MODEL 4150 WATERPROOF CONDUCTIVITY METER OPERATING MANUAL

CONTENTS

4150/REV A/02-96

MODEL 4150 CONDUCTIVITY METER OPERATING MANUAL

INTRODUCTION

The Model 4150 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 Conductivity/Temperature sensor.

SPECIFICATION

Conductivity

Ranges:	0 to 199.9mS
	0 to 19.99mS
	0 to 1999µS
	0 to 199.9µS
	0 to 19.99µS
Resolution:	0.1mS/0.01mS/0.01µS/
	0.1µS/0.01µS
Accuracy:	±0.5% ±2 digits

TDS

Ranges:	0 to 199.9g/l
	0 to 19.99g/l
	0 to 1999mg/l
	0 to 199.9mg/l
	0 to 19.99mg/l
Resolution:	0.1g/l/0.01g/l/1mg/l/
	0.1mg/l/0.01mg/l
Accuracy:	±0.5% ±2 digits

Temperature	
Range:	-10 to +105°C 14 to 220°F
Resolution:	0.1°C / 1°F
Accuracy:	±0.5°C / ±1°F
ATC Range:	0 to +100°C
Cell Constant:	Digitally settable 0.015 to 19.99
Reference Temperature:	18, 20, 25°C
Temperature Coefficient:	0.00 to 4.00%/°C linear
Probe(s):	2 plate configuration
Auto Standard Recognition:	10μS, 1413μS or 12.88mS
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 4150 Conductivity Meter (553 001)
2. Conductivity/Temperature Probe (epoxy bodied) (027 233)
3. 3 x AA alkaline batteries (021 007)

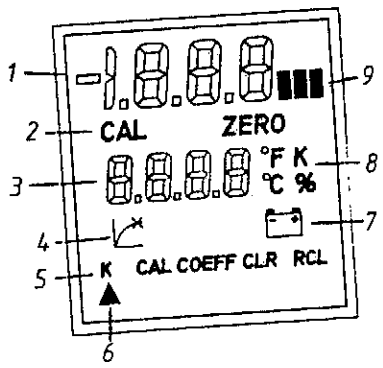
Optional accessories which may have been ordered:

1. Carrying Case (033 174)
2. Conductivity Standard 0μS (025 139)
3. Conductivity Standard 1413μS (025 138)
4. Conductivity Standard 12.88mS (025 156)
5. Cell K=0.1, epoxy bodied (027 235)
6. Cell K=10, epoxy bodied (027 236)
7. Cell K=1, glass (027 237)

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.

DISPLAYS



1. Main display - provides direct readout of conductivity (in µS or mS) and total dissolved solids (TDS) (in mgl^{-1} or gl^{-1}).
   Will also indicate Sto when the instrument is storing readings.
   The display will also show Underrange (-1) and Overrange (1) symbols if the instrument is reading outside the ranges as shown below:

2. CAL - will be displayed momentarily to indicate auto standard recognition calibration or probe zero.

3. Provides direct readout of temperature in °C, °F. Also provides readout of cell constant (K) and temperature coefficient (%).

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

5. Selected mode indicator.

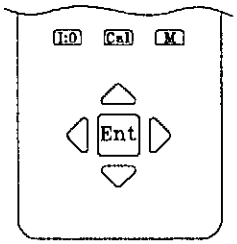
6. Cursor - used to select required mode.

7. Low battery indicator - this will be displayed when a maximum of five hours battery life remains.

8. Selected temperature measurement unit - °C or °F.

9. Measurement unit which is being used, µS, mS, mgl^{-1}, gl^{-1}

CONTROLS



I:O Switches the instrument on and off.

CAL This key is used to perform a conductivity calibration on 10μs, 1413μS, 12.88mS or 0μS. In TDS mode the unit calibrates to 6.6mgl^{-1}, 933mgl^{-1}, 8.5gl^{-1} or 0mgl^{-1}.

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. Used to adjust cell constant K.
4. Used to adjust temperature coefficient.
5. In Set-Up these keys are used to select the parameter required for modification.

◄► 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 Conductivity/Temperature probe supplied with the instrument, or an alternative electrode.

OPERATION

To set reference temperature, temperature units, auto power off and measurement mode 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 REF" and displays the current reference temperature, which can be adjusted using the ▲▼ keys. Once the reference temperature 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 moves on to the next parameter, conductivity or TDS mode.

The display prompts with "SET MDE" and displays "COND" or "TDS" to indicate conductivity or TDS mode. The ▲▼ keys allow selection between conductivity or TDS. 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.

PROBE ZERO

Pressing the ENT key with the cursor beneath the CAL menu option when the display reads less than 2μS (or 2mgl^{-1}) will illuminate the CAL annunciator for 1 second and then zero the display.

CONDUCTIVITY MODE

This gives a direct readout of the conductivity of the sample under test. The auto ranging facility will give the optimum display resolution with units of mS or μS.

TOTAL DISSOLVED SOLIDS MODE

This gives a direct readout of the total dissolved solids (TDS) contained within the sample under test. The auto ranging facility will give the optimum display resolution with units in g/l or mg/l.

PREPARATION OF CONDUCTIVITY STANDARDS

Suitable conductivity standards are available commercially or these can be made up as required from A.R. reagents with reference to the relevant physical tables.

Method for general purpose conductivity standard

1) Accurately weigh out 0.746 grammes of dried A.R. grade Potassium Chloride (KCl).
2) Dissolve in 1 litre of good quality deionised water.
This produces a 0.01N solution with a conductivity of 1413μS @ 25°C.

Storage

This solution must be stored in a plastic container and the air space should be kept to an absolute minimum. The shelf life of 1 week can be increased by storing below 4°C, but where any doubt exists about the viability of stored solution a fresh batch should be prepared.

CALIBRATION:

a) WITH KNOWN CELL CONSTANT

Connect a standard pre-calibrated cell to the unit.

Move the cursor to beneath the K menu option and press the ENT key. The secondary display will then show the current cell constant, K. The ▲▼ keys can then be used to adjust the cell constant to the desired value as indicated on the cell body.

b) ON STANDARD SOLUTION

Move the cursor beneath the CAL menu option. Press the ENT key. The display will illuminate the display annunciator for 1 second and update the conductivity reading to either 10μS, 1413μS or 12.88mS, providing the cell constant remains within the allowable range, otherwise Err will be displayed for 3 seconds before the primary display returns to the old conductivity reading, with no change to the cell constant.

c) MANUAL CALIBRATION ON STANDARD SOLUTION

Move the cursor beneath the K menu option and press the ENT key. The secondary display will then show the current cell constant, K. the ▲▼ keys can then be used to adjust the conductivity reading on the main display (by changing the cell constant) to as close as possible to the desired conductivity reading, subject to the precision of the cell constant.

SAMPLE MEASUREMENT

Conductivity is a temperature dependent measurement. All substances have a conductivity coefficient which varies from 1%/°C to 3%/°C for most commonly occurring substances. The temperature coefficient defaults to 2%/°C, this being adequate for most routine determinations. Conductivity readings varying with temperature may be due to the substances under test having a coefficient other than the typical value of 2%/°C. To eliminate this variation it is necessary to maintain all samples at the reference temperature by use of a thermostatic water bath or equivalent. Adjustment may be made by moving the cursor beneath COEFF option and pressing the ENT key. The reading can then be adjusted to the required value using the ▲▼ keys.

After calibration the measurement of samples is carried out by immersing the cell in the samples, allowing the reading to stabilise and recording the result. The cell should be rinsed in deionised water between each sample to avoid contamination, shaken to remove internal droplets, and the outside wiped prior to immersion in the next sample.

On completion of sample measurement the cell should be thoroughly rinsed in deionised water.

Storage

Short Term
The cell should be immersed in deionised water to keep the plates in a wetted.

Long Term
The cell should be thoroughly rinsed in deionised water, the exterior body wiped and then stored dry.

NOTE: When preparing the cell for storage the plate area must not be wiped dry.
When using a dry cell initial stability on re-use may be impaired until the cell plates become re-wetted.

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 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. The presence of particulate matter in the sample can lead to unstable and non-reproducible results. If necessary filter, or allow the particles to settle prior to immersion.

2. Ensure no air bubbles are trapped in the measuring cell. Gentle agitation of the cell should ensure that bubbles are purged.

3. The entire plate area must be immersed in the solution under test. The slots in the side of the sensor should be below the surface.

4. Whilst the 4-plate construction minimises the effect of fouling it is still advisable to clean the sensor if contamination is evident. This should be approached in a progressive manner, beginning with deionised water and progressing to other solvents or a soft air brush if the deposits persist. The carbon plates can be damaged and should not come into contact with anything which is likely to abrade their surface.

5. The temperature coefficient is very dependent on the solution being measured and its concentration level. The effect of temperature change on conductivity can be very significant, and if the temperature coefficient is not known it is wise to measure all samples at the same temperature.

6. The TDS mode displays results which have been calculated from the measurement of conductivity. The salinity mode assumes that the major constituent responsible for the conductivity of the solution is sodium chloride. If significant quantities of other conductive species are present then the displayed results could be inaccurate. Likewise, the TDS mode assumes some knowledge of the electrolyte balance of the analyte. The EC ratio parameter found in the set up routine allows selection of a factor suitable for the solution under test. Most analysers which do not offer this option use a default value of 0.6.

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.
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 4150 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 is tightened to prevent the ingress of moisture.

OPTIONAL ACCESSORIES

The following list of items are available for use with the Model 4150:

033 174	Carrying Case
025 139	Conductivity Standard 0μS
025 138	Conductivity Standard 1413μS
025 156	Conductivity Standard 12.88mS
027 235	Cell K=0.1, epoxy bodied
027 236	Cell K=10, epoxy bodied
027 237	Cell K=1, glass

EC Declaration of Conformity

JENWAY Model 4150 Conductivity Meter complies with the following European Standards:

EN 50081-1:1992 Electromagnetic compatibility - Generic emission standard

EN 50082-1:1992 Electromagnetic compatibility - Generic emission standard

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

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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