DO position. If the measured liquid is pure water or is known **not** to have a salt content, set the % Salt factor to 0%.

1. Press the % Salt key. The display will indicate **0%** on the middle portion of the LCD display and **S** on the bottom portion of the LCD.

2. Pressing the Factor Adj. key once will add 1% to the salt factor.

3. Press the Factor Adj. key until the correct factor is displayed.

4. Press the % Salt key to store the factor.
NOTE: 1% = 10 ppt (parts per thousand)

ALTITUDE Compensation

The meter has a default calibration for sea level operation (0 meters). Any significant deviation from sea level requires a compensation adjustment. Perform the following steps to do so:

1. Press the ALTITUDE key and the display will indicate a "0" in the middle of the LCD and an "H" on the lower portion of the LCD.

2. Press the Factor Adj. key once to add 100 meters, twice to add 200 meters, and so on. Maximum compensation is 3900 meters.

3. Once the desired compensation is displayed, press the ALTITUDE key again to store the value.

Taking Measurements

1. Immerse the probe in the solution under test. For best automatic temperature compensation, immerse the probe to a depth of at least 4" (10 cm).
2. Wait until the display stabilizes.
3. The velocity of the liquid coming into contact with the probe must be at least 0.6 to 1 ft/min (0.2 to 0.3 m/s). If the solution is standing, stir the solution with the probe or use an agitator.
4. Rinse the probe with clean water after each use.

Oxygen in Air (O2) Measurements

Follow the same steps above for DO measurements except for the variations described below:
1. Slide the O_2/DO switch to the O_2 position.
2. The display will indicate the oxygen air value in %.

Temperature Measurements

The lower display will indicate the temperature of the measured solution. Press the $^{o}C/^{o}F$ key to change the temperature units.

Advanced Features

Data Hold

Press the Data Hold key to freeze the displayed value. The LCD will display **DH** for Data Hold mode along with the held reading. Press the Hold key again to release the data hold function.

MIN/MAX/AVG Data Recording

When selected, the Data Recording function records the Min, Max, and Average readings. To start a data recording session:

1. Press the RECORD key once. The REC indicator will appear on the display and the meter will begin to record the lowest (min), highest (max), and average (avg) readings.
2. To recall the data, press the RECALL key once. The MAX indicator will appear along with the highest reading recorded since the RECORD key was pressed.
3. Press the RECALL key again to view the MIN value.
4. Press the RECALL key again to view the AVG reading.
5. To exit the Record mode, press the RECORD key again. The display indicators REC, MIN, MAX, and AVG will disappear.

Auto Power OFF

The meter includes an Auto shut off feature that preserves battery life. The meter will automatically turn off if no function button is pressed in any 10 minute period. To disable this feature press the RECORD key to engage the record function.

LCD Contrast Adjust

It may be necessary to adjust the display contrast due to a change in viewing angle or voltage drift. Use the LCD Contrast adjustment located on the right side of the meter to set the preferred contrast.

CPU Reset

Certain improper keystroke sequences can cause the meter to "hang" and become inoperable. The following procedure will reset the meter.

1. Slide the O_2/DO switch to the O_2 position.
2. Turn the meter OFF and disconnect the DO probe.
3. Press and HOLD the O_2 CAL key and then press the POWER key.
4. Release the O_2 CAL key and then press the ZERO key.
5. Connect the DO probe.
6. Wait several minutes for the reading to stabilize and then press the O2 CAL key.

RS-232 PC Interface

The meter includes a RS-232 serial data port. This interface was designed to operate with the Extech Data Acquisition Software/Hardware kit Part No. 407001. This kit enables the user to capture, store and display readings using a PC.

Membrane & Electrolyte Replacement

The tip of the probe holds a thin Teflon® membrane and an electrolyte container. Calibration or reading errors could indicate loss of electrolyte or a dirty/damaged membrane. The membrane is very delicate and can easily be damaged if it comes in contact with solid objects. Replace the electrolyte or the membrane as follows:

1. Unscrew the probe head and electrolyte container from the probe handle and drain the old electrolyte
2. Unscrew the probe head.
3. Remove the white O-ring, remove the old membrane and then carefully install the new membrane and secure with the O ring.
4. Replace the probe head onto the electrolyte container.
5. Fill the electrolyte container with new electrolyte.
6. Screw the tip and well assembly back onto the probe handle. Excess electrolyte may be forced out through the threads. Wipe clean.
7. Lightly tap the probe to remove any air bubbles.

1. Probe handle
2. Temperature sensor
3. Electrode holder
4. Electrolyte container
5. Diaphragm
6. O-ring
7. Probe head

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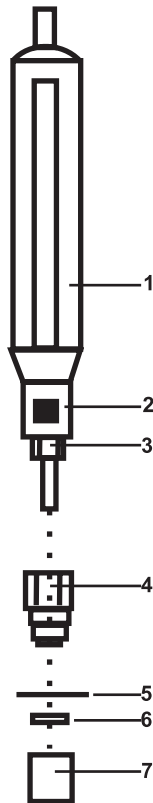
Battery Replacement

The low battery indication LBT appears on the LCD when the battery runs low.
To replace the battery:

1. Remove the meter's rubber protective cover to access the rear battery compartment.
2. Remove the battery compartment cover using a small coin or screwdriver and remove the 9V battery.
3. Replace the 9V battery and reinstall the cover and holster.

Calibration and Repair Services

Extech offers repair and calibration services for the products we sell. Extech also provides NIST certification for most products. Call the Customer Service Department for information on calibration services available for this product. Extech recommends that annual calibrations be performed to verify meter performance and accuracy.

Warranty

*EXTECH INSTRUMENTS CORPORATION warrants this instrument to be free of defects in parts and workmanship for **one year** from date of shipment (a six month limited warranty applies to sensors and cables). If it should become necessary to return the instrument for service during or beyond the warranty period, contact the Customer Service Department at (781) 890-7440 ext. 210 for authorization or visit our website www.extech.com for contact information. A Return Authorization (RA) number must be issued before any product is returned to Extech. The sender is responsible for shipping charges, freight, insurance and proper packaging to prevent damage in transit. This warranty does not apply to defects resulting from action of the user such as misuse, improper wiring, operation outside of specification, improper maintenance or repair, or unauthorized modification. Extech specifically disclaims any implied warranties or merchantability or fitness for a specific purpose and will not be liable for any direct, indirect, incidental or consequential damages. Extech's total liability is limited to repair or replacement of the product. The warranty set forth above is inclusive and no other warranty, whether written or oral, is expressed or implied.*

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Support line (781) 890-7440

Technical support: Extension 200; E-mail: support@extech.com

Repair & Returns: Extension 210; E-mail: repair@extech.com

Product specifications subject to change without notice

For the latest version of this User's Guide, Software updates, and other
up-to-the-minute product information, visit our website: www.extech.com

Extech Instruments Corporation, 285 Bear Hill Rd., Waltham, MA 02451