Palintest®

INST.24

INSTRUMENTS

WATERPROOF 800
DISSOLVED OXYGEN METER

OPERATING INSTRUCTIONS

PT 148 WATERPROOF 800 DISSOLVED OXYGEN METER
(Dissolved Oxygen/Temperature Meter)

Palintest Ltd, Palintest House, Kingsway, Team Valley, Gateshead, Tyne & Wear NE11 0NS England

Tel: 0191 491 0808 Fax: 0191 482 5372 E-Mail: palintest@palintest.com Web Site: www.palintest.com

Preface

This manual serves to explain the use of the Waterproof 800 Dissolved Oxygen Meter. It functions in two ways, firstly as a step by step guide to help you to operate the meter. Secondly, it serves as a handy reference guide. It is written to cover as many anticipated applications of the Waterproof 800 Dissolved Oxygen Meter as possible. If there are doubts in the use of the Waterproof 800 Dissolved Oxygen Meter, please do not hesitate to contact the nearest Palintest Authorized Distributor.

Palintest cannot accept any responsibility for damage or malfunction to the meter caused by improper use of the instrument.

Remember to fill in the guarantee card and mail it back to your authorized distributor or Palintest Ltd.

The information presented in this manual is subject to change without notice as improvements are made, and does not represent a commitment on the part of Palintest Ltd.

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1 INTRODUCTION

Thank you for selecting a Palintest waterproof portable meter. This meter is a microprocessor-based instrument that is designed to be handy capable of allowing one-hand operation. It is capable of measuring Dissolved Oxygen (mg/l), % Saturation of Oxygen and Temperature. It is completely WATERPROOF --- and it FLOATS!

This meter has many user-friendly features ---- all of which are completely accessible through the water-resistant membrane keypad. Your meter includes a dissolved oxygen and temperature probe with 3-m submersible cable (inclusive maintenance kit), instruction manual, and a warranty card. A soft carrying case is included which makes the meter ideal for use in outdoor field measurement. Please read this manual thoroughly before operating your meter.

Figure 1: Waterproof 800 Dissolved Oxygen Meter

2 DISPLAY AND KEYPAD FUNCTIONS

2.1 Display

The LCD has a primary and secondary display.

- The primary display shows the measured DO value either in mg/l, ppm or %, depending on units of measurement selected.
- The secondary display shows the measured temperature in °C.

The display also shows error messages, keypad functions and program functions. See Figure 2.

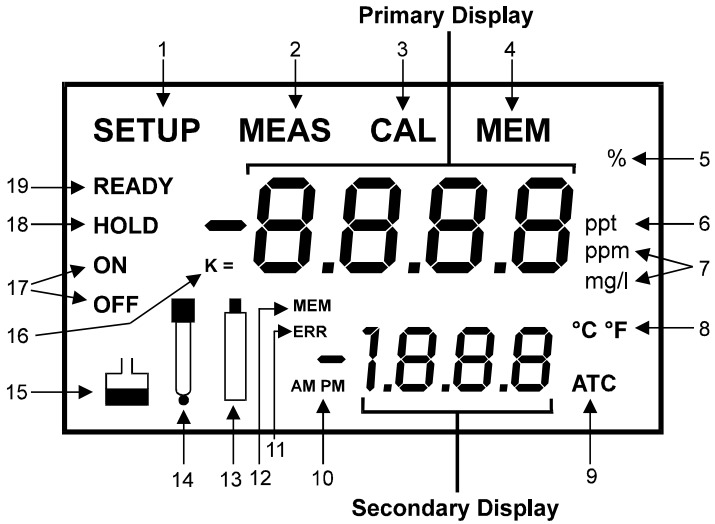


Figure 2: Full LCD Screen

1. SETUP mode indicator

2. MEASurement mode indicator

3. CALibration indicator

4. MEMory recall mode indicator

5. % saturation indicator

6. ppt indicator for input of Salinity value.

7. Oxygen solubility indicator in mg/l or ppm.

8. Temperature indicator

9. Automatic Temperature Compensation indicator

10. Clock indicator

11. ERRor indicator

12. MEMory location indicator

13. Low battery indicator

14. Probe indicator

15. Calibration indicator

16. DO probe cell factor

17. Function ON / OFF indicator

18. HOLD indicator

19. READY indicator

2.2 Keypad

The large membrane keypad makes the instrument easy to use. Each button, when pressed, has a corresponding graphic indicator on the LCD. See Figure 1. Some buttons have several functions depending on its mode of operation.

Key	Function
ON/OFF	Powers on and shuts off the meter. When you switch on the meter, the meter starts up in the mode that you last switched off from. For example, if you shut the meter off in mg/l measurement mode, the meter will be in mgl measurement mode when you switch the meter on.
HOLD	Freezes the measured reading. To activate, press HOLD while in measurement mode. To release, press HOLD again. *NOTE*: When auto endpoint feature is switched on, it automatically holds reading after 5 seconds of stability. The HOLD indicator appears on the display. Press HOLD to release auto endpoint feature.
MODE	1. Selects the measurement parameter. Press MODE to toggle between DO % saturation; DO mg/l; and date/time. 2. While in CAL mode under mg/l (or ppm) measurement status, this key will toggle between mg/l (or ppm) calibration and temperature calibration (refer to Sections 4.4).
CAL/MEAS	Toggles between Calibration and Measurement mode. 1. If you were in DO % saturation measurement mode, press CAL/MEAS to enter DO % saturation calibration mode. 2. If you were in DO mg/l (or ppm) measurement mode, press CAL/MEAS to enter DO mg/l (or ppm) calibration mode. 3. To abort calibration, press CAL/MEAS key again to go back to measurement mode. While in advanced SETUP mode: Press CAL/MEAS to return to main menu from sub menus. Press CAL/MEAS again to return to return to measurement mode from main menu.
ENTER	1. Press to confirm your calibration values in calibration mode. 2. While in SETUP, pressing ENTER key takes you through the various menu AND through each sub-menu.
MI & MR **▲ / ▼**	**In Measurement mode:** Press MI to store values in mg/l or % Saturation values with its corresponding temperature values and date/time values in the memory. Up to 50 sets of values can be stored. Press MR to retrieve data from memory in LIFO method. **In CALibration & SETUP mode:** In DO mg/l (or ppm) and temperature calibration mode, press up or down keys to increase or decrease the values. In SETUP mode, press up or down keys to scroll through the setup subgroup programmes.
SETUP	Takes you into the SETUP mode. This mode lets you customize meter preference and defaults, view calibration and electrode data.
	Back light.

3 PREPARATION

3.1 Inserting the Batteries

Four AAA batteries are included with your meter.

1. Use a Philips screwdriver to remove the two screws holding the battery cover. See Figure 3 below.
2. Remove battery cover to expose batteries.
3. Insert batteries. Follow the diagram inside the cover for correct polarity.
4. Replace the battery cover into its original position using the two screws removed earlier.

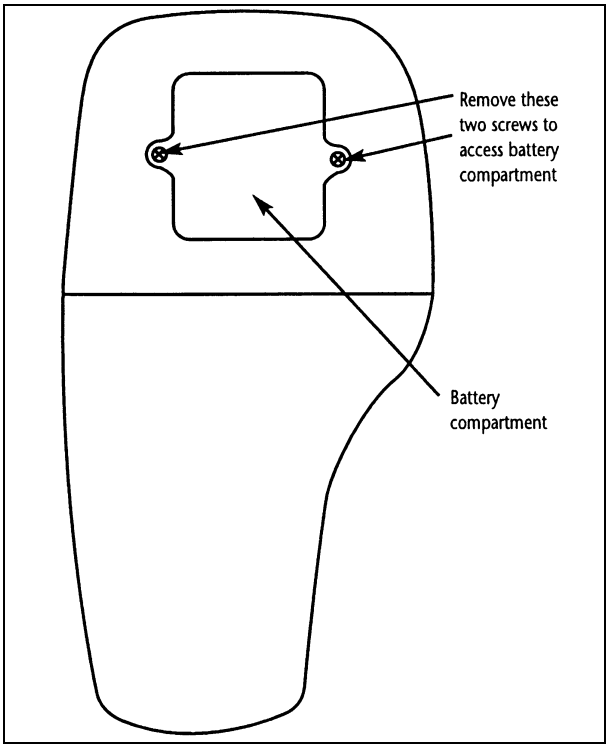


Figure 3: Back panel of meter showing meter compartment

3.2 Connecting the Probe

Your meter includes a dissolved oxygen/temperature probe. The probe cable has a notched 6-pin connector to attach the probe to the meter.

NOTE: Do not substitute other probes. For a replacement probe, see the “Accessories” section, page 42.

NOTE: Keep connector dry and clean. Do not touch connector with soiled hands.

To connect the probe:

1. Line up the notch and 6 pins on the probe connector with the holes in the connector located on the top of the meter. Push down and turn the locking ring to lock into place. See Figure 4 below.

2. To remove probe, turn the locking ring on the probe connector. Pull probe away from the meter.

CAUTION: Do not pull on the probe cord or the probe wires might disconnect.

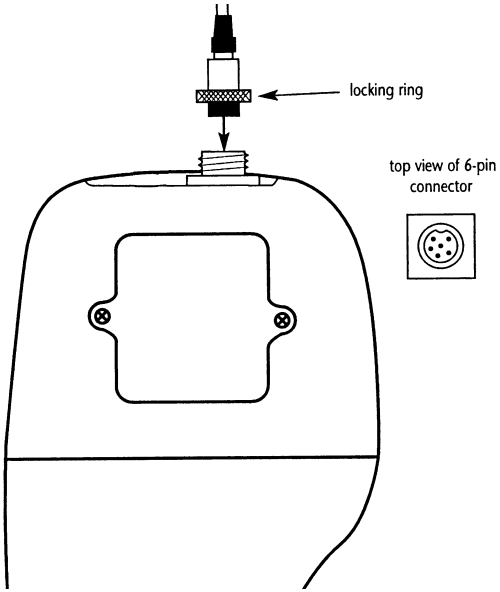


Figure 4: Connect DO Probe

4 CALIBRATION

4.1 Preparing the meter for calibration

Before calibrating your meter, make sure to rinse the probe well with de-ionized water or rinse solution.

NOTE: Do not let membrane surface of the probe touch any other surface. The probe guard (the piece with holes fitted over the end of the probe) protects the membrane; make sure this is always attached to the probe while it is in use.

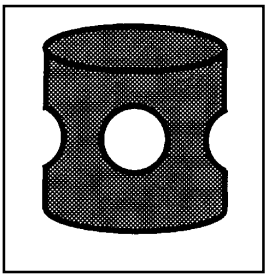


Figure 5: DO Probe guard

You can calibrate for dissolved oxygen in either % saturation or mg/l (ppm). **All new calibrations automatically override existing calibration data.**

Before Calibration

Before starting calibration, make sure you are in the correct measurement mode. When you switch on the meter, the meter starts up in the units last used (either mg/l, ppm. % air saturation,or clock). For example, if you shut off the meter off in “mg/l” units, the meter will read “mg/l” units when you switch the meter on.

NOTE: Most users will calibrate to 100% saturation even when working in mg/l. When calibrating the meter in mg/l mode, you can make fine adjustments, typically to a mid-range value between 10 and 100%. If you are calibrating to a mid-range value, you need to set the 100% saturation value first.

4.2 Dissolved Oxygen Calibration in % Saturation

You can calibrate this meter quickly and easily in air. The exact calibration value depends on barometric pressure. The meter is set to a factory default of 760 mm Hg, which results in a calibration value of 100% saturation in air.

NOTE : If the barometric pressure setting has been changed from 760 mm Hg, the calibration value in air will automatically adjust to a value other than 100%. The adjusted value will be correct for the new barometric pressure setting.

See page 20 to change the pressure setting. See Addendum 2 on page 44 for a table of adjusted % saturation values.

To calibrate 100% Saturation:

1. Rinse the probe well with deionised rinse water or rinse solution. For best accuracy, wrap the end of the probe in a damp cloth. Do not touch the membrane.
2. Press the MODE key to select the % saturation mode. See figure 9.
3. Press the CAL key. The CAL indicator will appear above the primary display. The primary display shows the current value of the measurement and the secondary display will show 100.0. See figure 6.
4. Hold the probe in the air. Wait for the reading to stabilize. If the READY indicator feature is enabled, it will appear when the reading is stable.
5. Press the ENTER key. The meter automatically calibrates to 100.0% air saturation and returns to Measurement mode.
6. See Figure 6.

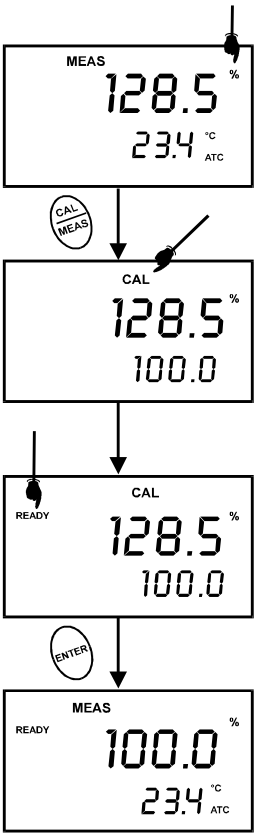


Figure 6: To calibrate for 100% saturation

NOTES :

Whenever an error occurs during calibration, the ERR indicator appears in the lower left-hand corner of the display.

You can offset your % DO calibration. See page 23 for directions.

4.3 Dissolved Oxygen Calibration in mg/l (ppm) mode

Calibrating the meter to 100% in saturation mode will also calibrate the mg/l mode at the value in mg/l corresponding to 100% saturation. This should produce acceptable results in most applications.

This meter also lets you make a calibration adjustment in mg/l (ppm) mode without affecting your % saturation calibration.

To select between mg/l and ppm units, see page 29.

To calibrate in mg/l (ppm) mode:

1. Calibrate 100% saturation as per Section 4.1.
2. Rinses the probe well with deionized rinse water or rinse solution. Wipe the outside of the probe carefully (do not touch the membrane).
3. Dip the probe into a sample of known oxygen concentration. Wait for the reading to stabilize. If the READY indicator feature is enabled, it will appear when the reading is stable.
4. Prress the MODE key to select the mg/l (ppm) mode.
5. Press the CAL key. The CAL indicator will appear above the primary display. The primary display shows the current value of the measurement and the secondary display shows the temperature.
6. Press the ▲ and ▼ keys to adjust the reading.
7. Press the ENTER key. The meter automatically calibrates to the value you entered and returns to Measurement mode.

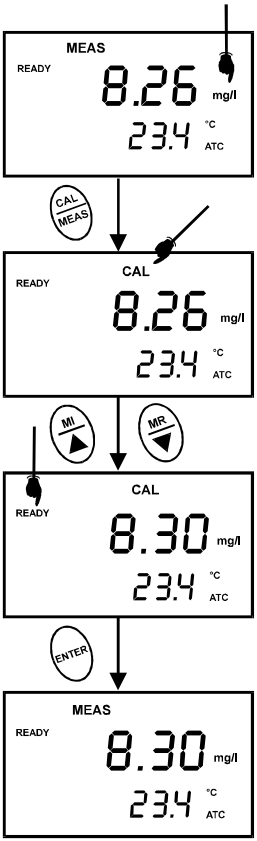


Figure 7: To calibrate in mg/l (ppm) mode
(The values shown above are for illustration purpose. Your meter may display different values depending on the settings and your environmental conditions)

Notes on mg/l (ppm) mode calibration

During mg/l (ppm) measurement and calibration, the meter adjusts to the barometric pressure value that is programmed into the meter. It also adjusts to the salinity value that is programmed into the meter.

You can change the barometric pressure value and salinity value in the mg/l (ppm) SETUP mode (see Section 8.3 on page 20 for directions).

Whenever an error occurs during calibration, the ERR indicator appears in the lower left hand corner of the display.

4.4 Temperature Calibration

The built-in temperature sensor included in the probe is factory calibrated. Calibrate your sensor only if you suspeect temperature errors that may have occurred over a long period of time or if you have a replacement probe.

1. Switch the meter on. Press MODE to select mg/l (ppm) Measurement mode.
2. Press the CAL/MEAS key to enter mg/l (ppm) calibration mode. The CAL indicator will appear above the primary display.
3. While in mg/l (ppm) calibration mode, press the MODE key to enter temperature calibration mode. The primary display shows the temperature reading and the secondary display shows you the factory default temperature value.
4. Compare the primary display reading to a NIST-traceable thermometer or another thermometer known to be accurate.
5. Press the ▲ or ▼ keys to adjust the primary display reading to agree with your temperature standard.
6. Press the ENTER key to confirm temperature calibration and return to Measurement mode.

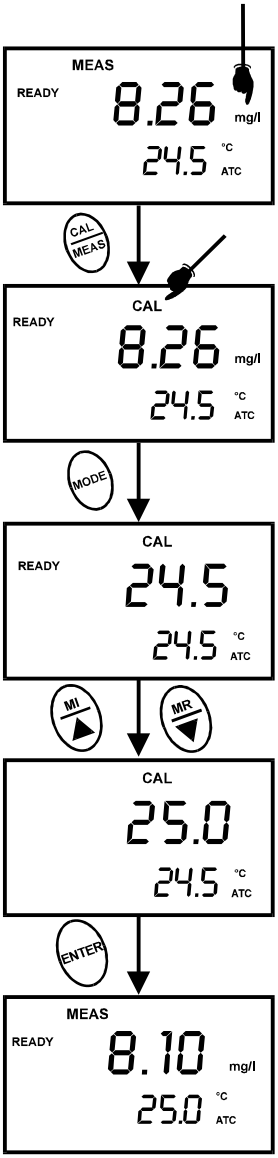


Figure 8: Temperature calibration

Notes:

To exit from Temperature Calibration mode without confirming calibration. DO NOT press ENTER in Step 6. Press CAL/MEAS instead.

Temperature calibration is restricted to ± 5℃ from the factory default value displayed during calibration (shown in the secondary display).

(The values shown above are for illustration purpose. Your meter may display different values depending on the settings & your environmental conditions)

5 MEASUREMENT

5.1 Taking DO readings

During measurement, the probe can be:

- Fully immersed in the solution
- Partially immersed in the solution

Do not allow the probe's membrane surface to touch anything! The probe guard (the piece with holes fitted over the end of the probe) protects the membrane; you should leave this piece attached to the probe at all times.

IMPORTANT: Since the DO probe consumes oxygen from the sample, the sample must constantly flow past the membrane to achieve more accurate readings. You can use a stirrer to accomplish this.

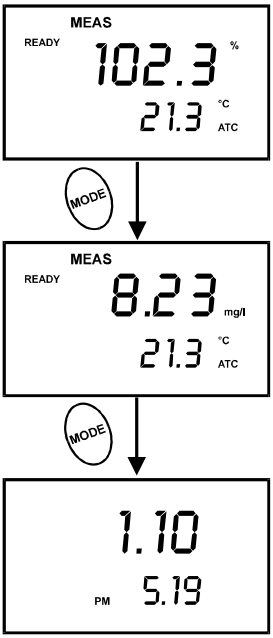


Figure 9: Change measurement mode

To take measurements:

1. Rinse the probe well with deionized rinse water or rinse solution.

2. Select the appropriate measurement mode. Press the MODE key to toggle between modes:
   - % Saturation
   - mg/l (ppm) **
   - date/time clock

3. Dip the probe into the sample. Stir the probe gently to homogenize the sample. Make sure that the sample is continuously flowing past the membrane sensor.

4. Note the reading on the display. If the READY indicator is switched on, it will appear when the reading is stable.

5. Press the key to activate the backlit LCD. This helps you read measurements in dimly lit areas.

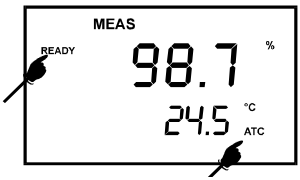


Figure 10: Taking measurement

** To select between mg/l and ppm units, see Section 8.7.2 on page 29.

The ATC indicator should appear in the lower right hand corner of the display. If it does not, this indicates an error.

Taking measurements with READY ON indicator selected on

If the READY indicator has been activated, the READY annunciator lights when the reading is stable.

To switch the READY indicator on or off in the SETUP program – see Section 8.7.1 on page 28 for directions.

Taking measurements with READY HOLD indicator selected on

When a reading is stable for more than 5 seconds, the auto endpoint feature will automatically "HOLD" the reading. The "HOLD" indicator appears on the left side of the display. Press the HOLD key to release the reading.

To switch the Auto endpoint feature on or off in the SETUP program – see Section 8.7.1 on page 28 for directions.

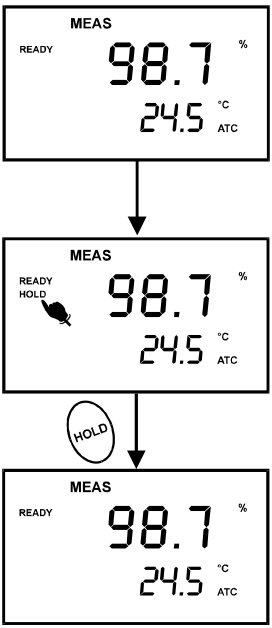


Figure 11 – Auto endpoint feature

(The values shown above are for illustration purpose. Your meter may display different values depending on the settings & your environmental conditions).

5.2 Taking Pressure/Salinity Compensated DO measurements

If necessary, you can adjust the pressure and salinity values of your measurements in the SETUP mode. The DO meter will automatically compensate for salinity and pressure based on the values entered in the SETUP functions. The meter is factory set at 760 mm Hg (101.3 Pascals) pressure adjustment and a factor of 0.0 ppt salinity adjustment. See Addendum 2 on page 44 for a "Pressure vs Altitude" table.

Pressure Adjustment

1. Press the SETUP key to enter SETUP mode.
2. Press the ▲ key once. The upper display shows 'dPr'.
3. Press the ENTER key until the upper display shows a number and the lower display shows 'Hg' or 'PA'.
4. Use the ▲ and ▼ keys to enter the barometric pressure. The upper display will show the value you have entered.
5. Press ENTER to confirm pressure value.
6. Press CAL/MEAS to return to Measurement mode, or continue with step 4 on page 22 to make a salinity adjustment [available from mg/l (ppm) mode only].
7. See Figure 18 on page 21.

Salinity Adjustment

NOTE : This mode appears in ppm (mg/l) measurement mode only.

1. Press the MODE key to select mg/l (ppm) mode.
2. Press the SETUP key to enter SETUP mode.
3. Press the ▲ key once. The upper display shows 'dPr'.
4. Press the ENTER key until the upper display shows a number and the lower display shows 'SAL'.
5. Use the ▲ and ▼ keys to enter the salinity of your solution in ppt. The upper display will show the value you have entered.
6. Press ENTER key to confirm value.
7. Press CAL/MEAS to return to Measurement mode.
8. See Figure 19 on page 22.

6 HOLD FUNCTION

This feature lets you freeze the dissolved oxygen and temperature readings for a delayed observation. HOLD can be used any time when in MEAS mode.

To hold a measurement, press the HOLD key while in measurement mode. “HOLD” will appear on the display.

To release the held value, press HOLD again. Continue to take measurements.

NOTE: This meter shuts off automatically after 20 minutes of last key press. If the meter is shut off either automatically or manually, the HOLD value will be lost. For longer storage, use the memory functions.

NOTE: This meter has an auto endpoint feature. When this feature is switched on, the display will automatically “HOLD” a reading that has been stable for more than 5 seconds. The “HOLD” indicator appears. Press the HOLD key to release the reading. To switch on or off the auto endpoint feature, see Section 8.7.1 page 28.

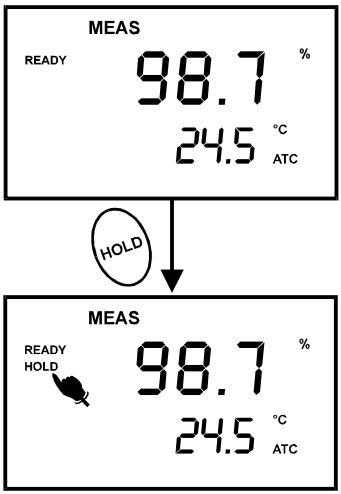


Figure 12: HOLD feature

(The values shown above are for illustration purpose. Your meter may display different values depending on the settings & your environmental conditions)

7 MEMORY FUNCTIONS

7.1 Memory Input

Your meter stores data in sets that include:

- Dissolved oxygen with corresponding temperature reading
- Time and date reading was taken

You can store up to 50 sets of data in any combination of %, mg/l or ppm readings.

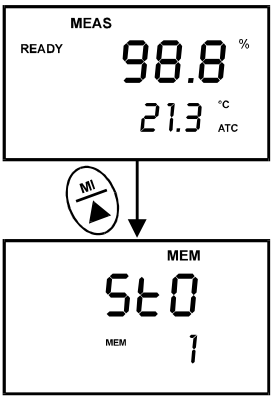


Figure 13: Memory Input, First Value

To store a reading:

1. During any measurement function (MEAS), press the MI key to input any data into the memory.

2. MEM, "Sto" and memory number will flash. The meter then returns to measurement mode.

NOTE: If the memory is full, the first value stored will be erased to create space for the new value.

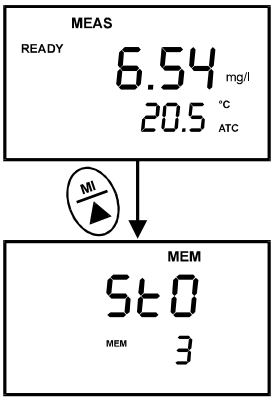


Figure 14: Memory Input, Third Value

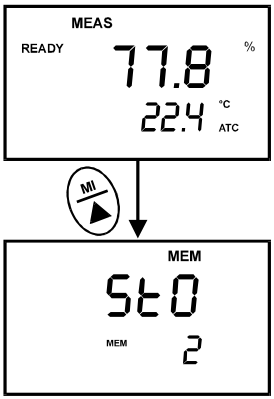


Figure 15: Memory Input, Second Value

7.2 Memory Recall

This function recalls the previous readings stored in the memory. You can only access MR from the MEASurement mode. Memory recall is in “Last In First Out” order.

To recall readings:

1. Press the MR key once to retrieve the last reading stored. The memory location screen --- MEM, “Loc” and the memory number --- will flash on the display.

2. Press the ENTER key to recall the reading stored under that memory number.

3. Press the ENTER key again to view the date and time the reading was taken.

4. Press the ENTER key again to return to the “memory location” screen. The display automatically moves to the next memory location screen.

5. If necessary, press the ▲ key to select the next “memory location” screen; press the ▼ key to select the previous “memory location” screen.

6. Repeat steps 2 to 5 to review additional stored data sets.

7. To exit Memory Recall, press the MEAS key to return to the Measurement mode.

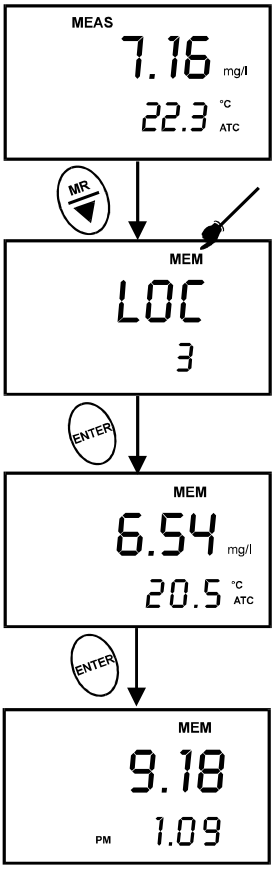


Figure 16: Memory Recall with Date and Time

NOTES

Readings stored in memory are retained even if the unit is turned off. To erase all readings stored in memory, use the SETUP mode Clr on Section 8.2 on page 19.

(The values shown above are for illustration purpose. Your meter may display different values depending on the settings & your environmental conditions)

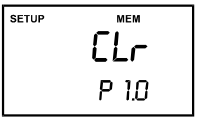
8 ADVANCED SETUP FUNCTIONS

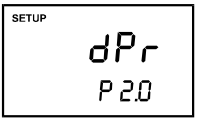
The advanced SETUP mode lets you customize your meter's preferences and defaults. Your Palintest waterproof meter features different sub groups that organize all set-up parameters.

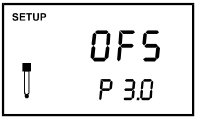
This meter blanks out subgroups that do not apply to the measurement mode [% saturation or mg/l (ppm)] you are in when you enter SETUP mode.

The full selection of available sub groups are:

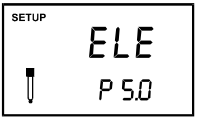
1. **CLR**: Memory clear
2. **dPr**: Dissolved Oxygen parameters
3. **OFS**: % saturation offset adjustment -- *% saturation mode only*
4. **CAL**: Calibration data
5. **ELE**: Probe data
6. **COF**: Configuration
7. **LCd**: Brightness of Backlit display – *DO 310 meter only*
8. **CLO**: Setting clock
9. **rSt**: Reset meter to factory default

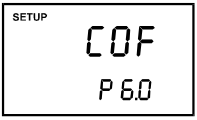


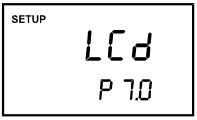




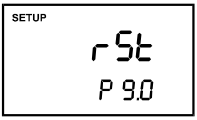
Available in % saturation mode only







Available in DO 310 meter only



IMPORTANT: ***If a parameter is not available in a particular mode, the meter automatically skips past it. <u>The parameter numbers in the lower (secondary) display adjust accordingly.</u>***

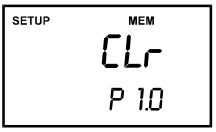
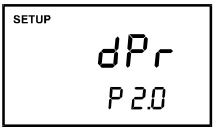
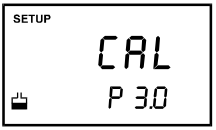
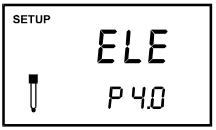
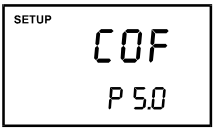
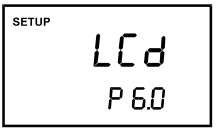
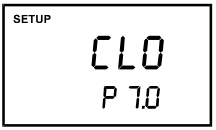
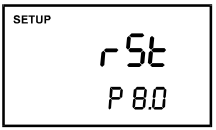
If you enter SETUP mode from the date/time measurement screen, you will see % saturation setup parameters.

See Addendum 5 on pages 46 – 49 for more a detailed overview on the different parameters available in % saturation mode and mg/l (ppm) mode.

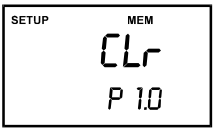
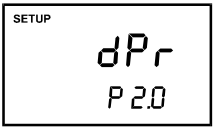
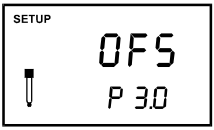
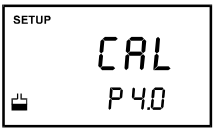
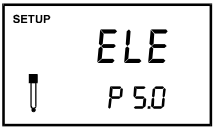
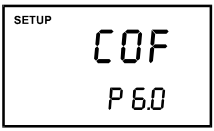
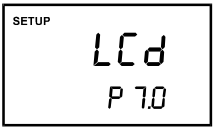
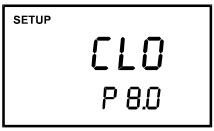
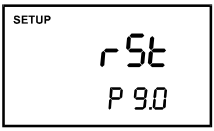
8.1 Advanced SETUP Mode Detailed Overview

Press the SETUP key to enter SETUP mode. Press ▲ and ▼keys to scroll through sub groups.

mg/l (ppm) Measurement Mode

	**CLr: Memory Clear** • Clear all stored readings *Instructions on page 19.*
	**dPr: Dissolved Oxygen parameters** • Select Hg or Pa barometeric pressure units • Select barometric pressure • Select salinity adjustment factor *Instructions on page 20.*
	**CAL: Viewing previous calibration data** • View previous calibration data, including date/time *Instructions on page 24.*
	**ELE: Viewing probe data** • View probe slope • View mV value equivalent to 100% saturation • View mV value equivalent to 0% saturation *Instructions on page 25.*
	**COF: Unit configuration** • Ready indicator ON or OFF / auto endpoint ON or OFF • Select mg/l or ppm units • Select °C or °F *Instructions on page 27.*
	**LCd: Backlit display – *for DO 310 meter only*** • Adjust brightness of backlit LCD *Instructions on page 31.*
	**CLO: Set clock** • Setting year • Setting date (month/day) • Setting time (hour/minute/second) *Instructions on page 32.*
	**rSt: Reset to factory default** • Reset to factory default settings *Instructions on page 34.*

% saturation Measurement Mode

	**CLr: Memory Clear** • Clear all stored readings *Instructions on page 19.*
	**dPr: Dissolved Oxygen parameters** • Select Hg or Pa barometeric pressure units • Select barometric pressure *Instructions on page 20.*
	**OFS: % saturation offset adjustment** • Set % saturation offset adjustment *Instructions on page 23.*
	**CAL: Viewing previous calibration data** • View previous calibration data, including date/time *Instructions on page 24.*
	**ELE: Viewing probe data** • View probe slope • View mV value equivalent to 100% saturation • View mV value equivalent to 0% saturation • View offset value *Instructions on page 25.*
	**COF: Unit configuration** • Ready indicator ON or OFF / auto endpoint ON or OFF • Select °C or °F *Instructions on page 27.*
	**LCd: Backlit display – *for DO 310 meter only*** • Adjust brightness of backlit LCD *Instructions on page 31.*
	**CLO: Set clock** • Setting year • Setting date (month/day) • Setting time (hour/minute/second) *Instructions on page 32.*
	**rSt: Reset to factory default** • Reset to factory default settings *Instructions on page 34.*

8.2 Clr: Memory Clear

Use this sub group to clear all memory values when you need to store a new series of values. This lets you avoid confusing the old values with the new ones. NO is the default setting.

NOTE: Selecting YES will wipe out all memory.

From measurement mode:

1. Press the SETUP key to enter SETUP mode.
2. Press ▲ and ▼ keys to scroll through subgroups until you view parameter “CLr” in the upper display.
3. Press the ENTER key to enter parameter.
4. Press ▲ and ▼ keys to toggle between NO and YES.
   - NO retains current memory.
   - YES clears all memory
5. Press the ENTER key to confirm selection and return to the subgroup menu. Press the CAL/MEAS key to return to measurement mode.

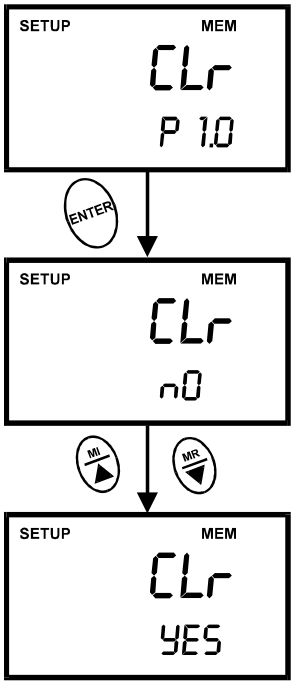


Figure 17 – Memory Clear

8.3 dPr: Dissolved Oxygen Parameters

This sub group lets you adjust the barometric pressure and salinity.

8.3.1 Pressure adjustment mode

Barometric pressure is vital to correct dissolved oxygen measurements. You need to enter the correct barometric pressure of the area you are measuring. This mode lets you perform two functions:

Select either mm Hg or Pascal barometric pressure units.

Adjust the barometric pressure. See Addendum 2 on page 44 for a “Pressure vs Altitude” table.

From measurement mode:

1. Press the SETUP key to enter SETUP mode.
2. Press ▲ and ▼ keys to scroll through subgroups until you view parameter “dPr” in the upper display.
3. Press the ENTER key twice. The upper display shows either Hg or PA and the lower display shows bAr. See Figure 18 next page.
4. Press ▲ and ▼ keys to toggle between mm Hg and Pascal units.
5. Press the ENTER key to confirm selection and move to the next screen. The upper display shows the barometric pressure and the lower display shows the units selected in Step 3.
6. Press ▲ and ▼ keys to adjust the barometric pressure. The pressure adjustment range is 500 to 1499 mm Hg (66.6 to 199.9 kPa).
7. Press the ENTER key to confirm selection and move to Step 5 on page 22 [salinity adjustment appears in mg/l (ppm) measurement mode only]. If instead you want to return to measurement mode, press CAL/MEAS twice.

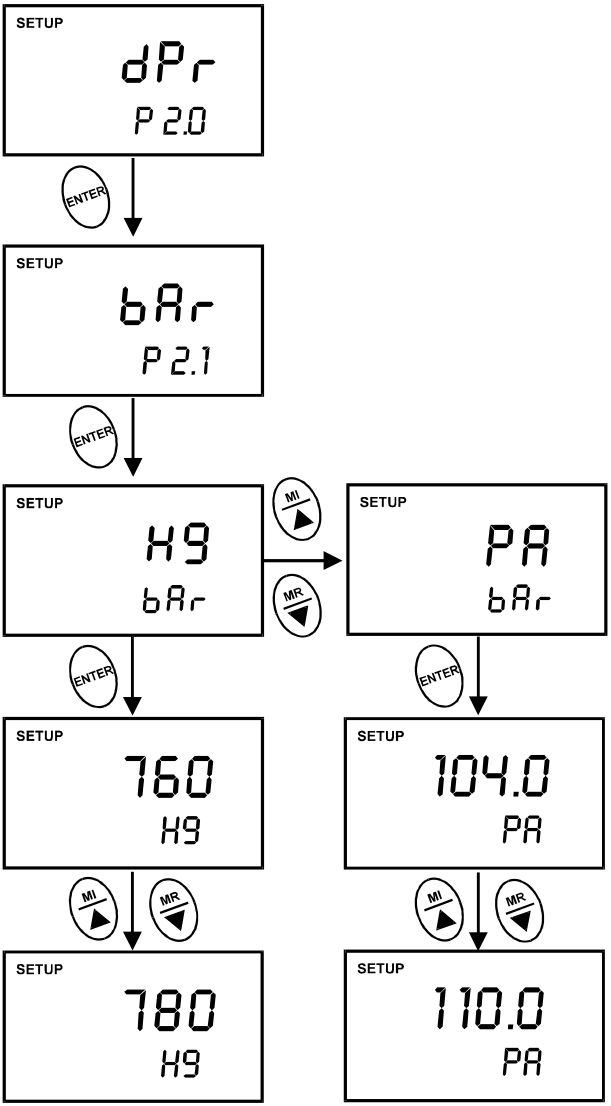


Figure 18: Change pressure units (mm Hg or kPa) & adjusting its values

8.3.2 Salinity Adjustment Mode

NOTE: *This mode appears in mg/l (ppm) measurement mode only.*

Salinity correction mode lets you correct for the variations in oxygen solubility due to salt concentration in the sample.

From measurement mode:

1. Press the MODE key to select mg/l (ppm) mode.

2. Press the SETUP key to enter SETUP mode.

3. Press ▲ and ▼ keys to scroll through subgroups until you view parameter “dPr” in the upper display.

4. Press the ENTER key five times. The upper display shows the salinity value and the lower shows **SAL**.

5. Press ▲ and ▼ keys to enter the correct salinity adjustment factor. The salinity adjustment factor range is 0.0 to 50.0 ppt.

6. Press the ENTER key to confirm selection and to move back to subgroup “dPr”. If you want to return to measurement mode, press CAL/MEAS.

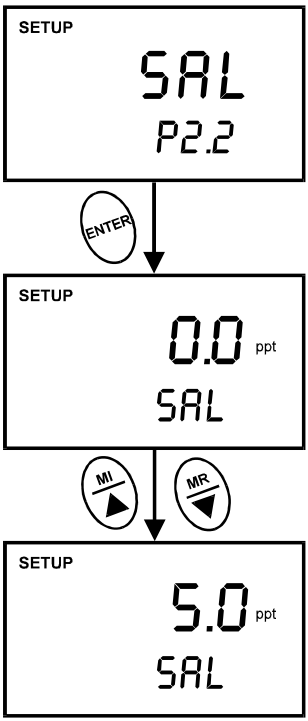


Figure 19: Input Salinity values for automatic correction

(The values shown above are for illustration purpose only)

8.4 OFS: Offset for % Saturation Measurement

NOTE: *This sub group appears in % saturation measurement mode only.*

From measurement mode:

1. Press the MODE key to select % saturation mode.
2. Press the SETUP key to enter SETUP mode.
3. Press ▲ and ▼ keys to scroll through subgroups until you view parameter “OFS” in the upper display.
4. Press the ENTER key. The upper display shows the current measurement in % saturation and the lower shows “OFS”.
5. Press ▲ and ▼ keys to offset the % saturation measurement.
6. Press the ENTER key to confirm selection and to move back to subgroup “OFS”. If you want to return to measurement mode, press CAL/MEAS.

(The values shown above are for illustration purpose. Your meter may display different values depending on the settings & your environmental conditions)

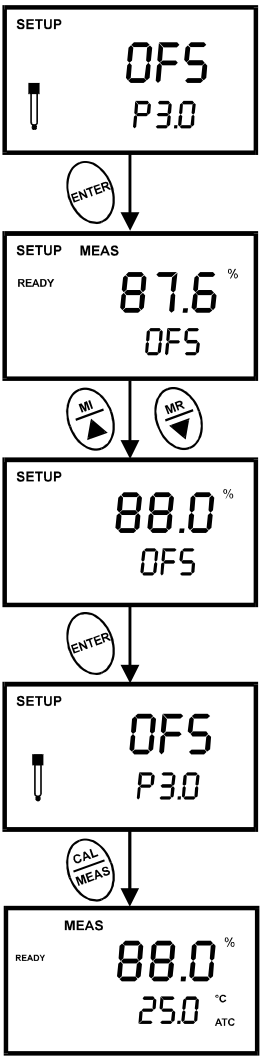


Figure 20: Offset for % saturation

8.5 CAL: Previous Calibration Information

This sub group shows you the previous calibration data, along with date and time of calibration. This is a “view only” parameter.

In % saturation mode: Calibration information is shown in % saturation units.

In mg/l (ppm) mode: Calibration information is shown in mg/l (ppm) units.

From measurement mode:

1. Press the MODE key to select the calibration data you want to view: % or mg/l (ppm).
2. Press the SETUP key to enter SETUP mode.
3. Press ▲ and ▼ keys to scroll through subgroups until you view parameter “CAL” in the upper display.
4. Press the ENTER key. The upper display shows the calibration data.
5. Press the ENTER key again. The display shows the date and time of the last calibration.
6. Press the ENTER key to move back to subgroup “CAL”. If you want to return to measurement mode, press CAL/MEAS.

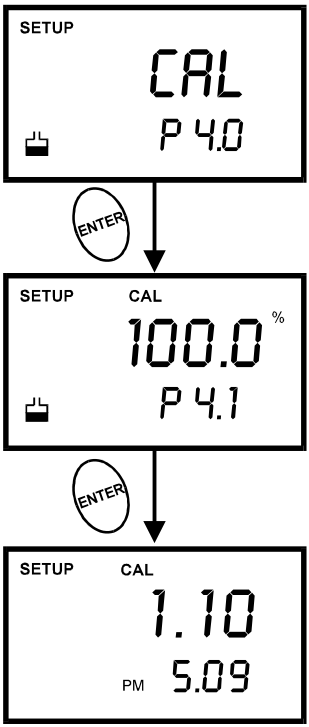


Figure 21: View calibration data

NOTE: *If you did not calibrate this meter in a particular mode, the screeen will show “ ---“. See Figure 22.*

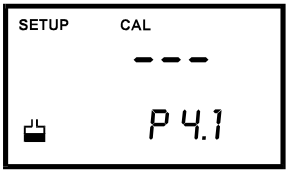


Figure 22: Meter is not calibrated

(The values shown above are for illustration purpose. Your meter may display different values depending on the settings & your environmental conditions)

8.6 ELE: Electrode Properties

These "view only" parameters show you the electrode properties for diagnostic purposes:

A. **Probe Slope**: Lets you view and gives an indication of the probe's efficiency. The value displayed is the ratio of the theoretical value to the actual value produced by the probe. The higher the number, the lesser output from the probe. The ratio displays from 0.5 to 1.999.

B. **% Saturation Offset**: *(available in % saturation mode only):* Lets you see the value of the % saturation offset entered in parameter "OFS" (see page 23 for instructions).

C. **100% Saturation mV value**: Lets you view the sensor's mV output corresponding to 100% saturation.

D. **0% Saturation mV Value**: Lets you view the sensor's millivolt output corresponding to 0% saturation.

From measurement mode:

1. Press the MODE key to select the measurement mode for the electrode properties you want to view: % or mg/l (ppm).

2. Press the SETUP key to enter SETUP mode.

3. Press ▲ and ▼ keys to scroll through subgroups until you view parameter "ELE" in the upper display.

4. Press the ENTER key. The upper display shows the probe slope.

5. Press the ENTER key. The upper display shows the % saturation offset. See directions for setting this offset on page 23. NOTE: This appears only in % saturation measurement mode. If you are in mg/l (ppm) mode, the meter skips to step 6 on page 26.

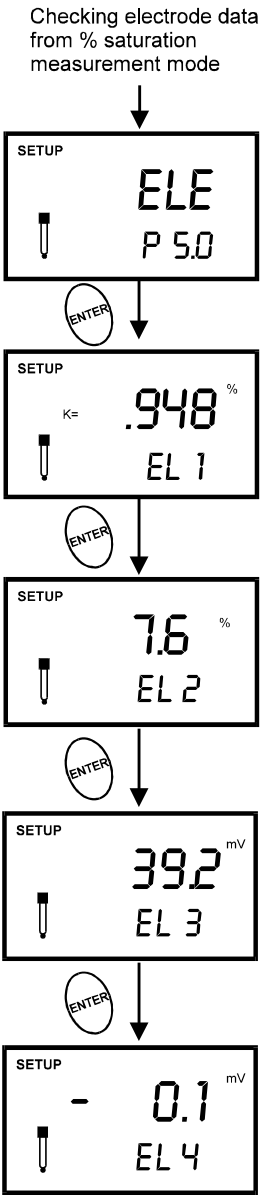


Figure 23: View electrode properties from % saturation

6. Press the ENTER key. The upper display shows the 100% saturation mV value.

7. Press the ENTER key. The upper display shows the 0% saturation mV value.

8. Press the ENTER key to move back to subgroup “ELE”. If you want to return to measurement mode, press CAL/MEAS.

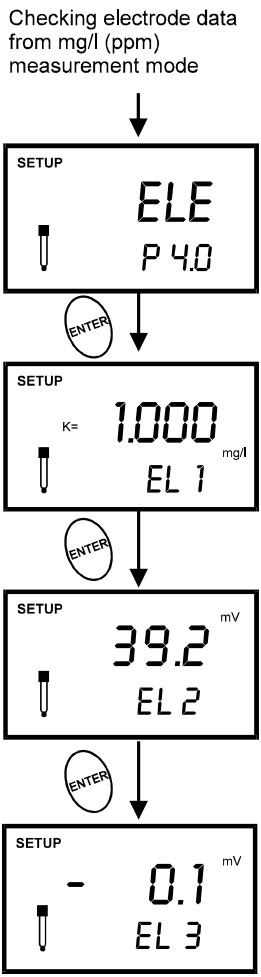


Figure 24: View electrode properties from mg/l (ppm) mode

(The values shown above are for illustration purpose. Your meter may display different values depending on the settings & your environmental conditions)

8.7 COF: Unit Configuration

Unit configuration mode lets you select the following parameters:

A. READY indicator and auto endpoint function.

B. mg/l or ppm units *(available from mg/l or ppm mode only)*

C. Temperature in ℃ or ℉.

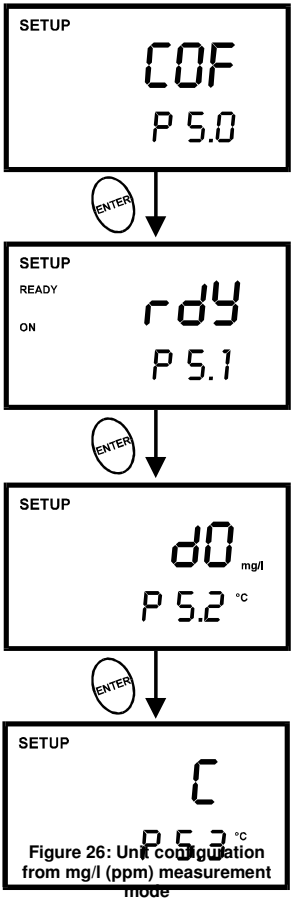


Figure 26: Unit configuration from mg/l (ppm) measurement mode

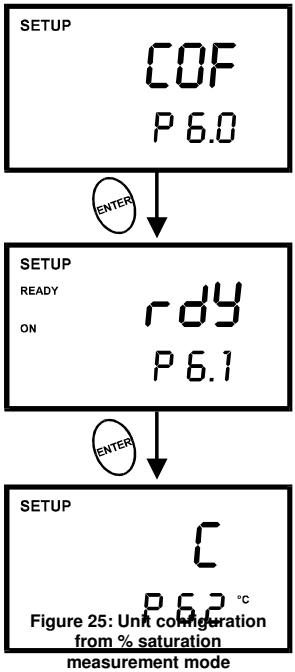


Figure 25: Unit configuration from % saturation measurement mode

8.7.1 READY Indicator and Auto Endpoint Function

The first program lets you select:

- **"READY indicator ON"** to indicate when the reading is stable.
- **"READY indicator OFF"** for faster meter response.
- **Auto Endpoint Function ON**. Select auto endpoint ON to "HOLD" the reading when it is stable for more than 5 seconds. The display automatically freezes, and the HOLD indicator appears on the left side of the display. Press the HOLD key to release the display and access other functions.

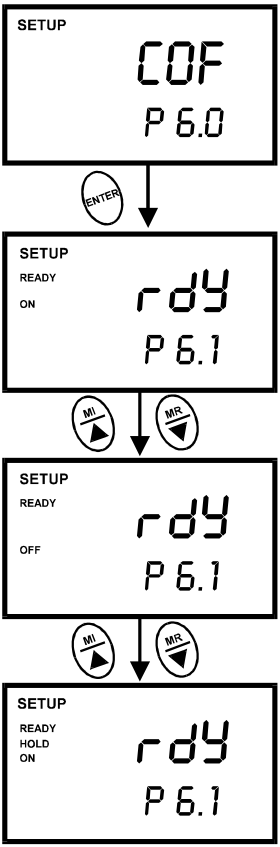


Figure 27: To configure for READY and Auto Endpoint functions

From measurement mode

1. Press SETUP key to enter SETUP mode.
2. Press ▲ and ▼ keys to scroll through subgroups until you view parameter COF in the upper display.
3. Press the ENTER key to select parameter "rdY" (Ready).
4. Press ▲ and ▼ keys to select the configuration you require.
   - ON switches the READY indicator on.
   - OFF switches the READY indicator off.
   - ON and HOLD together switches the auto endpoint feature on.
5. Press the ENTER key to confirm selection and to proceed to:
   - In % mode: step 4 on page 30.
   - In mg/l (ppm) mode: step 3 on page 29.

Or press the CAL/MEAS key twice to return to measurement mode.

NOTES: Meter default is set for Ready indicator ON, and auto endpoint function off.

8.7.2 Selecting mg/l or ppm units

NOTE: *This mode appears in mg/l (ppm) measurement mode only.*

This mode lets you select between mg/l or ppm dissolved oxygen units.

From measurement mode

1. Press the MODE key to select mg/l (ppm) mode.
2. Press SETUP key to enter SETUP mode.
3. Press ▲ and ▼ keys to scroll through subgroups until you view parameter “COF” in the upper display.
4. Press the ENTER key until “dO” appears in the upper display.
5. Press ▲ and ▼ keys to toggle between mg/l or ppm units.
6. Press the ENTER key to confirm selection and move to step 4 on page 30. Press the CAL/MEAS key twice to return to measurement mode.

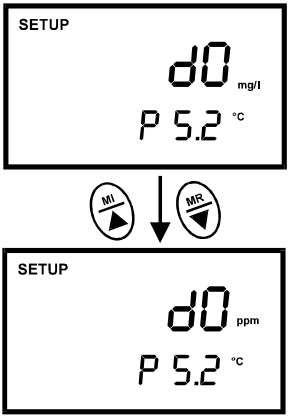


Figure 28: Change from mg/l to ppm unit

8.7.3 Selecting °C or °F Temperature Unit

This meter lets you select between °C and °F units for temperature readings.

From measurement mode

1. Press SETUP key to enter SETUP mode.
2. Press ▲ and ▼keys to scroll through subgroups until you view parameter “COF” in the upper display.
3. Press the ENTER key until “C” or “F” appears in the upper display.
4. Press ▲ and ▼keys to toggle between °C and °F.
5. Press the ENTER key to confirm selection and to return to the subgroup menu. Press the CAL/MEAS key to return to measurement mode.

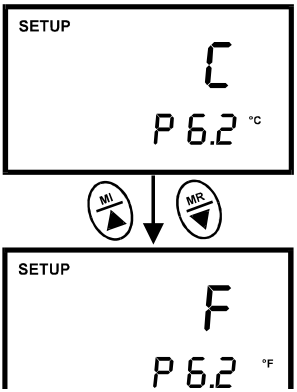


Figure 29: To change from units of measurement for temperature

8.8 LCd: Adjusting LCD Brightness

This mode lets you adjust the brightness of the backlit LCD. Selecting a dimmer back-lighting level helps conserve batteries.

From measurement mode

1. Press SETUP key to enter SETUP mode.
2. Press ▲ and ▼ keys to scroll through subgroups until you view parameter “LCd” in the upper display.
3. Press the ENTER key. A number (0 – 8) appears in the upper display and “LCd” appears in the lower display.
4. Press ▲ and ▼ keys to select from level 0 (dimmest light) to level 8 (brightest light).
5. Press the ENTER key to confirm selection and to return to the subgroup menu. Press the CAL/MEAS key to return to measurement mode.

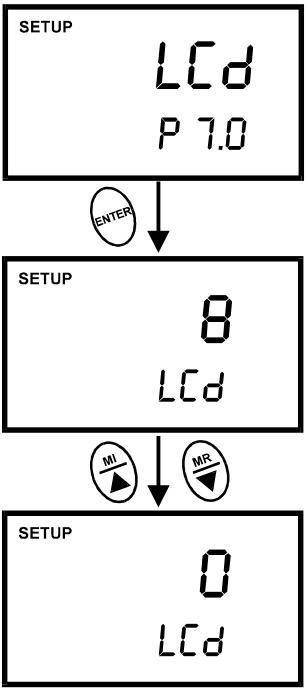


Figure 30:
Adjusting LCD brightness

8.9 CLO: Setting the Real-Time Clock

Your meter features a real-time calender and clock. This helps you meet GLP (Good Laboratory Practice) standards.

From measurement mode

1. Press SETUP key to enter SETUP mode.
2. Press ▲ and ▼ keys to scroll through subgroups until you view parameter “CLO” in the upper display.
3. Press the ENTER key to enter parameter “CLO”. The meter lets you select the century: “19-” or “20-”. The century digits will flash.
4. Press ▲ and ▼ keys to toggle to the correct century.
5. Press the ENTER key to confirm the century and move to “year” selection. The “year” digits will flash.
6. Press ▲ and ▼ keys to toggle to the correct year.
7. Press the ENTER key to confirm the year and move to “month” selection. The “month” digits will flash.
8. Press ▲ and ▼ keys to toggle to the correct month.
9. Press the ENTER key to confirm the month and move to “date” selection. The “date” digits will flash.
10. Press ▲ and ▼ keys to toggle to the correct date.
11. Press the ENTER key to confirm the date and move to “hour” selection. The “hour” digits will flash.
12. Press ▲ and ▼ keys to toggle to the correct hour. Note the “AM” and “PM” indicator on the lower portion of the display.
13. Press the ENTER key to confirm the hour and move to “minute” selection. The “minute” digits will flash.

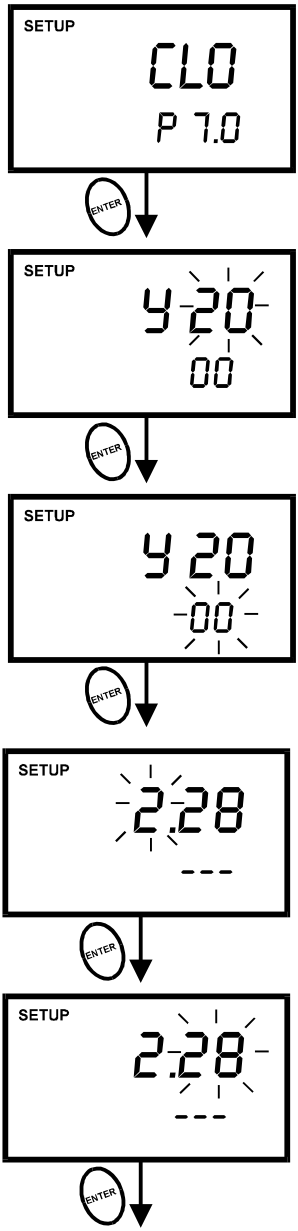


Figure 31: Setting Year and Date information

14. Press ▲ and ▼keys to toggle to the correct minutes.

15. Press the ENTER key to confirm the minutes and move to “second” selection. The “second” digits will flash.

16. Press ▲ and ▼keys to toggle to the correct seconds.

17. Press the ENTER key to confirm selection and to return to the subgroup menu. Press the CAL/meas key to return to measurement mode.

NOTES

Press the CAL/MEAS key at any point while setting the time to return to the subgroup menu.

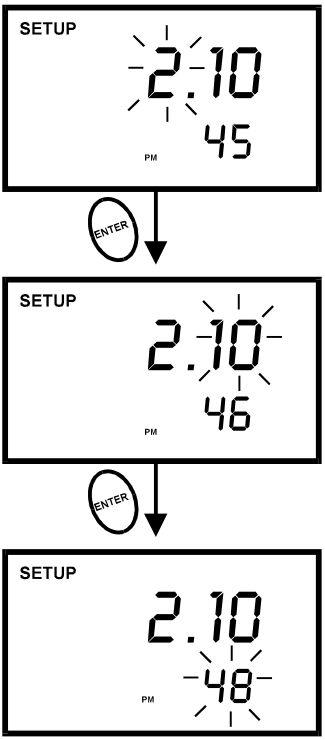


Figure 32: Setting Hours, Minutes & Seconds

8.10 rSt: Resetting to Factory Default Setting

This program lets you reset all parameters to factory default settings. This clears all calibration data, memory, and any other setup functions you might have changed. However, the clock settings will remain as you have set them.

There are also some other parameters that retain settings when reset is done. See Addendum 4 on page 45 for a table of factory default settings.

From measurement mode

1. Press SETUP key to enter SETUP mode.
2. Press ▲ and ▼ keys to scroll through subgroups until you view parameter “rSt” in the upper display.
3. Press the ENTER key.
4. Press ▲ and ▼ keys to toggle between NO and YES.
   - NO retains current memory.
   - YES clears all memory
5. Press the ENTER key to confirm selection and to return to measurement mode.

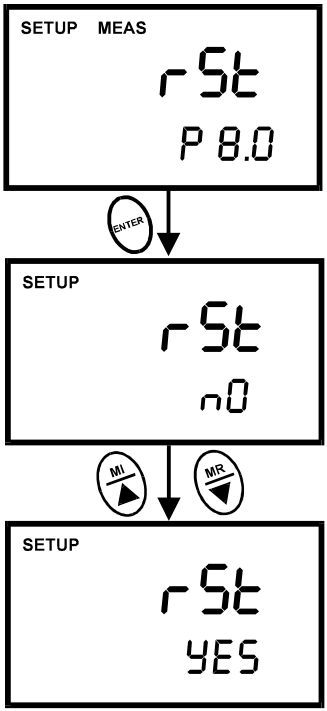


Figure 33: Reset to factory defaults

9 PROBE CARE AND MAINTENANCE

9.1 Principle

The probe is a galvanic measuring element which produces an output proportional to the oxygen present in the medium in which it is placed. The galvanic probe design lets you take measurements immediately – without the typical 15 minute wait of other dissolved oxygen probes.

The probe consists of two parts:

- An upper part consisting of an anode, a cathode, and cable.
- A lower part consisting of a membrane cap, membrane, and electrolyte solution.

See Figures 34 & 35.

Oxygen diffuses through the membrane onto the cathode, where it is consumed. This process produces an electrical current which flows through the cable to the meter. The electric current produced is proportional to the oxygen that passes through the membrane and the layer of electrolyte. This makes it possible to measure the partial pressure of oxygen in the sample at a given temperature.

Since the DO in the sample is consumed by the cathode it is essential that a new sample must flow past the membrane of the probe to prevent the occurrence of false readings. The probe uses very little oxygen for its measurement. This enables it to function correctly with liquid movement as low as 2.5 cm/sec.

The permeability of the membrane to oxygen varies greatly with temperature. Therefore compensation is needed for this variation. The Palintest DO probe comes with an in-built Temperature Compensation for the membrane variation.

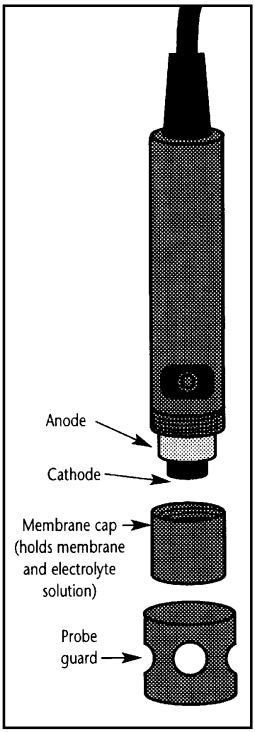


Figure 34: Main parts of Dissolved Oxygen electrode

9.2 Probe Care

Under typical operating conditions, the probe should last for several years. Proper care and maintenance will help you receive the maximum probe life and ensure more accurate readings.

Since any deposits on the membrane surface act as a barrier to oxygen diffusing through the membrane, the membrane must be cleaned at regular intervals to assure maximum reliability.

After using the probe, rinse the probe in clean water and wipe it with a soft cloth or paper to avoid any hardening of deposits. If growth develops on the probe, use a disinfecting chemical to clean.

NOTE: Although the membrane is strong and not easily damaged, wipe it gently while cleaning it. If the membrane is damaged or torn, the probe will no longer function.

There are no special probe storage requirements.

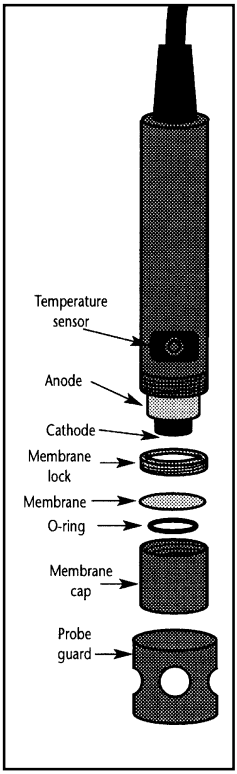


Figure 35: Parts of electrode showing O-ring, membrane & lock

9.3 Membrane Replacement

Replacement of the membrane is required only when you cannot calibrate the probe, or if the membrane is damaged.

Typical membrane damages are punctures or wrinkles caused during measurements or cleaning.

To order replacement probe components or a replacement probe, see the “Accessories” section on page 42.

To replace the probe membrane

1. Pull off the probe guard. See Figure 35.
2. Unscrew the membrane cap from the probe.
3. Hold the probe under a water tap and brush away the white oxide on the cylindrical anode with a stiff plastic brush – do not use metal cleaning material.
4. If the cathode has any deposits, remove them with a light scouring powder. Do not polish the cathode.

NOTE: If you have purchased a replacement membrane module with pre-installed membrane, skip to step 12.

5. Using the installation tool, unscrew and remove the membrane lock from the membrane cap. See Figure 36.

6. Remove the membrane and O-ring. Discard both.

7. Rinse the membrane cap and membrane lock in tap water.

8. Install a new O-ring inside the membrane cap.

9. Install a new membrane. Make sure the membrane covers the O-ring all around its circumference. See Figure 37.

10. Using the installation tool, screw the membrane lock back into the cap. Tighten the lock firmly over the membrane and O-ring, but do not overtighten.

11. Inspect the membrane for wrinkles. If wrinkles exist, remove the membrane and repeat steps 8 – 11.

12. Fill the membrane cap with water and inspect the bottom for leaks. If water drops are leaking from the membrane, re-seal the membrane on the O-ring (repeat steps 8 – 11).

13. If the assembly is leak-free, empty the water and fill the membrane cap with electrolyte to the brim.

14. Screw the cap onto the probe. Excess electrolyte will drain out.

15. Replace probe guard.

16. Calibrate the probe (see section 4) after the % saturation readings have stabilized.

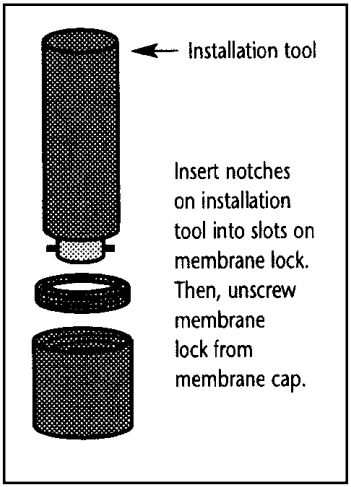


Figure 36: Use Tool to take out (or put in) membrane

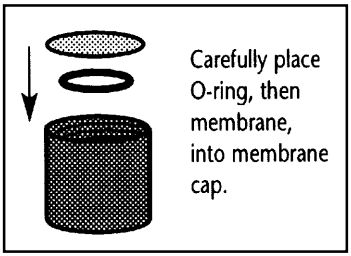


Figure 37: Positioning of O-ring & membrane

NOTE: Membrane can only be used once. When a membrane cap is screwed onto the probe, the membrane is stretched by the cathode. If the same O-ring and the membrane is used a second time it will not fit perfectly onto the cathode. This will result is erratic readings.

9.4 Electrolyte Solution

The electrolyte solution in your probe's cap will periodically evaporate and need to be replaced. The Palintest DO maintenance kit (Order Code PT 148/2) comes ready with a bottle of replacement electrolyte solution, spare O-rings, membranes, a spare cap and a ring tool. The replacement electrolyte comes premixed and ready to use.

If you purchase the electrolyte mixture package to make your own replacement electrolyte solution, use the following steps to prepare the solution:

1. Fill a beaker to the 400-ml mark with deionized water.

2. Pour the entire contents of 58.5 grams electrolyte package into the beaker.

3. Stir the solution until all of the chemical is dissolved – until the solution is clear.

4. Pour the solution into a clean container with a cap and keep sealed between use.

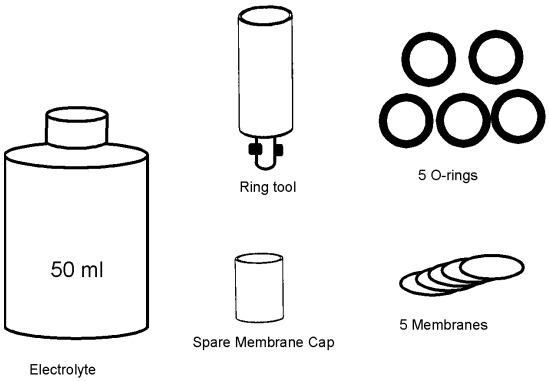


Figure 38: Components of DO probe maintenance kit

10 TROUBLE SHOOTING GUIDE

Problem	Cause	Solution
No display	a) Batteries not in place b) Batteries not in correct polarity (+ and – position). c) Weak batteries	a) Check that batteries are in place and making good contact. b) Re-insert batteries with correct polarity. c) Replace batteries.
Unstable readings	a) Insufficient electrolyte in probe. b) Air bubbles trapped around the probe. c) Dirty probe. d) Probe not deep enough in sample. e) External noise pickup or induction caused by nearby electric motor. f) Broken probe.	a) Fill probe with electrolyte & replace membrane. See page 36. b) Tap probe to remove bubbles. c) Clean the probe and re-calibrate. d) Make sure sample entirely covers the probe sensors. e) Move or switch off interfering motor. f) Replace probe.
Slow response	a) Dirty / Oily probe.	a) Clean probe. See “Probe Care & Maintenance”, page 36.
Not responding to key press	a) HOLD mode in operation. b) Damaged key-pad. c) Internal program error.	a) Cancel HOLD mode. b) Return to dealer. c) Reset all internal programs by reinserting batteries.

11 ERROR MESSAGES

LCD Display	Indicates	Cause	Solution
Err annunciator	Unrecognized input from keypad	Wrong input in selected mode.	Release key. Select valid operations depending on mode.
CAL & Err annunciators on / Buffer and electrode indicators blink.	Calibration error.	Wrong value input at calibration. Dirty probe.	Check your input value, clean probe. See Calibration sections or Probe Maintenance section.
Battery indicator blinks	Low battery level.	Need new batteries or battery connection is bad.	Clean battery contacts. Replace batteries with fresh ones, noting polarity.

12 SPECIFICATIONS

Dissolved Oxygen Range Resolution Relative accuracy	 0.00 – 19.99 mg/l or ppm 0.01 mg/l; 0.01 ppm ± 1.5% of Full Scale
% Saturation of Oxygen Range Resolution Relative accuracy	 0.0 – 199.9% 0.1 % ± 1.5% of Full Scale
Temperature Range Resolution Relative accuracy	 0.0 – 50.0 ℃ 0.1 ℃ ± 0.3 ℃
Salinity Correction Range Resolution Method	 0.0 – 50.0 ppt 0.1 ppt Automatic correction after manual input
Barometric Pressure Correction (mm Hg) Range Resolution Method	 500 to 1499 mm Hg or 66.6 to 199.9 kPA 1 mm Hg or 0.1 kPA Automatic correction after manual input
Temperature Compensation	Automatic from 0 to 50 ℃
Operating Range	0 to 50 ℃
Probe	Galvanic
Response Time	40 seconds to achieve 93% of the reading
No. of Calibration Points	Single point at 100% in saturated air or air-saturated water
Memory	50 sets with date & time
HOLD function	Yes
Auto-Off function	20 minutes after last key press
Averaging/Stability function	Selectable
Display	Customs Dual LCD
Back Lit Display	Yes
Inputs	6-pin military type
Power Requirements	four 1.5 V AAA-sized batteries (included)
Battery Life	> 100 hours continuous use
Dimensions	Meter: 19.1 cm (L) x 8.9 cm (W) x 4.5 cm (H) Probe: 173 mm (L) x 32 mm (Diameter), with 3-m cable
Weight	Meter: 0.92 kg

13 ACCESSORIES

Replacement Electrode and Meter accessories

Ordering Code No.	Item
PT 148/1	Submersible Dissolved Oxygen electrode with 3-metre cable and temperature sensor
PT 148/2	Maintenance kit for DO electrode PT 148/1. Contains 5 membranes; 5 O-rings; a 50-ml bottle of electrolyte; 1 spare cap and 1 ring tool.
PT 125/3	Zero Oxygen Solution, 500 ml

14 ADDENDUM 1: DISSOLVED OXYGEN& METER THEORY

Dissolved Oxygen (DO) refers to the volume of oxygen that is contained in water. There are two main sources of DO in water: from atmosphere and photosynthesis. Waves and tumbling water mix air into the water where oxygen readily dissolves until saturation occurs. Oxygen is also produced by aquatic plants and algae as a by-product of photosynthesis.

The amount of DO that can be held by water depends on 3 factors: water temperature, salinity, and atmospheric pressure.

1. Amount of DO increases with decreasing temperature (colder water holds more oxygen).

2. Amount of DO increases with decreasing salinity (freshwater holds more oxygen than saltwater does).

3. Amount of DO decreases with decreasing atmospheric pressure (amount of DO absorbed in water decreases as altitude increases).

The chart below shows the solubility of DO in mg/l in water at various temperature.

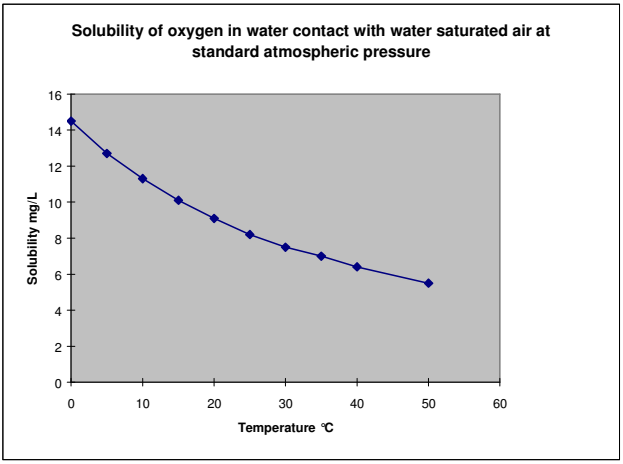


Figure 39: DO Solubility in Water vs Temperature ℃

15 ADDENDUM 2: PRESSURE VS ALTITUDE TABLE

Barometric pressure affects DO readings, therefore this meter lets you enter the correct barometric pressure at your altitude. If you do not have equipment that lets you measure the exact barometric pressure at your altitude, you can estimate it using the chart below.

If you change the barometric pressure setting from its factory setting (760 mm Hg), the % saturation calibration value in air will automatically adjust to a value other than 100% (see "corrected % saturation value" column below). The adjusted value is correct for the new barometric pressure setting.

See page 20 for information on how to adjust the barometric pressure.

Pressure vs Altitude

ALTITUDE		PRESSURE (mm HG)	CORRECTED % SATURATION VALUE
feet	metre		
0 (sea level)	0 (sea level)	760	100
500	152.4	746	98.1
1000	304.8	732	96.3
1500	457.2	720	94.7
2000	609.6	707	93.0
2500	762.0	694	91.3
3000	914.4	681	89.6
3500	1066.8	668	87.8
4000	1219.2	656	86.2
4500	1371.6	644	84.6
5000	1524.0	632	83.0
5500	1676.4	621	81.6
6000	1828.8	609	80.0

(1 feet ~ 0.3048 metre)

16 ADDENDUM 4: METER FACTORY DEFAULT SETTINGS

Resetting the meter to factory default settings clears all DO calibration data and memory, and returns other setup functions to the default settings shown in the table below. However, the clock settings will remain as you have set them. See page 34 for directions on setting the meter to factory default settings.

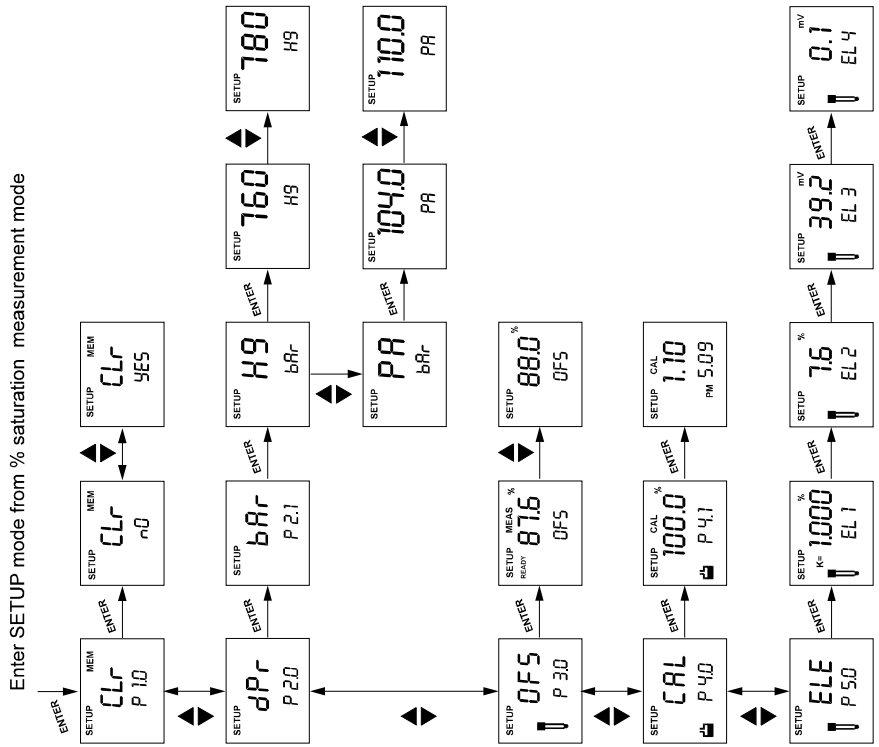
Program	Function	Options/settings	Default
CLr	Memory clear	Yes / no	No
DPr	Pressure inuts	Hg or Pa	Hg
	Barometric pressure	Adjust from 500 – 1499 mm Hg	760 mm Hg
	Salinity adjustment	Adjust from 0 – 50.00 ppt	0 ppt
OFS	Set % saturation offset	Up to ±10%	No offset
CAL	View calibration data	----	----
ELE	View probe slope	----	1.000
	View % saturation offset	----	0% offset
	View mV = 100% saturation	----	37.0 mV
	View mV = 0% saturation	----	0.3 mV
COF	Ready indicator / auto endpoint	On / off	Ready ON only
	Select mg/l or ppm units	mg/l or ppm	mg/l
	Select temperature units	℃ or ℉	Retains settings
LCd	Adjust back lit display	Levels 0 to 8 (brightest)	Retains settings
CLO	Setting clock	Year, date, time	Retains settings
RSt	Reset to factory default	Yes / no	no

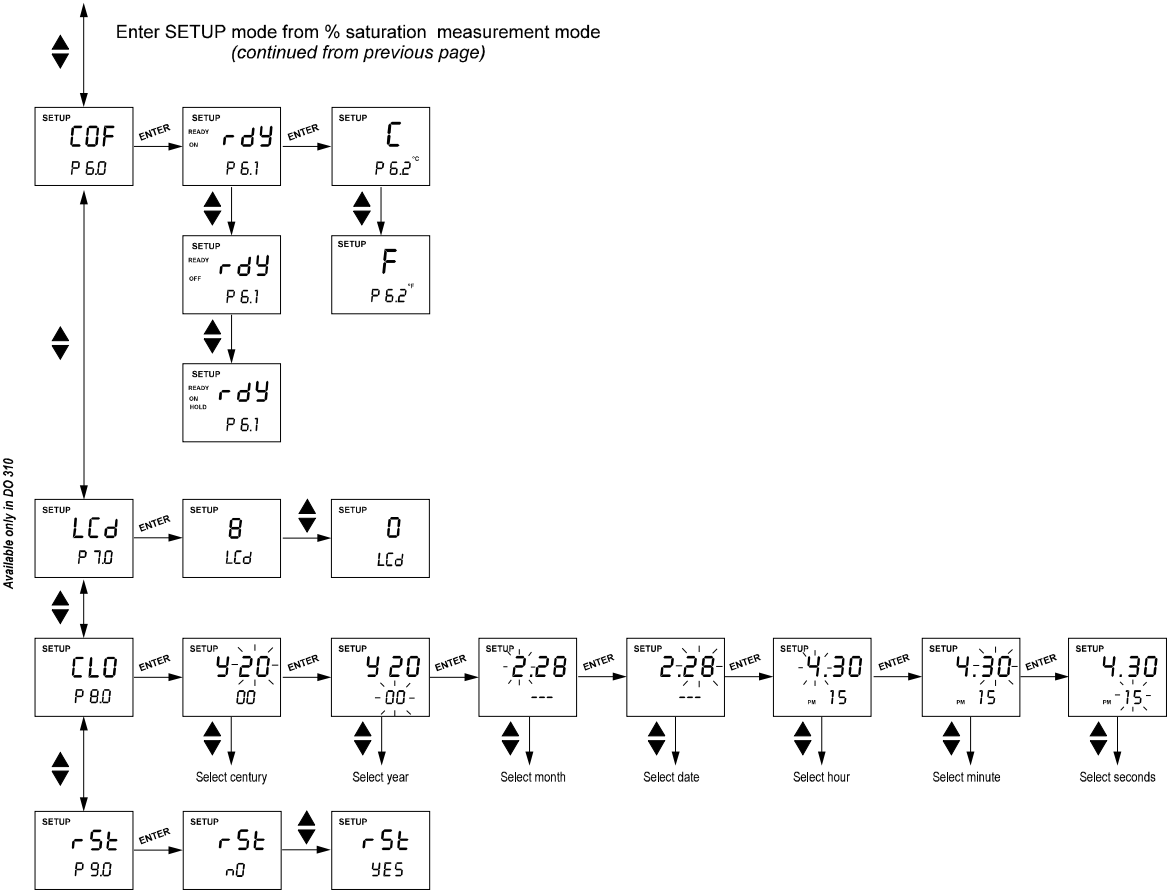
NOTES:

The P7.0 clock function retains the year and time that you set, even after reverting to factory default settings.

17 ADDENDUM 5: OVER-VIEW OF SETUP FUNCTIONS

(The values shown above are for illustration purpose. Your meter may display different values depending on the settings & your environmental conditions)

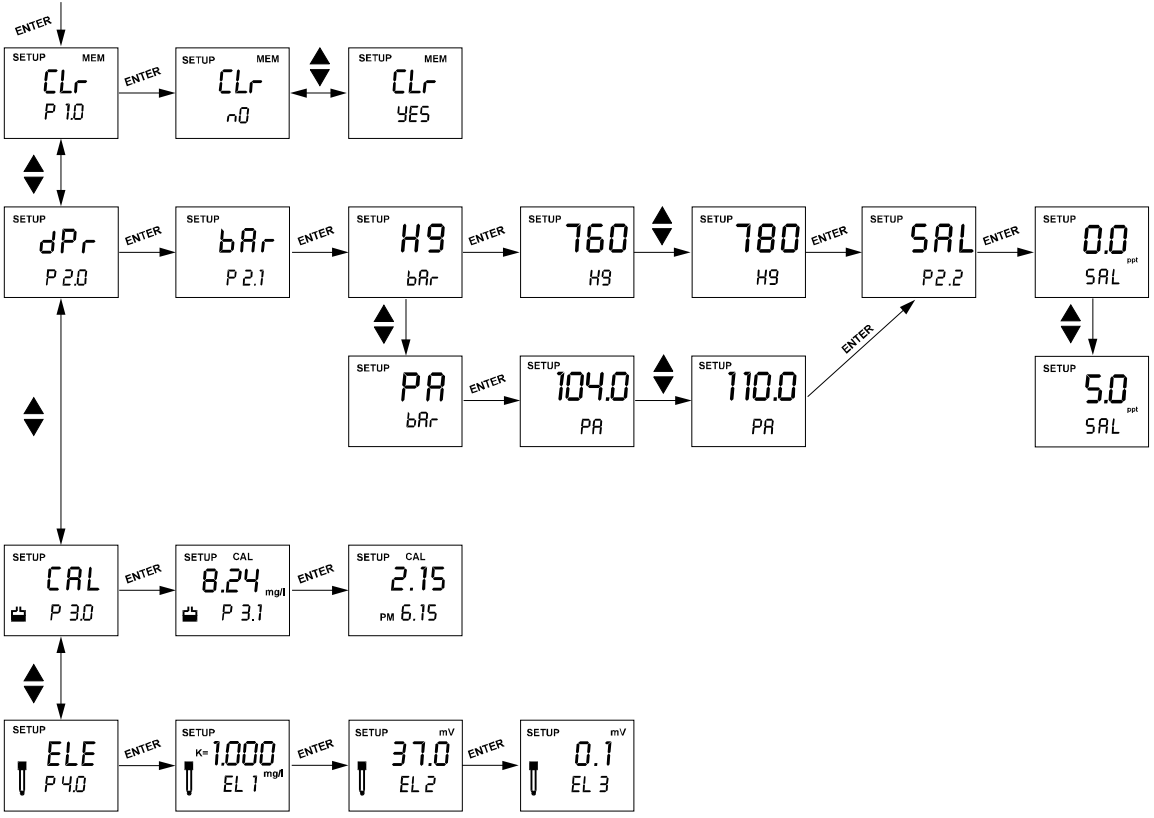


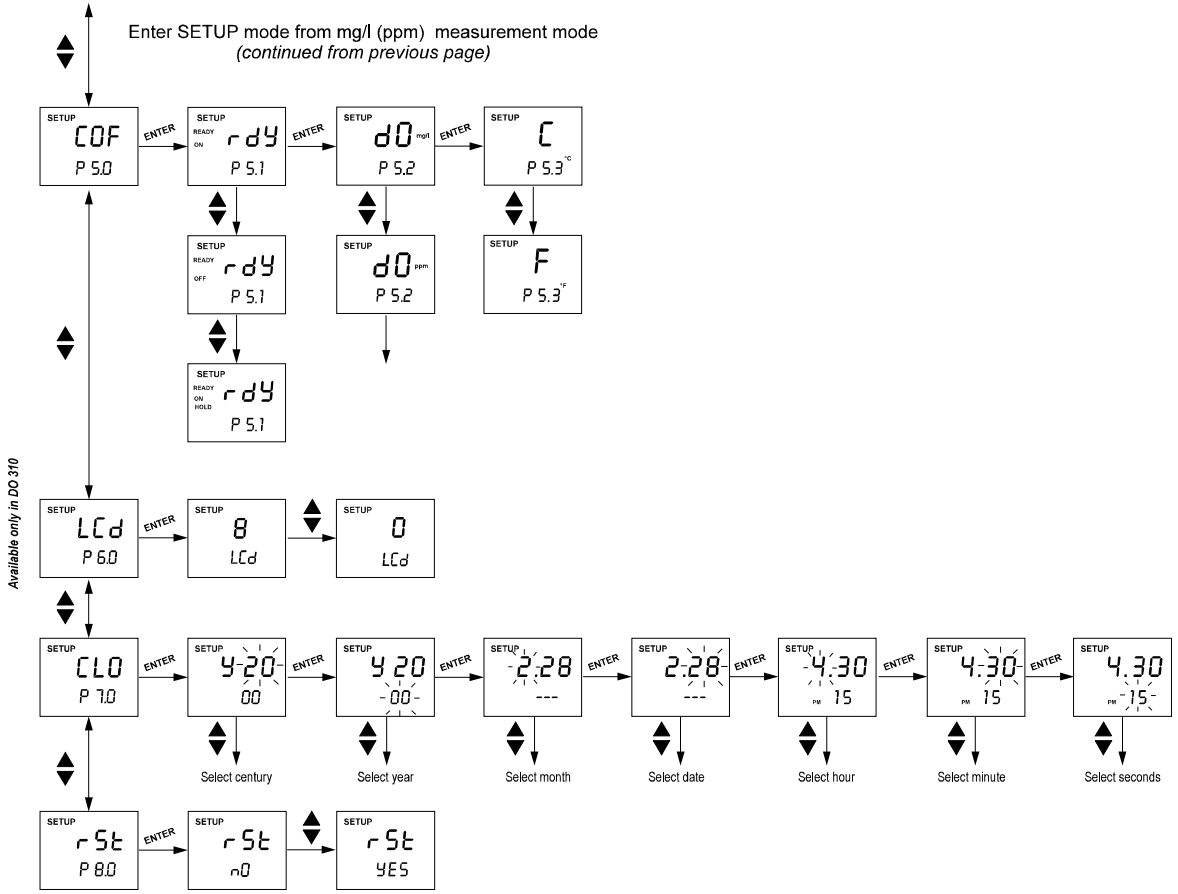

Enter SETUP mode from % saturation measurement mode
(continued from previous page)
SETUP
COF
P 6.0
ENTER
SETUP
READY
ON
rdY
P 6.1
ENTER
SETUP
C
P 6.2 °C
SETUP
READY
OFF
rdY
P 6.1
SETUP
F
P 6.2 °F
SETUP
READY
ON
HOLD
rdY
P 6.1
Available only in DO 310
SETUP
LCd
P 7.0
ENTER
SETUP
8
LCd
SETUP
0
LCd
SETUP
CLO
P 8.0
ENTER
SETUP
Y-20
00
ENTER
SETUP
Y 20
-00-
ENTER
SETUP
-2:28

ENTER
SETUP
2:28

ENTER
SETUP
-4:30
PM 15
ENTER
SETUP
4:30
PM 15
ENTER
SETUP
4.30
PM -15-
Select century
Select year
Select month
Select date
Select hour
Select minute
Select seconds
SETUP
rSt
P 9.0
ENTER
SETUP
rSt
nO
SETUP
rSt
YES

Enter SETUP mode from mg/l (ppm) measurement mode




Enter SETUP mode from mg/l (ppm) measurement mode
(continued from previous page)
SETUP
COF
P 5.0
ENTER
rdy
P 5.1
dO mg/l
P 5.2
C
P 5.3
dO ppm
F
P 5.3
READY OFF
READY ON HOLD
Available only in DO 310
LCd
P 6.0
8
0
CLO
P 7.0
Y-20-
00
Y 20
-00-
-2:28

2:28
-4:30
PM 15
4:30
4.30
-15-
Select century
Select year
Select month
Select date
Select hour
Select minute
Select seconds
rSt
P 8.0
nO
YES

18 WARRANTY & RETURN OF ITEMS

Palintest instruments are guaranteed for a period of one year from the date of purchase. The dissolved oxygen probe is guaranteed for a period of six months from date of purchase.

These guarantees exclude accidental damage or damage caused by misuse or unauthorised repair. The guarantee also excludes damage caused by chemical solutions or operation outside the environmental specifications for the product.

Return of Items

Should repair be necessary, contact Palintest Instrument Service Department or an authorised distributor. Authorisation in the form of a Product Return Note (PRN) must be obtained from Palintest Instrument Service Department before returning meters for repair under guarantee. Meters being returned must be sent freight-paid. Items should be packed carefully to prevent damage in transit and insured against possible damage or loss. Palintest will not be responsible for any damage resulting from loss in transit or inadequate packing.

NOTES:

Date	Time	Recorded Value	Remarks

For more information on Palintest products, contact your nearest Palintest distributor or visit our website listed below:

Palintest Ltd

Palintest House, Kingsway, Team Valley, Gateshead, Tyne & Wear NE11 0NS England

Tel: 0191 491 0808 Fax: 0191 482 5372
E.Mail: palintest@palintest.com Website: www.palintest.com