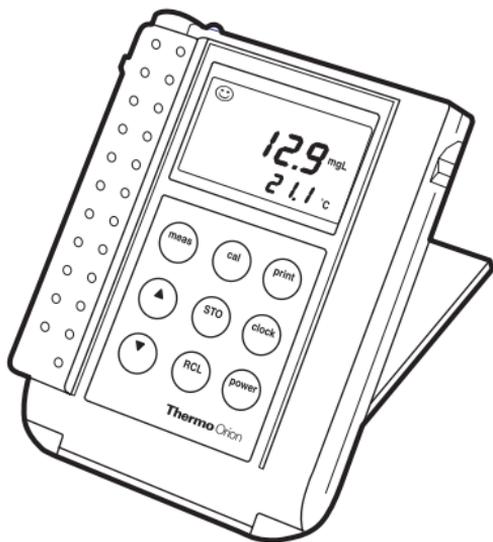

Models 835A and 830A Dissolved Oxygen Meters

INSTRUCTION MANUAL



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PerpHecT meters are protected by U.S. patent 4,321,544.

ROSS and PerpHecT ROSS are protected by U.S. patent 4,495,050.

ORION Series A meters and 900A printer are protected by U.S. patents 5,108,578, 5,198,093, D334,208 and D346,753.

ORION 81, 82, 91, and 92 series glass electrodes are protected by U.S. patents 4,661,236 and 4,687,500.

Sure-Flow electrodes are protected by European Patent 278,979 and Canadian Patent 1,286,720.

ionplus electrodes and Optimum Results solutions have patents pending.

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The specifications, descriptions, drawings, ordering information and part numbers within this document are subject to change without notice.

This publication supersedes all previous publications on this subject.

Safety Precautions

Be sure to read and follow these instructions!

The Models 830A and 835A may only be opened to change the batteries. If repairs are necessary, the meter must be sent in to the factory.

Never operate the meter within hazardous areas.

Whenever it is likely that the protection has been impaired, the instrument shall be made inoperative and secured against unintended operation.

The protection is likely to be impaired if, for example:

- The instrument shows visible damage
- The instrument fails to perform the intended measurements
- After prolonged storage at temperatures above 70 °C
- After severe transport stresses

Before recommissioning the meter, a professional routine test according to EN 61 010-1 shall be performed. This test should be carried out at our factory.

Information on this Instruction Manual

Italics are used for text which appears in the Thermo Orion Models 830A and/or 835A display.

Bold print is used to represent keys, e.g. **cal**.



Display examples

or



keys whose functions are explained are frequently shown in the left-hand column.

Note



Notes providing important information which should always be observed when using the instrument.

Warning



Warning means that the instructions given must always be followed for your own safety. Failure to follow these instructions may result in injuries.

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1. The Models 830A and 835A Dissolved Oxygen Meters

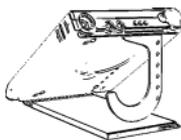
Package Contents

Please check the completeness of the shipment after unpacking.
The package should include:



- Thermo Orion Model 830A or 835A DO Meter (ready for operation)
- Neck strap
- This instruction manual
- Quickstart instructions
- Interface cable with adapter for printer and PC (Model 835A only)
- PC software (Model 835A only)

Short Description of Meters

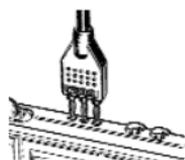


- The Models 830A and 835A measure percent saturation or concentration (mg/l) of dissolved oxygen and temperature in industry, the environment, food processing and wastewater treatment.
- The meters meet the European EMC regulations (89-336-EEC) and the recommendations of NAMUR NE 21.
- The meters are IP 66 protected to EN 60 529.
- Temperature compensation is automatic with a dissolved oxygen probe with integral temperature sensor.





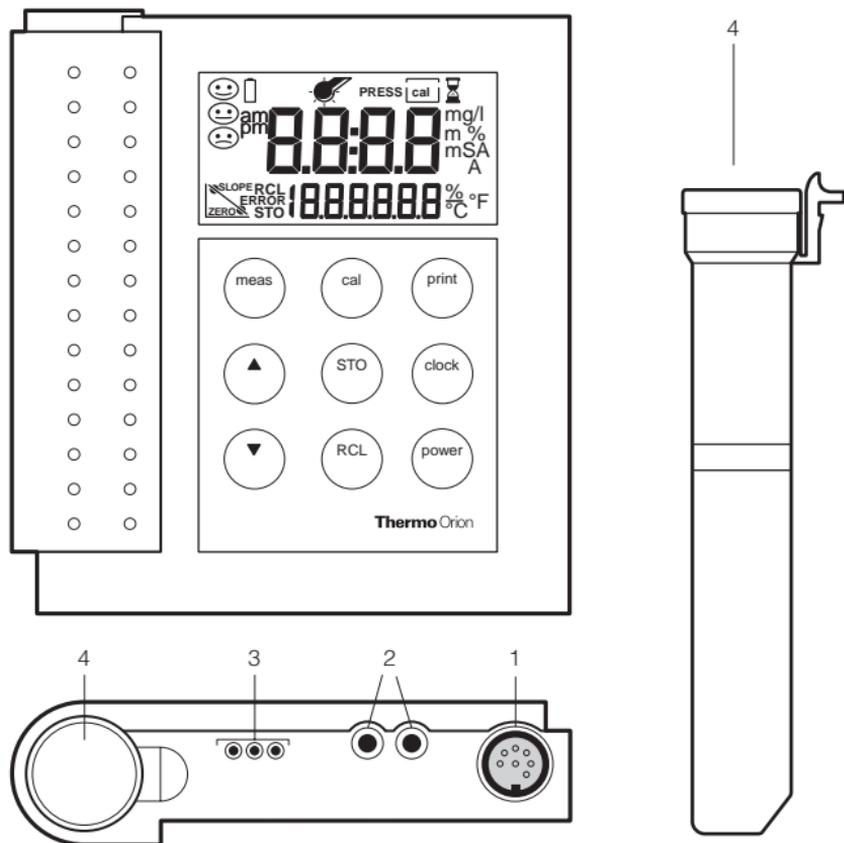
- ❑ Barometric Pressure is measured directly from the meter.
- ❑ The data log records up to 200 measured values with the temperature, date and time. Recording takes place either manually or automatically. Automatic logging occurs either on a time interval or a differential (based on a difference in measurement values).



- ❑ PC software allows complete remote control of the meter via PC (Model 835A only). All measured values and parameters can be read out and easily processed further (e.g. using Microsoft™ Excel).
- ❑ Measured values and GLPdoc™ can also be sent directly to a printer via the serial interface.
- ❑ Calibration can be carried out by water saturated air calibration (can be performed in moistened meter quiver), air saturated water calibration, calibration to a known concentration (corresponding to Winkler method), or two-point calibration using a zero point and saturation point.
- ❑ To minimize battery consumption, the meter switches off after either 1 or 12 hours of inactivity. (Default is 12 hours)
- ❑ Only three alkaline AA batteries are required for uninterrupted operation for approximately 1,000 hours.

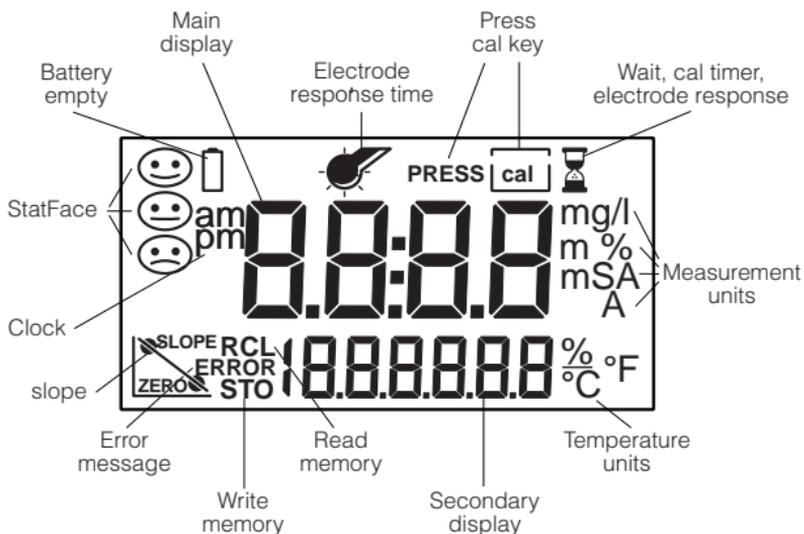
2. Operation

Meter Design



- 1 Sensor connection
- 2 Unused
- 3 PC/printer interface connection (Model 835A only)
- 4 Probe holder (quiver)/calibration chamber, removable

Display



Keypad



Pressing the **power** key switches the meter on or off. After switching on, the meter automatically performs a self-test and checks for the presence of a dissolved oxygen probe. Then it goes into the measuring mode.



Pressing the **meas** key returns the meter to the measuring mode from any function. Pressing the **meas** key in the measuring mode for two seconds toggles the AUTO-READ™ function on or off.

Note



You can also power the meter up using the **meas** key. However, only an abbreviated self-test is performed.



In measure mode, pressing the **cal** key starts calibration. In configuration mode, pressing the **cal** key writes parameter settings to memory.



With the **▲** and **▼** keys you can select and change parameters and select a mode.



Pressing the **clock** key switches the meter into the clock mode. All measurement processes are cancelled and the battery consumption is reduced to minimum. (Model 835A only)



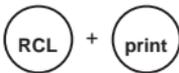
Pressing the **STO** key activates the data logger for writing measured values to memory. (Model 835A only)



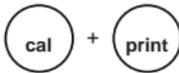
Pressing the **RCL** key activates the data logger for reading measured values in memory. (Model 835A only)



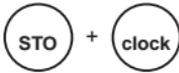
Pressing the **print** key sends the currently measured value to a printer or PC. (Model 835A only)



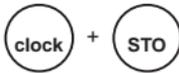
Pressing the **RCL** and **print** keys prints out the logged data in memory. (Model 835A only)



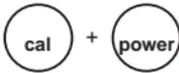
Pressing the **cal** and **print** keys prints out the GLPdoc™ report. (Model 835A only)



Pressing the **STO** and **clock** keys switches the meter into the data logger mode. (Model 835A only)



Pressing the **clock** and **STO** keys activates the mode for setting the date and time. (Model 835A only)



Pressing the **cal** and **power** keys, when the meter is switched off, activates the configuration menu.

Note



When pressing two keys simultaneously, make sure that the key shown at the left is pressed first.

Stat Face™ Electrode Monitoring



The Stat Face automatic electrode monitoring system provides information on the electrode condition. Slope, zero point, response time, impedance, membrane condition and drying out of the electrode are evaluated.

In addition, Stat Face reminds you to calibrate the meter at regular user-defined intervals.

For more detailed information on the displayed electrode state and the individual evaluations of the parameters, please see **Troubleshooting and Maintenance** (Pg. 32).

Connection and Start-up

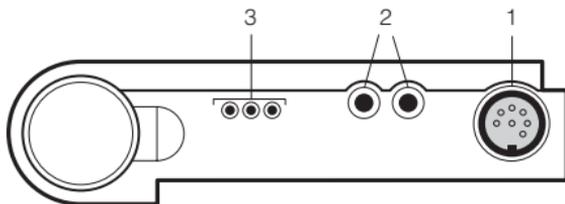
Connecting Sensor

The following sensors from the line of accessories can be connected to the meter.

083005A	Polarographic DO electrode with 1.5 meter cable
083010A	Polarographic DO electrode with 3 meter cable
083025A	Polarographic DO electrode with 8 meter cable
083060A	Polarographic DO electrode with 20 meter cable
083150A	Polarographic DO electrode with 50 meter cable, stainless steel guard
083300A	Polarographic DO electrode with 100 meter cable, stainless steel guard

Connection Assignment

Connection	Socket
Sensor	1
Unused	2
Interface (Model 835A only)	3



Startup

Note



If the meter is connected to a PC and is used to take measurements in a grounded liquid, measuring errors may result.

Note



Prior to first use, a DO probe calibration must be performed and time and date must be checked and set, if required.

The calibration and configuration data and the contents of the data log remain permanently stored both with the meter switched off and with the batteries removed (battery replacement).



Pressing the **power** key switches the meter into measuring mode.

When switched on, the meter checks for the presence of a dissolved oxygen probe and conducts a self-test:

- Simultaneous appearance of all display segments
- Display of the model number
- Display of the software version

Note

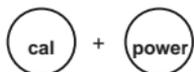


The meter can also be switched on with the **meas** key. However, only an abbreviated test is performed. The meter assumes that the last DO probe determined is used.

Configuration

The following basic settings can be changed in the configuration:

- SAL (salinity) correction factor (range of 0.0 to 42.0 ppt)
- Calibration *AirCAL Off* (Manual adjustable calibration) or *AirCAL On* (calibration in water saturated air)
- Calibration *0 Point Off* (one point saturation calibration) or *0 Point On* (two point calibration using residual current [Zero point] and saturation current point)
- Choose a single measurement mode and resolution: (mg/l at 00.00 *dspl*, mg/l at 00.0 *dspl*, % saturation at 000.0 *dspl*, or % saturation at 000 *dsp*)
- Calibration interval (*CALint*) - range is 0 to 14 days
- Autoshutoff time (1 hour or 12 hours) (*AutOFF*)
- Remote interface/ Printer output (*Print On* or *Print Off*) (Model 835A only)
- Baud Rate (choice of 600, 1200, 2400, 4800, 9600) (Model 835A only)
- Temperature display (°C or °F)
- Date and time format (Model 835A only)
24 hours and day, month, year or
12 hours (a.m./p.m.) and month, day, year



Conf

To activate the configuration, hold down the **cal** key with the meter switched off and then press the **power** key.

The menu items of the configuration menu are worked through in sequence. Press the **▲** or **▼** key to change the setting of the respective menu item. The **cal** key saves the parameters and switches to the next menu item.



Pressing the **meas** key exits the configuration menu at any time. The value last displayed will not be saved unless the **cal** key was pressed.

Salinity Factor

Set the salinity factor from 0 to 42 parts per thousand (ppt) for salinity compensation of oxygen concentration readings.

AirCal and 0 point Calibration

Set the *AirCAL* and *0 Point* functions On or Off to determine which calibration type is desired. See **Configuration**.

AirCAL on / 0 Point off = Single-point Autocalibration in water-saturated air. Calibration is performed by placing the probe into a moistened calibration chamber (use the built-in probe quiver, an external calibration chamber or a BOD bottle).

AirCAL on / 0 Point on = Two-point Autocalibration. First perform a Zero Point calibration in a sample containing oxygen-scavenging material to determine the residual current of the probe and set it to 0%. Then, follow with a second calibration point in water-saturated air. This is performed by placing the probe into a calibration chamber (use the built-in probe quiver, an external calibration chamber or a BOD bottle).

AirCAL off / 0 Point off (default setting) = Single-point Manual Calibration to a known dissolved oxygen concentration. Displays measured barometric pressure and temperature. Then, the calibration is performed by placing the probe into the calibration sample, generating a measurement, and scrolling the concentration to the desired value. Pressing the **cal** key enters the desired concentration.

AirCAL off / 0 Point on = Two-point Manual Calibration. First perform a Zero Point calibration in a sample containing oxygen-scavenging material to determine the residual current of the probe and set it to 0%. Then follow with a second calibration point in water-saturated air. This is performed by placing the probe into a sample, generating a measurement, and scrolling the concentration to the desired value. Pressing the **cal** key enters the desired concentration.

Measurement Mode and Resolution

This function is used to determine whether measurements will be made in concentration (mg/l) or percent saturation (%) mode.

The resolution of the measurement is also set in this function. The measurement options are as follows:

00.00 mg/l, 00.0 mg/l,
000.0 % or 000 %

Calibration Interval

The meter allows the user to enter a calibration interval. The user may select a duration of 0 to 14 days with a default setting of 6 days. After the calibration interval has expired, the user will be prompted (with display of sad Stat Face™ and hourglass) to calibrate the DO probe.

- Autoshutoff** To prolong battery life, the meter switches off (*AutOFF*) automatically when it is inactive for a period longer than specified. The user can select a shut-off of either one or 12 hours (default setting: 1 hour). The Autoshutoff feature is disabled during remote interface operation and when the data logger is active.
- Interface** If the meter is controlled with a PC, and interface conflicts occur when the **print** key is pressed, the print function should be deactivated (*Print OFF*). (Model 835A only) (Default setting: Print On, 4800 baud)
- The transmission speed can be set to 600, 1200, 2400, 4800 or 9600 baud. (Model 835A only)
- The transmission speed must correspond to that set in the printer or PC.
- The data format and protocol are permanently set to 7 bits, one stop bit, even parity and XON/XOFF protocol (NAMUR NE 28).
- Temperature Display** The temperature can be displayed either in °C or °F. (Default setting: °C)
- Date and Time Format** The user can choose between the display format 24 hours and day.month.year or 12 hours a.m./p.m. and month.day.year. (Model 835A only)

Calibration

The Models 830A and 835A offer several means of calibration which are defined by the user via the AirCal (*AirCAL*) and Zero Point (*0 point*) settings in the configuration menu. See **Configuration**.

General information on calibration

Calibration Conditions

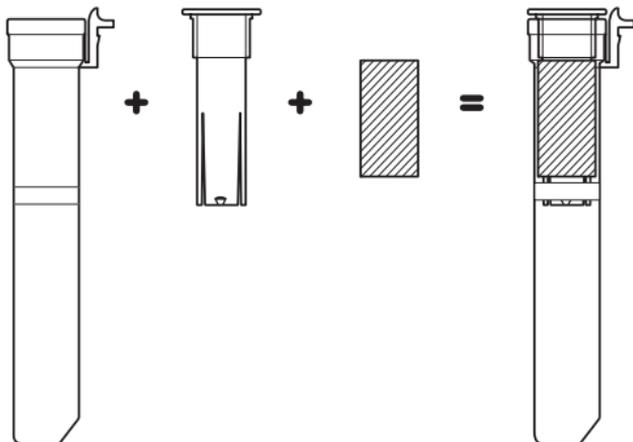
Care should be taken to ensure that, upon calibration, the probe has been polarized for at least 60 minutes, the air calibration chamber has had at least 10 to 15 minutes to attain proper humidity, or air-saturated water samples have been properly aerated with oxygen.

Note



Calibration Sleeve

Creates humid environment needed for calibrating the D.O. probe in H₂O saturated air. Remove the 2" plastic insert from the calibration sleeve and moisten the blue cloth. Wrap the blue cloth around the plastic insert and return it back into the calibration sleeve. Make sure the blue cloth is only slightly damp and that there are no water droplets on the sides of the calibration sleeve. Insert probe into the calibration sleeve and follow the calibration procedure.



Cleaning Probe	Before calibration, make sure that the DO probe is clean. Residue or any other buildup on the membrane should be rinsed off with distilled water. Afterward, the sensor should be gently wiped dry. Coating or fouling of dissolved oxygen membranes may adversely affect the dissolved oxygen calibration and measurement.
Temperature	The Thermo Orion polarographic DO electrode has advanced temperature measurement which allows for quick temperature response and accurate measurement.
Barometric Pressure	The barometric pressure is determined directly by the meter and used in determination of dissolved oxygen measurements. To display barometric pressure, see calibration descriptions pages 15, 16 and 18.
Polarographic Sensors	The polarographic electrode needs to be polarized for 60 minutes every time maintenance is performed, the electrode is unplugged from the meter, or the meter has been turned off for more than 72 hours. Whenever the probe is attached to the meter, it is maintaining a polarization voltage. Even when the meter is turned off, a polarization voltage will continue for 72 hours (as long as the probe is connected). After 72 hours, the meter will stop polarizing the probe. Ensure that the probe is fully polarized before starting any calibration or measurement procedures.

One-Point Autocalibration with water saturated air

(AirCAL ON / 0 point OFF)

Place the probe into the calibration chamber and ensure that the calibration chamber, whether internal or external, is wet and has been given proper time to come to equilibrium. Typically, the chamber should achieve equilibrium after 10 to 15 minutes. The chamber should be ready when the measurement stops drifting.



Press the **cal** key to activate calibration. **CAL** will be displayed above the *AirCAL* prompt. Press the **cal** key again to activate calibration process (hourglass will then begin flashing). Pressing the **meas** key aborts the calibration. After the calibration cycle is complete, the calibration slope will be displayed, press the **cal** key to accept the slope and return to measurement mode or press **meas** key to abort the calibration (old calibration data will be reinstated).

If the electrode doesn't achieve stability within 5 minutes, a timeout error (*t.out*) will be displayed. Press the **meas** key to abort the calibration or the **cal** key to reactivate the calibration process.

Note



If the slope is out of range (range is 60% to 120%), then "error" is displayed. Press the **meas** key to abort the calibration or the **cal** key to reactivate the calibration process.

Two-Point Autocalibration with a zero solution followed by water-saturated air (*AirCAL ON / 0 point ON*)

Prepare an oxygen scavenging solution, such as sodium sulfite. Add 18 grams of sodium sulfite to 300 mL of deionized water. Stir until most of the salt has dissolved. Transfer the solution into a BOD bottle. Place the overflow funnel into the bottle so that it is snugly sealed. Place the probe into the bottle ensuring that the thermistor is fully submerged in the solution. Place the bottle on a magnetic stir plate with a stirrer & stir gently.

Allow the solution to eliminate all oxygen from the membrane module. This should take at least 5 minutes. The system should be ready when the measurement stops drifting.



Press the **cal** key to activate calibration. *CAL* will be displayed above the *Set 0* prompt. Press the **cal** key again to activate the calibration process (hourglass will then begin flashing). Pressing the **meas** key aborts the calibration. When the probe input has stabilized, the residual current will be displayed as a percentage of the saturation current. Press the **cal** key to accept the zero point. Continue with the second calibration point or press the **meas** key to abort the calibration.

Note



If the residual current is out of range (Zero Point range is 0% to 5.0%), "error" is displayed, press the **meas** key to abort the calibration or the **cal** key to reactivate the calibration process.

If the electrode doesn't achieve stability within 5 minutes, a timeout error (*t.out*) will be displayed. Press the **meas** key to abort the calibration or the **cal** key to reactivate the calibration process.

Next, rinse the probe thoroughly with deionized water for a few minutes to ensure that the scavenging solution is fully cleansed from the probe. Place the probe into the calibration chamber and make sure that the calibration chamber, whether internal or external, is wet and has been given proper time to come to equilibrium. Typically, the chamber should achieve equilibrium after 10 to 15 minutes.



Press the **cal** key to continue with the second calibration point. *CAL* will be displayed above the *AirCAL* prompt. Press the **cal** key again to activate calibration process (hourglass will then begin flashing). Press the **meas** key to abort the calibration. When the electrode achieves stability, the calibration slope will be displayed, press the **cal** key to accept the slope and return to measurement mode or press the **meas** key to abort the calibration.

If the electrode doesn't achieve stability within 5 minutes, a timeout error (*t.out*) will be displayed. Press the **meas** key to abort the calibration or the **cal** key to reactivate the calibration process.

If the slope is out of range (range is 60% to 120%), then "error1" is displayed. Press the **meas** key to abort the calibration or the **cal** key to reactivate the calibration process.

One-Point Manual Calibration - adjustment to a known concentration value (AirCAL OFF / 0 point OFF)

Place the DO probe into the calibration solution, ensuring that the thermistor is submersed. If the instrument is being calibrated to a Winkler titration, stirring is recommended. The system should be ready when the measurement stops drifting.



Press the **cal** key to activate calibration. The measured barometric pressure and temperature will be displayed for reference. Press the **cal** key again to activate the calibration process. The sample concentration will be displayed above the calculated value of the slope (S_n). The user can then scroll the concentration value up or down until the desired value is obtained. (Note: While the value is being scrolled, the slope is also displayed and updated as the value is adjusted. The range is 40% to 150%.) Pressing the **cal** key accepts the value and slope. After the calibration cycle is complete, the calibration slope will be displayed. Press the **cal** key to accept the slope and return to measurement mode or press the **meas** key to abort the calibration.

If the slope is out of range (range is 40% to 150%), then “error” is displayed. Press the **meas** key to abort the calibration or the **cal** key to reactivate the calibration process.

Two-Point Manual Calibration with a zero solution followed by a second point (AirCAL OFF / 0 point ON)

Prepare an oxygen scavenging solution, such as sodium sulfite. Add 18 grams of sodium sulfite to 300 mL of deionized water. Stir until most of the salt has dissolved. Transfer the solution into a BOD bottle. Place the overflow funnel into the bottle so that it is snugly sealed. Place the probe into the bottle ensuring that the thermistor is fully submerged in the solution. Place the bottle on a magnetic stirrer & stir gently.

Allow the solution to eliminate all oxygen from the membrane module. This should take at least 5 minutes. The system should be ready when the measurement stops drifting.



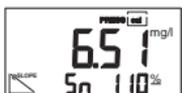
Press the **cal** key to activate calibration. The lower display should show a small line with the word "Zero". This indicates setting the Zero value. The meter will set the value to Zero, press **cal** to accept. Pressing **meas** key aborts the calibration.

If the residual current is out of range (Zero Point range is 0% to 5.0%), "error" is displayed, press the **meas** key to abort the calibration or the **cal** key to reactivate the calibration process.

Once the calibration point has been accepted with the **cal** key, the meter automatically displays the barometric pressure along with the temperature. This is a prompt to remove the probe and put it into the calibration solution to continue with the second calibration point.

If the electrode doesn't achieve stability within 5 minutes, a timeout error (*t.out*) will be displayed. Press the **meas** key to abort the calibration or the **cal** key to reactivate the calibration process.

Next, rinse the probe thoroughly with deionized water for a few minutes to ensure that the scavenging solution is fully cleansed from the probe. Place the DO probe into the calibration solution, ensuring that the thermistor is submerged. The system should be ready when the measurement stops drifting.



Press the **cal** key to continue with the second calibration point. The measured barometric pressure and temperature will be displayed for reference. Press the **cal** key again to activate the calibration process. The sample concentration will be displayed above the calculated value of the slope (*S_n*). The user can then scroll the concentration value up or down until the desired value is obtained. (Note: While the value is being scrolled, the slope is also displayed and updated as the value is adjusted. The range is 40% to 150%.) Pressing the **cal** key accepts the value and slope. After the calibration cycle is complete, the calibration slope will be displayed. Press the **cal** key to accept the slope and return to measurement mode or press the **meas** key to abort the calibration.

If the slope is out of range (range is 40% to 150%), then "error" is displayed. Press the **meas** key to abort the calibration or the **cal** key to reactivate the calibration process.

Measurement

Measuring Mode

Pressing the **meas** key accesses the measuring mode from all functions. In the measuring mode, the main display indicates the measured variable and the secondary display shows the temperature.

Note

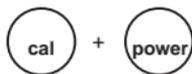


If the meter is connected to a PC and measurements are taken in a grounded liquid, measuring errors may result.

Measuring Dissolved Oxygen (DO)

The main display indicates the measured dissolved oxygen. The secondary display shows the temperature.

Salinity Correction



The instrument offers a salinity correction for determination of DO concentration. The salinity correction factor can be enabled by entering the configuration menu. Holding down the **cal** key with the meter switched off and then pressing the **power** key activates the configuration menu.

Once the configuration menu is entered the user can then scroll the salinity correction factor from 0.0 to 42.0 with the ▲ and ▼ keys. When a salinity correction factor is set, the SA icon will appear on the display during measurement in the concentration mode to indicate that a salinity correction factor is in effect.

Barometric Pressure

The Barometric Pressure is measured directly by the meter. There is no need for the user to enter or adjust the pressure. To read the barometric pressure, turn the AutoCal feature Off in the Configuration menu. Then exit to measure mode. The barometric pressure can subsequently be viewed by pressing the **cal** key. The user may continue with the calibration sequence or press the **meas** key to return to measure mode.

AutoRead Function

AUTO-READ Drift Control functions as a “ready” indicator, and “freezes” the reading when stability of the sensor signal is reached. Pressing the **meas** key for at least 2 seconds toggles the AUTO-READ function on and off. While the meter is checking for a stable reading, the A icon will flash. When the sensor reading stabilizes, the A icon will stop flashing and the reading will freeze. The **meas** key should be pressed (for less than 2 seconds) whenever the user wants to initiate the AutoRead function again.

Units of Measure

The units of measurement are selected from the configuration menu. The user may select percent saturation at 000.0% or 000% resolution. The user may also select concentration at 00.00 or 00.0 mg/l.

Note



Percent saturation resolution will always be 000% if the value is above 199.9%. Concentration resolution will always be 00.0 mg/l if value is above 19.99 mg/l.

Data Log Memory (Model 835A only)

Up to 200 measured values can be stored in the data log memory together with temperature, units (percent saturation or concentration), date and time. Storage is performed either manually or automatically using the data log.

Write memory



Press the **STO** key. The currently measured value is shown on the display.



Select any memory location using the ▲ and ▼ keys. Press the **STO** key to store the measured value in the selected memory location. After storing, the memory location number is automatically incremented and the meter returns to measuring mode.

Read memory



Pressing the **RCL** key displays the last stored measurement values.

Select any memory location using the ▲ and ▼ keys.

Pressing the **RCL** key switches between the measured values and the time/date of storage.



Press the **meas** key to return to the measuring mode.

Clear memory



To clear the entire data log memory, press the **STO** key to access the memory mode.



Then press the **clock** key to access the data log mode. Select Clear (Clr) using the ▲ and ▼ keys.



Press the **STO** key to clear the entire memory.



If you do not want to clear the data log, press the **meas** key to abort this procedure.

Data Log (Model 835A only)

Data log

The data log records up to **200** measured values together with temperature, units (percent saturation, or concentration) time and date. Data storage is performed either manually (by pressing the **STO** key), or automatically (based on either a time interval or a difference in measurement values).



Press the **STO** key to access the memory mode. Then press the **clock** key to access the data log mode. Choose between the four logging modes (continue, start, parameter or clear) using the ▲ and ▼ keys. When the desired mode is displayed, press the **STO** key. If the parameter mode is selected, choose between the three parameter-driven logging modes (interval, differential or shot manual) using the ▲ and ▼ keys.

When the desired mode is displayed, press the **STO** key. The Continue and Start modes activate the current data log mode. The current data memory location will be shown on the display.

Warning



If "Clear" has been selected, all memory locations will be cleared and the meter will return to the measuring mode.



Pressing the **meas** key exits the data log mode.

Data logging Modes

Continue mode If the user scrolls the log mode until Continue (*Cont*) is displayed, pressing the **STO** key will cause the meter to log data to the subsequent memory location from the last data point. The meter will log data based upon the current logging parameters. Press the **meas** key to end automatic logging.

Start mode If the user scrolls the log mode until Start (*Strt*) is displayed, pressing the **STO** key will cause the entire data log memory to be cleared. Storage then begins from memory location "00". The meter will log data based upon the current logging parameters. Press the **meas** key to end automatic data logging.

Clear mode If the user scrolls the log mode until Clear (*CLr*) is displayed, pressing the **STO** key will cause the entire data log memory to be cleared without starting automatic data logging.

Parameter mode If the user scrolls the log mode until Parameter (*PAR*) is displayed, pressing the **STO** key will cause the parameter menu to be displayed. Choose between the three parameter-driven logging modes (interval, differential or manual) using the **▲** and **▼** keys. If appropriate, the parameter value must be subsequently entered. Automatic storage then begins from the subsequent memory location from the last data point.

The meter will log data based upon the chosen logging parameters. Press the **meas** key to end automatic logging.

Warning



If the Start or Clear mode has been selected, all memory locations will be cleared. If the data in the logger is needed, print or transfer the data before activating either of these log modes.

Setting parameters of the data logger (Model 835A only)

In the parameter setting mode, you select whether data storage is to be done manually (*Shot*), on a time interval (*Int*), or based on a difference of measurement values (*diff*). Press the **STO** key to access the logging functions.

To select interval-controlled storage of measured values, scroll until *Int* is displayed and press the **STO** key. Set the interval using the ▲ and ▼ keys. The interval range is 5 seconds to 60 minutes. The default interval is 2 minutes. After selecting the interval time, press the **STO** key to enter the value. The meter will then display *Cont* to signify Continue mode. Press the **STO** key and the meter will automatically log data based upon the entered interval.

With differential data storage, a measured value is not stored until it deviates from the last logged value by the user-defined differential value. By using the storage time, you can determine when the value had changed. The differential value is entered in the subsequent parameter-setting step.

The differential value is always based on the current measured parameter (concentration or percent saturation). This means that if differential concentration values are to be logged, the meter must be set to concentration measurement prior to parameter setting and data logging. The concentration differential range is 0 to 19.99 mg/l. The default concentration differential value is 1 mg/l. The percent saturation differential range is 0 to 199.9 %. The default concentration differential value is 1 %.

To select differential storage of measured values, scroll until *diff* is displayed and press the **STO** key. Set the differential value using the ▲ and ▼ keys. When the desired differential value is displayed, press the **STO** key to enter the value. The meter will then display *Cont* to signify Continue mode. Press the **STO** key and the meter will automatically log data based upon the entered differential value.

To select manual storage of measured values, scroll until *Shot* is displayed and press the **STO** key. The meter will then display *Cont* to signify Continue mode. Press the **STO** key and the meter will return to measure mode.

With manual data logging, the measured values are saved with the **STO** key.

Note

The data logger is in a looped configuration, i.e., it does not stop after reaching the last memory location (199). Recording is automatically continued with memory location number 00. To avoid losing data by overwriting, download stored data and clear the logger before beginning a new set of data. Be aware of this when using interval-controlled data collection.

Clock Mode (Model 835A only)

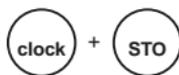
Setting clock



Pressing the **clock** key activates the clock mode. The time and date are displayed.

In this mode, the battery consumption of the meter is reduced to a minimum.

To set the time or the date, the clock mode must be activated.



Press the **clock** and **STO** keys simultaneously to set the clock.

The time display will flash. The time can be set using the ▲ and ▼ keys.



When the correct time is displayed, press the **STO** key. The date can now be set using the ▲ and ▼ keys.



When the correct time is displayed, press the **STO** key. The year can now be set using the ▲ and ▼ keys. Press the **STO** key to enter the year. The meter returns to clock mode.



Press the **meas** key to return to measuring mode.

Note



Upon the year 2000, the clock will continue counting normally. The Models 830A and 835A are both Y2K compliant.

Serial Interface (Model 835A only)

Note



If the meter is connected to a PC and measurements are taken in a grounded liquid, measuring errors may result.

With the remote interface, you can directly send data to a printer with serial port or set up a direct connection to a computer. Via the computer, the meter can be completely remote controlled and all data and parameters can be read. Using the printer (e.g. PRT 300 printer), you can directly print measured values, data points and GLPdoc™ report.

Interface parameters

The RS 232 interface can be defined for all common baud rates.

Setting is carried out in the Configuration menu

- Baud rate: 600 Bd
- 1200 Bd
- 2400 Bd
- 4800 Bd (default setting)
- 9600 Bd

The data format and protocol are permanently set to:

- 7 bits
- even parity
- one stop bit
- XON/XOFF protocol

PRT 300/301 dip switch settings should be set as:

- | | |
|--------|----------|
| switch | 1 - down |
| switch | 2 - up |
| switch | 3 - up |
| switch | 4 - down |
| switch | 5 - up |
| switch | 6 - down |
| switch | 7 - down |
| switch | 8 - down |

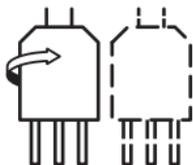
Note



For the command set of the meter, refer to the online help of the PC software for data transfer.

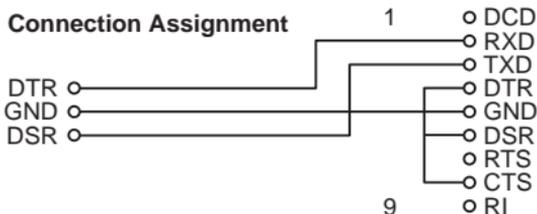
Interface cable (Model 835A only)

Only one interface cable is required to operate with a printer or PC. By simply turning the plug on the meter's interface port, the cable can be used to connect to either a printer or a PC.



The label facing the operator should match the output device being connected. The PRT 300 printer uses the PC interface and the dip switch settings on the previous page.

Standard Setting for PRT300 printer



Meter Configuration

Parameter	Setting
Baud rate	1200
Printer	On

Printing Measured Values and GLPdoc™ Report

Note



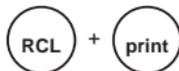
Make sure that the printer function is activated in the configuration (*Print On*) and the selected baud rate corresponds to that of the printer.

Printing Measured Values



Press the **print** key while in the measuring mode to print the currently measured value. The measurement value is printed with temperature, date, time and a three-digit identification number. The identification number is reset when the meter is switched off.

Printing Memory



Press the **RCL** and then **print** keys to print the logged data. All stored data points are printed with temperature, date, time and memory location number (Sxxx).

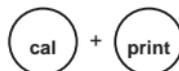
If you only want to print individual data points, press the **RCL** key first. Select the desired data point using the ▲ or ▼ key and confirm with the **print** key.

Note



If the permissible measurement or temperature range is exceeded during data logging, or if the clock has not been set, the line on the printout will be marked with “#”.

Printing GLPdoc™ report



To print out the GLPdoc™ report, press the **cal** and then **print** keys. The report printout contains:

- Serial number and meter model (Model 835A only)
- a calibration record with the data of the last calibration
- the settings of the configuration menu
- a record of the last self-test performed

3. Troubleshooting and Maintenance

Stat Face™ Electrode Monitoring



The automatic Stat Face electrode monitoring system provides information on the electrode condition. It evaluates slope, zero point, membrane condition and response time of the electrode.

In addition, Stat Face requests calibration at regular user-defined intervals.

Note



The deterioration of the electrode condition is signified by 😊, 😐 or 😞 of the Stat Face indicators. This evaluation is permanent. An improvement 😊 can only take place after a calibration.



This Stat Face indicator provides information on the electrode response time. The value is determined during calibration.

Due to wear, aging and lack of maintenance, the electrode membrane may become fouled or torn. This leads to a longer response time and the electrode becomes sluggish.



The electrode response is slow. You should consider performing maintenance on the electrode. It may be possible to achieve an improvement by cleaning or by replacing the membrane and electrolyte. If after electrode maintenance and membrane replacement the electrode response is still slow, you should consider replacing the electrode.



The electrode response is very slow. Correct measurement is no longer ensured. The electrode should be maintained. If appropriate maintenance fails to remedy the situation, the electrode should be replaced.



This Stat Face display provides information on the electrode slope and zero point.



Slope and zero point of the electrode are still acceptable, however the membrane should be replaced soon.



Slope and/or zero point of the electrode have reached values which no longer ensure proper calibration. See electrode instruction manual for cleaning and maintenance information.

Note



The Slope and zero point values are determined during calibration. Accurate information is required for proper calibration. For this reason, always use fresh zero solution, fresh deionized water for saturation calibration or fresh sample for manual calibration.

Cal



Using the calibration timer, you can set an interval within which calibration should take place.

The calibration timer continues to run with the meter switched off.



Over 80 % of the calibration interval has passed.



The calibration interval has been exceeded.

Error Messages

Range limits exceeded

If a measurement exceeds the specified range limits, the measured value will flash and “error” will be displayed.

ERROR 1

The measurement range was exceeded.

Possible causes:

- Sensor defective
- Break in sensor cable
- Wrong sensor connected
- Bad calibration data

ERROR 2

The DO membrane has failed.

Possible causes:

- Hole in the membrane
- Electrolyte leaking out from cap

ERROR 3

The measured temperature exceeds the specified range limits: -5 °C to + 50 °C

Possible causes:

- Temperature sensor in DO probe may be defective

Calibration error messages If errors occur during calibration, or if the determined sensor data are outside the valid range, an error message appears.

ERROR 7 The Barometric Pressure is outside of the permitted range of 525 to 810 mm Hg.

Possible causes:

- Barometric Pressure is out of range
- Barometric Pressure sensor in the meter is failing

ERROR 11 t.OUT The calibration was cancelled after approximately five minutes because the signal was not stable. This message appears only after a failed calibration.

Possible causes:

- Sensor not fully polarized
- Calibration chamber not equilibrated
- Sensor requires maintenance
- Major temperature fluctuation
- There may be a short between potential to ground, PC, meter and measuring medium

ERROR 14 If the clock has not been set (e.g. after battery replacement), this error message is displayed. To clear the message, set the clock (see Pg. 27).

ERROR 15 If an error occurs during transmission via the RS-232 interface, this error message will appear. To eliminate the error message, switch the meter off and then on again. Should the error message occur again, check the settings in the Configuration menu.

Possible causes:

- Wrong transmission rate (baud rate) (see Pg. 12)
- Error during transmission
- Wrong data format (e.g. parity setting) on the receiving device (see Pg. 28)
- Cable orientation is wrong
- Cable connections not fully seated

ERROR 18 Error during the meter self-test sequence.

Possible causes:

- Configuration or calibration data are defective.
Completely reconfigure and recalibrate the meter.

ERROR 19 Error in the factory settings or system memory. "FAIL" appears on the display.

Possible causes:

- EEPROM or ROM defective
- Error in meter factory settings

Normally, this error message should not occur as there are multiple safety functions which protect the data. Should this error message appear, the meter must be repaired and recalibrated at the factory. Contact Thermo Orion Technical Service for a Return Authorization Number and instructions for returning the meter.

Assistance

If, after checking each component of your measuring system, the source of the trouble remains unknown, call Thermo Orion's Technical Service Chemists.

In the United States or Canada, call 978-232-6000 or 800-225-1480.

In Europe, the Middle East, and Africa contact your local authorized Thermo Orion dealer, or:

Thermo Orion

500 Cummings Center
Beverly, MA 01915-6199 USA
Tel: 978-232-6000
Dom. Fax: 978-232-6015
Int'l. Fax: 978-232-6031

Thermo Orion Europe

12-16 Sedgeway Business Park
Witchford, Cambridgeshire
England, CB6 2HY
Tel: 44-1353-666111
Fax: 44-1353-666001

Thermo Orion Far East

Room 904, Federal Building
369 Lockhart Road
Wanchai, Hong Kong
Tel: 852-28360981
Int'l. Fax: 852-28345160

Thermo Orion Customer Support

Toll Free: 800-225-1480
WWW: <http://www.thermoorion.com>
Dom. e-mail: domcs1@thermoorion.com
Int'l. e-mail: intcs1@thermoorion.com

Maintenance

Changing batteries



When the battery symbol appears on the display, the batteries need replacement. However, the meter can still be used for a few days. If the battery voltage continues to drop, the meter will switch itself off.

Use only alkaline AA batteries. Be sure that the meter is carefully closed again and the protective cover is properly mounted on the meter after changing the batteries.

To replace the batteries, three alkaline AA cells and a screwdriver are needed.

1. Close the protective cover and remove the probe holder.
2. Unscrew the four screws on the back of the meter and remove the lid.
3. Remove the old batteries from the battery holder.
4. Insert the new batteries in the specified direction.
5. Ensure that the protective cover is in the notches provided and that the rubber seal is correctly seated, especially near the sensor socket.
6. Replace the lid and secure it with the screws.
7. Replace the probe holder.

Note

When changing the batteries, all calibration and configuration data are retained. The time and date must be reset. The current memory location is set to 00. (Model 835A only)

Note

After battery replacement, recording will also be continued with memory location 00 when the meter is in the data logger "Continue" mode. If you have stored measured values before battery replacement and you do not want to overwrite them, set the memory location to resume logging to by pressing the **RCL** key to enter the logging mode. Then scroll to the desired memory location using the **▲** and **▼** keys. Begin logging data by pressing the **STO** key twice. (Model 835A only)

Warning

If you want to store the meter for a longer period of time, the batteries must always be removed beforehand. Leaky batteries may damage the meter.

Cleaning the meter

To remove dust and dirt, the external surfaces of the meter may be cleaned with water and a mild household cleaner, if necessary.

Warning

Beware of electrostatic charging when using the meter in hazardous areas!

For example, never wipe the meter with a dry cloth.

Appendix

Salinity/Conductivity Table

Estimate the salinity correction factor by using the following table:
(To the nearest whole number, input value into meter)

Conductivity in mS/cm (20 °C)	Salinity in ppt	Conductivity in mS/cm (20 °C)	Salinity in ppt	Conductivity in mS/cm (20 °C)	Salinity in ppt
5	3.0	23	15.5	42	30.2
6	3.6	24	16.2	44	31.8
7	4.3	25	17.0	46	33.5
8	4.9	26	17.8	48	35.1
9	5.6	27	18.5	50	36.7
10	6.3	28	19.3	52	38.4
11	6.9	29	20.0	54	40.1
12	7.6	30	20.8	56	41.8
13	8.3	31	21.6		
14	9.0	32	22.3		
15	9.7	33	23.1		
16	10.4	34	23.9		
17	11.2	35	24.7		
18	11.9	36	25.5		
19	12.6	37	26.2		
20	13.3	38	27.0		
21	14.1	39	27.8		
22	14.8	40	28.6		

Salinity depending on the conductivity at 20 °C.

ppt = Parts per Thousands of Salinity

This table was calculated up to the conductivity of 56 mmhos/cm from the International Oceanographic Tables*.

* International Oceanographic Tables, Vol. 1, National Institute of Oceanography of Great Britain, Womley, Godaming, Surrey, England and Unesco, Paris 1971

Ordering Information

	Cat. No	Description
Meters	0835A0	Thermo Orion Model 835A Advanced Waterproof Dissolved Oxygen Meter and 083010A probe
	0835A2	Thermo Orion Model 835A Advanced Waterproof Dissolved Oxygen Meter (Meter Only)
	0835A3	Thermo Orion Model 835A Advanced Waterproof Dissolved Oxygen Meter Kit and case
	0830A0	Thermo Orion Model 830A Basic Waterproof Dissolved Oxygen Meter and 083010A probe
	0830A2	Thermo Orion Model 830A Basic Waterproof Dissolved Oxygen Meter (Meter Only)
	0830A3	Thermo Orion Model 830A Basic Waterproof Dissolved Oxygen Meter Kit and case
Probes	083005A	Polarographic DO probe, and maintenance kit 1.5 meter cable, 8 pin waterproof DIN
	083010A	Polarographic DO probe, and maintenance kit 3 meter cable, 8 pin waterproof DIN

	Cat. No	Description
	083025A	Polarographic DO probe, and maintenance kit 8 meter cable, 8 pin waterproof DIN
	083150A	Polarographic DO probe, and maintenance kit 50 meter cable, 8 pin waterproof DIN, Stainless Steel Guard
	083300A	Polarographic DO probe, and maintenance kit 100 meter cable, 8 pin waterproof DIN, Stainless Steel Guard
Maintenance Materials	080513	Electrolyte solution, polishing disk, 3 membranes for all 830A series Polarographic probes
	080515	One membrane cap for 830A series probes
	080514	Electrolyte solution, one bottle, 2 oz.
Accessories	PRT300	Ink-based Printer, 110 V, Cable Included
	PRT301	Ink-based Printer, 220 V, Cable Included
	PRT302	Replacement Printer Ribbon, 1 each

Specifications

DO Ranges	Concentration Ranges	0.0 to 60.0 mg/l at 20 °C 0.0 to 90.0 mg/l at 0 °C
	Resolution:	0.0 or 0.00 (for 0.00 to 19.99 mg/l) 0.0 (for 20.0 to 90.0 mg/l)
	Accuracy:	± 0.5% of measured value ± 0.02 mg/l + 1 digit (from 5 to 35 °C)
	% Saturation Ranges:	0 to 600 % at 20 °C
	Resolution:	0 or 0.0 (for 0.0 to 199 %) 0 (for 200 to 600 %)
	Accuracy:	± 0.5% of measured value ± 0.2 % + 1 digit (from 5 to 35 °C)
	Temperature:	- 5.0 to 50.0 °C
	Resolution:	0.0
	Accuracy:	± 0.1K ± 1 digit
	Pressure:	525 to 810 mm Hg
	Resolution:	1 mm Hg
	Accuracy:	± 2 mm Hg at 20 °C
	Display	LCD 35 x 67 mm, character height 15 mm
Measurement cycle	Approx. 2 sec	

Input 1 (Sensor)	Multi-contact for Polarographic sensors with integrated temperature probe
Sensor Standardization	AutoCal with Water-saturated Air, Manual calibration with Air—saturated Water, Manual calibration with known sample used as standard
Permissible Calibration Slope Range:	60 to 120 % 40 to 150 % (for Manual Adjustable Calibration)
Zero Point Calibration Range:	0 to 5 % of saturation current
Meter self-test	During power-up, segment test, display of model no. and software version
Salinity Compensation Range:	0.0 to 42.0 ppt
Calibration Timer Range:	0 to 14 days (default is 6 days)
Data Logger	Manual, interval or differential
Data Points	200 memory locations: DO concentration or % saturation, with temperature, date and time

Remote interface	Serial RS 232 interface, bidirectional, asynchronous, baud rate user-defined (600 to 9600 baud), can be used as either printer or computer interface
Data retention	Configuration/calibration data and factory settings > 10 years
Autoshutoff	After 1 or 12 hours
Ambient Temperature	Operation: -10 to +55 °C Transport and storage: -20 to +70 °C
Power supply	3 alkaline AA batteries (Do not use rechargeable batteries)
Operating time	Approx. 1,000 hours, clock operation > 2 years
Enclosure	Material: PA, IP 66 protected, with integrated probe holder
Dimensions	133 x 160 x 30 mm (W x H x D)
Weight	Approx. 560 g with batteries

Specifications for PRT300 Printer

Printer type	Impact printer
Interface	Serial RS 232 interface
Paper	Roll: Normal paper, Width: $57.5 \pm 0.5\text{mm}$ (2.25 inches) Diameter: 60 or 80mm Core ID: $12 \pm 1\text{mm}$ Core OD: $18 \pm 1\text{mm}$
Data transfer	Baud rate: 1200 baud, data bits: 7, stop bits: 1, parity: even, protocol: no
Power supply	110 V (PRT301 is 220 V)

Warranty

The Thermo Orion warranty covers failures due to manufacturer's workmanship or material defects from the date of purchase by the user. User should return the warranty card to Thermo Orion and retain proof of purchase. Warranty is void if product has been abused, misused, or repairs attempted by unauthorized persons.

Warranties herein are for product sold/installed by Thermo Orion or its authorized dealers.

Any product sold by a U.S. or Canadian distributor must be returned to Thermo Orion for any warranty work. A Return Authorization Number must be obtained from Thermo Orion Laboratory Technical Service before returning any product for in-warranty repair or replacement.

In the event of failure within the warranty period, Thermo Orion will at Thermo Orion's option, repair or replace product not conforming to this warranty. There may be additional charges, including freight, for warranty service performed in some countries. For service, call Thermo Orion (or its authorized dealer outside the United States and Canada). Thermo Orion reserves the right to ask for proof of purchase, such as the original invoice or packing slip.

Laboratory pH Meters, (Models 301, 611 and 940), SensorLink®, pHuture® pH Meters (Models 610 and 620), Sage® Pumps, Cahn® Balances, 930 Ionalyzer®, 950 ROSS™ FAST QC™ Titrator, 960 Titrator PLUS®, Karl Fischer Titrators, Autosamplers, Liquid Handling Devices, pHuture® Conversion Box, Wine Master®, 607 Switchbox, rf link™, AQUAfast® II Colorimeters, Vacuum Degasser, Flowmeter are warranted to be free from defects in material and workmanship for a period of twelve (12) months from the date of purchase by the user or eighteen (18) months from date of shipment from Thermo Orion, whichever is earlier, provided use is in accordance with the operating limitations and maintenance procedures in the instruction manual and when not having been subjected to accident, alteration, misuse, or abuse.

The warranty period for 960 Titrator PLUS, 950 Fast QC Titrator, Wine Master and 930 Ionalyzer pumps is three (3) months from date of purchase.

Economy Line Electrodes, Models 91-05, 91-06, 91-15, 91-16, 91-25, 91-26, 91-35, 91-36, 92-06, are warranted to be free from defects in

material and workmanship for a period of three (3) months from date of purchase by customer or six (6) months from date of shipment from Thermo Orion, whichever is earlier. Warranty also includes failure for any reason (excluding breakage), except abuse, provided the electrode is not used in solutions containing silver, sulfide, perchlorate, or hydrofluoric acid; or in solutions more than one (1) Molar in strong acid or base at temperatures above 50 °C.

Ion Selective Electrodes, ionplus® Electrodes, ROSS™ Electrodes, Sure-Flow® Electrodes, PerpHecT® Electrodes, AquaPro Professional Electrodes, Standard Line pH Electrodes, Tris pH Electrodes, ORP Triode™ (Cat. No. 9180BN), pHuture® pH Probes (Cat. No. 616500) and pHuture MMS™ Quatrode™ and Triode (Cat Nos. 616600 and 617900), Model 97-08 DO Probe, Series 100 Conventional Conductivity Cells, temperature probes and compensators (except those models noted), AQUAfast® II Colorimeters are warranted to be free from defects in material and workmanship for a period of twelve (12) months from the date of purchase by the customer or eighteen (18) months from date of shipment from Thermo Orion, whichever is earlier, except for abuse or breakage of electrodes. 93 and 97 ionplus Series sensing modules are warranted to give six (6) months of operation if placed in service before the date indicated on the package, except 93-07 and 97-07 Nitrate modules are warranted to give ninety (90) days of operation if placed in service before the date indicated on the package.

Thermo Orion pHuture (Cat. No. 615700) and pHuture MMS Pentrode™ (Cat. No. 617500), Quatrode (Cat. No. 617800) and Triode (Cat. No. 615800), Low Maintenance Triode™ (Cat. No. 9107BN), ORP Low Maintenance Triode (Cat. No. 9179BN), and PerpHecT Low Maintenance Triode (Cat. No. 9207BN), Waterproof Triode (Cat. Nos. 9107WP, 9107WL, 9109WL and 9109WP), QuiKcheK™ Meters and Micro Electrodes are warranted to be free from defects in material and workmanship for a period of six (6) months from date of purchase by the customer or twelve (12) months from date of shipment from Thermo Orion, whichever is earlier, when used in accordance with the operating limitations and maintenance procedure in the instruction manual and when not having been subjected to accident, alteration, misuse or abuse.

AQUAfast® IV Colorimeters, Series 100 DuraProbe™ Conductivity Cells and Series 800 Dissolved Oxygen Probes are warranted to be free from defects in material and workmanship for a period of twenty-four (24) months from the date of purchase by the user or thirty (30) months from the date of shipment from Thermo Orion, whichever is earlier, provided use is in accordance with the operating limitations and maintenance procedures in the instruction manual and when not having been subjected to accident, alteration, misuse, or abuse.

Waterproof Meters (Models 830A, 835A, 260A, 261S, 265A, 266S, 130A, 131S, 135A, 136S, 1230, 142 and 842), Conductivity Meters (Models 105Aplus™, 115Aplus, 125Aplus, 145Aplus, 150Aplus and 162A), PerpHect pH/ISE Meters, pH/ISE Meters (Models 210Aplus, 230Aplus, 250Aplus, 290Aplus, 410Aplus, 420Aplus, 520Aplus, 525Aplus, 710Aplus, 720Aplus and 920Aplus), pHuture MMS Meters (Models 535A and 555A), pH/Conductivity Meter (Model 550A), Dissolved Oxygen Meters (Models 810Aplus, 850Aplus and 862A), are warranted to be free from defects in material and workmanship for a period of thirty-six (36) months from the date of purchase by the user or forty-two (42) months from date of shipment from Thermo Orion, whichever is earlier, provided use is in accordance with the operating limitations and maintenance procedures in the instruction manual and when not having been subjected to accident, alteration, misuse or abuse.

LabConnect™ and DataCOLLECT™ carry an “out-of-box” warranty. Should they fail to work when first used, contact Thermo Orion immediately for replacement.

Thermo Orion Meter, Electrode and Analytical System Accessories (such as Printers, Cables, Cases, Standards, Line adapters, etc.), Solutions, AQUAfast Test Strips, AQUAfast II Reagents, Kits and Accessories, AQUAfast IV Reagents, Kits and Accessories, Series 800 Dissolved Oxygen Probe Membranes and Cahn® Balance Accessories such as cables, printers, and line adapters carry an “out-of-box” warranty. Should they fail to work when first used, contact Thermo Orion immediately for replacement. Should Thermo Orion Solutions or Buffers be unusable when first “out-of-box,” contact Thermo Orion immediately for replacement.

Thermo Orion EZFlash® GC Accessory, TEA Analyzer®, Models 610 and 510 and Incubators carry a twelve (12) month warranty, excluding consumable items.

Incubators have a full one-year parts and labor warranty. The CO₂ gas sensor (T/C) is covered by a five-year warranty. The CO₂ gas sensor (IR) and CO₂ fuel sensor are covered by a two-year warranty. The construction and integrity of the water jacket chamber is covered by a lifetime warranty.

For products in the catalog not listed in this warranty statement, please visit our website.

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Note: For in- or out-of-warranty repair or service, contact Thermo Orion Technical Service (or its authorized dealer outside the United States and Canada). Technical Service will issue a Return Authorization (RA) for all repair services. You must have a Thermo Orion RA prior to returning/forwarding any product to Thermo Orion.

Glossary

Autoshutoff	To protect the batteries, the meter switches off automatically after 12 hours when it is (<i>AutOFF</i>) not operated.
Barometric pressure	Barometric pressure, altitude and atmospheric conditions affect the partial pressure of Pressure oxygen, which causes a variation in dissolved oxygen levels in solution. The models 830A and 835A offer automatic barometric compensation.
BOD	Biochemical Oxygen Demand is the analysis that determines the amount of oxygen that microorganisms consume from water when organic matter is broken down.
cal	Key for activating calibration.
Calibration	Procedure performed regularly to insure proper performance of the sensor. Calibration can be achieved by using humidified air, air saturated water, or zeroed through the use of an oxygen scavenging chemical. Ideally, calibration of the sensor will be performed at the same temperature and barometric pressure as the sample.
Calibration Solution	Sodium sulfite (Na_2SO_3) is the oxygen scavenging solution used for performing the zeroing of the probe.
Data Log	The data log records up to 200 measured values together with the temperature, date and time. Logging can be done either manually or automatically. Automatic logging can be done either on a timed interval or on a differential basis (based on a difference in measurement values).
GLP	Good Laboratory Practice: Rules for conducting and documenting measurements in the laboratory.
Henry's Law	Law that states that "The partial pressure of a gas dissolved in a liquid is the same as the partial pressure of the gas in the vapor above the liquid."
meas	Pressing this key returns to the measuring mode from all other levels.

Membrane	Material which permits the passage of oxygen molecules to the cathode and anode. The membrane is incorporated into a plastic cap, which is then installed over the top of the electrode sensor.
Polarization	Process which ensures that the cathode and anode allow for proper reduction of oxygen molecules.
Percent Saturation	Dissolved oxygen units, describes the percentage of oxygen in solution in relation to oxygen solubility of the solution.
Response Time	Time from the start of a calibration step to the stabilization of the measured value or the time it takes an electrode to achieve stable readings when placed into a sample. Factors include barometric pressure and temperature variation.
Salinity	Salts reduce the solubility of oxygen in water allowing less oxygen to dissolve in the water. The Models 830A and 835A allow the user to enter a salinity factor to compensate for the effect of salts on the levels of dissolved oxygen. The salinity factor is set to a default value of 0.0 ppt, but can be set within the range of 0.0 to 42.0 ppt.
Temperature	Temperature effects oxygen measurements in two ways. The rate at which oxygen diffuses through a membrane varies with temperature. And the solubility of oxygen in solution is also temperature dependent. The Models 830A and 835A have automatic temperature compensation.
Winkler, Lajos	(1863-1939, Budapest) founder of redox titration for dissolved oxygen determination
Winkler Titration	Lab method for measurement of oxygen in solution. The 830A and 835A allow the user to adjust the measured value to this titration via Manual calibration.
Zeroing	Application used when measuring low levels of oxygen. The user enters an oxygen-depleting agent into solution as in order to generate a “zero”, or low current reading.

Declaration of Conformity

Manufacturer:

Thermo Orion
500 Cummings Center
Beverly, MA 01915 U.S.A

hereby declares that the products

Dissolved Oxygen Meter Models 830A and 835A

conform with the following standards and documents

Safety EC Directive 72/23/EEC Low Voltage Directive
EN 61010-1: 1990 Laboratory Equipment

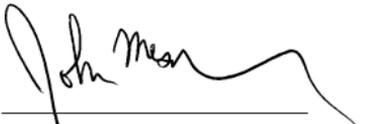
EMC EC 89/336/EEC Electromagnetic Compatibility

Emissions: EN 50081-1 / 01.1992 Emissions
FCC Part 15 Class A

Immunity: EN 50082-2 / 03.1995 Generic Immunity
ESD Susceptibility
Radiated Susceptibility
IEC 801-4 Conducted Susceptibility

These products have been manufactured in compliance with the provisions of the relevant Thermo Orion manufacturing and test documents and processes. Further, these documents and processes are recognized as complying with ISO 9001: 1994(E) by QMI, listed as File # 001911.

Place and date of issue:
Beverly, MA, USA
August 9, 1999



John Meserve
Quality Assurance Manager

Solubility of Oxygen in water exposed to water saturated air at atmospheric pressure (760 mm Hg)

Salinity = Chlorinity x 1.80655

Oxygen Solubility (mg/L)

Temp. (°C)	Chlorinity:					
	0	5.0	10.0	15.0	20.0	25.0
0.0	14.62	13.73	12.89	12.10	11.36	10.66
1.0	14.22	13.36	12.55	11.78	11.07	10.39
2.0	13.83	13.00	12.22	11.48	10.79	10.14
3.0	13.46	12.66	11.91	11.20	10.53	9.90
4.0	13.11	12.34	11.61	10.92	10.27	9.66
5.0	12.77	13.02	11.32	10.66	10.03	9.44
6.0	12.45	11.73	11.05	10.40	9.80	9.23
7.0	12.14	11.44	10.78	10.16	9.58	9.02
8.0	11.84	11.17	10.53	9.93	9.36	8.83
9.0	11.56	10.91	10.29	9.71	9.16	8.64
10.0	11.29	10.66	10.06	9.49	8.96	8.45
11.0	11.03	10.42	9.84	9.29	8.77	8.28
12.0	10.78	10.18	9.62	9.09	8.59	8.11
13.0	10.54	9.96	9.42	8.90	8.41	7.95
14.0	10.31	9.75	9.22	8.72	8.24	7.79
15.0	10.08	9.54	9.03	8.54	8.08	7.64
16.0	9.87	9.34	8.84	8.37	7.92	7.50
17.0	9.67	9.15	8.67	8.21	7.78	7.36
18.0	9.47	8.97	8.50	8.05	7.62	7.22
19.0	9.28	8.79	8.33	7.90	7.48	7.09
20.0	9.09	8.62	8.17	7.75	7.35	6.96
21.0	8.92	8.46	8.02	7.61	7.21	6.84
22.0	8.74	8.30	7.87	7.47	7.09	6.72
23.0	8.58	8.14	7.73	7.34	6.96	6.61
24.0	8.42	7.99	7.59	7.21	6.84	6.50
25.0	8.26	7.85	7.46	7.08	6.73	6.39

Oxygen Solubility (mg/L)

Temp. (°C)	Chlorinity:					
	0	5.0	10.0	15.0	20.0	25.0
26.0	8.11	7.71	7.33	6.96	6.62	6.29
27.0	7.97	7.58	7.20	6.85	6.51	6.18
28.0	7.83	7.44	7.08	6.73	6.40	6.09
29.0	7.69	7.32	6.96	6.62	6.30	5.99
30.0	7.56	7.19	6.85	6.51	6.20	5.90
31.0	7.43	7.07	6.73	6.41	6.10	5.81
32.0	7.31	6.96	6.62	6.31	6.01	5.72
33.0	7.18	6.84	6.52	6.21	5.91	5.63
34.0	7.07	6.73	6.42	6.11	5.82	5.55
35.0	6.95	6.62	6.31	6.02	5.73	5.46
36.0	6.84	6.52	6.22	5.93	5.65	5.38
37.0	6.73	6.42	6.12	5.84	5.56	5.31
38.0	6.62	6.32	6.03	5.75	5.48	5.23
39.0	6.52	6.22	5.93	5.66	5.40	5.15
40.0	6.41	6.12	5.84	5.58	5.32	5.08
41.0	6.31	6.03	5.75	5.49	5.24	5.01
42.0	6.21	5.93	5.67	5.41	5.17	4.93
43.0	6.12	5.84	5.58	5.33	5.09	4.86
44.0	6.02	5.75	5.50	5.25	5.02	4.79
45.0	5.93	5.67	5.41	5.17	4.94	4.72
46.0	5.84	5.58	5.33	5.10	4.87	4.66
47.0	5.74	5.49	5.25	5.02	4.80	4.59
48.0	5.65	5.41	5.17	4.95	4.73	4.52
49.0	5.57	5.32	5.09	4.87	4.66	4.46
50.0	5.48	5.24	5.02	4.80	4.59	4.39

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Notes

Thermo Orion

500 Cummings Center
Beverly, MA 01915-6199 USA
Tel: 978-232-6000
Dom. Fax: 978-232-6015
Int'l. Fax: 978-232-6031

Thermo Orion Europe

12-16 Sedgeway Business Park
Witchford, Cambridgeshire
England, CB6 2HY
Tel: 44-1353-666111
Fax: 44-1353-666001

Thermo Orion Far East

Room 904, Federal Building
369 Lockhart Road
Wanchai, Hong Kong
Tel: 852-2836-0981
Fax: 852-2834-5160

Thermo Orion Customer Support

Toll Free: 800-225-1480
www.thermoorion.com
Dom. e-mail: domcs1@thermoorion.com
Int'l. e-mail: intcs1@thermoorion.com

Thermo Orion

A Thermo Electron business
Formerly Orion Research, Inc.