JENCO®

QUALITY INSTRUMENTS

Operation Manual

MODEL 9031M

Basis Portable

DO/Temperature Meter

9031M

CONTENTS

GENERAL INTRODUCTION

Thank you for selecting the 9031M meter. The 9031M is a precision tool that measure dissolved oxygen in % and mg/L and temperature. A built-in microprocessor stores, calculates and compensates for all parameters related to DO determinations including DO electrode temperature characteristics.

This unit has a waterproof IP67 case. The touch mode keys are highly reliable with tactile and audio feedback. The 9031M up to 2 point calibration. This meter can operate with one 9 V battery. Re-calibration is not required when power is turned on again.

The front of the meter has a large LCD that displays DO% saturation or mg/L, and temperature simultaneously along with user prompts and mode indicators. The unit prompts the user through calibration and measurement procedures.

The 9031M measures dissolved oxygen in water using optical, lifetime luminescence technology and uses a digital signal to send information between the instrument and probe. Key advantages of the 9031M include the elimination of sensor flow dependence (stirring) and sensor warm-up time, greater stability, less frequent calibrations, and the elimination of frequent membrane/electrolyte changes.

The unit is also equipped with a non-volatile memory allowing the user to store 50 different sets of readings. This unit will assign a site number for each set of reading, so the user can review the data easily.

Other features include long battery life and 50/60 Hz AC noise rejection. This meter is user-friendly for field, industrial and laboratory applications.

INITIAL INSPECTION

Carefully unpack the unit and accessories. Inspect for damages made in shipment. If any damage is found, notify your **Jenco** representative immediately. All packing materials should be saved until satisfactory operation is confirmed.

INSTALLING THE BATTERIES

The 9031M meter is packaged with one 9 V battery required for operation. To insert the batteries into the meter, follow the procedure outlined below.
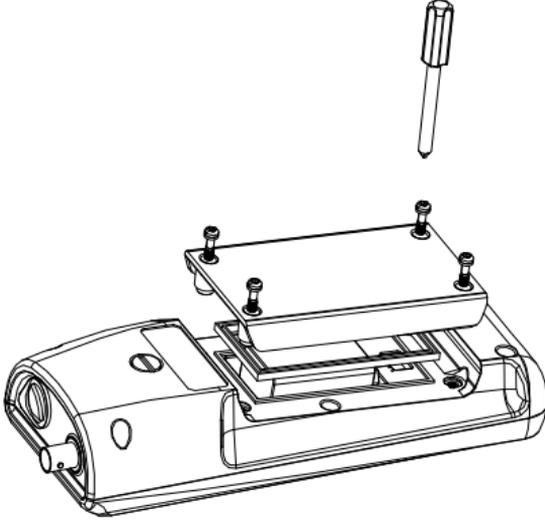

Figure 1: Battery compartment

1. Use a screw driver to remove the four screws and battery cover to expose the battery compartment. (Figure 1.)

2. Replace the 9 V battery.

3. Replace the battery cover and make sure to secure the four screws for the water-tight feature.

CONNECTOR
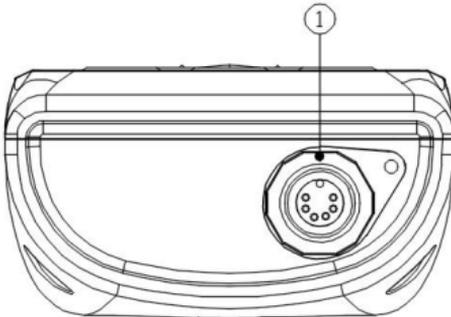
Figure 2: 9031M Connector

1. DO connector (6 PIN Waterproof connector)

DISPLAY & KEYS FUNCTIONS

A. <u>Display</u>
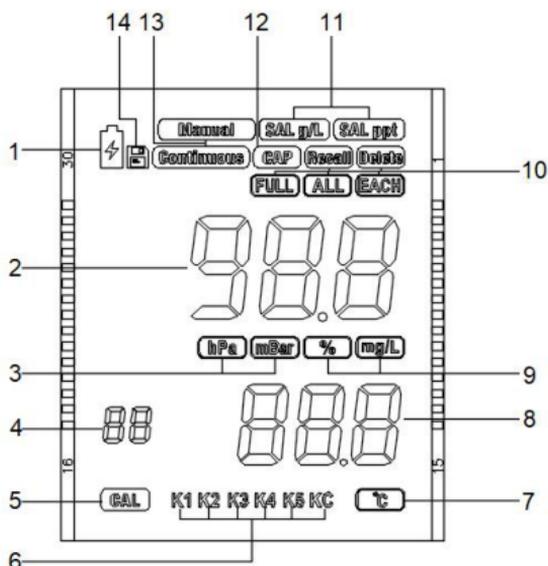
Figure 3: Active LCD screen

1. ⚡- Low battery indicator.	2. **MAIN DISPLAY-** Main display for dissolved oxygen values.
3. **mBar-** Display pressure units in calibration mode.	4. Data storage site number.
5. **CAL-** Calibration mode indicator.	6. **K1, K2, K3, K4, K5, KC:** Sensor cap coefficient indicators when entering new sensor cap coefficient.
7. Temperature unit.	8. Temperature values
9. **mg/L,%-** dissolved oxygen unit.	10. **Full, Recall, Each, All, Delete:** Instrument's data storage indicators.
11. **SAL ppt-** Display salinity units in calibration mode.	12. **CAP-** Sensor cap parameter setting mode
13. **Continuous or Manual-** Continuous or Manual sampling mode indicator.	14. **SAVE-** To save a reading into the data storage.

B. Keys

(symbol)	**ON/OFF-** Powers on and shuts off the meter.
(symbol)	**Mode-** Selects display mode. In normal operation, press this key to sequentially display Dissolved Oxygen in % air saturation, Dissolved Oxygen in mg/L, Recall and Delete interface. In calibration mode, press this key to exit the current calibration parameter and enter into the next one. In "Recall" and "Delete" modes, press this key to exit "Recall" and "Delete" modes respectively.
(symbol) (symbol)	**Up & Down-** To adjust inputs for salinity correction, calibration and sensor cap coefficients. Increases or decreases the display value as desired. In "Recall" mode, view saved data and data storage site number by pressing these keys. In "Delete" mode, press these keys to select between the "Delete Each" and "Delete All" mode. In "Delete Each" mode, view to be deleted data and data site numbers by pressing these keys.
(CAL)	**CAL-** In "Measurement" mode, press this key to enter into "Calibration" mode.
(symbol)	**Enter-** In "Calibration" mode, press this key to save the current parameter to memory. In "Measurement" mode, press this key to save reading into the next available data storage site. At the Recall interface, press this key to display the last set of saved data. At the Delete interface, press this key to go into "Delete" mode. In the "Delete All" mode, press this key to delete all saved data. In the "Delete Each" mode, press this key to delete a single set of data. In the "Cap coefficients" mode, press this key to confirm coefficient entries.
(CAP)	**CAP-** Press to enter new sensor cap coefficients.

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	Sample/MODE- Press and hold for 3 seconds to switch between continuous and manual measurement modes. Press and release to restart the measurement when in manual mode. Continuous mode: the instrument will continuously update the dissolved oxygen measurement. Manual mode: the instrument will update the DO reading until reaching a stable measurement. The stable measurement will be 'locked' on the display until the user initiates a new measurement reading by pressing the **"Sample/MODE"** key.

THE LSDO PROBE

A. Probe

Throughout the manual, the term "probe" refers to the end of the cable where the sensor is located, the term "sensor" refers to the Light Sensing Dissolved Oxygen sensing portion of the cable/probe assembly, and the term "sensor cap" refers to the removable sensing cap that is replaced about once per year (Figure 4).
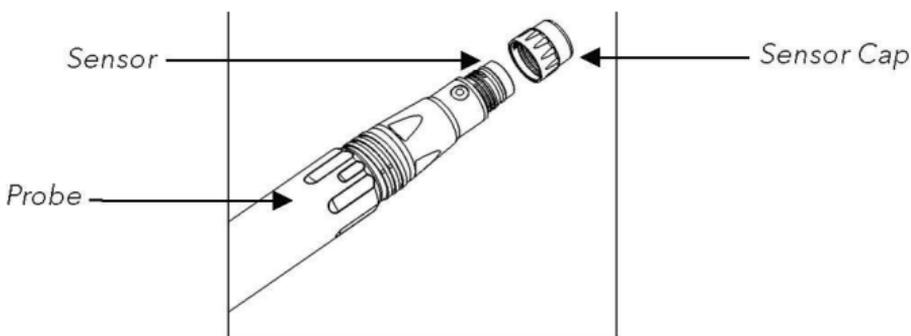

Figure 4: Probe

B. Preparing the Probe

Each 9031M sensor cap has unique calibration coefficients associated with it. These coefficients are labeled on the instruction sheet included with each 9031M cable/probe assembly and replacement 9031M sensor cap.

Remove the probe/cable assembly from the shipping container and locate the sensor cap instruction sheet. Be sure to save the

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instruction sheet in case you need to reload these calibration coefficients. New probe/cable assemblies have the sensor cap installed and coefficients loaded into the probe at the factory. When a cable is installed, the coefficients are automatically sent to the instrument.

Preparing the probe for the first time:

1. Remove the probe guard from the probe by turning it counterclockwise.

2. Remove the red storage cap which contains a moist sponge from the end of the probe by pulling it straight off the sensor. Save this to use later for long term storage.

3. Reinstall the probe guard by sliding it carefully over the sensor and then threading it onto the cable/probe assembly with a clockwise rotation (Figure 5).

4. Locate the gray calibration/storage sleeve that was shipped with your probe/cable assembly. Moisten the sponge in the gray calibration/storage with a small amount of clean water.

5. Slide the calibration/storage sleeve over the probe guard to keep the probe in a moist environment for storage and calibration (Figure 6). It is important to always keep your sensor in a moist environment so the sensor cap does not dry out.

6. Connect the cable to the instrument by aligning the connectors, pushing them together and then screwing down the retainer clockwise.
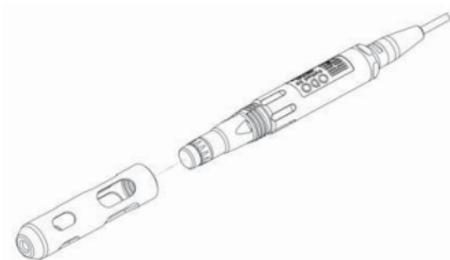
Figure 5   **Figure 6**

OPERATIONAL PROCEDURES

A. Entering Sensor Cap Coefficients into the 9031M

Connect the probe/cable assembly to the instrument and turn the instrument on. Locate the Calibration Code Label at the top of the instruction sheet and note the six numbers which are listed as K1 through K5 and KC. These six numbers contain the calibration code for this particular sensor cap. Follow these instructions to enter the new calibration coefficients into your instrument:

1. Press and hold the **"CAP"** key for 3 seconds.

2. The instrument will prompt for K1 and show 8 alpha/numeric values with the first value blinking.

3. Use the **"Up"** and **"Down"** keys to adjust the first value to match the first value of the new cap's K1. Press the **"Enter"** key to accept.

4. Continue using the **"Up"** and **"Down"** keys to adjust all 8 alpha/ numeric values for K1 pressing the **"ENTER"** key to confirm each entry.

5. After confirming the last value for K1, the instrument will prompt you for K2. Follow the instructions in step 3 and 4 to enter and confirm the value for K2. Continue with K3, K4 and K5.

6. After confirming K5, the 9031M will prompt you for KC. KC has two values. Follow the instructions in step 3 and 4 to enter the coefficients. After confirming KC, the instrument will return to the measurement screen.

7. After entering the Sensor Cap Coefficients, perform a 1-point or 2-point calibration as described in the Calibration Section.

8. Press and hold the **"CAP"** key for 3 seconds at any time to exit and cancel the cap coefficient update.

If errors are made in entering the Sensor Cap Coefficients, the instrument will block the update and an error message will appear on the display and the instrument will return to the K1 entry screen. If you see this error message, re-enter the coefficients and check them carefully for correct transcription from the Calibration Coefficient Label.

The coefficient values are hexadecimal. Due to the 9031M's display, 6 and b look very similar. Hexadecimal values on the 9031M will be displayed as: A, b, C, d, E, F, 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9.

If you continue to get an error message after several entry attempts, contact JENCO Technical Support for assistance.

B. Dissolved Oxygen Calibration

The 9031M offers two options for calibrating dissolved oxygen: DO% in water saturated air, and a Zero point. If performing a zero point calibration, you must also perform a DO% calibration following the zero calibration. For ease of use, JENCO recommends performing a 1-point DO% water-saturated air calibration.

a. 1-point DO% water-saturated air calibration

1. Connect the LSDO probe to the unit and turn the unit on.

2. Hold the probe in the air gently with the sensor facing down and press **"Mode"** key to select "Dissolved Oxygen in %" mode.

3. Wait 3 to 5 minutes for the dissolved oxygen and temperature reading to stabilize, press the **"CAL"** key to enter the "Calibration" mode. The "CAL" icon appears on the LCD. The main screen will display "1013 mBar" (factory default value). The meter is now ready for atmospheric pressure calibration.

4. To change the pressure factor, use the **"Up"** and **"Down"** keys to adjust the value between 500 and 1125 mBar. Press **"Enter"** key to save the new value and the unit will automatically go into the next calibration parameter which is the value of 100% saturation in air. If **"Mode"** key is pressed instead of the **"Enter"** key, any changes made will be cancelled and the previous calibration settings will be retained.

5. In this interface, the user can view the calibration value in the secondary display. Once the value in the main display stabilizes, press **"Enter"** key to save the new value and the unit will automatically go into the salinity compensation parameter. If "Mode" key is pressed instead of the **"Enter"** key, any changes made will be cancelled and the previous calibration settings will be retained.

6. The salinity default factor value is 0.0 ppt. To change the salinity compensation factor, use the **"Up"** and **"Down"** keys to adjust the value between 0.0 and 40.0 ppt. Press **"Enter"** key to save the new value and the unit will automatically

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switch to "Measurement" mode. Calibration is now complete. If **"Mode"** key is pressed instead of the **"Enter"** key, any changes made will be cancelled and the previous calibration settings will be retained and will automatically switch to "Measurement" mode.

b. **2-point calibration**

1. Connect the LSDO probe to the unit and turn the unit on.

2. Place the sensor in a solution of zero DO.(A zero DO solution can be made by dissolving approximately $8 \sim 10$ grams of sodium sulfite (Na_2SO_3) into 500 mL tap water or DI water. Mix the solution thoroughly. It may take the solution 60 minutes to be oxygen-free.).Press **"Mode"** key to select "Dissolved Oxygen in %" mode.

3. Wait 3 to 5 minutes for the dissolved oxygen and temperature reading to stabilize, press the **"CAL"** key to enter the "Calibration" mode. The "CAL" icon appears on the LCD. The main screen will display "1013 mBar" (factory default value). The meter is now ready for atmospheric pressure calibration.

4. To change the pressure factor, use the **"Up"** and **"Down"** keys to adjust the value between 500 and 1125 mBar. Press **"Enter"** key to save the new value and the unit will automatically go into the next calibration parameter which is the value of 100% saturation in air. If **"Mode"** key is pressed instead of the **"Enter"** key, any changes made will be cancelled and the previous calibration settings will be retained.

5. In this interface, the user can view the calibration value flashing in the secondary display. Press **"Up"** or **"Down"** key to select the display to "0.0". Once the value in the main display stabilizes, press "**Enter**" key to save the new value and the unit will automatically go into the second point calibration. If **"Mode"**key is pressed instead of the **"Enter"** key, any changes made will be cancelled and the previous calibration settings will be retained.

6. Repeat steps 5 to 6 of **"1-point DO% water-saturated air calibration"** for second point calibration.

C. Dissolved Oxygen Measurements

Press **"Mode"** key to choose the dissolved oxygen in % mode or dissolved oxygen in mg/L mode. Rinse the LSDO probe with distilled water and immerse it in the sample to be measured.

D. Sampling Mode- continuous or manual

The 9031M sampling mode can be set to Manual or Continuous.

During the "Measurement" mode, press and hold the **"Sample/MODE"** key for 3 seconds to switch between "Continuous" and "Manual" mode. When in "Manual" mode, press **"Sample/MODE"** key to initiate a new measurement.

"Continuous" mode: the instrument will continuously update the dissolved oxygen measurement.

"Manual" mode: the instrument will update the DO reading until reaching a stable measurement. The stable measurement will 'lock' on the display until the user initiates a new measurement by pressing the **"Sample/MODE"** key. "Manual" mode conserves battery power.

E. Save, Recall and Delete Data

a. Saving readings to memory.

1. In "Measurement" mode, press the **"Enter"** key to save data. The "Save" icon with the corresponding site number will lit up for a brief moment to indicate a successful data save.

2. If the "Full" icon is displayed, this means that all 50 data saving sites are used up. No new data can be saved until existing saved data are deleted.

b. Recalling readings from memory.

1. To recall saved data, press **"Enter"** key at the Recall interface to go into "Recall" mode.

2. Press the **"Up"** or **"Down"** keys to select the storage site number.

3. Press **"Mode"** key to exit "Recall" mode.

c. Deleting data.

1. Press the **"Enter"** key at the Delete interface to go into "Delete" mode.

2. Select "Delete All" or "Delete Each" mode by pressing the **"Up"** or **"Down"** key.

3. In the "Delete All" mode, press **"Enter"** key to clear all stored data. Deletion is now complete.

4. In the "Delete Each" mode, use **"Up"** and **"Down"** key to select data to be deleted. Then press **"Enter"** key to delete. Deletion is now complete. The next set of saved data will automatically move up a slot in the storage site.

5. Press **"Mode"** key to exit "Delete" mode.

SENSOR MAINTENANCE

Sensor caps last longer if stored in a moist environment and kept clean and free of scratches in the paint layer. Erratic readings can result from damaged or dirty caps. If unstable readings occur from large scratches in the paint or dye layer, replace the sensor cap. See the Maintenance and Troubleshooting section of this manual for information on how to clean or replace the sensor cap. The average sensor cap replacement interval is 12 to 18 months, although they may last longer.

Avoid substances that may damage probe materials such as concentrated acid, caustics and strong solvents. Probe materials include urethane (cable), Xenoy (probe body), acrylic (sensor cap) and acetal and stainless steel (probe guard).

To prevent the sensor cap from drying out, store the probe in the gray calibration/storage sleeve with a moistened, clean sponge. In the event the sensor cap dries out, rehydrate it following the instructions in the Maintenance and Troubleshooting section of this manual.

A. <u>Cleaning the Sensor Cap</u>

The Sensor Cap should be kept clean since some types of fouling can consume or produce oxygen or block the water sample from reaching the sensor which could affect the dissolved oxygen measurements.

To clean the Sensor Cap, gently wipe away any fouling with a lens cleaning tissue that has been moistened with water. Do not use organic solvents to clean the Sensor Cap. Using an organic solvent to clean the Sensor Cap may cause permanent damage to the cap. For example, alcohol will dissolve the outer paint layer and other organic solvents will likely dissolve the dye in the cap. Dissolving or scratching the paint or dye layer will cause erratic dissolved oxygen measurements.

To disinfect the probe, soak the probe in 3% hydrogen peroxide for 15 to 30 minutes and then rinse it with clean water.

B. Sensor Cap Replacement

The sensor cap should be replaced about once per year but may last longer. It should also be replaced if it is cracked or damaged (see Troubleshooting section for instructions on how to inspect the cap for damage). The instruction sheet shipped with the replacement LSDO sensor cap includes the calibration coefficients specific to your sensor cap.

The replacement LSDO sensor cap is shipped in a humidified container. The package should not be opened until ready for use. Once the sensor cap has been installed on the sensor as described below, it is important to keep the sensor in a 100% humid environment. Therefore, the sensor should be stored in either the gray calibration/storage sleeve with a moistened sponge or immersed in water, see Sensor Storage for more information. If the sensor dries out, refer to the Rehydration procedure in this manual.

Refer to Figure 7 below when following the instructions for replacing the cap.

[Note: Avoid touching the sensing end of the sensor cap during the following maintenance procedures.**]**
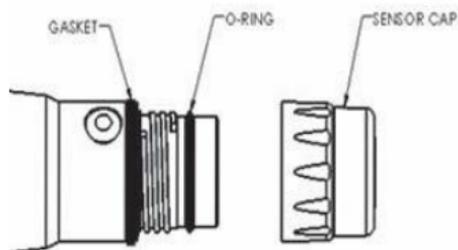

Figure 7

1. Remove the old sensor cap assembly from the sensor by grasping the probe body with one hand and then rotating the sensor cap counterclockwise until it is completely free. Do not use any tools for this procedure.

2. Inspect the o-ring on the probe for damage. If there is any indication of damage, carefully remove the o-ring and replace it with the new o-ring included with the replacement sensor cap. Do not use any tools to remove the o-ring.

3. Ensure that the o-ring installed on the probe is clean. If necessary, wipe clean with a lint free cloth or replace the o-ring as described in the previous step.

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4. Locate the o-ring lubricant included with the new sensor cap. Apply a thin coat of o-ring lubricant to the installed o-ring. Remove any excess o-ring lubricant from the o-ring and/or probe with a lens cleaning tissue.

5. Remove the new sensor cap from its hydrated container and dry the inside cavity of the sensor cap with lens cleaning tissue. Next, clean the clear surface of the sensor on the end of the probe with lens cleaning tissue.

6. Using clockwise motion, thread the new sensor cap onto the probe assembly until it is finger-tight. The o-ring should be compressed between the sensor cap and probe. Do not over-tighten the sensor cap and do not use any tools for the installation process.

7. After installing the new sensor cap, store the sensor in the gray calibration/storage sleeve with a moistened sponge.

8. Follow the procedures below for entering in the new sensor cap's coefficients into the 9031M instrument.

[Note: The Sensor Cap must remain in a moist environment; see Sensor Storage for storage recommendations. If the sensor cap is allowed to dry out, it is likely to drift slightly at the beginning of your next study unless it is rehydrated. If the cap dries out, you can rehydrate it by soaking the probe tip with the sensor cap installed in room temperature tap water for 24 hours. After rehydration is complete, recalibrate and be sure to store the probe in a moist environment.**]**

C. Sensor Storage

a. Short-Term Storage

When the LSDO sensor is not in use, store it in a moist environment. For short-term storage (less than 30 days), moisten the sponge in the calibration/storage sleeve with a small amount of clean water and place this over the probe with the sensor cap and sensor guard installed. This will provide a 100% saturated air environment.

b. Long-Term Storage

For long-term storage (>30 days), remove the battery from the instrument. Moisten the sponge in the calibration/storage sleeve with a small amount of clean water and place this over the probe with the sensor cap and sensor guard installed. Inspect the sponge every 30 days to make sure it is still moist.

Alternatively, you can place the probe with sensor cap directly in a beaker or other container of water, making sure that the water does not evaporate over time.

ERROR DISPLAYS AND TROUBLESHOOTING

Erroneous dissolved oxygen readings typically indicate a need to clean the sensor cap, replace the sensor cap, and/or recalibrate the instrument. First, clean the sensor cap following the instructions in the Maintenance section and then perform a calibration. If erroneous readings persist, inspect the sensor cap for damage (cracks, large scratches in paint or dye layer), replace if necessary, enter new coefficients and then attempt to recalibrate the instrument.

If the sensor cap is not damaged, try to rehydrate the sensor cap then recalibrate.

If you are still getting erroneous dissolved oxygen readings, try replacing the sensor cap, enter the new coefficients and then recalibrate. If the erroneous readings continue, contact JENCO Technical Support to help determine the next step.

[Note: If the meter still does not perform normally after the above measures are taken, call **Jenco** Service Department.**]**

Symptom	Possible Cause(s)
Instrument will not turn on, the BAT symbol displays on the screen.	1. Low battery voltage, replace batteries. 2. Batteries installed incorrectly, check battery polarity. 3. Return system for service.
Temperature values display Over or Undr.	1. Sample temperature is less than 0°C or more than +50°C. Increase or decrease the sample temperature to bring within the allowable range. 2. Contact JENCO Tech Support. Possible temperature sensor failure.
Instrument will not calibrate dissolved oxygen.	1. Verify calibration routine - correct barometric pressure, salinity input, and calibration environment. 2. Allow sufficient stabilization time for dissolved oxygen and temperature. 3. Check sensor cap. Clean, rehydrate or replace as necessary. 4. Contact JENCO Tech Support.
DO readings are inaccurate.	1. Verify temperature readings are accurate. 2. Sample temperature should be between 0 and 45°C , the temperature compensation range for DO mg/L. 3. DO sensor not properly calibrated, recalibrate the sensor. 4. Check sensor cap. Clean, rehydrate or replace as necessary. Recalibrate. 5. Contact JENCO Tech Support.
Dissolved Oxygen values display Over or Undr on Run screen.	1. Sample dissolved oxygen concentration is more than 20 mg/L or 200%, or less than 0.0 mg/L or 0.0%. 2. Verify temperature readings are accurate. 3. DO sensor not properly calibrated, recalibrate the sensor. 4. Check sensor cap. Clean, rehydrate or replace as necessary. Recalibrate. 5. Contact JENCO Tech Support.

SPECIFICATIONS

Display	Range	Resolution	Accuracy
Dissolved Oxygen	0.00 to 20.00 mg/L	0.01 mg/L	±1.5% of reading or ±0.15 mg/L whichever is greater
Dissolved Oxygen % saturation	0.0 to 200.0%	0.1%	±1.5% of reading or ±1.5% air saturation, whichever is greater
Temperature	0.0 to 50.0 °C	0.1 °C	±0.3 °C

Pressure compensation	500 to 1125 mBar
Salinity compensation	0.0 to 40.0 ppt
Calibration	Up to 2 point
Calibration Back-up	EEPROM
Datalogging capabilities	50 data sets
Automatic shut off function	10 minutes of non-use
Audio Feedback	All Touch Keys
Power	9 Volt battery
Battery Life	50 hour battery life in manual
Ambient Temperature Range	0 to 50 °C
Relative Humidity	At 90% RH
Case	IP67 waterproof
Dimensions	214 x 74 x 42 mm 216 X 80 X 50 mm (Have jacket)
Weight	290 grams

* Automatic dissolved oxygen temperature compensation range is 0 to 45 °C

WARRANTY

Jenco warrants this product to be free from significant deviations in material and workmanship for a period of 1 year from date of purchase. If repair or adjustment is necessary and has not been the result of abuse or misuse, within the year period, please return-freight-prepaid and the correction of the defect will be made free of charge. If you purchased the item from our **Jenco** distributors and it is under warranty, please contact them to notify us of the situation. **Jenco** Service Department alone will determine if the product problem is due to deviations or customer misuse.

Out-of-warranty products will be repaired on a charge basis.

RETURN OF ITEMS

Authorization must be obtained from one of our representatives before returning items for any reason. When applying for authorization, have the model and serial number handy, including data regarding the reason for return. For your protection, items must be carefully packed to prevent damage in shipment and insured against possible damage or loss. **Jenco** will not be responsible for damage resulting from careless or insufficient packing. A fee will be charged on all authorized returns.

NOTE: Jenco reserves the right to make improvements in design, construction and appearance of our products without notice.

Jenco Instruments, Inc.
7968 Arjons Drive, Suite C
San Diego, CA 92126 USA
TEL: 858-578-2828
FAX: 858-578-2886
E-Mail: jencoinfo@jencoi.com; sales@jencoi.com
Website: www.jencoi.com

Jenco Electronics, Ltd.
6F., NO. 81, Sec.2, Chang-an E. Rd., Jhongshan District, Taipei
City 104, Taiwan
TEL: 886-2-2508-2928
FAX: 886-2-2508-2938
E-Mail: sales@jenco.com.tw
Website: www.jenco.com.tw

Shanghai Jenco Instruments, Ltd.
18 Wang Dong Zhong Road
Sijing Town, Songjiang
Shanghai, China
TEL: 86-021-5761-9599
FAX: 86-021-5761-9598
E-Mail: jencos@jenco.com.cn
Website: www.jenco.com.cn