MODEL 9150 WATERPROOF DISSOLVED OXYGEN METER OPERATING MANUAL

557 006/REV A

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9150/REV A/05-98

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INTRODUCTION

The Model 9150 is ruggedly designed and constructed to resist the harshest of field, industrial and laboratory environments. The whole system is rated at IP67 and will float if dropped into water.
The instrument is supplied with a fully integrated DO_2/Temperature sensor.

SPECIFICATION

DO_2	
Ranges:	0 to 199% 0 to 25.0% 0 to 19.99mg/l
Resolution:	1% / 0.1% / 0.01mg/l
Accuracy:	±2% within 10°C of calibration temperature
Temperature Measuring	
Ranges:	-10 to +60°C 14 to 140°F
Resolution:	0.1°C / 1°F
Accuracy:	±0.5°C / ±1°F
ATC Range:	-10 to +60°C
Power:	3 AA cells
Size:	200(l)x80(w)x60(d)mm
Weight:	370g

INSTALLATION

Unpack the instrument and ensure the following items are present:
1. Model 9150 DO_2 Meter (557 001)
2. DO_2/Temperature Probe (541 520)
3. Membrane Kit (541 550)
4. Membrane Protective Cap (541 512)
5. Zero Powder (983 030)
6. 3 x AA alkaline batteries (021 007)
7. Membrane Cover (541 513)

Optional accessories which may have been ordered:
1. Carrying Case (033 175)
2. B.O.D. Probe (541 620)

BATTERIES

Remove the battery compartment cover and fit the batteries, taking care to observe the correct polarity, as indicated on the moulding. Re-fit the cover and tighten the screws to achieve a watertight seal.
Once the batteries have been inserted a time, approximately 30 minutes, will be required to allow full polarisation of the probe to take place. Re-polarisation will not be required unless the batteries are replaced. Polarisation continues even when the instrument is switched off.

PREPARATION FOR USE

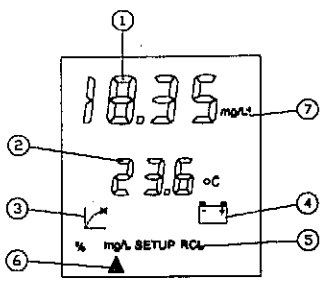
The probe is delivered with the membrane module detached. Prior to use the membrane module must be fitted to the probe body.
A protective cap is also supplied. This should be fitted to the probe when not in use. The sponge contained within the cap should be wetted with deionised water prior to fitting. This covers the membrane and keeps it wet, thus preventing the electrolyte filling from drying out.

1. Remove the protective cap from the probe.

2. Take a membrane module and hold in the vertical position. Fill with the electrolyte solution (5% KCl) supplied with the instrument.

3. Whilst still holding the module upright, screw the probe slowly down onto the thread, allowing the excess electrolyte to escape through the screw thread. Ensure no air bubbles are present and that the membrane is not creased.

DISPLAYS



1. Primary display - provides direct readout of % oxygen saturation, % air saturation, mg/l oxygen.
   If the primary reading is overrange this display will indicate "1" with all other digits blanked.
   If the primary reading is underrange this display will indicate "-1" with all other digits blanked.

   Primary Ranges:

% oxygen saturation	0 to 25.0%
% air saturation	0 to 199%
mg/l oxygen	0 to 19.99mg/l

2. Auxiliary display - provides direct readout of temperature in °C or °F.
   If the auxiliary reading is overrange this display will indicate "1" with all other digits blanked.
   If the auxiliary reading is underrange this display will indicate "-1" with all other digits blanked.

   Auxiliary Ranges:

Temp	-10 to 60°C
	14 to 140°F

3. Endpoint Detection symbol - this is displayed once a stable reading is detected and is maintained until the input changes.

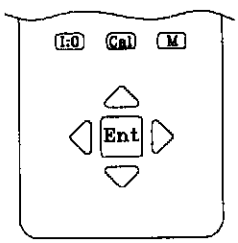
4. Low Battery Indicator - this will be displayed when a maximum of 5 hours battery life remains.

5. Selected mode indicator (%, mg/l^{-1}, SETUP, RCL).

6. Cursor (▲) used to select required mode.

7. Measurement unit which is being used % DO_2 or mgL^{-1}.

CONTROLS



I:O Switches the instrument on and off.

CAL This key is used to perform a %oxygen saturation calibration or a % air saturation calibration.

M The Memory Store key is used to store the displayed readings in any measurement mode. When the M key is pressed the display will read STO and give the next available index number. If the ENT is pressed at this point the reading will be stored in this location and the instrument will return to the previous display. If no key is pressed within 5 seconds the reading will be stored in the specified location. The location (0 to 99) can be changed via the ▲▼ keys. If the key is pressed and held the timer is disabled until the key is released. At this stage the 5 second timer is re-initialised.

If all 100 locations have already stored readings then the instrument displays FULL. Pressing the ENT key aborts storage of the reading. The ▲▼ keys can be used to overwrite an existing location.

▲▼ These keys are used to change a parameter.
1. Used when storing a reading to change the stored location index.
2. In recall (RCL) mode these keys are used to change the displayed stored location.
3. In Set-Up these keys are used to adjust pressure correction value and salinity correction value.

◄► 1. These keys are used to move horizontally between menu options.

ENT The ENT (enter) key is used to select the displayed menu option. It also places stored values in the selected location(s). If held down at switch on the unit will enter the SET UP mode.

ELECTRODE SOCKET

Connection socket for DO_2/Temperature probe supplied with the instrument, or an alternative electrode.

OPERATION

To set $\%DO_2$ calibration value, temperature units and auto power off the SET UP menu must be entered at switch on. This can be carried out by pressing and holding down the ENT key when the unit is switched on.
On entry into SET UP mode the display prompts with "SET CAL" and displays the current $\%DO_2$ calibration value, which can be adjusted using the ▲▼ keys. Once the $\%DO_2$ calibration value is set, pressing the ENT key moves to the next parameter, auto power off.

The display prompts with "SET PWR" and displays "ON" or "OFF" to indicate whether the auto power off feature is enabled (on) or disabled (off). The ▲▼ arrow keys allow selection between on or off. Pressing the ENT key moves to the next parameter, temperature units.

The display prompts with "SET °T" and displays "°C" or "°F" to indicate the temperature units. The ▲▼ keys allow selection between °C and °F.

Pressing the ENT key exits the SET UP mode and puts the instrument into normal operation mode.

SET UP mode can be exited at any time by pressing the on/off key.

$\%DO_2$ MODE

This gives a direct readout of the $\%DO_2$ of the sample under test as either % oxygen saturation or % air saturation. If a cal value $<25.0\%$ is set at the power on set-up procedure, the resolution will automatically increase to 0.1%.

% Oxygen Saturation - this will give a reading of 20.9% in air where 20.9% is the amount of oxygen as a percentage of oxygen in air and will give a reading directly as a percentage of oxygen in the sample. All measurements in this range are given to a resolution of 0.1%.

% Air Saturation - this will directly assign a percentage dissolved oxygen to air saturated water and further readings are then given as a percentage of this air saturated water sample. All measurements in this range are given to a resolution of 1%.

CALIBRATION

DO_2 CALIBRATION

If DO_2 measurements are to be performed in mg/l and then the current barometric pressure should be entered into the instrument using the SETUP menu option.

Prepare a zero oxygen solution by mixing 2gms of sodium sulphite in 100mls of water.

Allow to stand for a few minutes prior to use.

NOTE: The powder supplied with the Model 9150 is sodium sulphite.

Calibration is performed by either pressing the CAL key.

Immerse the probe in the zero solution and stir gently for approximately 2 minutes. Once the reading has stabilised i.e. the endpoint symbol has appeared press the CAL key. The instrument automatically detects the zero solution and will calibrate the reading to zero $\%DO_2$ which will cause the primary display to read zero.

Remove the probe from the zero solution. Fill a suitable container with a sample of clean water. Hold the probe so that the membrane is close to, but not touching the surface of the water (approx. 1cm above).

Once the reading has stabilised i.e. the endpoint symbol has appeared press the CAL key. This will cause the primary display to read the value of percentage dissolved oxygen set by the power on set-up procedure.

SET UP MENU OPTION

Pressing ENT with the cursor beneath this menu option toggles the secondary display between pressure (0 to 6.00 bar), salinity (0 to 35g/l) and temperature. With pressure or salinity displayed, the ▲ ▼ arrow keys can be used to adjust the displayed parameter. Moving the cursor off the SETUP menu option returns the secondary display to temperature.

NOTE: The oxygen dissolved in water changes with salinity when making measurements in mg/l. If measurements are made in % saturation no salinity compensation is required.

STORING RESULTS

The M key (Memory Store) is used to store the displayed readings in any measurement mode. When the M key is pressed Sto will be shown on the main display and the next available index number will appear on the auxiliary display.

To store the displayed reading the ENT key should be pressed. The instrument will then return to the previously selected mode.

If no key is pressed within 5 seconds the reading will be stored in the specific location. The required location (between 0 to 99) can be changed via the ▲ ▼ keys. If the key is pressed and held the timer is disabled until the key is released. At this stage the 5

STORING RESULTS (cont)

second timer is re-initialised.

If all 100 locations already have stored readings the instrument will display FULL. Pressing the ENT key aborts the storage of the reading. The ▲▼ keys can be used to overwrite an existing location.

RECALLING STORED READINGS

To recall a stored reading select the RCL menu option by using the ◄► keys and then pressing ENT. The main display will update to the stored reading and the auxiliary display will flash the stored reading number and then update to the temperature display. If no stored reading is present the main display will read Clr and the auxiliary display will read the stored location index number.

To scroll through the index press and hold either the ▲ or ▼ key.

To exit the recall mode press ENT with the cursor under the RCL position. The instrument will return to the previous display.

CLEARING STORED READINGS

To clear all stored readings from the instrument memory select the RCL menu option by moving the cursor to the RCL menu option by using the ◄► keys and then pressing ENT. Select CLR by using the ► key. The ENT key should now be pressed for >2 seconds. The stored readings will be cleared and Clr will be shown on the display to confirm this.

GOOD PRACTICE GUIDELINES

1. Ensure the membrane is kept wet at all times. When not in use the probe should be stored with the tip in a beaker of deionised water. For longer periods (overnight) the protective sheath should be fitted, with the sponge insert soaked in distilled water. This will prevent the electrolyte fill solution from drying out due to loss of water through the porous membrane.
2. The probe is fitted with a temperature compensating element. This is housed underneath the silver ring on the probe body. Always ensure the probe is immersed in solution to a depth suitable to cover this ring. Allow sufficient time for these to respond if measuring samples with varying temperatures or where sample temperature is significantly different to ambient temperature.
3. Ensure the sample is moving across the membrane at a speed greater than 15cm/min

to avoid oxygen starvation at the membrane. If the flow rate is insufficient then the sample should be stirred (e.g. either by a gentle stirring motion with the probe or with a magnetic stirrer).

4. When using the probe in liquors, sludges or polymers a coating may be deposited on the membrane, causing low response or drifting. This can be reduced by rinsing the probe in deionised water after each test.

5. Ensure the probe is rinsed in deionised water after each test.

6. When measuring in mg/l (ppm) results are pressure dependent and determinations carried out at pressures other than 760mm/Hg will need to be compensated (refer to Set Up menu option).

7. When measuring in mg/l (ppm) results obtained from saline samples will need to be adjusted for salinity (refer to Set Up menu option).

8. Ensure the probe is polarised prior to use (refer Installation). It is essential to perform this procedure after replacement of the membrane or probe.

9. When replacing the membrane ensure no air bubbles are trapped in the electrolyte fill solution and that the membrane is not creased or damaged after fitting. If the probe response is sluggish, or the readout is unstable after membrane replacement, clean the anode and cathode (refer Maintenance).

MAINTENANCE

Although the oxygen probe is supplied in a clean and tested condition it may, after some time, become sluggish or erratic due to contamination of the gold cathode, silver anode or membrane.

a) **Membrane Replacement**

1. Hold the probe in a vertical position and carefully unscrew the membrane module.

2. Take the new membrane module and holding it in a vertical position, fill with O_2 electrolyte (5% KCl).

3. Still holding the module in a vertical position, screw the probe slowly down onto the thread, allowing excess electrolyte to escape through the screw thread. Ensure no air bubbles are present and the membrane is not creased.

b) **Cathode and Anode Cleaning**

The gold cathode tip can be re-polished using a fine abrasive ("crocus paper") material. Lay the abrasive sheet on a flat surface, hold the probe in a vertical position and gently polish by moving the tip over the sheet in a circular motion.

A toothbrush dipped in diluted ammonia solution will remove any deposits from the silver anode. Rinse with deionised water prior to re-assembly. If the probe is not to be used for 24 hours, store with the protective sheath fitted to prevent the electrolyte from drying out due to evaporation through the membrane, which is porous to water vapour as well as oxygen. If the probe is disconnected from the unit or a

new membrane has been fitted, it will be necessary to allow the probe to polarise before stable readings can be obtained. Polarisation will normally be achieved within 30 minutes.

BATTERY REPLACEMENT

The battery symbol will be displayed to the right hand side of the display to indicate a maximum of 5 hours battery life remains.

NOTE: Stored results are retained in non-volatile memory and will not be lost during battery replacement.

To fit new batteries; remove the battery compartment cover, remove and carefully discard the used batteries. Fit the new batteries, type R6, AA or AM3, ensuring the correct polarities are observed, as indicated on the moulding. Refit the battery compartment cover, ensuring that the fixings are secured into place, but are not overtightened.

ELECTRODE REPLACEMENT

To replace the electrode switch the model 9150 off and disconnect the faulty electrode by first carefully unscrewing the locking ring counter-clockwise and withdrawing the connector from the receptacle.Fit the new electrode by reversing the above method, ensuring that the polarising keyway is correctly aligned and the locking ring tightened to prevent the ingress of moisture.

OPTIONAL ACCESSORIES

The following list of items are available for use with the Model 9150:

033 175	Carrying Case
541 620	B.O.D. Probe

SPARES

541 520	DO_2/Temp. Probe
541 550	DO_2 Probe Membrane Kit
541 650	B.O.D. Probe Membrane Kit

HEALTH & SAFETY

PRODUCT: Potassium Chloride Solution

PHYSICAL DATA
Description: Colourless solution
Specific Gravity: 1.0
Solubility in water: miscible in all proportions

HEALTH HAZARD - May be harmful if ingested in quantity, causing nausea, vomiting and diarrhoea.
May irritate eyes.

FIRST AID

Eyes	Irrigate thoroughly with water. If discomfort persists **OBTAIN MEDICAL ATTENTION.**
Lungs	Remove from exposure.
Skin	Wash off thoroughly with soap and water.
Mouth	Wash out mouth thoroughly with water. In severe cases **OBTAIN MEDICAL ATTENTION.**

PRODUCT: Sodium Sulphite Anhydrous

PHYSICAL DATA
Description: White Powder
Specific Gravity: 2.63
Solubility in water: very soluble

HEALTH HAZARD - If ingested in quantity can cause gastric irritation, colic, diarrhoea, central nervous system depression and death, due to liberation of sulphur dioxide. Irritating to skin, eyes and respiratory system. Used in controlled quantities as a food preservative and antioxidant.

FIRST AID

Eyes	Irrigate thoroughly with water for at least 10 minutes. **OBTAIN MEDICAL ATTENTION.**
Lungs	Remove from exposure, rest and keep warm. In severe cases **OBTAIN MEDICAL ATTENTION.**
Skin	Wash off thoroughly with water. Remove contaminated clothing and wash before re-use. In severe cases **OBTAIN MEDICAL ATTENTION.**
Mouth	Wash out mouth thoroughly with water and give plenty to drink. In severe cases **OBTAIN MEDICAL ATTENTION.**

EC Declaration of Conformity

JENWAY Model 9150 Dissolved Oxygen Meter complies with the following European Standards:
EN 50081-1:1992 Electromagnetic compatibility - Generic emission standard

EN 50082-1:1992 Electromagnetic compatibility - Generic immunity standard (Performance criterion B)

EN 61010-1:1993 Safety requirements for electrical equipment for measurement, control and laboratory use

Following the provision of:

EMC Directive - 89/336/EEC and
Low Voltage Directive - 73/23/EEC

Thank you for reading this data sheet.

For pricing or for further information, please contact us at our UK Office, using the details below.

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