Palintest

EC/TDS/SALT Pocket Meter

Large Screen Waterproof Multi Range Conductivity/TDS/Salt with Temperature Display

Instruction Manual

Introduction

Thank you for selecting microprocessor-based waterproof EC/TDS/SALT meter with large dual line display. You have one of the following models:

PT157 • PT153T

These instruments come with the user-replaceable cup type sensor and have additional features such as Multi-range measurement, up to 3-point calibration and higher resolution measurement.

Before You Begin

Remove the electrode's protective cap. Soak the electrode for a few minutes in alcohol to remove any oil stains on the electrodes which will affect the accuracy of the meter. Rinse thoroughly with de-ionised water and shake off dry.

Key Functions

Key	Function
ON/OFF	- Power on and off the meter (The meter automatically switches of, if no button is pressed for 8.5 seconds).
°C/°F	- In measurement mode, temperature reading switches between Celsius & Fahrenheit. - In calibration mode, switches the meter to temperature calibration mode. - In temperature calibration mode, exits calibration mode without confirming calibrated values.
HOLD	- In measurement mode, switches to hold mode freezing the display. - In hold mode, switches back to measurement mode. - In manual calibration and temperature calibration modes, exits calibration mode without confirming calibrated values. - In range selection mode, selects a range.
INC DEC	- In measurement mode, enters calibration mode. - In calibration mode, adjusts the calibration values. - In hold mode, enters TDS factor setting mode. - In TDS factor setting mode, adjusts TDS factor.

Note: INC & DEC keys are located inside the battery compartment. Refer figure 1.

The caption of **HOLD** key is **'HOLD/ENT'**.

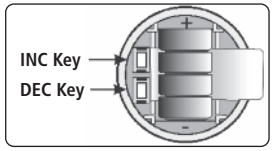

Figure 1: Battery Compartment

Switching On

Press **ON/OFF** key to switch on the meter. The LCD shows the power-up sequence as illustrated in Figure 2. When the meter is on, if you do not press a key for 8.5 minutes, the meter automatically switches off to conserve batteries.

Figure 2: Power Up Sequence

Range Selection

Depending on the selected model, you can set the meter to limit its reading to a particular measuring range (PU, LO or HI) or full scale (AUTO). The default setting is AUTO. When you select a range other than AUTO, the meter can be calibrated only for that particular range. If you try to measure a sample which has a higher conductivity/TDS value than that of the selected measuring range, the LCD shows 'OR' error message. Refer **Specifications** section for available ranges of the selected model.

To select a range:

1 Switch off the meter. Press and hold **°C/°F** key and then switch on the meter using **ON/OFF** key. Release **°C/°F** key.

2 The meter goes to range selection mode. The LCD shows the currently selected Range (the default is AUTO) in the lower display. The upper display shows the maximum possible reading for the selected range. Press **HOLD** key repeatedly until you see the required range (PU, LO or HI).

Note: If no key is pressed within 5 seconds, LCD shows power-up sequence and meter goes to measurement mode.

3 The meter automatically confirms the last selection if no key is pressed for 5 seconds. Upper display momentarily shows 'CO'. The LCD shows power-up sequence and the meter goes to measurement mode.

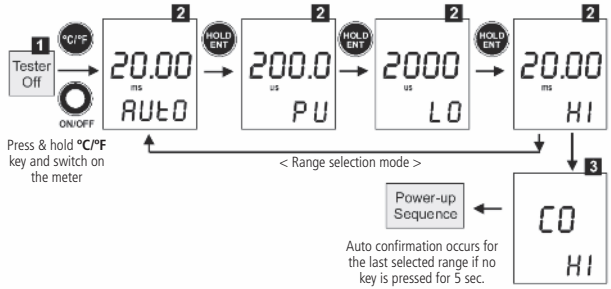

Figure 3: Range selection sequence from AUTO to HI

Measurement

1 Press the **ON/OFF** key to switch on the meter. The 'MEAS' indicators appears when the meter is in measurement mode.

2 Dip the electrode into the test solution making sure that it is fully immersed. Stir to clear any trapped air bubbles from the electrode and let the reading stabilise. For plus models, you can opt for the cup style measurement by filling the electrode cup with sample of test solution.

Note: The LCD indicates 'Or' (over range) if the reading is outside the selected range. If this occurs, select an appropriate range to suit the reading.

3 The upper display shows the main reading (conductivity/TDS/Salt) of the solution, automatically temperature compensated (ATC) to normalised temperature of 25°C. The lower display shows the temperature of the solution.

HOLD Function

This feature lets you freeze the display for a delayed observation.

1 Press **HOLD** key to freeze the measurement. The meter goes to hold mode and 'HOLD' indicator is displayed in LCD. The measurements are frozen and the 'MEAS' indicator disappears.

2 Press **HOLD** key again to release the measurement. The 'HOLD' indicator is no longer displayed. The meter goes back to measurement mode.

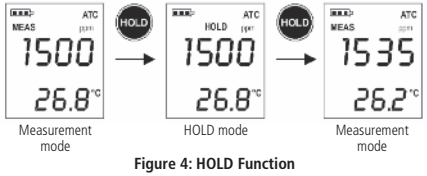

Figure 4: HOLD Function

Temperature Unit of Measurement Selection

This feature lets you set the unit of measurement of temperature to either Celsius (°C) or Fahrenheit (°F). When the meter is in the measurement mode, press **°C/°F** button. The temperature display toggles between the Celsius and Fahrenheit reading.

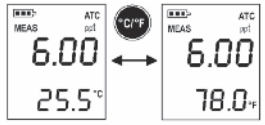

Figure 5: Temperature unit of measurement selection

About Calibration

To ensure higher accuracy, the meter must be calibrated on a regular basis. Calibration can be manual or automatic; calibration can be 1-point or multi-point. You can choose any combination of the above two options for calibration. If you calibrate the meter for 1-point, the calibration is applied for all the measuring ranges. In applications where you need higher accuracy, and when you intend to measure values in more than one range, it is recommended to select multi-point calibration.

Selection of Automatic or Manual Calibration

These instruments have both automatic & manual calibration while all other models have to be calibrated manually. In automatic calibration, the meter automatically detects and verifies known conductivity standard solutions (84uS,1413uS & 12.88mS). In manual calibration, you can use non-standard solutions which may be specific for your application.

The factory default is Automatic calibration (Auto). You can enable or disable automatic calibration as described below.

Selection of 1-point or Multi-point Calibration

The factory default is 1-point Calibration. For higher accuracy, it is recommended that you calibrate the meter for multiple ranges if you intend to measure values in multiple ranges. You can enable or disable multi-point calibration as described below.

Note: If you have selected a specific measuring range for the meter, selecting multi-point calibration has no meaning, as the meter can only be calibrated for 1-point for the selected range. Set the meter to 'AUTO' measuring range if you wish to calibrate multi-points.

To enable/disable auto calibration and multi-point calibration:

1 Switch off the meter. Press and hold **INC** key and then switch on the meter using **ON/OFF** key.

2 The meter goes to auto calibration selection mode. The lower display shows 'A.CAL' and the upper display blinks the current choice ('Yes' or 'No').

Press **INC** or **DEC** key to select 'Yes' (to enable auto calibration) or 'No' (to disable auto calibration)

Note: Press °C/°F key, if you wish to skip this setting without confirming changes.

Note: Press °C/°F key twice, if you wish to return to measurement mode without confirming changes.

3 Press **HOLD/ENT** key to confirm the selection. The display shows 'CO'.

4 The meter goes to 1-point calibration selection mode. The lower display shows '1.Pnt' and the upper display blinks the current choice ('Yes' or 'No'). Press **INC** or **DEC** key to select 'Yes' (to enable 1-point calibration) or 'No' (to disable 1-point calibration, i.e. to enable multi-point calibration).

Note: Press °C/°F° key if you wish to skip this setting without confirming.

5 Press **HOLD/ENT** key to confirm the selection. The display shows 'CO' for few seconds and then shows power-up sequence The meter goes to measurement mode.

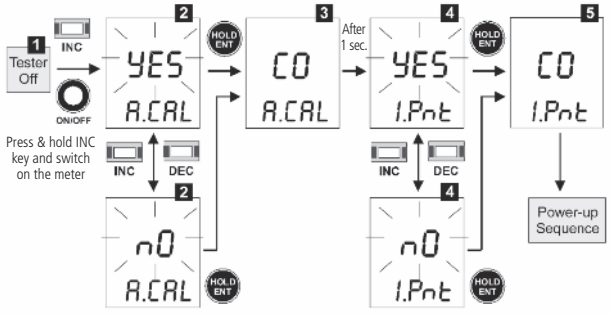

Figure 6: Selecting auto calibration & 1-point calibration

Auto Calibration

Auto calibration feature is available only for the conductivity model. Make sure that 'auto calibration' is enabled as described in the previous section. Auto calibration is suitable if you use standard conductivity solutions for calibration process.

If you selected 1-point calibration, you need to choose a calibration standard corresponds to the selected measuring range of the meter listed below. If you have selected multi-point calibration & AUTO measuring range, you can choose any of the calibration standards listed below. During auto calibration, the meter recognises the calibration standard if its value is within 50% tolerance. For multi-point calibration (with AUTO measuring range), the meter automatically scans through all possible calibration points until all of them are calibrated.

Selected Measuring Range	Calibration Standard
PU (0 to 200.0 uS/cm)	84 uS
LO (0 to 2000 uS/cm)	1413 uS
HI (0 to 20.0 mS/cm)	12.88 mS
AUTO	84 uS, 1413 uS, 12.88 mS

To prepare calibration standards:

Use fresh calibration standard solutions listed in the above table. Prepare each solution in two beakers - one for rinsing and the other for calibration. Rinse the electrode in de-ionised water before calibration.

To begin automatic calibration:

1 Switch on the meter. Make sure the meter is in measuring mode. Press **INC** or **DEC** key to enter conductivity calibration mode.

2 'CAL' indicator appears in LCD. The display briefly shows 'CAL' and the number of points the meter will be calibrated.

3 The upper display shows the conductivity reading and the lower display sequentially shows calibration standard values 1413 uS & 12.88 mS 84 uS, 1413 uS & 12.88 mS if the measuring range of the meter is set to AUTO.

Note: If you have selected a specific measuring range for the meter, the lower display shows the corresponding calibration standard value that matches the selected measuring range.

4 Rinse the electrode with the calibration standard that you intend to calibrate and then dip the electrode in the other beaker with same calibration standard. Swirl gently to create a homogenous sample and allow time for the reading to stabilise.

Note: For multi-point calibration, the lower display automatically locks at the calibration standard value that closely matches. The tolerance range is ± 50% of the calibration standard. The meter shows error message 'Er.1' if you try to calibrate with a solution whose conductivity is outside the tolerance range.

Note: Press INC or DEC key if you wish to exit from auto calibration, during any of the above steps.

5 Press **HOLD/ENT** key to confirm the calibration. LCD shows 'CO' for 2 seconds. The calibration is complete and the meter returns to measurement mode, if this is a 1- point calibration.

6 For multi-point calibration, the meter goes to the next calibration point, lower display showing next calibration standard values. Rinse the electrode in de-ionised water and repeat step 4 & 5 to continue calibrating with next calibration standard solution.

Note: The meter shows error message 'Er.0' and returns to measuring mode if the temperature of the calibration solution is not within 0°C to 50°C.

Note: The meter shows error message 'Er.1' if you press HOLD/ENT key before the meter recognises the calibration standard.

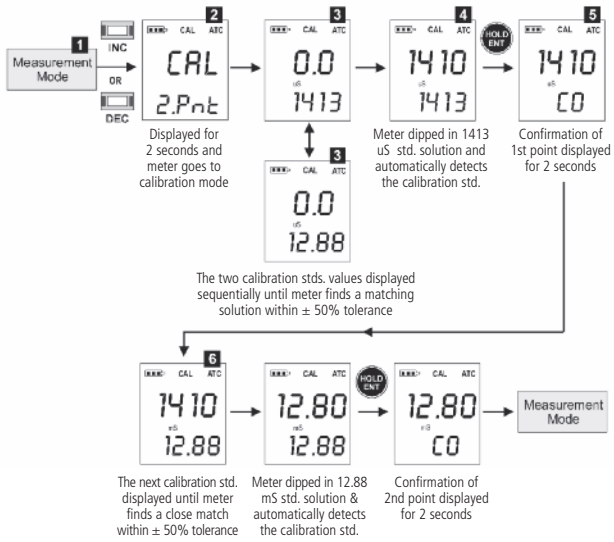

Figure 7: Two-point automatic calibration sequence

Manual Calibration

In manual calibration, the meter allows 1-point calibration for each measuring range. You can use customised calibration solutions with known conductivity/TDS values to calibrate the meter. The following table shows acceptable conductivity/TDS ranges of calibration solutions for each measuring range. Make sure your calibration solutions are within the given ranges.

Selected Measuring Range	Acceptable Calibration Standard Range	
	Conductivity	TDS/Salt
PU	2.0 - 200.0 uS/cm	2.0 - 200.0 ppm
LO	200 - 2000 uS/cm	200 - 2000 ppm
HI	2.00 - 20.00 mS/cm	1.00 - 10.00 ppt
AUTO	Select a calibration standard nearer to application sample	

To prepare calibration standards:

Use fresh calibration solutions. Measure conductivity/TDS values of the solution with a meter known to be accurate. Prepare each solution in two beakers - one for rinsing and the other for calibration. Rinse the electrode in de-ionised water before calibration.

To begin automatic calibration:

1 Switch on the meter. Make sure the meter is in measuring mode. Rinse the electrode with the calibration standard that you intend to calibrate and then dip the electrode in the other beaker with same calibration standard. Swirl gently to create a homogenous sample and allow time for the reading to stabilise.

2 Press **INC** or **DEC** key to enter calibration mode. The 'CAL' indicator appears in LCD. The display briefly shows 'CAL' and the number of points the meter will be calibrated.

3 The upper display shows the measured conductivity/TDS reading of the solution based on previous calibration (if any) and the lower display shows the default (uncalibrated) conductivity/TDS reading.

Note: The meter shows error message 'Er.1':

(a) If the reading is over range (Or) of selected measuring range of the meter, or
(b) If the default (uncalibrated) reading is not within the acceptable calibration standard range.

Use **INC** and **DEC** keys to adjust the upper display to the correct conductivity/TDS value of the calibration solution.

Note: The calibration adjustment window is ± 50% from the default reading.

Note: If you do not press INC or DEC key within 5 seconds, the meter shows the confirmation 'CO' and returns to the measurement mode. However, the meter is not calibrated to new values yet. The old calibration is still active. If this happens, press INC or DEC key once again to enter calibration mode.

4 Wait for 5 seconds for the meter to automatically confirm the calibration by displaying 'CO' and return to the measurement mode.

Note: To exit calibration mode without confirming the calibration, press HOLD/ENT key before the automatic confirmation takes place.

Note: The meter shows error message 'Er.0' and returns to measuring mode if the temperature of the calibration solution is not within 0°C to 50°C.

5 For multi-point calibration rinse the electrode in de-ionised water and repeat step the above steps with another standard solution.

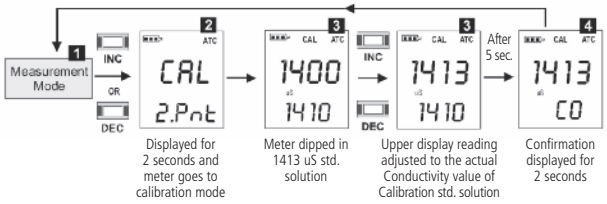

Figure 8: One-point manual calibration sequence

TDS Factor Setting

The factory default TDS factor is 0.71. You can adjust the TDS factor to suit different samples of your applications.

To change TDS factor:

1 Switch on the meter. Make sure the meter in measurement mode. Press **HOLD** key to bring the meter to the HOLD mode.

2 Press **INC** or **DEC** key to enter the TDS factor setting mode.

3 The upper & lower displays of LCD show the last configured TDS factor. The upper display is adjustable. Use the **INC** or **DEC** key to adjust the TDS factor. The adjustable range is 0.4 to 1.0

Note: If you do not press INC or DEC key within 5 seconds, the meter shows the confirmation 'CO' and returns to measurement mode.

4 Wait for 5 seconds for the meter to automatically confirm the new setting by displaying 'CO' and return to the measurement mode.

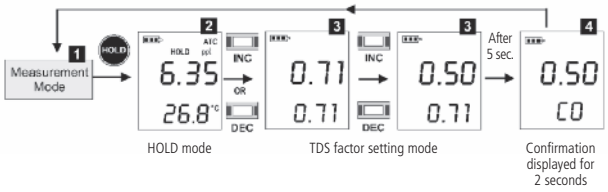

Figure 9: TDS Factor setting

Temperature Calibration

Temperature calibration need not be performed every time, unless the temperature reading differs from that of an accurate thermometer. If temperature calibration is performed, Conductivity/TDS/Salt calibration is mandatory.

1 Switch on the meter. Make sure the meter is in measuring mode. If required, press **°C/°F°** key to select the desired unit of measurement for temperature (Celsius or Fahrenheit). Dip the meter into a solution of known temperature and allow time for the temperature reading to stabilise.

2 Press **INC** or **DEC** key to bring the meter to the calibration mode. CAL' indicator appears in LCD. Immediately press **°C/°F** key to switch to the temperature calibration mode.

Note: When you enter calibration mode, if the conductivity/TDS/salt reading is outside the specified range (Or), the meter shows 'Er.1' error message. You can still proceed to the temperature calibration mode by pressing °C/°F key immediately. If the °C/°F key is not pressed within 2 seconds, the meter exits the calibration mode and

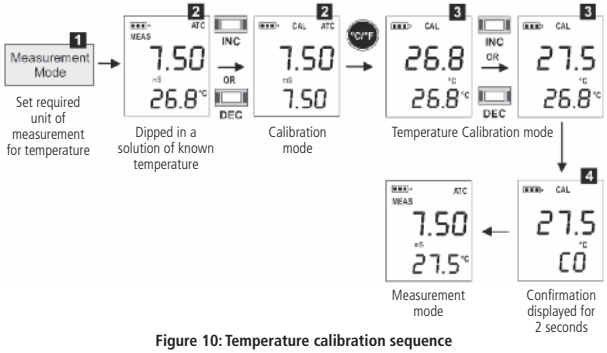

Figure 10: Temperature calibration sequence

3 The upper display shows the measured temperature reading based on the last set offset (if any) and the lower display shows the default (uncalibrated) temperature reading based on factory settings. Use **INC** and **DEC** keys to adjust the upper temperature reading to the known temperature value of the solution.

Notes: The temperature adjustment window is ± 5°C (± 9°F) from the default reading.

4 Wait for 5 seconds for the meter to automatically confirm the temperature calibration value by displaying 'CO' and return to the measurement mode.

Note: To exit temperature calibration mode without confirming the calibration, press °C/°F key or HOLD/ENT key before the automatic confirmation takes place.

Note: The meter shows error message 'Er.0' and returns to measuring mode if the temperature of the solution is not within 0°C to 50°C.

Reset

Reset option allows you to restore the calibration and other parameters back to factory default settings.

1 Switch off the meter. Press and hold the **HOLD** key and then switch on the meter using **ON/OFF** key. Release **HOLD** key.

2 The lower display shows 'rSt' (reset) and the upper display blinks 'No'. Use **INC** or **DEC** key to select 'Yes' (to proceed with resting) or 'No' (to quit without resetting).

Note: Press °C/°F key if you wish to skip to measurement mode without making any selection.

3 Press **HOLD** key to confirm your selection. LCD shows 'CO'. If 'Yes' is selected, the meter resets to its factory default values as listed below. LCD shows power-up sequence and meter goes to measurement mode.

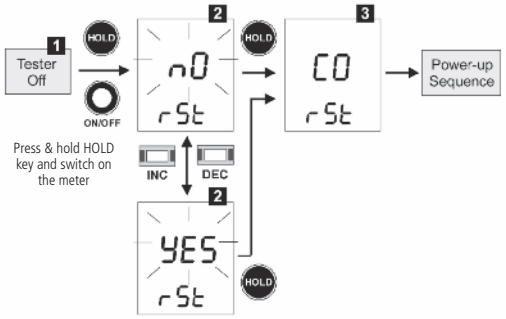

Figure 11: Resetting sequence

Parameter	Factory Default
User calibration (conductivity/TDS/salt)	(Reset)
Temperature unit of measurement	Celsius (°C)
Temperature offset	0
Auto calibration	Enable
1-point calibration	Enable
Conductivity calibration factor	1.0
TDS factor	0.71

Changing Batteries

Replace the batteries when the low battery indicator starts blinking.

1 Open the battery compartment lid (with attached lanyard loop).

2 Remove old batteries by pulling plastic ribbon. Replace with fresh ones. Note polarity as shown in figure 12.

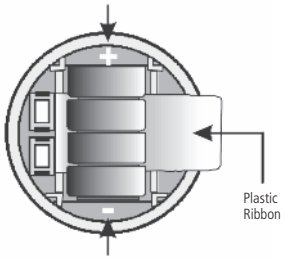

Figure 12: Battery compartment

Electrode Maintenance

1 Always keep the sensor electrodes clean. Rinse the electrodes with de-ionised water and wipe them dry with clean cloth before storing with its protective cap. For cup type electrodes, remove the white plastic cup and insert to thoroughly clean viscous solutions. Never scratch electrodes with a hard substance.

2 For better performance, soak the electrode in alcohol for 10 to 15 minutes and rinse with de-ionised water before starting any measurement process. This is to remove dirt and oil stains on the electrode which may affect the accuracy of the measurements.

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Electrode Replacement

When the meter fails to calibrate or gives fluctuating readings in calibration standards, you need to change the electrode module. You can replace the electrode module at a fraction of the cost of a new meter.

1 With dry hands, grip the ribbed meter collar with electrode facing you. Twist the collar counter clockwise (see Figure13-A). Save the ribbed meter collar and O-ring for later use.

2 Pull the old electrode module away from the meter.

3 Align the four tabs of the new electrode module so that they match the four slots on the meter (see Figure 13-B).

4 Gently push the module into the slots to sit it in position. Push the smaller O-ring fully onto the new electrode module. Push the collar over the module and thread it into place by firmly twisting clockwise.

Note: It is necessary that you recalibrate the meter prior to measurement after an electrode replacement.

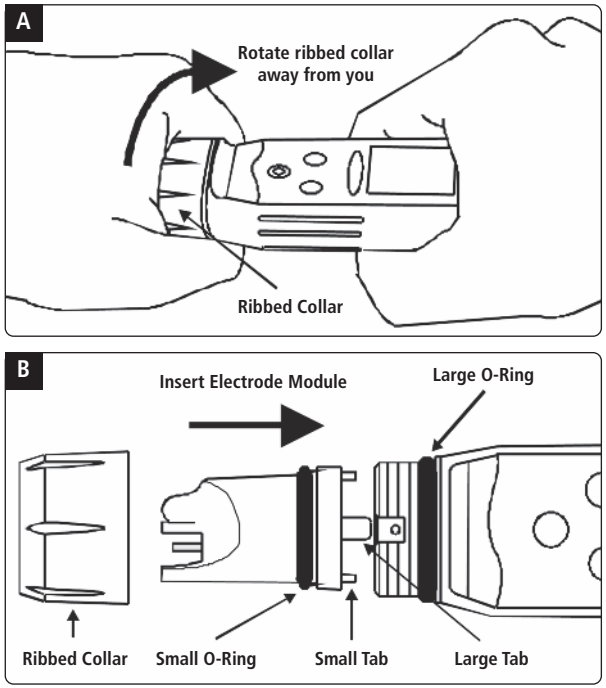

Figure 13: Removing collar & inserting electrode

Self-Diagnostic Messages

Low Battery indicator		3 Bars indicates battery is full (100%)
		2 Bars indicates 50% of the battery life is left
		1 Bar indicates 25% of the battery life is left
		Blinking battery casing indicates the need to replace batteries with fresh ones as specified by manufacturer
Over Range / Under Range Signal	**Or/Ur** (Still)	The sensor electrodes short circuited
		Replacement sensor is not connected properly to the meter during sensor replacement
		Measured value or temperature value exceeds the specified maximum or minimum value
	ATC/Or/Ur (Blinking)	Blinking 'ATC', 'Or' or 'Ur' indicates that there is a short or open circuit at the built in temperature sensor
Error Message	**Er.0**	Calibration error due to temperature value not within the specified range
	Er.1	Calibration error due to Conductivity/TDS/Salt value not within the specified calibration standard range

Replacement Parts

Type	Part Code
Conductivity Sensor	PT157CON
TDS Sensor	PT153TDS
Conductivity Meter Complete	PT157
TDS Meter Complete	PT153T

Warranty

The waterproof meters are warranted to be free from manufacturing defects for 1 year and electrode module for 6 months, unless otherwise specified. If repair, adjustment or replacement is necessary and has not been the result of abuse or misuse within the time period specified, please return the meter - freight prepaid - and correction will be made without charge. Out of warranty products will be repaired on a charge basis.

Certificate of Conformity

Palintest Ltd certify this instrument, PT157 and PT153T have been tested and calibrated to meet all performance specifications.

It is recommended that regular calibration of the probe is carried out in accordance with the instruction manual to ensure correct operation.

The process used to verify this product is carried out in accordance with procedures contained within Palintest's certified ISO 9001 Business Management System.

Specifications

Model		EC Meter	TDS Meter
Range:	PU	0 to 200.0 uS/cm	0 to 200.0 ppm
	LO	0 to 2000 uS/cm	0 to 2000 ppm
	HI	0 to 20.00 mS/cm	0 to 10.00 ppt
Resolution:	PU	0.1 uS/cm	0.1 ppm
	LO	1 uS/cm	1 ppm
	HI	0.01 mS/cm	0.01 ppm
Accuracy		± 1% of Full Scale	
Calibration Type		Auto or Manual	Manual
Calibration Points		1, 2 or 3 points	1, 2 or 3 points
Calibration Window		± 50% from each point	
Calibration:	PU	2.0 - 200.0 uS/cm	2.0 - 200.0 ppm
Standard Range:	LO	200 - 2000 uS/cm	200 - 2000 ppm
(Manual):	HI	2.00 - 20.00 mS/cm	1.00 - 10.00 ppt
Sensor Type		Cup	Cup
TDS Factor		-	0.4 to 1.0 (Default 0.71)
Temperature:	Range in °C	0.0 to 50.0°C	
	Range in °F	32.0 to 122°F	
	Resolution	0.1°C (0.1°F)	
	Accuracy	± 0.5°C (± 0.9°F)	
Calibration Point		1 point	
Calibration Window		± 5°C (± 9°F) from factory default	
ATC		0 to 50°C	
Temp Coefficient		2% per °C	
Normalisation Temp		25.0°C	
Auto Off		8.5 minutes after last key press	
Operating Temp		0 to 50°C	
Power Battery		4 x 1.5V "A76" micro alkaline battery	
Battery Life		>150 hrs	
LCD Display		Custom Dual Display 27mm(h) x 21mm(w)	
Dimensions		Meter: 16.5cm x 3.8cm; 90g	
Weight		Boxed: 22cm x 6cm x 5cm; 170g	

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