

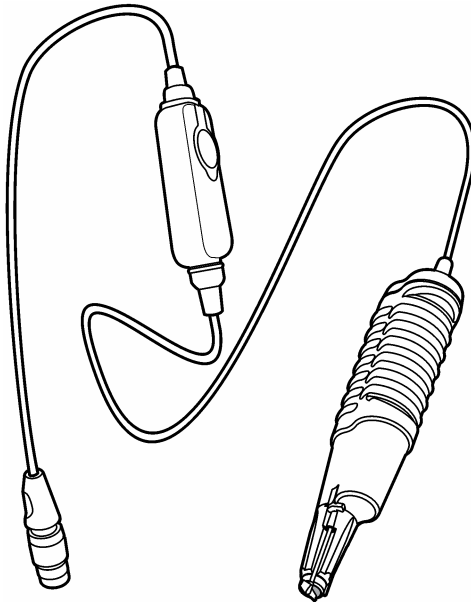


DOC022.53.80025

LBOD101

05/2021, Edition 4

User Manual

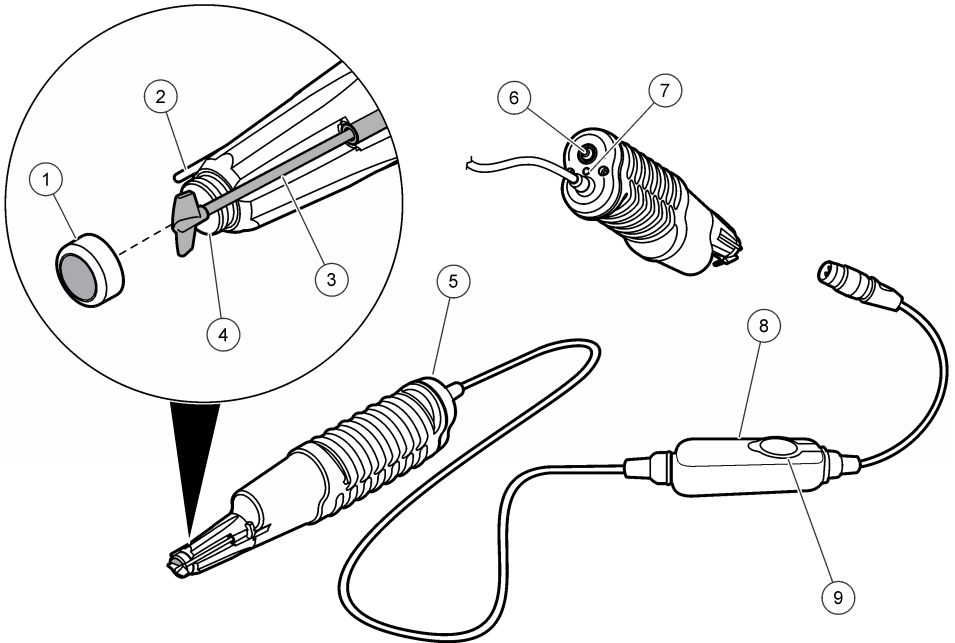


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Section 1 Product overview

The Intellical LBOD101 probe is a digital, luminescent dissolved oxygen sensor that measures the dissolved oxygen concentration of BOD (biochemical oxygen demand) samples. The probe has temperature and absolute air pressure sensors for accurate dissolved oxygen measurements. The probe stays on standard BOD bottles and stirs the sample during measurements. Refer to [Figure 1](#).

Figure 1 Probe overview



1 LBOD sensor cap	6 Stirrer on/off button
2 Thermistor	7 Power indicator LED
3 Stirrer assembly	8 Air pressure sensor module
4 Probe lens	9 iButton® compartment ¹
5 Probe body with stirrer assembly	

Section 2 Specifications

Specifications are subject to change without notice.

Specifications	Details
Probe type	Luminescent dissolved oxygen (LDO) sensor with integrated stirring system
Dissolved oxygen range	0.05 to 20.0 mg/L (ppm); 1 to 200% saturation
Dissolved oxygen accuracy	±0.05 mg/L for concentrations less than 10 mg/L O ₂ ±0.1 mg/L for concentrations more than 10 mg/L O ₂

¹ iButton is a registered trademark of Maxim Integrated Products, Inc.

Specifications	Details
% saturation resolution	0.1%
% saturation accuracy	±0.59% of reading
Stabilization time	T90% at 10 seconds (when the solution is stirred)
Temperature resolution	0.1 °C (0.18 °F)
Temperature accuracy	±0.3 °C (±0.54 °F)
Pressure resolution	5 mbar (0.5 kPa)
Pressure accuracy	±3 mbar (0.3 kPa)
Operating temperature	0 to 50 °C (32 to 122 °F)
Storage temperature	5 to 40 °C (41 to 104 °F)
Minimum immersion depth	10 mm (0.394 in.)
Dimensions	Diameter: 15.875 mm (0.625 in.) Length: 215 mm (8.46 in.) Cable length: 1.8 m (5.9 ft)
Cable connection	M12 digital output and connector
Warranty	1 year on the probe. This warranty covers manufacturing defects, but not improper use or wear.
Certifications	CE, FCC/ISED

Section 3 Safety information

3.1 Intended use

The Intellical probes are intended for use by individuals who measure water quality parameters in the laboratory or in the field. The Intellical probes do not treat or alter water.

3.2 Use of hazard information

DANGER

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

WARNING

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.

NOTICE



Indicates a situation which, if not avoided, may cause damage to the instrument. Information that requires special emphasis.

3.3 Precautionary labels

Read all labels and tags attached to the instrument. Personal injury or damage to the instrument could occur if not observed. A symbol on the instrument is referenced in the manual with a precautionary statement.

	Electrical equipment marked with this symbol may not be disposed of in European domestic or public disposal systems. Return old or end-of-life equipment to the manufacturer for disposal at no charge to the user.
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3.4 Product hazards

▲ CAUTION	
	Chemical exposure hazard. Obey laboratory safety procedures and wear all of the personal protective equipment appropriate to the chemicals that are handled. Refer to the current safety data sheets (MSDS/SDS) for safety protocols.
▲ CAUTION	
	Chemical exposure hazard. Dispose of chemicals and wastes in accordance with local, regional and national regulations.

Section 4 Preparation for use

Prepare the probe for calibration and measurement as follows. Do not touch the protective black layer on the LBOD sensor cap.

1. Open the pressure sensor module cap and make sure that the label on the iButton is on top.
2. Rinse the probe with deionized water. Blot dry with a lint-free cloth.
3. Make sure that the meter has the correct date and time settings. The service-life time stamp in the probe comes from the date and time settings in the meter.

Note: Some meters automatically open the date and time settings when the meter starts for the first time, or after battery replacement.

4. Connect the probe to the meter.

Section 5 Calibration

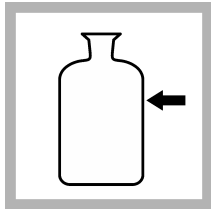
The procedure that follows is applicable to meters that can connect to Intellical LBOD probes. Refer to the applicable meter documentation for meter operation and probe-specific settings.

5.1 Calibration notes

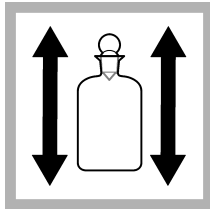
Read the notes that follow before calibration.

- Measure samples as soon as possible after collection.
- Use the single display mode for calibration when more than one probe is connected to the meter (if applicable).
- Calibrate the probes and verify the calibration regularly for best results. Use the meter to set calibration reminders.
- The calibration data is stored in the probe. When a calibrated probe is connected to a different meter with the same calibration options, a new calibration is not necessary.
- Air bubbles below the sensor when in solution can cause a slow response or error in the calibration. Make sure to remove air bubbles during calibration.
- The meter uses the slope value shown at the end of the calibration to monitor the condition of the sensor cap.

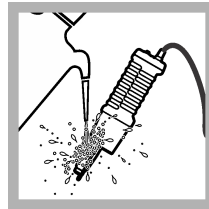
5.2 LBOD water-saturated air (100%) calibration procedure



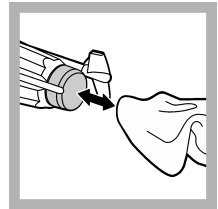
1. Fill a BOD bottle approximately $\frac{3}{4}$ full with water.



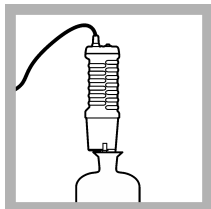
2. Put a stopper on the bottle and shake for 30 seconds.



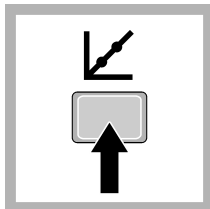
3. Rinse the probe with deionized water. Dry the probe with a lint-free cloth.



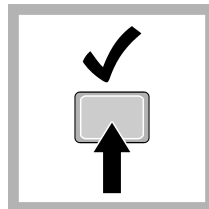
4. Carefully dry the LBOD sensor cap with a non-abrasive cloth.



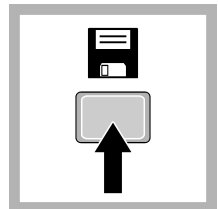
5. Put the probe in the bottle. Wait approximately 10 minutes for the contents to adjust to ambient temperature.



6. Go to the calibrate menu. Select the probe, if applicable.



7. Read the dissolved oxygen value. The display shows 100% when the reading is stable.



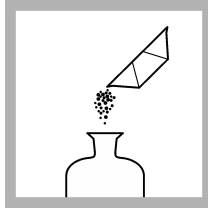
8. Save the calibration.

5.3 Zero-point calibration procedure

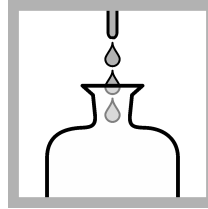
A zero-point calibration can increase the measurement accuracy of samples that have less than 1 mg/L O₂. A zero point calibration is not recommended for samples that have more than 1 mg/L O₂. Set the calibration mode to "100% with 0". The meter starts the calibration with the 100% measurement, then continues to the zero-point measurement.



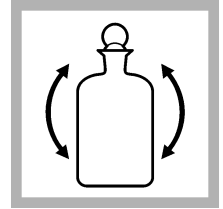
1. Fill a BOD bottle with deionized water.



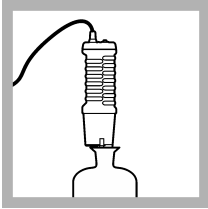
2. Add 300 mg of sodium sulfite to the bottle.



3. Add 2 mL of cobalt chloride solution to the bottle.



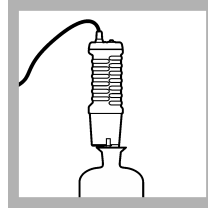
4. Put a stopper on the bottle and fully mix for 30 seconds.



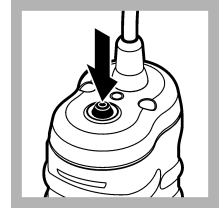
5. Remove the stopper. Put the probe in the bottle.



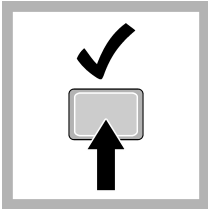
6. Tap the probe to remove air bubbles.



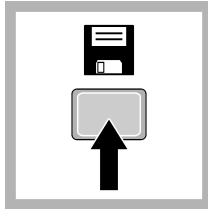
7. Wait approximately 10 minutes for the contents to adjust to ambient temperature.



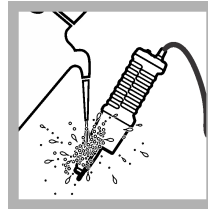
8. Start the stirrer.



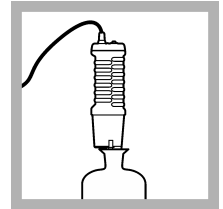
9. Read the dissolved oxygen value. Wait for the measurement to become stable.



10. Save the calibration.



11. Rinse the probe with deionized water. Dry the probe with a lint-free cloth.



12. Fill a BOD bottle with deionized water. Put the probe in the bottle and stir for 10 minutes to fully remove the sulfite from the probe.

Section 6 Sample measurement

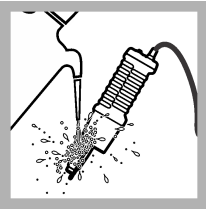
The procedure that follows is applicable to meters that can connect to Intellical LBOD probes. Refer to the applicable meter documentation for meter operation and probe-specific settings.

6.1 Sample measurement notes

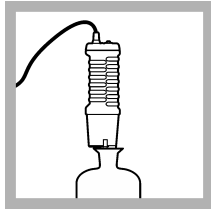
Read the notes that follow before sample measurements.

- Salinity changes the solubility of oxygen in water. Measure the sample salinity and enter the value in the probe settings of the meter.
- High concentrations (more than 1 molar) of acids or bases will decrease the service life of the LBOD sensor cap.
- Rinse the probe with deionized water and dry with a lint-free cloth between measurements to prevent contamination.
- If complete traceability is necessary, enter a sample ID and operator ID before measurement. Refer to the meter manual for instructions.
- The meter automatically saves the measurement data when the user manually reads each data point and when the meter is set to read at regular intervals. The user must manually save each data point when the meter is set to read continuously.
- Air bubbles below the sensor can cause a slow response or error in the measurement. Make sure to remove air bubbles before and during measurements.

6.2 Sample measurement procedure



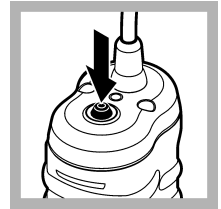
1. Rinse the probe with deionized water. Dry the probe with a lint-free cloth.



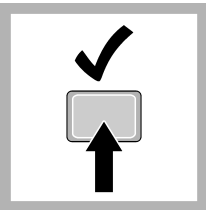
2. Put the probe in the BOD sample.



3. Tap the probe to remove air bubbles.



4. Start the stirrer.



5. Read the dissolved oxygen value of the sample. The display shows the dissolved oxygen value when the reading is stable.

6.3 Low-level measurements

If samples are expected to have less than 1 mg/L O₂, calibrate the probe with a zero-oxygen solution. A zero-point calibration is not recommended for samples that have more than 1 mg/L O₂. Use the guidelines and steps that follow only when the sample is expected to have less than 1 mg/L O₂.

- Calibrate the probe with a zero-oxygen solution. Use the "100% with 0" calibration option in the meter. Measure the 100% value first, then measure the zero-oxygen solution. Refer to [Zero-point calibration procedure](#) on page 7.
- Measure the salinity of the sample and enter the salinity correction factor in the probe settings.
- Wait approximately 10 minutes for the measurement contents to adjust to ambient temperature, then measure the sample. Measure the sample again to make sure the result is the same.
- Clean the probe regularly. Refer to [Clean the probe](#) on page 9.

Section 7 Maintenance

7.1 Clean the probe

NOTICE

The LBOD sensor cap has a protective black layer to increase the life of the LBOD sensor. Do not rub the black layer to clean the LBOD sensor cap. Do not use alcohol or other organic solvents to clean the LBOD sensor cap.

Keep the LBOD sensor cap clean for best results. Use only water and neutral detergents to clean the probe.

1. Put the probe in a neutral cleaning solution and stir the solution. Do not rub or remove the black layer on the LBOD sensor cap.
2. Rinse the probe with deionized water. Blot dry with a lint-free cloth.

7.2 Replace the sensor cap and iButton

NOTICE

Do not use sharp metal tools to remove the LBOD sensor cap.

Replace the LBOD sensor cap after 365 days, or more frequently if the cap becomes damaged or dirty. The LBOD sensor cap and iButton operate together and must be replaced at the same time.

1. Use fingers to remove the LBOD sensor cap from the probe. Do not touch the probe lens. Refer to [Figure 2](#). Discard the used LBOD sensor cap.
Note: *The stirrer assembly can stay installed.*
2. If water is between the LBOD sensor cap and the probe lens, or if the probe lens looks dirty, rinse with dilute isopropyl alcohol (10% or less) or deionized water and blot dry with a non-abrasive cloth. Do not wipe the probe lens or use abrasive cleaners.
3. Hold the new LBOD sensor cap by the sides and install the new cap on the probe. Refer to [Figure 2](#). Make sure the LBOD sensor cap is on tightly.

Note: *Do not touch the protective black layer on the LBOD sensor cap.*

4. Install the new iButton® in the pressure sensor module. Refer to [Figure 3](#). Make sure that the label on the iButton is on top when the cap is open. Make sure to fully close the cap.

Figure 2 Replace the LBOD sensor cap

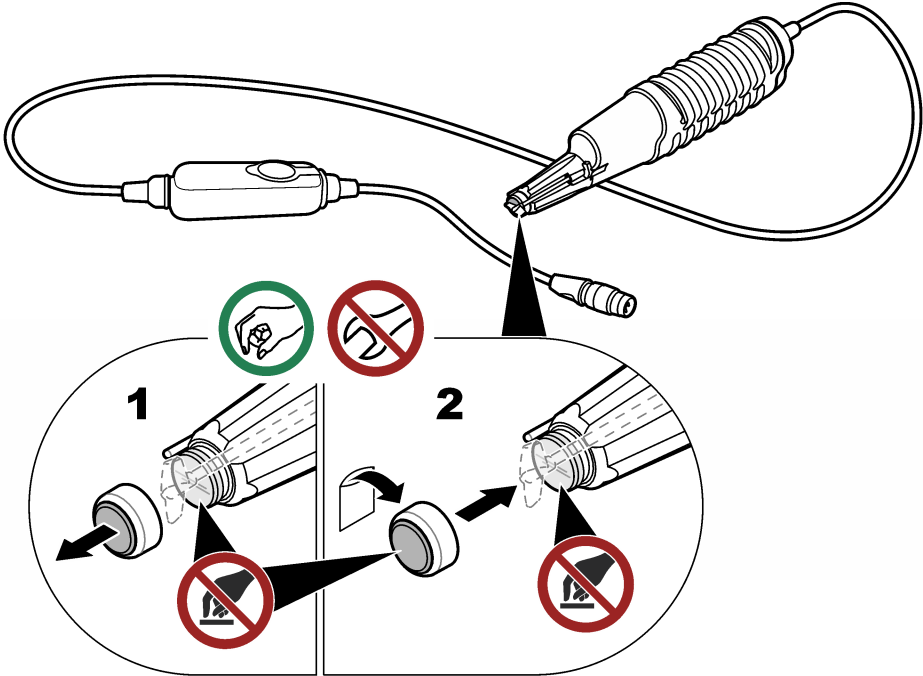
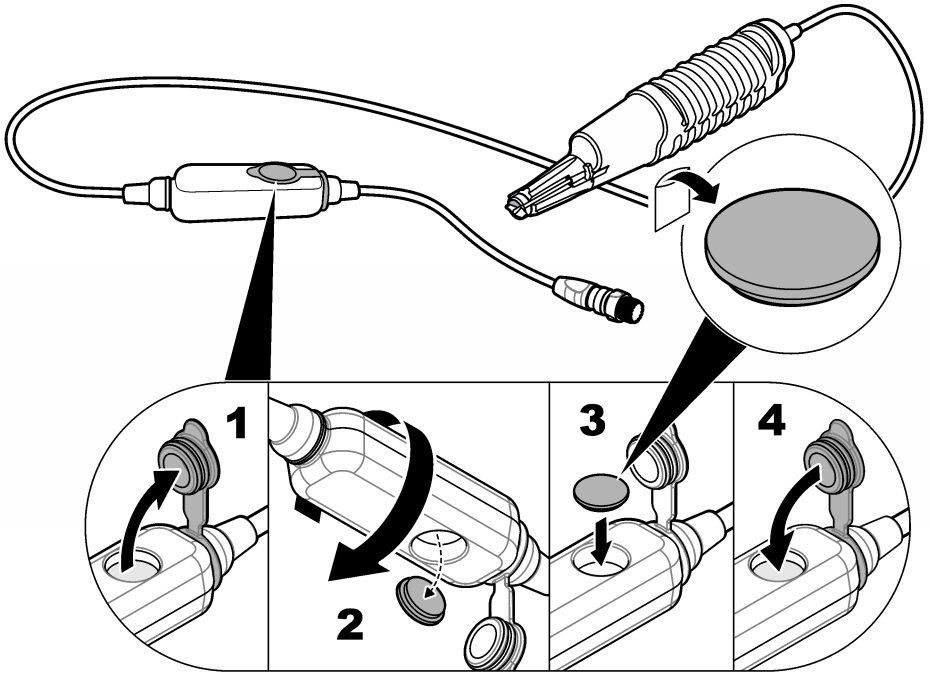


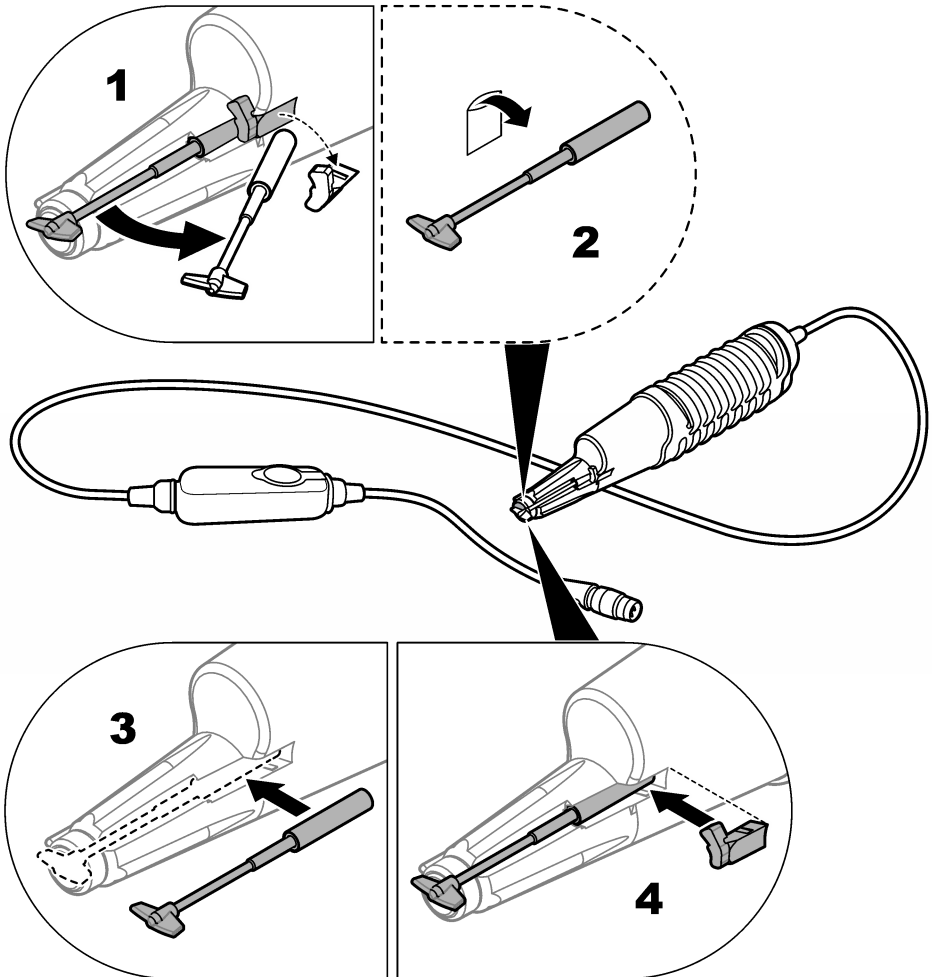
Figure 3 Replace the iButton



7.3 Replace the stirrer

Refer to [Figure 4](#) to replace the stirrer assembly.

Figure 4 Replace the stirrer



7.4 Storage

Keep the probe in a BOD bottle with some water (fill to $\frac{1}{4}$ minimum) when not in use.

Section 8 Troubleshooting

Problem	Possible cause	Solution
Decreased probe performance causes slow stabilization and prevents accurate calibrations or measurements.	The sensor cap is loose or damaged.	Tighten or replace the sensor cap. Always replace the sensor cap and the iButton at the same time. Refer to Replace the sensor cap and iButton on page 9.
	Water is between the sensor cap and the probe lens.	Remove the sensor cap and dry the probe lens. Refer to Replace the sensor cap and iButton on page 9.
	The sensor cap is not sufficiently conditioned.	Keep the probe in the BOD bottle with some water for more time, then try the calibration again.
	The temperature or pressure sensor does not operate correctly.	Compare the temperature and pressure readings of the probe with external measurements. The pressure sensor reads absolute pressure, which is not adjusted to sea level. If the measurements are not correct, contact technical support.
	The lot code on the iButton is not the same as the lot code on the sensor cap.	Replace the sensor cap and iButton.
The stirrer does not operate correctly.	The stirrer does not operate.	The stirrer uses the power from the meter to operate. Make sure to start the meter, then start the stirrer.
	The stirrer turns only when the probe is not in a BOD bottle.	Remove and install the stirrer assembly. Refer to Replace the stirrer on page 12.
	The stirrer makes a lot of noise.	Remove and install the stirrer assembly. Refer to Replace the stirrer on page 12.
Sample properties cause slow stabilization or inaccurate measurements.	The measurement was not adjusted for salinity in the sample.	Measure the salinity of the sample and enter the value as a salinity correction factor in the meter.
Procedure problem causes slow stabilization and prevents accurate calibrations or measurements.	Air bubbles are around or below the probe tip.	Carefully tap or shake the probe to remove air bubbles.
	The contents of the BOD bottle did not fully adjust to ambient temperature.	Wait more time for the contents of the BOD bottle to adjust to ambient temperature.

Section 9 Consumables

Note: Product and Article numbers may vary for some selling regions. Contact the appropriate distributor or refer to the company website for contact information.

Description	Quantity	Item no.
LBOD sensor cap replacement kit (includes iButton)	1	5838000
LBOD probe replacement stirrer assembly	1	5850800
LBOD stirrer bearing clip	1	5852800
BOD bottle with glass stopper, 300 mL	1	62100
Beaker, 250 mL, polypropylene	1	108046
Cobalt chloride solution	500 mL	1422249
Sodium sulfite	100 g	2386026
Disposable wipes, 11 x 22 cm	280/pkg	2097000
Wash bottle, polyethylene, 500 mL	1	62011



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