



Palintest

Water Analysis Technologies

Turbimeter Plus

User Manual

About us

A rich history in innovation

Palintest are committed to making water analysis technologies simple and accessible.

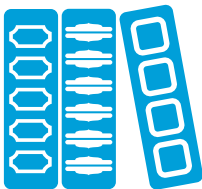
A global company with a local approach

•USA •UK •Middle East •China •Australia



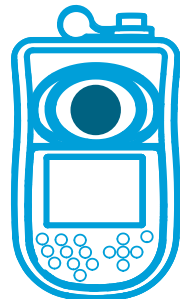
75 Years of research

Extensive online library, we are proud to share our research.



Instrumental

From multiparameter photometer kits to visual test Palintest has an instrument solution for every application.



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Turbidity and Total Suspended Solids (TSS) are two of the most important indicator parameters for water quality monitoring.

The new Turbimeter Plus has been developed with leading water utility companies and provides the ideal testing platform for drinking water, wastewater and safe water monitoring.

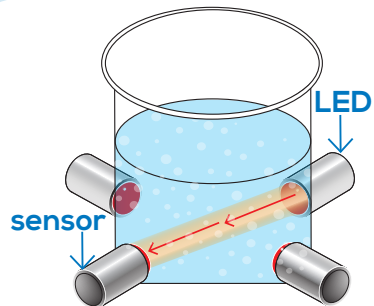
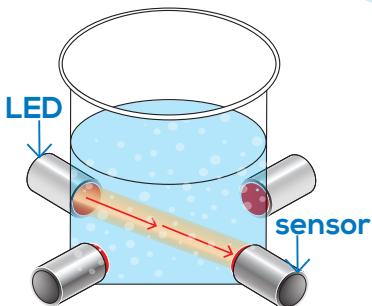
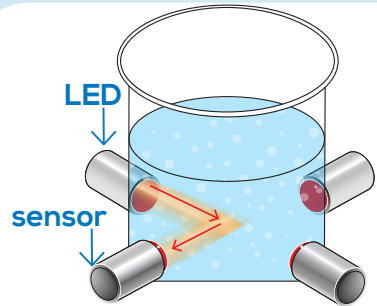
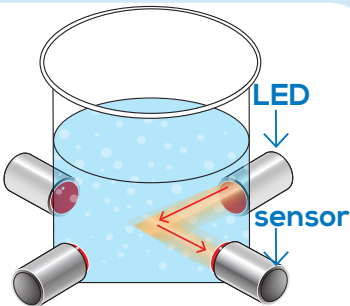
- Fast and reliable results within 5 seconds
- Specifically designed for field use with storage for 1000 results and battery power for approximately 10,000 tests
- Unique Quadoptix technology with four individual measurement points for increased reliability
- Variety of operating and reading modes including TSS, Average and Continuous Capture
- USB connectivity for power, downloading data and installing software upgrades
- IP67 certified with a waterproof USB socket

Quadoptix™ Technology

The Palintest Turbimeter Plus utilises Quadoptix™ technology for turbidity measurement.

Quadoptix technology uses two independent sources and two independent detectors to provide four entirely autonomous measurement systems, allowing multiple validation of all results for greater accuracy.

Turbidity measurements are carried out by analysis of light scattered at 90° to the incident light (nephelometric measurement) at levels below 40 NTU. Above 40 NTU the recommendation is to measure also at 180° to 'compensate' the 90° readings.



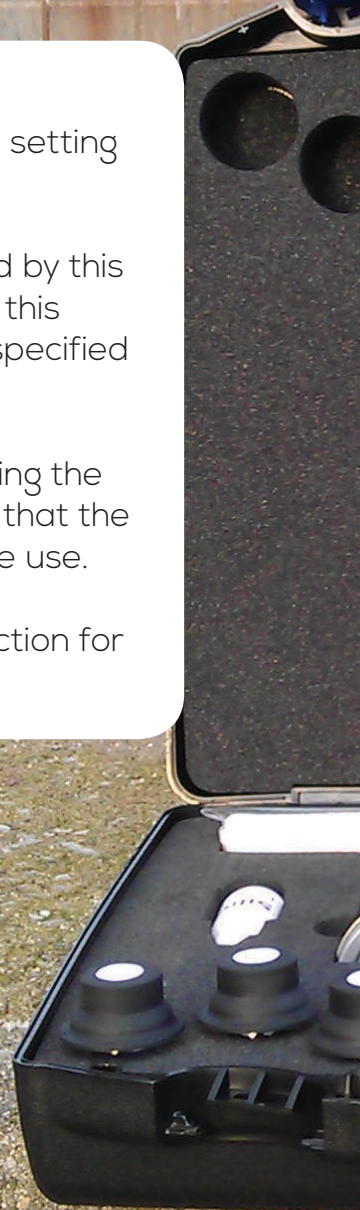
Safety Information

Please read the entire manual prior to setting up or operating this equipment.

Make sure that the protection provided by this equipment is not impaired, do not use this instrument in any manner other than specified in this manual.

The instrument is IP67 certified, including the USB port, however it is recommended that the Turbimeter Plus is clean and dry before use.

Review the 'Care and Maintenance' section for recommendations on best practice.





Start Up Guide

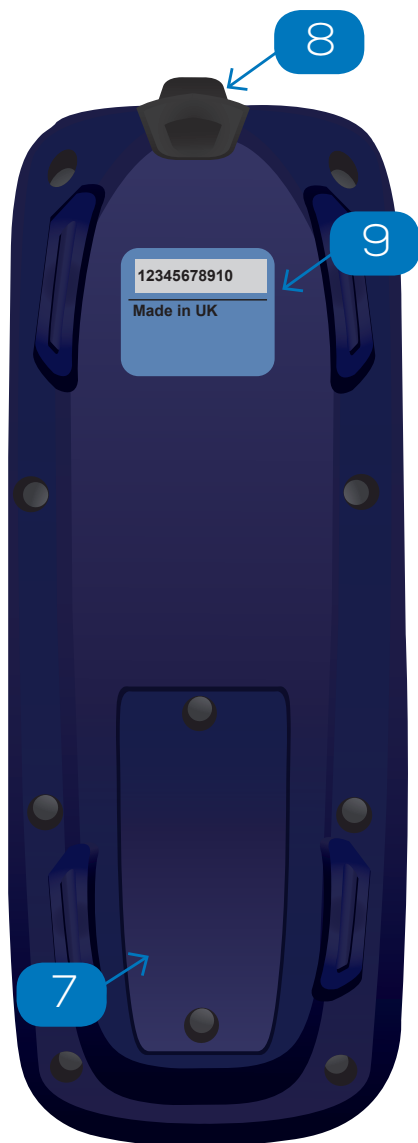
Front of product

- 1 Power
- 2 Left
- 3 Right
- 4 Up
- 5 Down
- 6 Sample Holder



To Switch Turbimeter Plus On

Press the power button **1** and release. An audible beep will confirm the instrument is on. Switch off by holding the POWER button for 1 second.



Back of product

- 7 Battery
- 8 USB
- 9 Serial number

LCD Screen

The LCD screen is provided with a backlight option that can be set to on/off in the 'System' menu (see Page 42). The initial default setting is ON.

Battery Life Replacement

The Turbimeter Plus is supplied with batteries that will provide power for approximately 10,000 tests. The instrument can also be powered through the USB port.

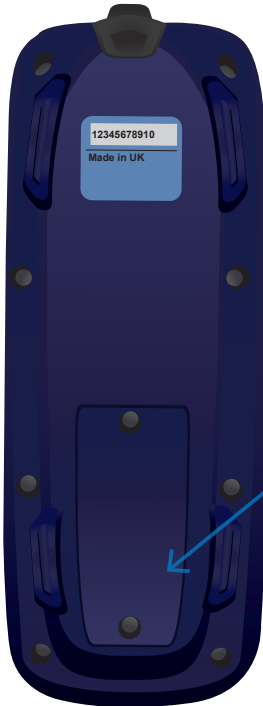
An indication of remaining battery life is displayed on screen with the battery status icon. To save power, the instrument will switch off after five minutes of inactivity.

When battery life is very low, the instrument will display the following error messages:

Message	Error	To solve
Error 110	Battery Low	Instrument has insufficient power to perform reading. Menu functions still available.
Error 111	Battery Critical	Insufficient battery to power instrument. Instrument will save data and shut down.



Replacing batteries will not lead to settings or calibration data being lost. All user data is retained.

When replacing batteries, ensure the gasket seal is correctly fitted to maintain the IP67 rating of the instrument. A spare gasket is included with your instrument and should be used if the gasket looks to be damaged, stretched or twisted.



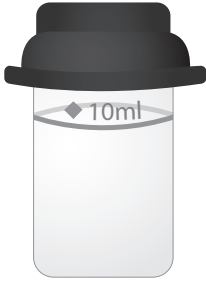
To replace the batteries turn over the instrument and remove the battery compartment cover, insert two AA 1.5V alkaline batteries and replace the compartment cover.

Information Panel Icons

Icon	Description
	Battery status
	USB connected
DISK / COM	Hard drive/COM port mode

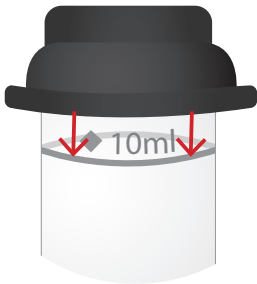
Guidelines for Use

The following guidelines for sample handing should be followed to ensure accurate and consistent results are obtained.

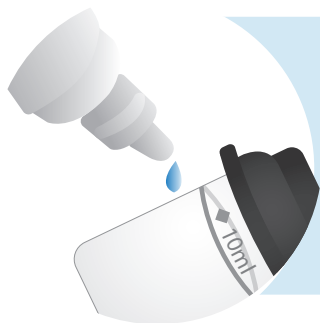


Use only clean sample tubes and rinse with sample before use.

Remove all marks and fingerprints from the sample tube before measuring.

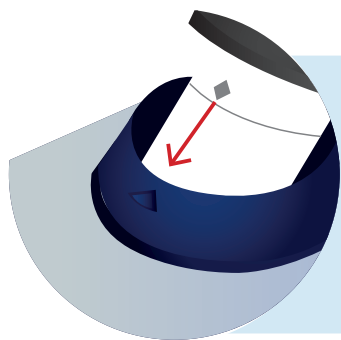
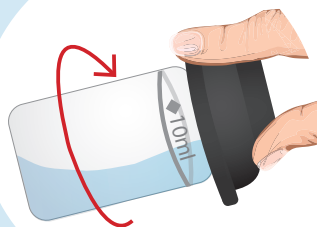


Ensure the sample tube cap is in place during measurement.



To reduce the effect of scratches on the glass, place a drop of Silicone oil onto the tube and wipe using the lint free polishing cloth.

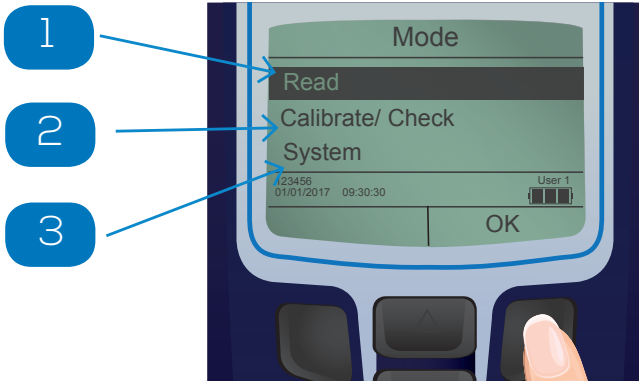
Remove bubbles from sample tube wall. Hold the capped tube at an angle and rotate.



Place the sample tube in the instrument in the same orientation for all readings .

Heavily scratched or contaminated sample tubes should be discarded.





1. Read

Select the read mode to measure turbidity or suspended solids.

[See page 13](#)

2. Calibration/Check

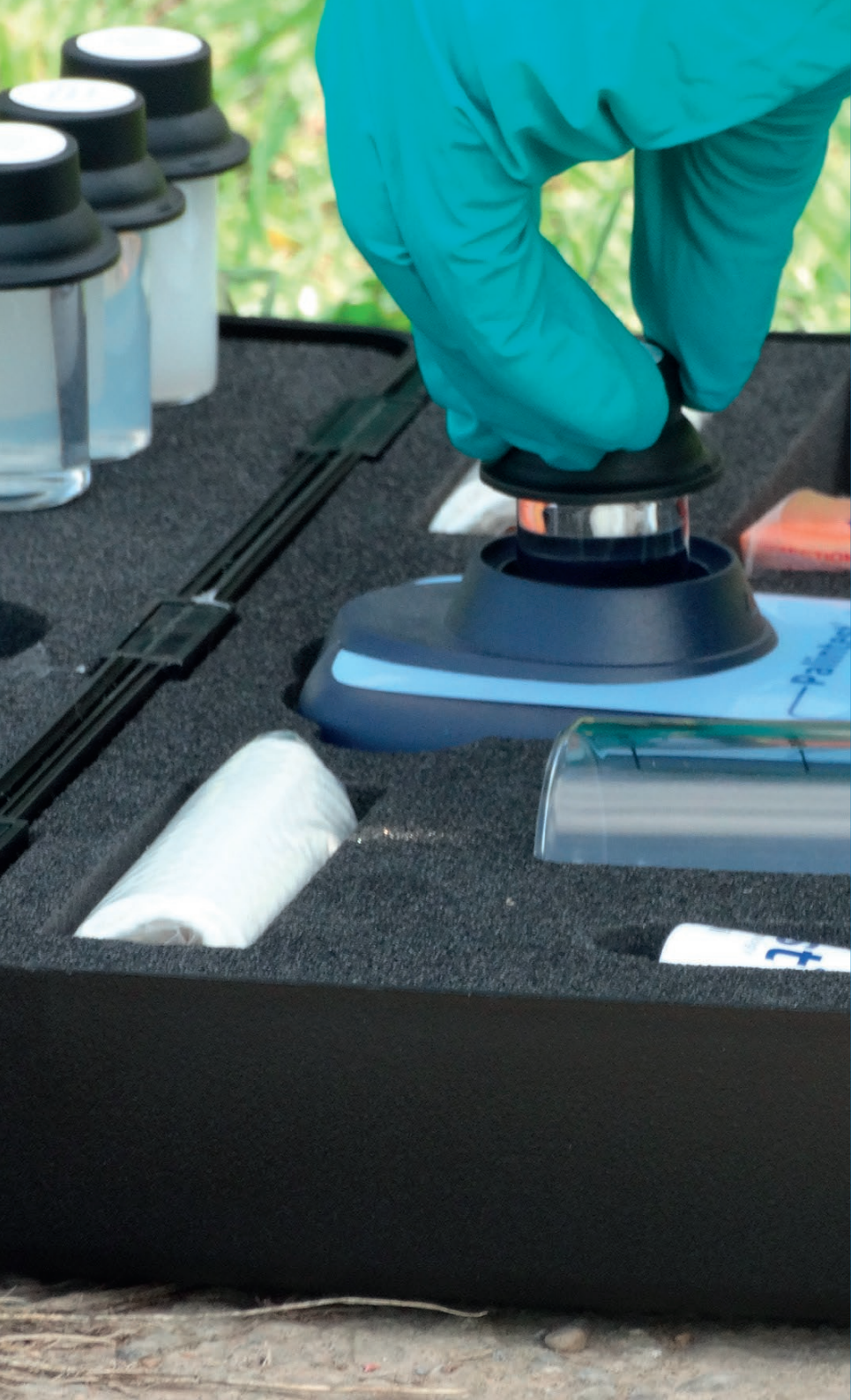
Select this mode to check or set the instrument calibration.

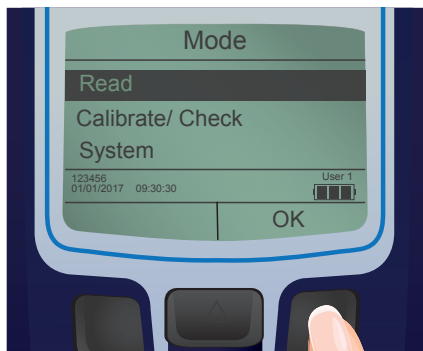
[See page 20](#)

3. System

General system and instrument settings.

[See page 30](#)





From the main menu select 'Read' mode and you will be given the following options:

Normal

This mode reads the turbidity of the sample in approximately 5 seconds.

[See page 14](#)

Average

This mode takes multiple measurements and averages the results. This mode supports measurements where sample turbidity may be changing over time, for example due to settling of particles.

[See page 15](#)

Continuous Capture

This mode performs repeated normal readings of sample turbidity until measurement is stopped by the user. This mode will support sample tube indexing and trending turbidity on settling samples. Trending arrows show the direction of turbidity change.

[See page 16](#)

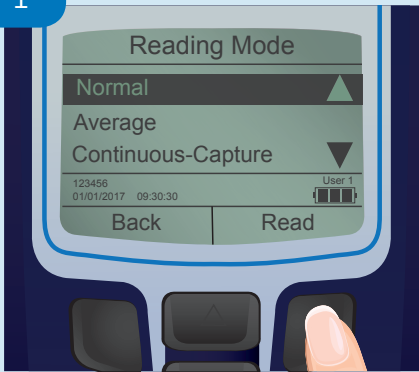
Total Suspended Solids (TSS)

This mode will measure the site specific relationship between turbidity and suspended solids.

[See page 18](#)

Reading Mode - Normal

1



Select the 'Read' menu and highlight 'Normal'.

2



Insert the sample with the orientation mark \blacklozenge facing forward and press 'Read'. An audible tone will sound at the start and end of measurement.

3



Result is displayed on-screen and is automatically stored in the results log with date, time, Reading Mode, Operator ID and Sample ID.

Reading Mode - Average

1



This mode takes multiple measurements and averages the results. Three options are available: Short (3 readings), Medium (6 readings) and Long (12 readings).

2



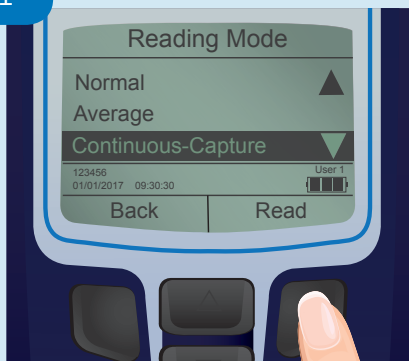
Select the number of readings required: Short (3), Medium (6), Long (12). Insert the sample with the orientation mark \diamond facing forward and press 'Read'.

3



An audible tone will sound at the start and end of measurement. Result is displayed on the screen and stored in the log with time, date, Reading Mode, Operator ID and Sample ID.

1



This mode performs repeated Normal readings of the sample until stopped by the user.

2



Insert the tube with the orientation mark \diamond facing forward and press read. An audible tone will sound after each reading.

3



Results are not stored automatically. To store a result in the log, press 'Capture' (repeat as required). To stop measurement, press 'Stop' at any time.

4

**To index a sample tube:**

In continuous capture mode, insert the tube with the orientation mark \diamond facing forward.



Lift and rotate the sample tube by a fixed amount (e.g. 45°) in between measurements for a full 360° .



5

The lowest turbidity result returned corresponds to the optimal sample tube orientation. Mark the tube in this position to indicate the optimum orientation. See page 44 for more information.

Reading Mode - Total Suspended Solids (TSS) Measurement

1



This mode will only be active if a site calibration has been stored within the Turbimeter. Once a calibration has been created, the Sample ID can be used to recall the site specific relationship between turbidity and suspended solids.

2



Select the Sample ID for the site/sample. The calibration data will be recalled automatically. Insert the sample with the orientation mark \blacklozenge facing forward and press 'Read'.

3



An audible tone will sound at the start and end of measurement. Result is displayed on the screen in mg/l and stored in the log with time, date, Operator ID and Sample ID.





Calibration Menu



Select the 'Calibrate/Check' from the main menu and choose from the following options:

Check Standard Mode

For verifying the instrument calibration.

[See page 22](#)

SDVB

For field or laboratory calibration using SDVB standards.

[See page 24](#)

Formazin

For laboratory calibration using prepared Formazin standards.

[See page 26](#)

Total Suspended Solids (TSS)

For creating the site specific calibration between TSS and turbidity.

[See page 28](#)

Check Standard Care Points:

Check standards are manufactured to precise values/tolerances and provided in sealed sample tube. Do not remove the sealed cap from the check standard.

Use the lint free polishing cloth to ensure the check standard tubes are clean before they are inserted into the sample holder.

Check Standard Mode



In check standard mode there are two options for selection:

Check Standard Values
Check Standard Read

Check Standard Values



Use the up/down keys to adjust the displayed values to match the assigned target for each check standard.

1 Check Standard Read



Select the Check Standard Read option to perform a recorded read back of each turbidity check standard.

2



Follow the on-screen prompts and insert the Check Standards as requested. Select the Read button to perform the measurement.

3



'Pass' will appear on-screen if the result is within the tolerance displayed on the standard. If the result is outside of the tolerance, the instrument may need to be re-calibrated.

SDVB

For field use, a set of SDVB (styrene divinylbenzene) calibration standards are provided to check the factory calibration and recalibrate the meter if necessary. Only SDVB standards from Palintest can be used with the Turbimeter Plus.

Note: Recalibration is only required if the instrument does not pass the check standard mode.

An "Operator ID" will be logged with a recalibration, this can be changed in 'System Settings' before recalibrating.

1



Choose 'SDVB' from the calibration menu. Insert the lowest value turbidity calibration standard when prompted.

2



Use the Up/Down buttons to adjust the value on screen to that on the standard and press 'Read'.

3



The instrument will request the remaining standards in order of increasing turbidity value. After the final standard has been read, the screen will show a countdown timer. When the calibration process is complete the screen will show

'Successful'. The time, date and Operator ID for successful calibrations are stored in the calibration log.

If calibration is unsuccessful, the instrument will display '**Error 101**' for one of the following reasons:

- **Standards inserted in incorrect sequence**
- **Standards have expired**
- **Standards are scratched or damaged**

SDVB Standards should not be inverted or shaken before use. If they have been inverted or the kit containing them has recently been moved they will need to be allowed to stand for at least 10 minutes before being used.

1



From the Calibrate/ Check Mode chose Formazin.

(User-prepared Formazin standards can also be used for calibration where available)

Formazin standards should be prepared within the following ranges:

First Standard	10.0 – 30.0 NTU
Second Standard	90.0 – 110.0 NTU
Third Standard	720.0 – 880.0 NTU

2



Insert the lowest turbidity value calibration standard when prompted. Use the Up/Down buttons to adjust the value on screen to that on the standard and press 'Read'.

3



The instrument will request the remaining standards in order of increasing turbidity value. After the final standard has been read, the screen will show a countdown timer. When the calibration process is complete the screen will show 'Successful'.

The time, date and Operator ID for successful calibrations are stored in the calibration log. To manage the calibration log see page 38.

Total Suspended Solids (TSS)

The Turbimeter Plus can store 50 user calibrations for Total Suspended Solids. These can either be entered by providing TSS values for results already in the log or by entering a definition (slope and intercept) for the calibration to be used.

Use Results From Log

- 1 Select the appropriate Sample_ID or scroll to the bottom to create a new one.
- 2 Select 'Use Results from Log'. The default (0, 0) automatically appears, this is normally used as the first data point but can be edited or deleted.
- 3 To recall a result from the log, press 'Down' then 'Add' and scroll through the log to select a value.
- 4 Repeat step 3 to add further results, or when data entry is complete, press 'Done'. The data is used to generate slope and intercept values, which are automatically saved and displayed on screen.

Only the slope and intercept are saved. Individual data points are not held in memory.

Use Slope and Intercept

- 1 A slope and intercept will first need to be determined from externally existing data.
- 2 Select the Sample ID from the list or scroll to the bottom of the list to create a new one.
- 3 Press 'Edit' to enter a value for Slope, and repeat for Intercept. The saved slope and intercept are displayed on screen.

Measurement of TSS by calibration of turbidity results are indicative. Changes in the nature of the sample will affect the accuracy of results.

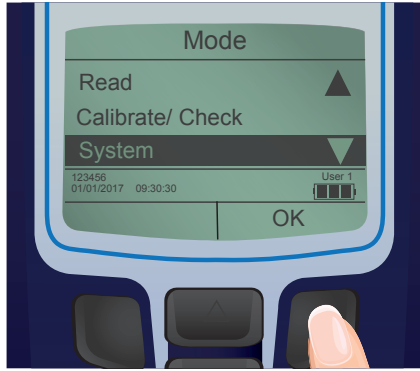
Restore Factory Calibration



Select 'Calibrate/Check' from the main menu then 'Restore Factory Calibration'. Select 'YES' to confirm the restoration.



System Settings



Select 'System' from the main menu and choose from the following options:

Log

[See page 32](#)

Operator ID

[See page 33](#)

Sample ID

[See page 34](#)

USB Connection

[See page 36](#)

Units of Measurements, Language

[See page 39](#)

Set Time and Date, Version

[See page 40](#)

Backlight and LCD Contrast

[See page 42](#)

Log



From the main menu select 'System mode' then 'Log' where the 'Results' and 'Calibrations' logs are stored. In both sections there is a choice to either view or clear data.

The results log holds up to 1000 data points. Each log entry records date, time, Sample ID, Operator ID, Reading Mode and result for each measurement.

The log can be viewed on the device or downloaded to a PC as a text file using the USB connection.

Data is stored in chronological order. When the log is full, the oldest stored result will automatically be overwritten

1. Operator ID



To access operator ID from the home screen press 'System' mode then 'Operator ID'. Up to 12 Operator IDs can be created. When selected, the ID will appear in the info panel on screen as well as in the log.

2



To create a new Operator ID

Scroll to the bottom of the list, then select 'New' to create an ID.

Note: The screen will be blank on first use.

3



Use the Up/Down buttons to select characters. When the correct character is shown, press and hold the [+] key to move to the next character. To delete characters press and hold the [Del] key. Select 'Done' to save the ID.

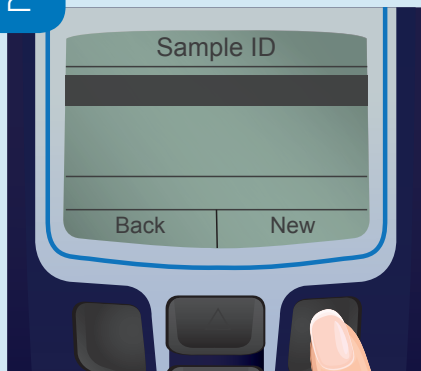
1. Sample ID



Select the 'System' mode then 'Sample ID'.

The Sample ID is required to generate TSS (Total Suspended Solids) calibrations.

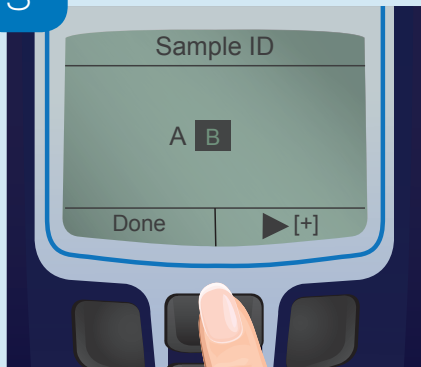
2



To create a new Sample ID

Scroll to the bottom of the list, then select 'New'. Use the Up/Down buttons to select characters. When the correct character is shown, press and hold the [+] key to move to the next character.

3



To delete characters press and hold the [Del] key. Select 'Done' to save the ID. Up to 24 Sample IDs can be created.

4



Select 'OK' on the Sample ID to be used. When selected, the ID will appear in the information panel on screen as well as in the log when results are stored.

5



To record results without a Sample ID. Select a blank entry by scrolling to the bottom of the list and select 'Back'.

Edit or Delete a Sample ID



Highlight the ID and select 'OK'. The screen shows the option to select either 'Edit' to change the ID, or 'Delete'. Deleting the sample ID will not affect results stored in the log.

USB



To access USB from the home screen press 'System' mode then 'USB'.

There are 2 options:

Hard Drive

Use 'Hard Drive' mode for to downloading results and calibration logs or updating the instrument firmware.

[See page 38](#)

COM Port

In COM Port Mode results are streamed across the USB connection in real time using a serial communication format (emulating RS-232). In this mode of operation, Palintest COM Port drivers are required. Please contact Palintest to access the drivers for installation.

1. Hard Drive



To download results and calibration logs, or to update the instrument firmware the device must be in 'Hard Drive' mode .

From the home screen press 'System' mode then 'USB' then 'Hard Drive'.

2



Once the device is in 'Hard Drive' mode connect to a PC, using the supplied USB cable.

When the instrument is connected it will be accessible as a removable drive, containing two log files:

CAL LOG

The calibration data log file.

LOG

The results data log file.

The log files should be copied to the PC before being opened or edited in a text viewer or other application. The CAL LOG will only appear if a calibration has been completed.

This data can be imported in to most common spreadsheet applications by using the import wizard and setting the columns as 'tab' delimited.

Turbimeter_Plus_XXX_YYY

This is the operating firmware of the instrument which can be upgraded if required. XXX & YYY represent the major and minor release version numbers of the firmware file (e.g Turbimeter_Plus_001_001).

Please ensure your device is up to date with the latest firmware releases to ensure the best performance from your device. Any upgrade files will be made available by Palintest.

Units



To change units which results are shown in, from the home screen press 'System' mode then 'Units'.

Results can be displayed in:

- **NTU** -Nephelometric Turbidity Units
- **FTU** -Formazin Turbidity Units
- **FNU** -Formazin Nephelometric Units
- **FAU** -Formazin Attenuated Units

Language



To change the language of your device from the home screen press 'System' mode then 'Language'. Choose from English, French or Spanish.

1. Set Time



From the main menu select 'System mode' then 'Set Time'.

2



Use up/down keys to adjust the hour; press the right key to select and adjust the minutes. The time is displayed in 24Hr format.

Set Date



From the main menu select 'System mode' then 'Set Date'.

2



Use the up/down keys to adjust each value in the date display, using the left/right keys to select the field. The date format can be set to either DD/MM/YY or MM/DD/YY

To change the date format select 'System Mode' from the main menu then 'Date Format'. DD/MM/YYYY OR MM/DD/YYYY.

Version/ Serial Number



From the main menu select 'System mode' then 'Version'. The serial number of the instrument and the software version are displayed.

1. Backlight



The instrument display features a high intensity backlight for use in low light conditions. Select either 'On' or 'Off'.

LCD Contrast



From the main menu select 'System mode' then 'LCD Contrast'.

2



The LCD screen contrast can be manually adjusted. Use the up/down buttons to adjust the contrast until the alternating shapes are clearly visible and press 'Save'.

Message	Error	To solve
Error 100	Measurement	The reading is above 1050 NTU.
Error 101	Incorrect Standard	The standard inserted is either the incorrect value or is no longer within an acceptable tolerance for calibration. Use the correct standard or replace the calibration set.
Error 107	Light Detection	The sample tube cap is not in place or the sample tube is not fully inserted. Replace the cap and read again or fully insert the sample tube. If the error persists, set the zero reference level by pressing the 'Ref Reset' whilst a capped tube is in the holder
Error 110	Battery Low	Instrument has insufficient power to perform reading. Menu functions still available .
Error 111	Battery Critical	Insufficient battery to power instrument. Instrument will save data and shut down.

Technical Support and Warranty

The Turbimeter Plus has a two year warranty.

Calibration standards should not be used after their stated expiry date. Replacement sets are available with part code PTC 092.

For technical and product support please visit

www.palintest.com

or contact Palintest at

support@palintest.com

Care and Maintenance

The Turbimeter Plus is IP67 compliant, so contact with water will not damage the internal components. It is recommended that the instrument is dry prior to use. The USB connector and cable must be dry before use. The instrument does not require regular cleaning for normal operation. If required, clean the instrument with a dust and lint free cloth. Do not clean the Turbimeter Plus with solvents or other cleaning agents.

Sample Tube

The sample tube should be clean and dry prior to insertion into the sample holder. Lint free polishing cloths are provided for this purpose. Small scratches on the sample tube can cause discrepancies in the test results. To reduce the effect of these scratches, place one drop of Silicone oil onto the tube and wipe across the glass using the lint free polishing cloth. Sample tubes should be rinsed with distilled water. Use a soft cloth to dry the sample tube. Do not air dry the sample cells as this may leave marks or residue on the surface.

Indexing a Tube

Indexing is used to identify the optimum orientation of the sample tube, particularly when taking measurements of low turbidity (<1NTU). Our continuous capture mode has been designed for this use, instructions shown on pages 17.

Check and Calibration Standards

SDVB turbidity standards are provided in the kit. Do not use the standards after the stated expiry date. Exposure to freezing temperatures can affect the quality of the standards. Do not store the standards at temperatures close to 0 °C. The use of a heat pad is recommended for shipping. Replacement SDVB turbidity standards are available from Palintest and authorised distributors.

- When storing the unit in the case, always keep a clean, dry tube with its cap on in the optical cell.
- Ensure all glassware is kept clean and dry before storage.
- If there is water in the optical cell this needs to be removed before replacing it in the case. (Be especially careful that dirt is not wiped into the optical windows – consider using a cotton bud or similar to remove water without touching the sides of the optical cell)
- Do not keep damp cleaning cloths inside the case.
- Be especially careful when changing the batteries to place the sealing gasket over the raised flange on the battery compartment cover before replacing.
- If any moisture gets into the case keep the lid propped open until it dries out thoroughly.
- Never attempt to wipe the recessed optical lenses or the areas around these recesses. Dirt or debris pushed into the recessed window will cause erroneous readings or error messages to be displayed.

Replacement Sample Tubes	PTC555
USB Cable	PT126
Replacement Calibration Kit	PTC092
Silicone Oil	PT120
4000 NTU Formazin Stock Solution	PT121
Lint Free Polishing Cloth	PT399
Sample Tube Brush	PT663
Battery Compartment Gasket and Screws	PT123
Battery Compartment Kit (Cover, Gasket and Screws)	PT125
Replacement Gaskets For Battery Cover, Pack of 5.	PT124
Absorbent cloths, Pack of 5	PT122

Technical Specification

Optical System	Instrument Type QuadoptiX™ technology for turbidity measurement dual light source.
IP Rating	IP67
Optical Source	Dual infrared LED sources 860nm with optical focusing of beams
Optical Detectors	Photodiodes 750nm to 1100nm
Ranges	0.01 – 1050 NTU
Accuracy	± 2.0% NTU
Display	240 x 160 pixel LCD with contrast adjustment
User Interface	On-screen prompts available in English, French and Spanish
Result Units	NTU, FNU, FTU, mg/L (TSS mode)
Modes	Turbidity (normal, average, continuous capture), Total Suspended Solids
Data Storage	1000 results including date, time, sample ID, operator ID and mode. Last 12 good calibrations including Operator ID

Size (W x L x H) & Weight	82 x 225 x 50mm, 340 g
Power Supply	2x 1.5V 'AA' alkaline batteries
Battery Life	10,000 tests (typical use, backlight off, 'AA' alkaline cells) and auto-off
Mains	5V DC, 900mA delivered via USB port
Power Management	Auto switch off or continuous
Power Saving	User control for backlight
USB	Micro- USB type B connector
Instrument Memory	Non-volatile storage
Memory Capacity	Up to 1000 data sets. Each data set includes date, time, Sample ID, Operator ID, method number, method name, result, units
Sample IDs	Up to 24 at any time
Operator IDs	Up to 12 at any time
Data Output Format	Plain text
Software Upload	Software update by 'drag and drop' in USB Hard Disk Mode.

www.palintest.com

Palintest

Water Analysis Technologies

A **Halma** company

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