Potalab® + (C)

Advanced Portable Water Quality Laboratory (Physico-Chemical)

ZI PTW 10010C

Palintest®

Who We Are

Over the last 20 years the **Wagtech®** name has become synonymous with water testing in the most extreme circumstances and remote locations.
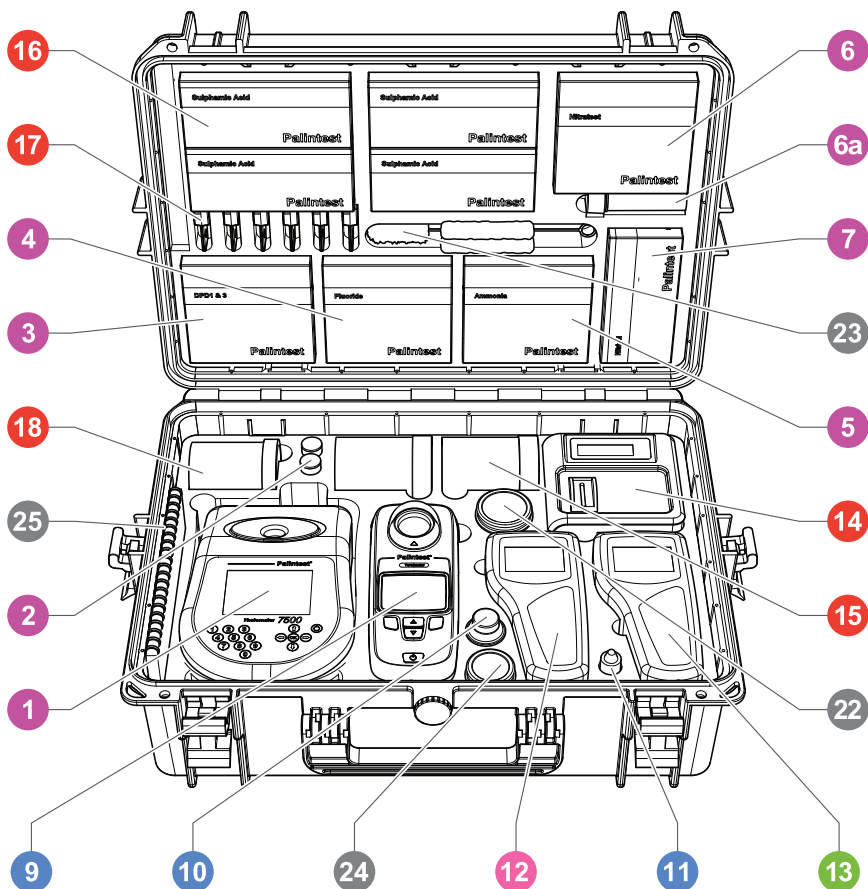
Developed for a range of applications, from long term surveillance to rapid response testing in an emergency, the **Wagtech®** kits provide a robust solution to testing key water quality parameters in the field.

Acquired by **Palintest®** in 2011, the manufacture and support of the **Wagtech®** portable water quality laboratory range has now been integrated into the **Palintest®** product family.

Further information regarding the **Wagtech®** product range can be found at: **www.palintest.com**

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Fig 1. Potalab® + (C) Physico-Chemical test kit layout.
Coloured circles indicate the chapter colour in which their use is explained.

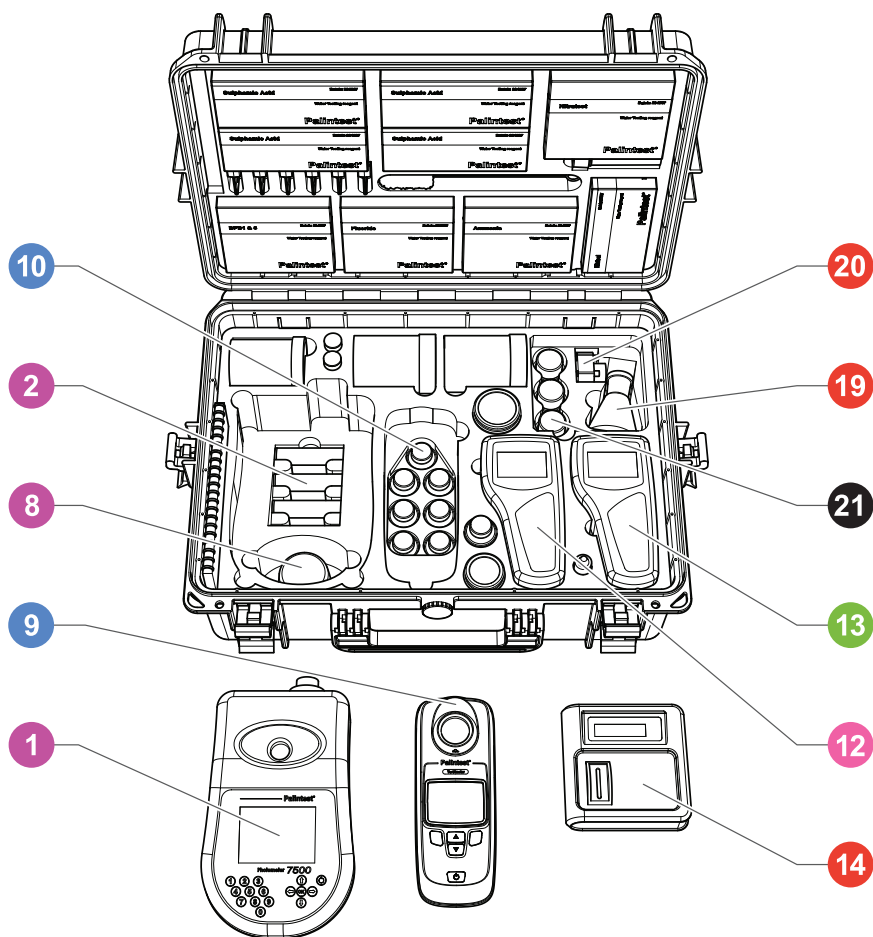| Function	Equipment
● Parameter Testing Using Photometer 7500	① **Photometer 7500 BT**
	② **Cuvettes (+ under Photometer)**
	③ **Reagent Tablets (Chlorine DPD) 'DPD1 & 3'**
	④ **Reagent Tablets (Fluoride)**
	⑤ **Reagent Tablets (Ammonia)**
	⑥ **Reagent Tablets (Nitrate) 'Nitratest' and Tube (6a)**
	⑦ **Reagent Tablets (Nitrite) 'Nitricol'**
● Turbidity Measurement	⑨ **Compact Turbimeter**
	⑩ **Turbidity Standard & Cuvettes**
	⑪ **Silicon Oil**
● pH Measurement	⑫ **Digital pH Meter (+ electrode)**
● Conductivity Measurement	⑬ **Digital Conductivity Meter (+ electrode)**
● Arsenic Testing	⑭ **Digital Arsenator**
	⑮ **Reagent Tablets (Sodium Borohydride A2)**
	⑯ **Reagent Powder (Sulphamic Acid)**
	⑰ **Filter Paper Holders (Black & Red)**
	⑱ **Arsenator Filter Papers**
● Other Items	㉒ **Dilution Tube**
	㉓ **Tube Brush & Lint Free Cloth**
	㉔ **Dilution Tube - Sample Bottle Inside**
	㉕ **Instruction Manual**

Potalab® + (C) Water Test Kit - Layout

Fig 2. Potalab® + (C) Physico-Chemical test kit with instruments removed to show equipment beneath. Coloured circles indicate the chapter colour in which their use is explained.

Function	Equipment
🟣 Parameter Testing Using Photometer 7500	① **Photometer 7500 BT** ② **Cuvettes (+ under Photometer)** ⑧ **Photometer Cap (under Photometer)**
🔵 Turbidity Measurement	⑨ **Compact Turbimeter** ⑩ **Turbidity Standard & Cuvettes**
🩷 pH Measurement	⑫ **Digital pH Meter (+ electrode)**
🟢 Conductivity Measurement	⑬ **Digital Conductivity Meter (+ electrode)**
🔴 Arsenic Testing	⑭ **Digital Arsenator** ⑲ **Conical Flask (under Arsenator)** ⑳ **In-Filter Arsenic Trap (under Arsenator)**
⚫ Other Items	㉑ **pH Buffer and Conductivity Solutions (under Arsenator)**

2.0 Introduction

Ideally suited to longer term surveillance and professional monitoring, the **Potalab® + (C)** Advanced Portable Water Quality Laboratory provides portable analysis of a wide and comprehensive range of key drinking water quality parameters where the most important factor is to obtain laboratory levels of accuracy.

Built for physico-chemical water testing, the **Potalab® + (C)** is the most advanced portable water quality laboratory available today.

3.0 Introduction

The **Palintest Photometer 7500 Bluetooth** is a direct-reading, waterproof photometer for determining key water quality parameters for drinking water, wastewater and process water samples. Designed for both portable and laboratory use, the Photometer 7500 Bluetooth should always be used with genuine Palintest reagents for optimal performance.

The fundamental operating technique applied to the Photometer 7500 Bluetooth is based on the principles of optical absorbance and scattering of visible light.

Optical absorbance techniques are based on the use of Palintest (spectro)photometric reagents, creating visible colours with specific analytes upon reaction. The intensity of colour produced is measured with the Photometer 7500 and the data compared to the stored calibration data to deliver the final result.

Optical scattering techniques produce small particles to scatter the source beam, the amount of scatter providing a result for the concentration of parameter under test.

For more information regarding the science behind both photometric and turbidimetric analysis technology please visit **www.palintest.com/know**.

The Photometer 7500 is provided with programmed methods for a comprehensive range of water quality parameters. Upon choosing a test the instrument automatically selects the required parameters for accurate analysis including wavelength and reaction time. Upon completion of the test optional follow-on tests are available and results can be converted to alternative units of expression e.g. mg/l to ppm, N or NH_3.

The Photometer 7500 Bluetooth offers a choice of connectivity to download all or selected results and/or upload up to 30 User Defined Tests. Choose from Bluetooth 4.0 wireless connectivity or USB connection.

Bluetooth 4.0 (also known as Bluetooth SMART or Low Energy) connection allows seamless data exchange using the Palintest Aqua Pal app, available for iOS and Android devices. See Section 3.11 for more details.

USB connection via the port located at the rear of the instrument provides a choice of either 'Hard Disk' mode or serial communication mode.

See Section 3.4 for more details.

The Photometer 7500 Bluetooth offers a choice of either mains power via the USB port or using three 1.5V 'AA' batteries (supplied).

The Photometer 7500 Bluetooth is supported with a two year warranty and a full range of service, calibration and technical support. Support resources are available at **www.palintest.com** relating to both products and applications.

3.1 Quick Start

Photometer 7500 Layout

Adaptive Cuvette Holder (do not insert finger!)   USB Port   Light Cap   On/Off

LCD screen with backlight

Numerical keys for Hotkey operation and text entry

Navigation Keys
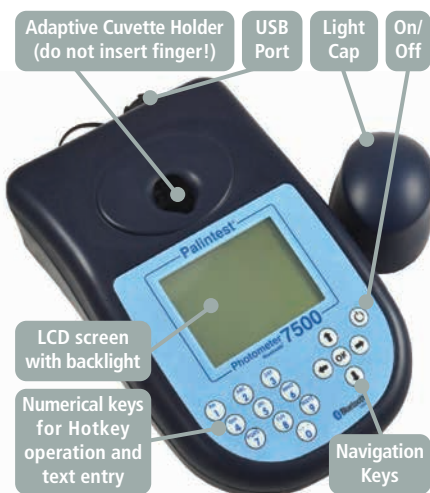
Photometer 7500 Interface

The LCD screen features a selectable backlight with the screen separated into four clear, easy to read zones:
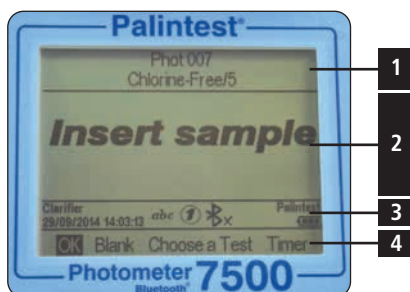
1 Mode or Test Identification.

2 Dialogue screen - prompts and choices will be displayed as a list. Select using up/down arrows.

3 Info Panel - displays status icons, date/time and Sample/Operator ID

4 Action select - choices are displayed as a row. Use left/right arrows to select.

Info Panel Icons

Icons	Description
(███)	Battery status
✳✓	Bluetooth connected
✳✗	Bluetooth on, not connected
ABC abc 123	Upper/lower case text/number entry
①	Hotkey Entry Mode Enabled
•⟵•←	USB connected
DISK / COM	Hard Drive/COM port mode

3.2 Taking a Sample

The first critical step in any analysis is taking a representative sample. When selecting a sample point a number of care points are recommended as follows:

• Ensure the sample point is safe to access and follow all relevant/required precautions

• When sampling from a tap or outlet, remove any attachment and clean the tap/outlet with a dry cloth before allowing the tap/outlet to run for 1 minute prior to sample collection

• When sampling from a river or stream take the sample as near as possible to the main flow and not too close to the edge where the water may be still and unrepresentative of the sample as a whole

• Rinse any sample container repeatedly with the sample to prevent any cross contamination from previous samples

• Once collected the sample must be processed immediately or as quickly as possible, especially for highly reactive species such as chlorine for example. The use of a portable field test kit makes this possible. However if the delay between sample collection and analysis is likely to be several hours chill the sample to preserve and prevent potential microbiological growth

• Samples containing solid particles can interfere with photometric analysis. Either allow solids to settle and decant the clear liquid or filter the sample prior to analysis

3.3 Starting up the Instrument

Power Supply

The Photometer 7500 Bluetooth is designed to be powered either from alkaline batteries or via the USB port.

When operating on battery power, the battery level is indicated on the Info Panel. A minimum voltage of 3.0V is needed to operate the photometer and a flashing battery symbol indicates a critically low battery. Change batteries immediately or switch to alternative USB power. The Photometer 7500 Bluetooth will automatically power down when power is no longer capable of providing acceptable performance.

To power via the USB port, use the supplied cable connected either to the mains adaptor or a PC. The USB icon will appear when the USB connection is made and battery power will no longer be consumed.

The Photometer 7500 Bluetooth has a back-up battery mounted internally to save instrument settings and data during power loss and instrument idle periods.

Replacing Batteries

The battery compartment is located on the base of the instrument and secured by four screws. Remove the cover and install a complete set of new batteries, observing the correct polarity as indicated. Use 3 x 1.5V 'AA' alkaline batteries or equivalent. See Section 3.9 for more details.

To avoid corrosion damage through leakage, remove batteries from the instrument if it is to be stored or left unused for a long period.

Start-up Screen
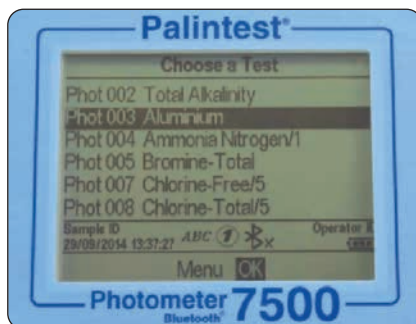
The default start-up screen on power up is the 'Choose a Test' screen.

To access the Mode menu press the left arrow key to highlight 'Menu' and OK.

To choose a test use the up/down arrows to scroll through the list and press OK on the desired parameter.

Mode Screen
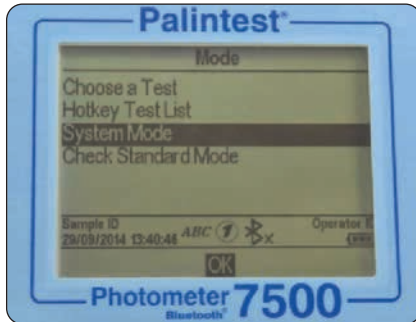
The Photometer 7500 has four operating modes as follows:

Choose a Test

The Choose a Test mode is the standard operating mode for taking photometer readings and is the default start-up screen on power up. See Section 3.5 for more information.

Hotkey Test List

Assign up to 10 of the most frequently used tests for single button access when in Hotkey mode, indicated by the icon in the Info Panel. More information on how to set up and use Hotkey mode can be found in Section 3.4.

System Mode

Personalise your Photometer 7500 Bluetooth and manage stored data within the System mode. Options include setting Operator/Sample IDs, interrogating the result log and defining the instrument operating conditions. See Section 3.4 for further information.

Check Standard Mode

Validate performance of your Photometer 7500 Bluetooth using Palintest Check Standards. See Section 3.7 for more information.

3.4 System Mode

Personalise your Photometer 7500 Bluetooth and access the data log via the System Mode.
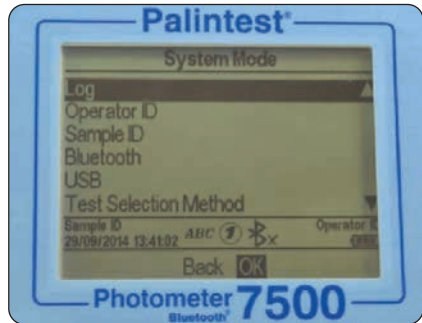
Scroll up or down using the appropriate keys to see all available options. The options and available settings are as follows:

Log

The Photometer 7500 Bluetooth has an internal data log for up to 500 data points. The data is stored automatically upon completion of the test and automatically overwrites the oldest result when the memory is full. The data log is unaffected by power on/off.

Each data point is stored in a comma-separated values (CSV) format and consists of date, time etc.
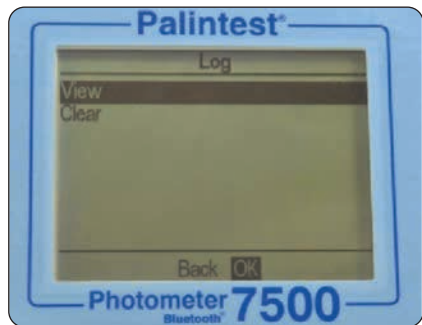
Selecting Log offers two choices:

View - to view individual data points use the up/down keys. Data is stored in chronological order with the most recent result shown by default. Scroll through results using the up/down arrows.

Select Back to return to the previous menu.

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Clear - the entire log can be deleted from the Photometer 7500 Bluetooth if the instrument is not locked (see **System Lock**). Selecting Clear produces the following screen:
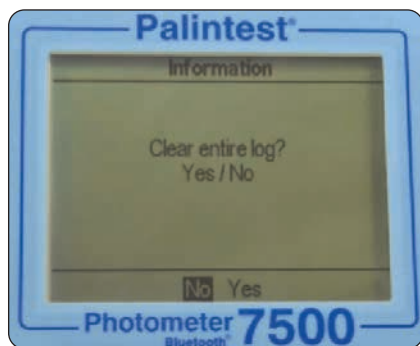
Data can be downloaded via either Bluetooth (see **Bluetooth Log Transfer**) or USB connection (see **USB Interface**).

Operator ID

The Photometer 7500 Bluetooth offers the option to create up to 12 unique alphanumeric Operator IDs. Operator IDs are added to the result data automatically but deleting IDs does not affect the result log.
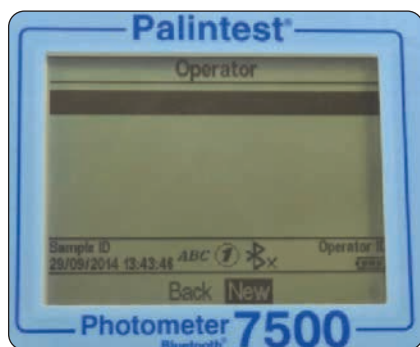
To create a new Operator ID, select Operator ID and use the up/down keys to select a blank field. Select New and press OK.

Alphanumeric characters are entered/edited using the 0-9 keys or the up/down keys. Press and hold the 1 key to toggle between upper case, lower case and numeric characters.

After entering a character, the cursor automatically moves to the next position if no key is pressed. Alternatively press the right key.

Up to 10 characters can be added for Operator IDs, including spaces.

To edit characters use the left/right keys to select the desired character. Press and hold the left key to delete the character or change the character using the entry mode.

When the Operator ID is correct press the OK key to create the ID and return to the Operator ID list. The new Operator ID will be displayed in the Operator list.
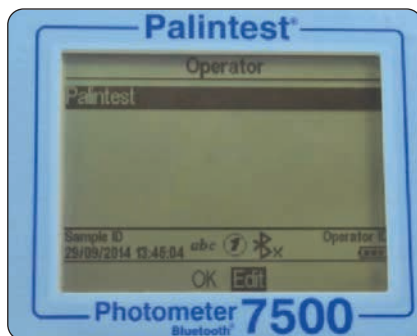
Choose the Operator ID to be used by scrolling through the list and pressing the OK key on the desired choice. The instrument will return to the System menu.

To modify or delete an existing Operator ID, highlight the ID and select Edit. Choose either Edit to modify the existing entry or Delete to remove it from the list.

Sample ID

The Photometer 7500 Bluetooth offers the option to create up to 24 unique alphanumeric Sample IDs. Sample IDs are added to the result data automatically but deleting IDs does not affect the result log.
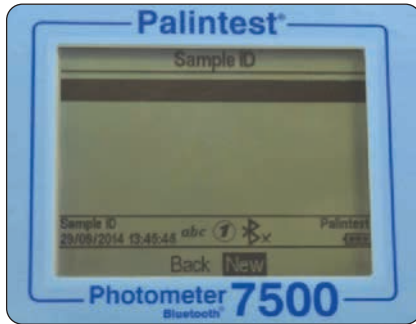
To create a new Sample ID, select Sample ID and use the up/down keys to select a blank field. Select New and press OK.

Alphanumeric characters are entered/edited using the 0-9 keys or the up/down keys. Press and hold the 1 key to toggle between upper and lower case characters.

After entering a character, the cursor automatically moves to the next position if no key is pressed. Alternatively press the right key.

Up to 10 characters can be added for Sample IDs, including spaces.

To edit characters use the left/right keys to select the desired character. Press and hold the left key to delete the character or change the character using the entry mode.

When the Sample ID is correct press the OK key to create the ID and return to the Sample ID list. The new Sample ID will be displayed in the Sample list. Choose the Sample ID to be used by scrolling through the list and pressing the OK key on the desired choice. The instrument will return to the System menu.

To modify or delete an existing Sample ID, highlight the ID and select Edit. Choose either Edit to modify the existing entry or Delete to remove it from the list.

Bluetooth

The Photometer 7500 Bluetooth features the latest Bluetooth 4.0 (also known as Bluetooth Low Energy or Bluetooth SMART) for wireless communication with external devices.

The Palintest Aqua Pal app provides seamless data exchange with the Photometer 7500 Bluetooth, provides data trend analysis and user-defined action limits for key parameters.

Additional data management functionality is provided by the Palintest Portal (www.palintestportal.com). Uploaded data can be shared with colleagues and customers within your User Group(s) and integrated into customised reports. See Section 3.11 for more information on the Aqua Pal app and the Palintest Portal.

There are four options available in the Bluetooth menu:

- Bluetooth Communications ON - activate the Bluetooth and make the Photometer 7500 Bluetooth visible for connection/pairing
- Bluetooth Communications OFF
- Bluetooth Log Transfer - transfer historical log data to the Aqua Pal app when connected to a remote device
- Bluetooth Device ID - create a unique device name for the Photometer 7500 Bluetooth to discriminate between multiple connections

Bluetooth Communication On

Select this option to enable Bluetooth communications allowing the instrument to be paired with a suitable Bluetooth SMART enabled device. Visit www.palintest.com\know for more information regarding available/suitable Bluetooth SMART devices.

The Bluetooth icon is shown in the Info Panel when Bluetooth is enabled. Connection status is shown as follows:

indicates the Bluetooth is activated and connected to an external device

indicates the Bluetooth is activated but the Photometer 7500 Bluetooth is not connected to an external device

Bluetooth Communication Off

Selecting this option disables the Bluetooth communications module. The Bluetooth icon is not visible on the Info panel.

Bluetooth Log Transfer

Selecting this option transfers all or a selected group of results stored in the log to the paired mobile device.

The Photometer 7500 Bluetooth will validate the paired connection and confirm readiness to transfer.

Transferring selected data will require specification of the result log window e.g. from result 40 to result 100 to be transferred selectively.

Press OK to transfer the data log. The data will transfer in series. Each data point is validated by the Aqua Pal app prior to upload of the next.

If the connection is lost the Photometer 7500 Bluetooth will prompt for re-connection. If connection is not required or possible press Exit to disable Bluetooth and cancel the log transfer.

The message 'Log transfer is complete' will be shown when all data points have been uploaded successfully. Press OK to return to the previous menu.

Bluetooth Device ID

A number of Photometer 7500 Bluetooth instruments may be available to connect to a remote device, although only one active connection is possible at any time. A user-defined Bluetooth Device ID ensures simple pairing between the desired Photometer 7500 Bluetooth and the Palintest Aqua Pal app.

Creating and/or editing Bluetooth Device ID is identical to Operator and Sample ID creation.

USB Interface

The waterproof USB interface provides both communication between the Photometer 7500 Bluetooth and a PC and an alternative mains power source via the adaptor.

When connected the USB icon will appear, replacing the battery icon in the Info Panel, as power will be preferentially drawn from the external source.

The USB data interface has a choice of two operating modes - Hard Drive and COM Port. The current status of the USB connection is shown on the Info panel when the USB lead is connected.

Toggle between COM Port and Hard Disk mode in the System -> USB menu by selecting the desired option.

The USB connection supports software update and data download through a simple 'drag and drop' approach when operated in Hard Disk mode.

Hard Drive

The instrument appears as a removable hard drive when connected to a PC in Hard Disk mode. Upon connection the remote drive will have the following files included:

- 7500_***.afx.*** where * represent version numbers of software - this is the operating software for the Photometer 7500 Bluetooth
- Log.txt - the data log file stored in a comma separated value (csv) format
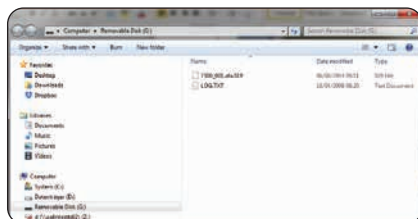
Operating software or calibration library can be updated by dragging a new version to the instrument - contact support@palintest.com for new software if this option is required. Any updates to operating software will be notified via the www.palintest.com\know portal.

Downloading the result log is carried out by dragging the LOG.txt to the local desktop and opening the file with any program that can open CSV format files.
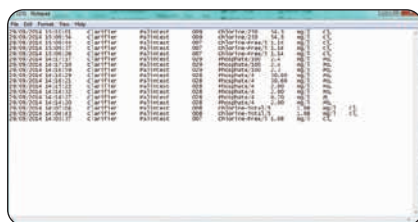
For more information regarding extracting and opening result logs using the Hard Disk mode visit www.palintest.com/know.

COM Port

The instrument behaves as if connected to the PC serial port via RS232 when connected in COM Port mode, allowing remote control from an external software system and data upload. This allows backwards compatibility with software written for earlier models of Palintest instruments. In this mode, the PC requires installation of a USB virtual COM Port driver, available from www.palintest.com/know, and the availability of software operating as a virtual com port.

A large number of third-party software systems are available to provide data upload and remote control of testing using the COM port mode. Please contact your local Palintest representative for more details.

Test Selection Method

The Photometer 7500 Bluetooth offers two distinct methods of selecting test parameters - Phot Number Entry Mode or Hotkey Entry Mode.
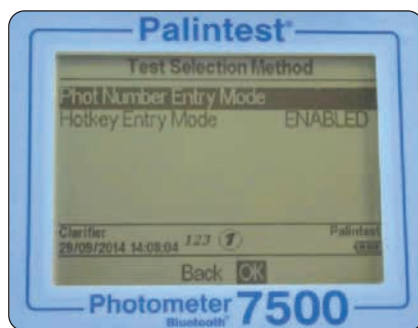
Phot Number Entry Mode is active by default. Switching to Hotkey mode is carried out by enabling Hotkey Entry Mode in the Test Selection Method menu.

Select Hotkey Entry Mode and press OK. If 'Hotkey Entry Mode' is enabled, the ① icon is displayed on the Info panel.

Only one Test Selection Method is permitted at any time.

Phot Number Entry Mode

All methods/calibrations (including User Defined Tests) are identified by a unique three-digit ID Phot Number. When operating in Phot Number Entry Mode, access the test of choice quickly by typing the three-digit number when in either the Choose a Test screen or any result screen.

For example, to access the Phot 002 Total Alkalinity test press '002', '02' or just '2' to load the method instantly.
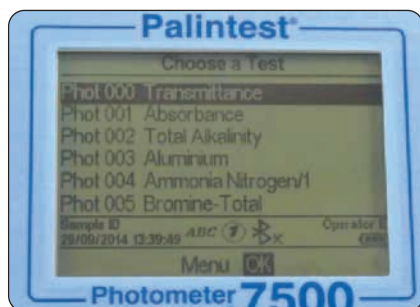
Hotkey Entry Mode

This option provides single button access to the ten most frequently used tests by assigning each to a unique position on the numerical keypad.

To assign a test to a specific Hotkey (0-9), firstly ensure that 'Hotkey Mode' is enabled. This is shown by the ① indicator on the Info Panel.

Select the Hotkey Test List from the Mode menu. The ten available positions are listed along with assigned or empty slots.

Select the Hotkey to assign (0-9) and use the up/down arrows to highlight the required parameter/method from the Choose a Test list.
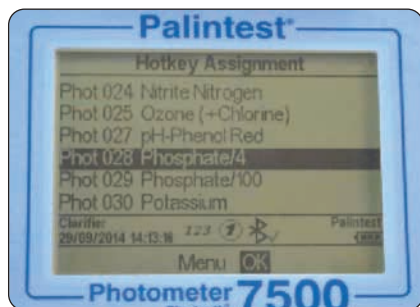
Press OK and the test will be assigned to the defined number.
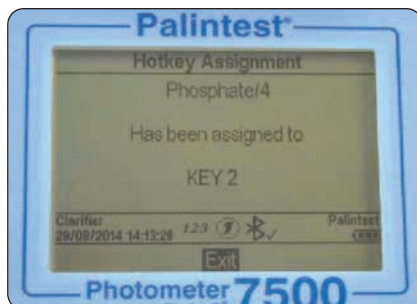
Units

The Photometer 7500 Bluetooth offers the choice of result expressed in mg/l, ppm, mmol/l, μmol, g/l and μg/l.
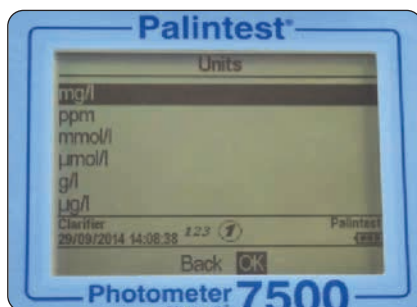
Changing the result units will not affect the result log.

Dilution Factor

When samples are above the test range, indicated by >> on the result screen, a dilution procedure can be used. Setting Dilution Factor to On will prompt the Photometer 7500 Bluetooth to automatically request the dilution factor when carrying out a test.

Change the dilution factor by using the up/down arrows or manually type the dilution factor. The instrument will automatically correct the result for the dilution and display the corrected result (which will also be stored in the result log).

The maximum dilution factor permitted is 99.

If the calculated result exceeds the available number of permitted characters >> will be displayed

NOTE: do not use sample dilution when measuring pH or alkalinity.

System Lock

To prevent unauthorised or inadvertent changes to the System settings or log deletion a four digit code can be used to lock several options.

The default code is set to 6812. To change the System Lock code follow the on-screen prompts to choose a memorable four digit number.

When the System Lock is applied, the items accessible within the System Mode are limited until the unlock code is entered. Access is limited to viewing the result log, adjusting the backlight, contrast and Bluetooth settings.

User Defined Tests

In addition to the many available calibrations/methods, the Photometer 7500 Bluetooth provides additional capability for up to 30 User Defined Tests. A User Defined Test is built using a table of calibration data consisting of up to 10 data pairs of absorbance and concentration.

Download or request a copy of Usertestbuilder.exe (suitable for Windows operating systems) from our websites to define the details and calibration data as shown below:
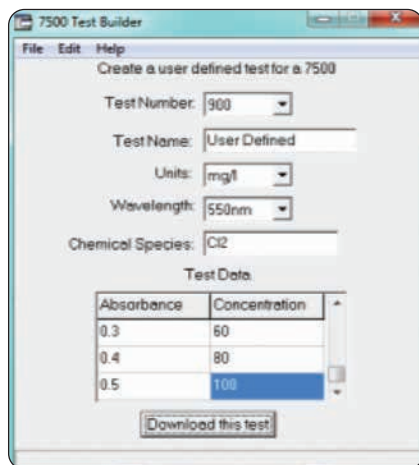
Connect the Photometer 7500 Bluetooth to the PC using the USB cable provided, ensuring the instrument is set to Hard Drive mode.

Once data is complete press "Download this test" to transfer the method details and calibration. The Photometer 7500 Bluetooth will respond with Test Data Accepted.

Alternatively save the test data as a *.txt file and drag and drop onto the Photometer 7500 Bluetooth. User Defined Tests are stored in Phot Numbers 900 - 929 to avoid confusion with standard Palintest calibrations.

Press OK once the test has been uploaded to view the test in the User Defined Test list.

A number of options are available within the Edit User Defined Test menu:

BACK   return to the previous menu

ADD   add additional User Defined Tests

EDIT   upload new data for the selected test

DELETE remove the test from the instrument

For more information regarding creation and upload of User Defined Tests please visit **palintest.comknow**

Accessing User Defined Tests can be carried out by assigning to Hotkeys (if enabled), scrolling through the list of tests or entering the required Phot Number.

Language

Select the desired local language for operation, choosing from English, French, Spanish, German, Italian and Chinese (Mandarin). The selection of language will also adjust appropriate tests and units to local convention as required.

Set Time/Set Date/Date Format

All test results are recorded automatically in the Data Log and appended with date and time (plus additional information). Date and time are stored on an internal clock, supported by a coin cell battery.

To correct the time select Set Time from the System menu.

Use the up/down keys to adjust the hour; press the right key to select and adjust the minutes.

Press OK when the correct time is set.

To correct the date select Set Date from the System menu.

Use the up/down keys to adjust the day/month/year, using the left/right keys to select the field.

Press OK when the correct date is set.

The Date Format can be set to DD/MM/YYYY or MM/DD/YYYY as required. To select the required format highlight the desired choice and press OK.

Time Out

When operating using battery power the Photometer 7500 Bluetooth provides automatic power-off as a power-saving measure. Three settings are provided:

Normal 5 minutes

Long   15 minutes

Off   (disables Time Out)

The time intervals begin after the last key is pressed or activity takes place.

Time Out is automatically disabled when the instrument is powered by USB supply and during a Bluetooth data log transfer.

Back Light

The instrument display features a high intensity backlight to support use in low light conditions. The backlight is designed to use minimal energy but activating the Backlight will naturally consume battery power more rapidly. The settings available for Backlight are:

Backlight Auto-Dim Backlight activates on any key press and dims after 15 seconds automatically.

Backlight On   Backlight is on permanently

Backlight Off   Backlight is off permanently

LCD Contrast

In addition to the Backlight, the default contrast setting for the display can be adjusted using the up/down keys when light conditions are difficult.

The display provides a sequence of alternating squares to give visual indication of the correct settings to apply.

When complete/acceptable press the OK key.

Version

The serial number of the instrument and the software version are displayed. The instrument serial number will be required for technical support and servicing/warranty and can also be found on the base of the instrument.
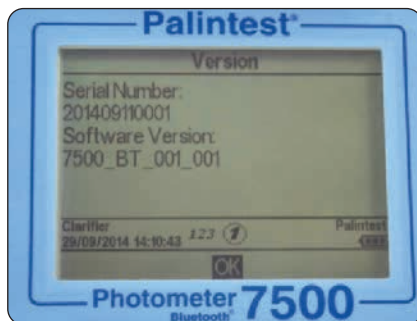
3.5 Analysing Samples

The Photometer 7500 Bluetooth provides simple, accurate and reliable analysis of key drinking water, wastewater and process water parameters. Selecting the required parameter and performing the test are supported through on-screen prompts and comprehensive test instructions.

The principle of photometric testing is based on the absorption or scattering of a measured intensity

of incident light compared to the light intensity reaching the detector array. The light intensity is determined as Transmittance (%T) or Absorbance (A) and compared to calibration tables stored within the Photometer 7500 Bluetooth. The stored calibration tables convert %T or A to results in a variety of units (mg/l, ppm etc.) as defined in Section 3.4.

Calibration tables are defined by Palintest based on the measurement of reference standards using Palintest reagents. To achieve the best quality results there are a small number of care points:

1 Always use the provided light cap to prevent ambient light affecting the results.

2 Ensure Sample and Blank cuvettes are clean, dry and inserted correctly into the sample chamber, using the allocated orientation mark to align.

3 Always blank the instrument with untreated sample prior to analysis.

Additional guidance is provided in **Section 3.8 Photometric Testing Hints and Tips**

Selecting Test Parameters

The Photometer 7500 Bluetooth offers a number of choices to select the parameter to test:

Phot Number Entry - use the numeric keypad to enter the unique Phot Number to directly access any programmed calibration (including User Defined Tests). This method will not be available if the Photometer 7500 Bluetooth is operating in Hotkey Entry Mode.

Hotkey Entry - use the numeric keypad to directly access up to 10 of the most commonly used tests. When operating in this mode the Info panel will display the ① icon and Phot Number Entry mode will be disabled.

Choose a Test - available in either Phot Number Entry or Hotkey Entry modes, the full list of test parameters is available by selecting Choose a Test and scrolling using the up/down keys. When the desired parameter is highlighted, press the OK key to access the method. Tests are presented in Phot Number order.

When the required test is selected the Photometer 7500 Bluetooth automatically selects the correct wavelength and sets additional method parameters as required.

Test method protocols are defined in detail in the Palintest Phot Book, supplied with the Photometer 7500 Bluetooth, including the reagents and accessories that may be required.

When a test is selected, the Photometer 7500 Bluetooth screen will display a number of screens and options to guide the user through the testing process, as described in the following pages.

Dilution Factor

If selected in the System menu, the initial screen will request the defined Dilution Factor to apply to results.
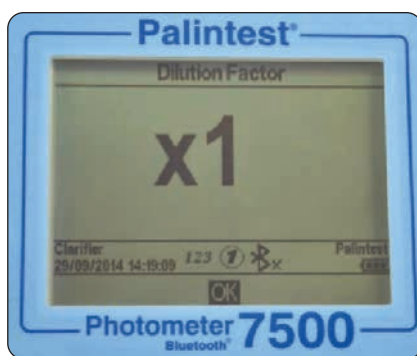
If Dilution Factor is not active this screen will not be shown.

Results shown on the final screen have automatically been corrected for dilution prior to display. Corrected results will also be stored in the log.

Blanking the Photometer 7500 Bluetooth

Blanking the photometer is a key first step in photometric analysis, effectively removing the potential entrained sample colour and minor amounts of turbidity from calculation of analytical results.

To blank the photometer, prepare a Blank cuvette using untreated sample i.e. sample that has not been reacted with any reagents. If the sample is to be diluted or physically treated (filtered for example) before analysis, use the same dilution/treatment for the Blank cuvette.

When accessing the test method the Photometer 7500 Bluetooth will request the user to Insert Blank.
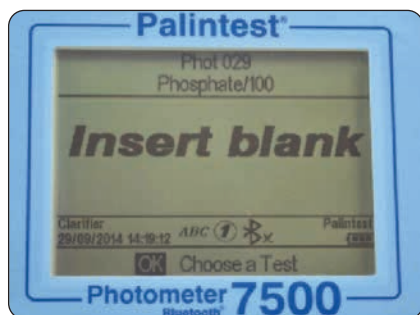
Insert the Blank cuvette and press OK.

The Photometer 7500 Bluetooth will determine the absorbance due to the sample colour at all wavelengths simultaneously and store in temporary memory for use in analysis.

Upon successful blanking the Photometer 7500 Bluetooth will automatically move to the **Insert sample** stage of the analytical method.

If the sample is too highly coloured to support effective blanking and subsequent analysis the error message "Error 9 is caused by the blank cuvette being too dark. Check the correct cuvette is being used".
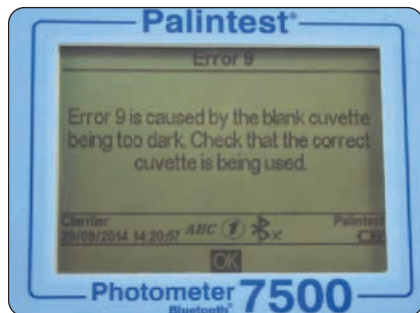
Ensure the blank cuvette is being used, not the sample plus reagent cuvette. Sample colour can be reduced by dilution with clean water; the dilution selected should take account of the expected concentration of parameter under test.

Blank results are stored in the temporary memory of the Photometer 7500 Bluetooth and will be used for all subsequent tests until:

- The instrument is powered down (temporary memory is lost/deleted)

- A new Blank reading is taken - this option is available on accessing any subsequent test at the base of the screen. Repeat the blanking process if the sample changes significantly or a new sample is under test

- Some tests use a reversed blanking process where a coloured blank cuvette may be required. When changing between standard tests and 'reverse blank' test, a new blank sample will be requested by the Photometer 7500 Bluetooth

If the blank value generated in this step is not detectable an error message will be displayed "Error 7 is caused by too much ambient light. Try using the light cover provided with the instrument".
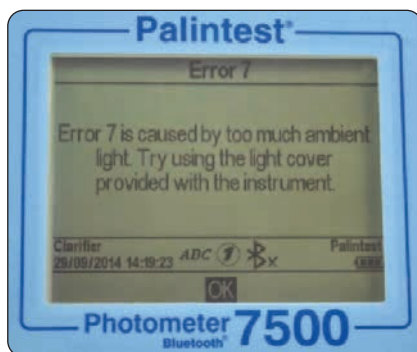
See Section 3.8 Photometric Testing Hints and Tips for more advice regarding effective blanking.

Reading Results with the Photometer 7500 Bluetooth

Assuming a suitable blank has been recorded, the next step of the photometric analysis process is to carry out the reading step.

Prepare a Sample cuvette following the method instructions provided in the Palintest Phot Book.

Select **Read** at the base of the screen and press **OK**.

At the **Insert sample** prompt, insert the sample cuvette ensuring it is clean and dry and oriented correctly using the location mark.
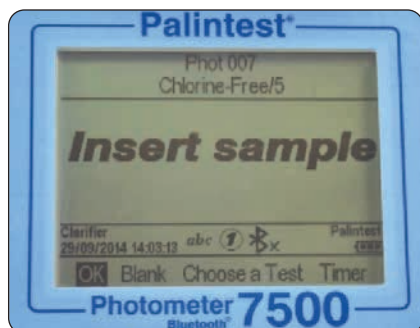
Press OK to begin the measurement process. The screen will display Reading...

At the completion of the measurement process the result is displayed on screen.

Timer

Many photometric methods require a reaction time to develop optimise sensitivity, the recommended time period being documented in the Palintest Phot Book and included as part of the method parameters programmed into the Photometer 7500 Bluetooth.

Tests requiring a reaction time will have the option to select an automatic timer to count down the reaction time required. While in the Insert sample screen use the right key to move the cursor to highlight **Timer**.

The programmed reaction time will be displayed.

Press OK to Start the countdown.

Three options will be displayed:

Stop   cancel the countdown timer

Exit   exits the countdown screen and returns to the Insert sample screen. The countdown will continue and the current time can be seen by selecting **Timer**. At the end of the countdown an audible alarm will sound to indicate the sample is ready to read. Select OK to read the sample manually.

Exit and Read exits the countdown screen and automatically reads the sample at the completion of the allocated time period.

Changing Result Units of Expression

Many chemical species have a number of alternative units that can be used for reporting results e.g. Phosphate can be expressed as PO_4 or P for example.

Where alternative units of expression for results are available the ▲▼ symbols will be displayed next to the current result units. Use the up/down arrows to change the units of expression as required. Values are modified automatically.

Results stored in the log will be in the units selected on screen, changing the chemical species will add an entry to the log showing the updated result and species parameter selected.

Follow-on Tests

A number of photometric methods have additional optional methods that can be applied, known as Follow-on Tests e.g. Phot 008 Total Chlorine follows Phot 007 Free Chlorine. Follow-on methods are usually either based on further reagent addition to the sample just measured for sequential parameters or used to correct for potential/known interferences.

Follow-on tests are clearly defined in the Palintest Phot Book and, if available, are accessed via the **Follow-on** option located at the right hand side of the options.

To access the Follow-on test, highlight Follow-on and press OK. The next method is automatically loaded and operated in the usual manner.

NOTE: if no viable result is produced during the first stage of a sequential test method, the **Follow-on** option will be automatically removed.

For correction methods, the data log will store the corrected result automatically along with all other results in the sequence.

All Follow-on methods have unique allocated Phot Numbers but not all can be directly accessed. Follow-on methods that cannot be directly accessed are not listed in the **Choose a Test** list for Hotkey Entry but will be available following a viable result in the initial test stage.

3.6 7500 Test Methods

Fluoride

Range: 0-1.5mg/l (ppm) F

Colour change: Colourless - Red/Yellow

1 Fill test cuvette with sample to the 10ml mark.
2 Add **one Fluoride No 1** tablet, crush and mix to dissolve.
3 Add **one Fluoride No 2** tablet, crush and mix to dissolve.
4 **Stand for 5 minutes**.
5 Take photometer reading.

Chlorine-Free

Range: 0-5.00mg/l (ppm) Cl_2

Colour change: Colourless - Purple/Red

1 Rinse test cuvette with sample leaving two or three drops in the tube.
2 Add **one DPD 1** tablet, crush tablet and then fill the test tube with sample to the 10ml mark. Mix to dissolve tablet fully and ensure no particles remain.
3 **Take photometer reading immediately**. The result may drift on standing.
4 Retain test solution if the Total Chlorine Follow-On Test is required.

Chlorine-Total

Range: 0-5.00mg/l (ppm) Cl_2
Colour change: Purple/Red from Free Chlorine Test increases in intensity

Carry out this test on the solution remaining from the Free Chlorine test.

1 Add **one DPD 3** tablet, crush and mix to dissolve.

2 Stand for two minutes to allow full colour development.

3 Take photometer reading after two minutes have elapsed.

Note: To obtain **Combined Chlorine** residual subtract Free Chlorine result from Total Chlorine result:

**Combined Chlorine =
Total Chlorine - Free Chlorine**

Nitrate

Range: 0-20mg/l (ppm) N
Colour change: Colourless - Red

1 Take a clean Nitratest Tube (PT 526). Using the Measuring Syringe (PT 361) add 1ml of sample. Fill the Nitratest Tube to the 20ml mark with deionised water.

2 Add one level spoonful of Nitratest Powder and one Nitratest tablet. Do not crush the tablet. Replace screw cap and shake tube well for exactly **one minute** then allow contents to settle.

3 Then, either: Invert tube gently 2 or 3 times and then allow to stand for at least **two minutes** to ensure complete settlement. Remove screw cap and wipe around top with a clean tissue. Decant clear solution into test cuvette, filling to the 10ml mark. **or:** Using the Palintest Filtration Set (PT 600) filter a portion of the solution through a GF/B filter paper into a test cuvette filling to the 10ml mark.

4 Add **one Nitricol** tablet, crush and mix to dissolve.

5 Stand for 10 minutes.

6 Take photometer reading.

Nitrite

Range: 0-0.5mg/l (ppm) N
Colour change: Colourless - Red

1 Fill test cuvette with sample to the 10ml mark.

2 Add **one Nitricol** tablet, crush and mix to dissolve.

3 Stand for 10 minutes.

4 Take photometer reading.

Ammonia

Range: 0-1.00mg/l (ppm) N
Colour change: Yellow - Green

1 Fill test cuvette with sample to the 10ml mark.

2 Add **one Ammonia No 1 tablet and one Ammonia No 2** tablet, crush and mix to dissolve.

3 Stand for 10 minutes.

4 Take photometer reading.

3.7 Calibration/Validation

Your Photometer 7500 Bluetooth is delivered with a calibration certificate validating the performance of the instrument as it leaves Palintest.

We recommend annual service and calibration of all photometric instruments in normal use.

The Photometer 7500 Bluetooth also includes an automatic routine to validate analytical performance using certified Palintest Check Standards. Accessed via the Mode menu, the **Check Standard Mode** provides a field method of ensuring your instrument is operating within defined specifications and also a troubleshooting method for unexpected results.

Every Palintest Check Standards set is supplied with certified values expressed as %T (Transmission), derived from traceable reference materials. Acceptable tolerances are defined on the certificate and are automatically specified within the Photometer 7500 Bluetooth.

Check Standard Mode

Access Check Standard Mode from the Mode screen.

Highlight Check Standard Mode and press OK.
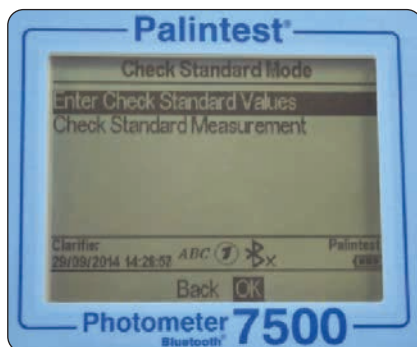
Two choices are offered:

Enter Check Standard Values	use the up/down keys to adjust the displayed values to match the certificate
Check Standard Measurement	insert the Check Standards in the defined order to generate a validation report

Enter Check Standard Values

Each standard has two values assigned, for two individual wavelengths.

Use the up/down keys to adjust the values to match the certificates, following the order defined on the display. Press OK when the correct value is shown and the prompt will forward to the next value.

Upon completion the message **Check Standard Values assigned successfully** will be displayed. Press **OK** to return to the Check Standard Mode menu.

Check Standard Measurement

Follow the on-screen prompts to insert the Check Standards in the defined order. The Photometer 7500 Bluetooth will automatically measure the Transmittance at the required wavelength.

Upon completion of the sequence the results are displayed on screen with pass or fail status.

If the Check Standard Mode reports a failure, see Section 3.9 Troubleshooting for guidance or contact your local Palintest supplier.

3.8 Photometric Testing Hints and Tips

Photometric analysis is a very powerful technique, providing accurate analysis of a wide range of critical drinking water, wastewater and environmental parameters.

A complete guide to the science behind photometric (also known as colorimetric) analysis can be found in the Know portal at **www.palintest.com/know/**

Palintest has focused on simplifying the test methods and equipment used for this technique but there are still a number of ways to ensure the results you generate are as accurate as possible:

1   Always use genuine Palintest reagents when using the programmed test methods. Each parameter has a unique calibration which has been generated using Palintest reagents. Alternative reagents may follow the same general methodology but can differ substantially in formulation and colour generated thereby rendering the calibration and hence results inaccurate.

2   Always correct for the blank value - any inherent colour in the sample (which may not be visible to the naked eye) will offset the result if the blank step is omitted. If the sample colour is too intense for the photometer to blank use dilution with deionised water to reduce the intensity. Remember to dilute the sample to the same extent for analysis.

3   Always respect the reaction time specified within the instructions. Some methods produce instant colour whereas others require a reaction time to reach full development. Taking a reading before the reaction time has elapsed may lead to low results.

4   The presence of solids, either large or in the form of turbidity, can adversely affect the quality of results by preventing incident light from reaching the detector. The blanking step can reduce the impact of turbidity interference but large solid particles must be removed prior to analysis. Solids can be removed by filtration prior to analysis or, if the solids are settleable and will not lie in the optical path, allowing them to settle in the photometer cuvette can be acceptable.

5   Calibration curves relate transmission/absorbance to concentration to provide result data but not all calibration ranges are linear. Frequently at higher concentrations the curve 'flattens' leading to higher potential variability in results. If greater accuracy is required than can be achieved on neat samples then dilution can be used to improve performance.

6   Ensure the photometer cuvette is clean, has no droplets on the outside and not excessively scratched. Good technique is to wipe the outside surface of the cuvette prior to inserting into the optical chamber to prevent contamination of the optical system.

7   Always use good quality, genuine Palintest cuvettes. Use the orientation mark to ensure repeatable positioning of the cuvette.

8   Maintain the cleanliness of the optical chamber by only inserting clean cuvettes. If the chamber becomes fouled or sample is spilled the base can be removed for cleaning access. Clean the optical chamber with a soft cloth. Do not use abrasive chemicals or scouring agents.

9   Always use the light cap provided to prevent ambient light affecting results. This is especially relevant when operating in strong sunlight or other light conditions.

10 Ensure your Photometer 7500 Bluetooth is operating effectively by using Palintest Check Standards and the Check Standard Mode (see Section 3.7 Calibration/Validation) and having the photometer serviced and calibrated at regular intervals. Calibration is recommended at 12 month intervals for normal usage and can be provided by your local Palintest distributor.

3.9 Troubleshooting

The Photometer 7500 Bluetooth features self-diagnostic software and hardware to optimise performance and battery life. The Info Panel indicates the status of the Photometer 7500 Bluetooth and any specific fault conditions are defined and displayed on screen.

Optical Errors

I have an Error 9 message

Error 9 is caused by the blank cuvette being too dark to allow the blanking step to be carried out.

Check that the correct cuvette is being used i.e. ensure the sample cuvette is not being used for blanking.

If the sample is too highly coloured or contains significant solids, dilute and repeat the blanking step.

If the problem persists and the blank cuvette is not the issue, clean the optical chamber by removing the access cover and cleaning with a soft cloth. Do not use corrosive or abrasive chemicals.

I have an Error 7 message

Error 7 is caused by too much ambient light reaching the detector. Use the light cover provided with the instrument.

Check Standard Issues

How do I maintain my Check Standards?

Check Standards are manufactured to precise values/tolerances, certified against traceable reference materials and provided in sealed cuvettes. Do not decant or remove the sealed cap from the Check Standard.

Ensure the Check Standard cuvettes are clean and dry using lint-free cloths before inserting into the optical chamber.

Insert the Check Standard aligning the orientation arrow towards the front of the optical chamber.

Values assigned to calibration standards are defined at 20-25°C. Extremely high or low ambient temperatures can affect Check Standard results so ensure standards are at the defined temperature to effectively validate.

Check Standards have a two year shelf-life, after which the colours will no longer be valid. Please dispose of the expired standards after this period according to the MSDS.

My Check Standard validation has failed

Photometers may fail the Check Standard validation step due to the requirement for service/calibration. Contact your local Palintest partner for service and support.

Ensure the Check Standards are inserted correctly, using the orientation mark to align and inserted fully. Use the light cap to prevent any ambient light interference.

Service/calibration is recommended at annual intervals in normal operation.

Bluetooth Issues

The Photometer 7500 Bluetooth features the latest Bluetooth SMART connectivity.

I can't connect the Photometer 7500 Bluetooth to my device

Ensure your device is Bluetooth SMART ready. Previous versions of Bluetooth (also known as Bluetooth Classic) will not connect to the Photometer 7500 Bluetooth. Check your device specification or visit **www.bluetooth.com** to see the latest list of SMART ready devices.

I can't download my results to my connected device

The Info Panel will show the connected status of the Photometer 7500 Bluetooth. Ensure the connected icon is displayed.

If more than one remote device is running the Aqua Pal app, check that the correct device is connected to the Photometer.

The connected device is indicated at the base of the Aqua Pal results screen.

I can't upload my data to the Palintest Portal

Ensure you have a reliable internet connection to exchange data with the Palintest Portal. Once uploaded data can be shared within your secure user group and downloaded for report generation.

Bluetooth Error Messages

The Photometer 7500 Bluetooth communicates seamlessly with the Palintest Aqua Pal app. In the event of any errors the Photometer 7500 Bluetooth will display either of the following messages:
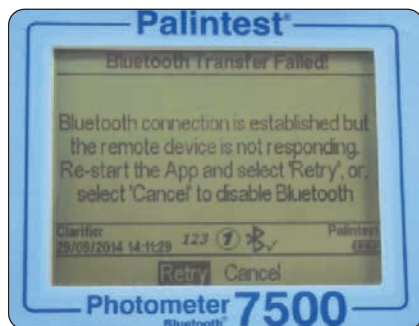
The Photometer 7500 Bluetooth is not receiving a response from the Palintest Aqua Pal app but the remote device is connected. This will appear 10s after a result transmission has started and no valid response has been received.

Re-start the Aqua Pal app and select Retry.

When the Bluetooth connection to the remote device the following message is shown:
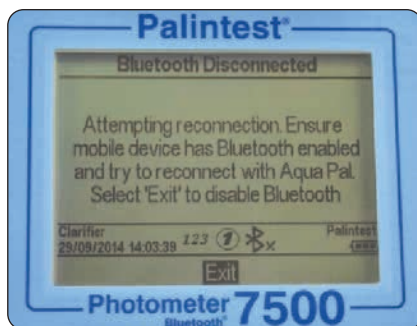
Check the Bluetooth has not been inadvertently deactivated in the mobile device settings.

NOTE: the Photometer 7500 will not appear as a 'paired device' in the settings of a Bluetooth SMART device.

Battery/Power Issues

My batteries are running out too quickly

Use good quality batteries and always replace the batteries completely when indicated on the Info Panel. The battery compartment is located underneath the Photometer 7500 Bluetooth and secured by four screws.

Remove the battery cover and replace batteries as a set.

Refit the battery cover ensuring the cover is tight enough to prevent water ingress. Do not overtighten as this will damage the screw housings.

The Photometer 7500 Bluetooth has a number of power-saving features such as auto-dim of the backlight and automatic power down after inactivity (See Section 3.4). Activating these features will prevent power being used unnecessarily. Bluetooth can also be de-activated if not required.

Using the USB port to provide power will automatically prevent battery power being consumed when mains or external power is available.

My photometer will not switch on

The Info Panel provides an ongoing indication of power available from the battery supply. When the voltage available falls below 3.0V the Photometer 7500 Bluetooth will not switch on as the available power will not be sufficient to provide effective photometric testing.

Use the USB cable to provide an alternative power supply. If the photometer still fails to switch on, contact your local Palintest partner for service support.

My USB power supply is not working

Ensure your PC is not operating in power save mode or the mains supply is not isolated.

Replace the cable with an alternative to ensure the cable is not faulty.

USB Connection Issues

I cannot download my data

Check the USB mode is set to Hard Disk, not COM port mode. In Hard Disk mode the data can be 'dragged and dropped' as with a conventional memory stick and is available in CSV format.

Opening CSV data files can be accomplished by a number of text editing or spreadsheet programs.

Where do I find the COM port drivers?

The latest drivers are available at **www.palintest.com**

COM port drivers are provided for Windows operating systems (Windows Vista, XP and 7).

Care and Maintenance

The Photometer 7500 Bluetooth contains no user-serviceable parts internally. User maintenance is only recommended for cleaning of the optical chamber, changing batteries and validating performance using the Check Standard Mode.

Cleaning the Optical Chamber

The optical chamber has been designed to support removal and cleaning with a lint-free cloth as required by removal of the access cover.

Access Cover Screws
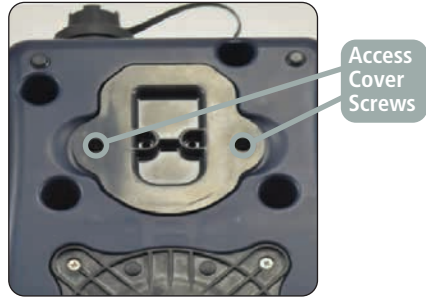
Do not use any of the following agents when cleaning this optical chamber:

• Abrasive cloths
• Corrosive chemicals
• Any organic solvents

Do not overtighten the screws on re-assembly to avoid damaging the access cover.

Replacing the Batteries

Remove the four retaining screws from the battery cover and gently prise the cover free.

Battery Cover Access Screws
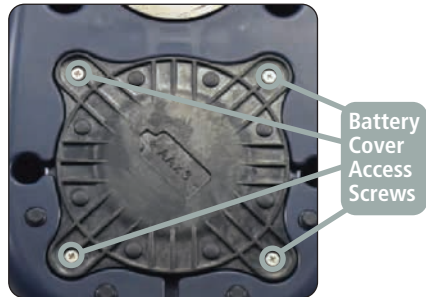
Replace all batteries at the same time.

Ensure on replacing the battery cover that the gasket is correctly located to prevent any water ingress. Tighten the screws carefully but do not overtighten.

3.10 Technical Specifications

Instrument Type	Dual light source photometer offering direct-reading of pre-programmed test calibrations, Absorbance and Transmittance
Optical System	
Optical Source	Dual LED sources with optical filters
Optical Detectors	Silicon photodiodes
Peak Wavelengths	450nm, 500nm, 550nm, 570nm, 600nm, 650nm
Wavelength Selection	Automatic
Bandwidth	±5nm
Range	1 - 100%T (0-2.3 Abs)
Accuracy	± 1.0% T
User Interface	
Display	320 x 240 pixel LCD with contrast adjustment
Backlight	Timed, on key press with auto-dim and off
User Interface	On-screen prompts available in English, French, Spanish, German, Italian, Turkish and Mandarin (Chinese).
Keypad	Numeric keypad with assignable Hotkeys. Four navigation keys and OK key
Physical	
Size (W x L x H)	150 x 250 x 70mm
Weight	975g
IP Rating	IP67
Power Supply	
Batteries	3 x 1.5v 'AA' batteries
Lifetime	40 hours (typical use, backlight off, 'AA' alkaline cells)
Mains	5V DC, 900mA delivered via USB port
Power Management	Auto-switch off (user selectable between 5-15 minutes on battery) or continuous operation
Power Saving	User control for Backlight and Bluetooth to minimise battery consumption
Test Methods	
Tests Available	Pre-programmed for Palintest tablet reagent and Tubetests® format tests. Also operates in Absorbance and Transmittance modes
User Defined Tests	Up to 30 user calibrations can be entered. Up to 10 points per calibration
Test Selection	Phot number entry, Hotkey or selection from a list
Test Cuvettes	12-20mm OD with automatic cuvette centering
Result Units	g/l, mg/l, ppm, mmol/l, µmol/l, µg/l, ppb
Blanking	Automatic blanking at all wavelengths. Blank value stored in memory until power off or new blank recorded
Connectivity	
USB	USB Type B Connector. Waterproof connector available
Wireless	Palintest Bluetooth SMART profile
Data Management	
Instrument Memory	Non-volatile storage
Memory Capacity	Up to 500 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 Download	To computer via USB using Hard Disk or COM port mode. Wireless Bluetooth SMART download, either instantly or as a data batch, using a connected device running the Palintest Aqua Pal app. Optional Palintest Portal data management available
Data Output Format	Plain text
Software Upload	Software update by 'drag and drop' in USB Hard Disk Mode

3.11 Palintest Aqua Pal App and the Palintest Portal

What is the Aqua Pal App?

Generating reliable and accurate water test data is only part of the process of managing drinking water, wastewater, process water and environmental compliance.

Collating the data quickly and sharing with other members of the team can be the difference between effective control and failing to adhere to local regulatory standards.
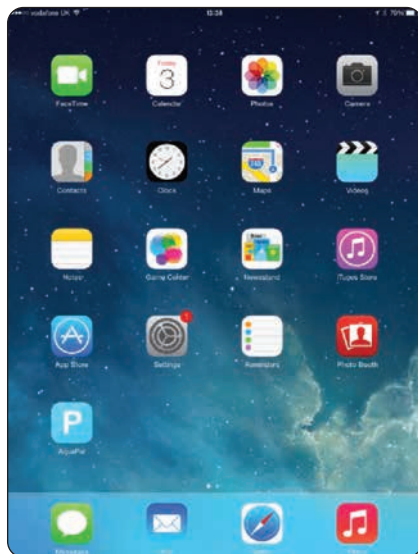
The Palintest Aqua Pal app is intrinsic in the process of storing, sharing and managing data produced by the Photometer 7500 Bluetooth and also allows for additional data to be added manually for the Big Data experience.

The Aqua Pal app is available for both iOS and Android (version 4.3 or later) devices that are equipped with Bluetooth SMART connectivity.

On first use the Aqua Pal app will require a registration step for both the app and the secure Palintest Portal. An internet connection is required to process the request as it will involve a second stage authentication via the provided email address.

Once the sign up process is completed the Aqua Pal app and Palintest Portal are ready to go.

Connecting to the Aqua Pal App

Enable Bluetooth on the Photometer 7500 Bluetooth. The icon will appear on the Info Panel showing Bluetooth is on but not connected.

Open the Aqua Pal app and log in using your registration credentials. Choose whether to use automatic or manual result addition.
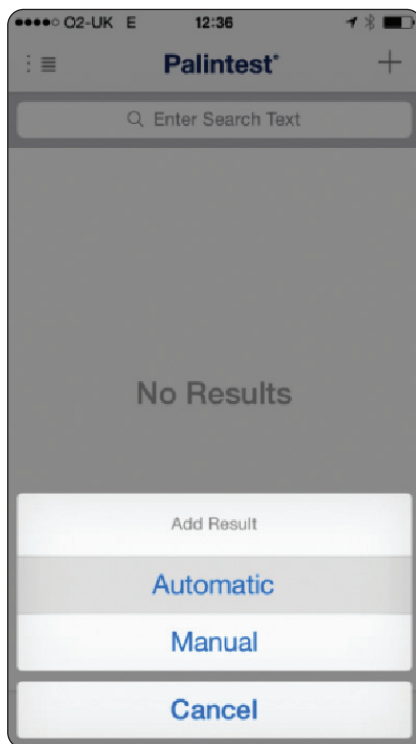
To connect the Photometer 7500 Bluetooth press the '+' symbol in the top right hand corner of the device screen. This will produce the list of all locally advertising Bluetooth SMART devices.

Select the Photometer 7500 Bluetooth you wish to connect (see also Section 3.4 - Adding Device Name) and Aqua Pal will link. The Info Panel will display the connected Bluetooth icon.

Previously connected instruments are stored in the app for future selection.

Once connected, data can either be uploaded automatically (if selected) or direct from the log (all or a selected group).

Manual data entry is also possible for results generated with non-Bluetooth instruments or external devices such as TDS meters, flow meters or level sensors.

Connecting with the Palintest Portal

Also included with the Aqua Pal app is the secure Palintest Portal found at **https://palintestportal.com**
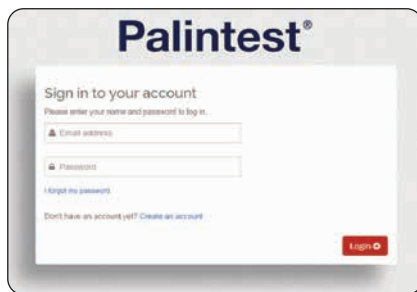
Data stored in the Aqua Pal app can be uploaded to the Palintest Portal when an internet connection is available.

Data stored within the portal can be shared with team members using the User Group functionality. Simply assign team members to the User Group and they can view data generated by logging in to the portal.

Results stored within the portal can be filtered by date, sample ID, Operator ID and parameter.

Data can be viewed graphically over time with the status (in spec, nearing limit, out of spec) being indicated by a simple colour key.

Further Information

The full guide to the Aqua Pal app and the Palintest Portal are available at **www.palintest.com** and available for download from the Palintest Know portal.

4.0 Introduction

The **Compact Turbimeter** is the latest addition to the Palintest Compact Meter range which includes photometers for chlorine, ozone, chlorine dioxide and ammonia.

The Turbimeter operates according to the ISO 7027 method for measurement of turbidity, utilising two NIR light sources at 860nm as part of the **QuadoptiX™** optical system.

The Turbimeter is provided with accessories and standards to support effective use of the instrument.

For technical support or to report issues with this product please contact Palintest or your supplier.

4.1 QuadoptiX™ Technology

The **Palintest Compact Turbimeter** utilises **QuadoptiX™** technology for turbidity measurement - a sophisticated optical approach designed to ensure turbidity measurements are as accurate and repeatable as possible in even the most challenging circumstances.

Turbidity measurements are carried out by analysis of light scattered at 90° to the incident light (nephelometric measurement) at levels below 40NTU.

Above 40NTU the recommendation is to measure also at 180° to 'compensate' the 90° readings.

QuadoptiX™ technology uses two independent sources and two independent detectors to provide effectively four entirely autonomous measurement systems in the same instrument, allowing multiple validation of all results for greater accuracy.

4.2 Start-up and Start Page

To switch the unit **'on'**, press the **POWER** button and release. An audible beep will confirm the instrument is on. Switch **'off'** by holding the **POWER** button for 1 second.

The LCD screen is provided with a **backlight** option that can be set to **on/off** in the **'System'** menu (see Section 4.4). The initial default setting is **ON**.

After initialisation, the **Start page** will appear and display, initially defaulted to Mode screen and showing three options:

1 **Reading** - Select the mode to measure turbidity or suspended solids (see Section 4.5).

2 **Calibration** - Choose either SDVB, Total Suspended Solids or to Restore the factory calibration values (see Section 4.7).

3 **System** - view or set Log (result and calibration), Operator ID, Sample ID, Units, Language, Set Time, Set Date, Date Format, Software Version and switch the backlight **on/off** (see Section 4.4).

The option to change the Start page is available in the **'System'** menu, allowing the user to choose to start in the default mode above, normal measurement mode or the last measurement mode used.

Navigation through Menus is carried out using the **Up/Down** buttons, using the **'OK'** button to select or the **'Back'** button to return up a level.

4.3 Battery Life/Replacement

Your Compact Turbimeter is supplied with fresh batteries that will be suitable for at least 150 hours of use. Changing batteries is carried out through the compartment on the rear of the instrument.

Two 'AA' 1.5V batteries are required. Current battery status is displayed on the screen to assist in power management.

The Turbimeter has an **auto-off** function to save power, automatically switching off the meter after five minutes of inactivity.

A **back-up battery** is located on the PCB to store all user data including the last mode used for reading. Replacing the AA batteries will not lead to settings or calibration data being lost.

If battery power is insufficient for effective analysis the Turbimeter screen will show **Error 110: Battery Low** and advise to change batteries. The battery icon will also show **'Empty'** status.

If battery power is insufficient for any operation the Turbimeter screen will show **Error 111: Battery Critical** and automatically shut down.

4.4 System Menu

The System menu allows the user to set the Compact Turbimeter preferences and review results and calibration data.

4.4.1 Log

Select **'Results'** or **'Calibrations'**.

Once the log has been chosen, select **'View'** or **'Clear'**.

The **'Readings'** log holds up to 100 data points with date, time, Sample ID, Operator ID, Reading Mode and Result.

The oldest result will automatically be overwritten when the log is full.

The **'Calibrations'** log stores the date, time, method and Operator ID (if set) for the last 12 good calibrations.

To view data select **'View'** and use the **Up/Down** buttons to scroll in either direction.

Use **'Clear'** in either log to delete the entire log. Select **'Clear'** then **'Yes'** in the following screen to delete.

4.4.2 Operator ID

Optionally select or edit the username using alphanumeric characters.

To create a new Operator ID select a blank line and press **'OK'**.

Press **'New'** to create the ID.

Use the **Up/Down** buttons to **Show/Change** characters.

When the correct character is shown, press and hold the [+] key for one second to move to the next character.

Correct mistakes by holding the **[Del]** key for one second. Complete the process by pressing **'Done'** briefly. Select **'OK'** to accept the entry or **'Edit'** to modify the entry.

To modify or delete an existing Operator ID, highlight the ID and select **'Edit'** Choose either **'Edit'** to modify the existing entry or **'Delete'** to remove it from the list.

Deleting the Operator ID will not affect results stored in the log. Up to 12 Operator IDs can be stored and recalled from memory as required.

To return to the System menu, either select the Operator ID required using **'OK'** or highlight a blank entry (if one is available) and press **'Back'**.

4.4.3 Sample ID

Optionally set the Sample ID using the same method as Operator ID.

Up to 24 Sample IDs can be stored and recalled as required.

Both Operator ID and Sample ID are stored in the log with result and calibration data.

4.4.4 Units

Results can be displayed in NTU, FTU and FNU.

4.4.5 Language

Select English, French, German, Spanish or Italian and press **'OK'** to switch to alternative languages.

4.4.6 Set Time

Increase/decrease the time by using the **Up/Down** buttons. When the correct time is shown select **'OK'**.

4.4.7 Set Date

Increase/decrease the date by using the **Up/Down** buttons. When correct select **'OK'**.

4.4.8 Date Format

Select **DD/MM/YYYY** or **MM/DD/YYYY** as required.

4.4.9 Version

The serial number of the instrument and the software version will be displayed.

The instrument serial number is required for support and warranty claim.

4.4.10 Backlight

Select either **'Off'** or **'On'** as required. The Compact Turbimeter will maintain the current status until changed.

4.4.11 Start Page

The **'Start Page'** allows the user to define a choice of initial screens/modes on powering the Compact Turbimeter. To change start page, highlight the favoured choice for initial screen - Mode Menu, Normal Reading Mode or Last Reading Mode. The new Start Page choice will appear when the instrument is next powered on.

4.4.12 LCD Contrast

The default setting is appropriate for all but the most challenging light conditions but, should it become necessary, the contrast setting for the LCD screen can be manually adjusted.

Use the **Up/Down** buttons to adjust the image on screen until the alternating shapes are clearly visible and press **'Back'**.

4.5 Reading Menu

When taking readings ensure the cuvette is free from dirt, dust and condensation using the supplied lint free cloths.

Ensure the light cap is in place to prevent stray light from adversely affecting readings. If no light cap is fitted or the sample cuvette is not correctly inserted Error 107: Blanking Error will be reported.

Microscopic scratches on the sample cuvette will refract light and can lead to higher than expected values.

To prevent scratches having an impact apply a thin film of silicone oil (provided) to the sample cuvette.

Select the **'Reading'** menu and choose from:

Normal - This mode reads the turbidity of the sample in approximately eight seconds with an audible beep at the start and finish of measurement.

Average - Selecting this mode prompts a further choice of Short Average (3 readings), Medium Average (6 readings) and Long Average (12 readings). Averaging readings is extremely useful for turbidity measurement where particles are in motion or where extremely high accuracy is required.

Continuous-Capture

This mode allows continuous reading of sample turbidity until measurement is manually interrupted. This mode will support cuvette indexing and settling studies on rapidly settling samples.

Total Suspended Solids

The relationship between turbidity and suspended solids can be approximated with correlated data. The **QuadoptiX™** bench provides the performance required to produce reliable data for suspended solids, based on calculated factors (slope and offset) for turbidity versus suspended solids.

Default factors are not possible due to the unique variety of size, shape and reflectivity of individual sample matrices.

Calculated factors will provide a rapid qualitative value for Total Suspended Solids that will be relevant until process conditions change. This reading mode will only become active upon a site specific calibration being stored in the Compact Turbimeter.

4.6 Taking Readings

Normal Mode

Choose **'Reading'** mode, select **'Normal'** and press **'OK'**.
Insert the sample with the orientation mark facing forward and press **'Read'**.
A beep will sound at the start and end of measurement.
Result is displayed and stored in the results log with date, time, Operator ID and Sample ID.
(**NOTE:** See the **'System'** section for details of the result log).

Average Mode

Choose **'Reading'** mode, select **'Average'** and press **'OK'**.
Select the number of readings required for the averaging function:
Short Average - 3 consecutive readings
Medium Average - 6 consecutive readings
Long Average - 12 consecutive readings
Insert the sample with the orientation mark facing forward and press **'Read'**.
The instrument will beep at the start and end of measurement cycle. Result is displayed on the screen and stored in the log with time, date, Operator ID and Sample ID.

Continuous-Capture Mode

Choose **'Reading'** mode, select **'Continuous-Capture'** and press **'OK'**.
Insert the sample with the orientation mark facing forward and press **'Read'**.
A beep will occur at the start and end of each measurement cycle.
To store data in the log, press **'Capture'** (repeat as required). To cease measurement, press **'Back'** at any time.

To index a cuvette, insert the sample cuvette with the orientation mark facing forward. Systematically rotate the sample cuvette 45° at a time and record the position of the lowest value. This is the optimal cuvette alignment for low turbidity measurement.

Total Suspended Solids

This mode will only be active if a site calibration has been stored within the Turbimeter. Once a calibration has been created (via the **'Calibration'** menu) the site ID can be used to recall the site specific relationship between turbidity and suspended solids.

Choose **'Reading'** mode, select **'Total Suspended Solids'** and press **'OK'**. Highlight the Site ID for the Site/Sample under investigation using the **Up/Down** arrows. The calibration data will be recalled automatically.

Insert the sample with the orientation mark facing forward and press **'Read'**. A beep will occur at the start and end of each measurement cycle.

Result is displayed on the screen in mg/l and stored in the log with time, date, Operator ID and Sample ID.

4.7 Calibration Menu

The Compact Turbimeter is delivered with a stored calibration carried out on primary Formazin standards and validated as part of the production process. For field use, a set of calibration standards are provided as part of the kit.

Recalibration is only required if the standards provided show an unacceptable level of variation from the stated values on read-back.

Two different methods of calibration are available for the Turbimeter.
The calibration methods are:

SDVB

The use of SDVB for field calibration of turbidity meters is preferable due to the improved stability and handling compared to Formazin. When calibrating turbidity instruments SDVB standards are assigned to a specific model and cannot be transferred.

Using SDVB standards from another manufacturer may differ greatly when applied to the Turbimeter. This is normal behaviour and should not cause concern.

Formazin

Freshly prepared standards can also be used for calibration where available.

Formazin is used as the primary calibration material for the Turbimeter and can also be used to align the calibration of different instruments when discrepancies occur. Preparation of Formazin standards from 4000NTU stock solution is required to be within the stated limits detailed below.

Total Suspended Solids

When using the Turbimeter in Total Suspended Solids Reading mode, a calibration is required to set the relationship between the measured turbidity values and the 'true' suspended solids value, determined by gravimetric methods. This calibration can either be an assigned series of values from the results log or a simple algorithm with factors provided by the user. This relationship is typically a straight line and hence the factors consist of a slope and intercept.

The Compact Turbimeter has two methods of generating the data for relating the measurement of turbidity to total suspended solids (TSS):

1 **Correlation** - Using the stored turbidity data from the instrument log and relating it to manually entered Total Suspended Solids data derived from elsewhere. The minimum number of correlation points required is one, as the zero point can be used as a second point. A maximum number of 50 data points can be used.

2 **Factor** - Using data manipulated externally, a slope and intercept for the straight line relationship can be entered directly. Slope factors range from 0.1 - 50.0 and intercepts can be set from -50.0 - +50.0

Calibrating the Compact Turbimeter
SDVB

Select Calibration and press **'OK'**.
Choose **'SDVB'** and press **'OK'**.

Select the lowest (0.05 - 0.15) NTU standard and insert into the sample chamber with the orientation mark facing forward.

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

Repeat the process for the 20NTU, 100NTU and 800NTU standards.

NOTE: 100NTU and 800NTU require inverting gently 5 - 8 times for accurate calibration. This DOES NOT APPLY to the low and 20NTU standards.

If standards have expired, are inserted in incorrect sequence or the 100 and 800NTU standards are not inverted prior to use **Error 101: Incorrect Standard** may be shown.

After the final 800NTU standard, the screen will show **'Calculating...Please wait'** and a countdown will appear to show time remaining.

On completion of the process the Compact Turbimeter screen will show **'Successful'**.

Press **'Back'** to leave the calibration process and return to the Calibration menu.

To cease calibration during the data capture phase press **'Cancel'**.

To cease the calibration process at any step, press **'Back'** (calibration data will be discarded).

The time, date and Operator ID are stored in the calibration log for GLP compliance (see Section 4.4).

Formazin

Select **'Calibration'** and press **'OK'**.
Choose **'Formazin'** and press **'OK'**.

Acceptable fresh Formazin standards should be prepared within the following ranges:

Low Standard	0.01 - 1.00NTU
Second Standard	10.0 - 30.0NTU
Third Standard	90.0 - 110.0NTU
High Standard	720.0 - 880.0NTU

Select the lowest (0.01 - 1.00) NTU standard and insert into the sample chamber with the orientation mark facing forward.

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

Repeat the process for the second, third and high standards.

After the final standard, the screen will show **'Calculating...Please wait'** and a countdown will appear to show time remaining.

On completion of the process the Compact Turbimeter screen will show **'Successful'**.

Press **'Back'** to leave the calibration process and return to the Calibration menu.

To cease calibration during the data capture phase press **'Cancel'**.

To cease the calibration process at any step, press **'Back'** (calibration data will be discarded).

The time, date and Operator ID are stored in the calibration log for GLP compliance (see Page 40, System menu).

Total Suspended Solids - Correlation

Select **'Total Suspended Solids'** and press **'OK'**.

If the Sample ID has already been created use the **Up/Down** arrows to highlight and press **'OK'** to select.

If a new Sample ID is required, move the highlight to a blank area and press **'New'**.

Create the new Sample ID using the **Up/Down** buttons to select characters as describe in the **'System'** section.

Select **'Correlation'** to enter the data entry screen.

The default (0, 0) point is always included. This can be deleted or edited if not required.

Select **'Add'** to recall data points from memory for which a correlated suspended solids value has been measured.

Press **'Select'** to enter the concentration of suspended solids determined externally using the **Up/Down** buttons.

When data entry is complete press **'Done'** and the slope/intercept will be calculated and shown automatically.

Data points can be edited or deleted as required. Highlight the data point of interest and select **'Edit'**.

Choose either **'Edit'** or **'Delete'** as required. When complete select **'Done'** Press **'Back'** to return to the **'Mode'** menu.

Total Suspended Solids - Factor

Select **'Calibration'** and press **'OK'**. Select **'Total Suspended Solids'** and press **'OK'**.

If the Sample ID has already been created, use the **Up/Down** arrows to highlight and press **'OK'** to select.

If a new Sample ID is required, move the highlight to a blank area and press **'New'**.

Create the new Sample ID using the **Up/Down** buttons to select characters as describe in the System section.

Select **'Factor'** to enter the data entry screen.

Highlight **'Slope'** and press **'OK'**.

Use the **Up/Down** buttons to enter the slope calculated externally. The value is limited between 0.1 and 50.0.

Press **'Done'** to return to the **'Factor'** screen.

Highlight **'Intercept'** and press **'OK'** (in many cases the intercept will be zero but for straight line fitting an offset will sometimes be required).

Use the **Up/Down** buttons to enter the intercept.

Select **'Add'** to recall data points from memory for which a correlated suspended solids value has been measured.

To edit factors highlight the slope or intercept and press **'OK'**.

Use **Up/Down** buttons to adjust the value.

Press **'Back'** to return to **'Calibration'** menu.

Restore Factory Calibration

To restore the default calibration, select this option and press **'OK'**.

Choose to continue - **'Yes'/'No'**.

The screen will show **'Successful'**.

Care and Maintenance

The Compact Turbimeter has been tested for IP67 compliance so accidental immersion will not damage the internal components.

Sample cuvette should be clean and dry prior to insertion into the sample holder. Lint free cloths are provided for this purpose.

Silicon oil is also present to use on scratched cuvette surfaces. Its use should not be necessary unless turbidity readings are consistently higher than expected. If required, place two or three drops onto the vial and smear across the glass using the lint free cloth.

Indexing cells to find the optimal position for turbidity measurement is recommended, especially if measuring low values. The Continuous-Capture reading mode (see Section 4.5) contains more details on the suggested method.

User calibration is advised on a need only basis, using the supplied SDVB standards. Calibration frequency is at the user's discretion and can be deduced by reading the standards to determine any offset that may have occurred due to fouling.

Subjecting the standards to prolonged exposure to freezing temperatures will destroy the SDVB standards, seen by physical settling and a lowering of the NTU value. The use of a WP48 Heat Pad is recommended in these circumstances to prevent standard degradation.

Standards have a 12 month stability and should be replaced after this date.

Replacement calibration sets are available, part number **PTC 090**, from your supplier or direct from **Palintest Ltd**.

No prescribed maintenance intervals are possible due to the high dependence on frequency of use, types of samples and conditions and user protocol. Service and maintenance is available via authorised service centres or direct from **Palintest Ltd**.

Troubleshooting

The Compact Turbimeter has internal diagnostics to advise on some issues as follows:

Error 100 - Measurement Off-Scale

The reading is above 1050NTU. Dilute using the provided PT 512 Dilution Tube and clean water and re-measure.

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 expired calibration set.

Error 107 - Blanking Error

The sample cuvette cap is not attached allowing ambient light into the **QuadoptiX™** chamber or the sample cuvette is not fully inserted. Replace the cap and read again or fully insert the sample cuvette.

Error 110 - Battery Low

The available power is insufficient to support reliable analysis. Replace the batteries.

Error 111 - Battery Critical

Battery level is critically low and the instrument will automatically shut down immediately to ensure all data is written to the memory correctly.

Other more general issues that arise may be as follows:

Readings are consistently higher than expected.

Check the sample cuvette for dirt, scratches and marks. Turbidity is an optical measurement and will be adversely affected by unwanted items in the optical paths.

Index the cuvette using the **'Continuous-Capture'** mode to ensure the most accurate reading position is selected.

Apply a thin film of silicone oil to the cuvette to 'fill in' any scratches. Replace the cuvette with a new, unused cuvette.

Check the calibration using the supplied standards to ensure no offset has been inadvertently applied. Recalibrate if necessary.

Readings are consistently lower than expected.

Fouling in the optical chamber may prevent the sources being transmitted with full intensity. The unique **QuadoptiX™** system will prevent this issue arising in all but the most challenging circumstances.

Gently clean the optical chamber using a soft, damp cloth. Do not use abrasive materials.

Recalibrate the meter using the supplied standards to remove the offset.

Readings are unstable/variable.

Turbidity is a measurement of scattered light with the source of scattering being microscopic and larger solids present in the sample. Solids can be mobile or settle during measurement leading to changes in readings over time.

Using the **'Continuous-Capture'** mode will show the changes over time.

Using the **'Average'** mode will remove/reduce the effects of settling or mobile solids.

The **QuadoptiX™** system measures at four points and will also reduce the effects of solid distribution across the sample cuvette.

Total Suspended Solids (TSS)

The relationship between TSS and turbidity is a site/sample/season specific correlation and will require frequent validation. If results vary significantly from laboratory data a repeat calibration should be carried out.

Technical Support and Warranty

For technical questions, reports of issues and any aspects related to this product, please contact your Palintest representative or **support@palintest.com**

When requesting technical or warranty support, please quote instrument serial number found on the underside of the Compact Turbimeter and in the System/Version area of the software.

The Compact Turbimeter has a **two year warranty**. Calibration standards supplied have a 12 month stability. Replacement sets are available with part code **PTC 090**.

Other replacement items are also available via your authorised representative or direct from **Palintest Ltd**.

Compact Turbidity Meter Technical Specification

Ingress Protection	IP67
Weight	340g (inc batteries)
Dimensions	50 x 82 x 225mm
Temp/Humidity Limit	0 - 50ºC/90%
User Interface	Backlit LCD screen, four soft keys, power button
Power	2 "AA" batteries, 5000 readings average, power indication and auto-off
Optical System	QuadoptiX™ system, 860nm LED source
Result Units	NTU, FTU, FNU, mg/l (TSS)
Range	0 - 1050NTU
Accuracy	2% of reading
Resolution	0.01NTU up to 9.99NTU, 0.1NTU up to 99.9NTU, 1NTU above 100NTU
Languages	English, French, Spanish, German, Italian
Result Log	100 data points including time, date, Operator ID, Sample ID, measurement mode

5.0 Introduction

The Digital pH Meter is part of a range of microprocessor-based instruments that are designed to be easily handled, capable of allowing one-handed operation. The meter has a large custom dual display LCD for clear and easy reading. It is a unique and intelligent instrument that has the capability to cater to the preferences of the discerning individual.

The meter has many user-friendly features - all of which are accessible through the splash-proof membrane keypad.

Your meter includes a temperature probe, electrode holder, built-in meter stand and batteries. Palintest offers a wide selection of pH and ORP electrodes. The advanced model is the pH 11, which is capable of measuring pH, Temperature, and millivolt (mV).

For power requirements either use 4 AAA-sized batteries or an AC/DC power adapter (sold separately).

Please read this manual thoroughly before operating your meter.

5.1 Display

The LCD has a primary and secondary display.
The primary display shows the measured pH, mV or Relative mV values.
The secondary display shows the measured temperature.
The display also shows error messages, keypad functions and program functions.
It has the following indicators:

1   **SETUP** - Setup mode
2   **MEAS** - Measurement mode
3   **CAL** - Calibration
4   **MR** - Memory recall
5   **R.mV** - Relative millivolt (pH110 only) and millivolt (mV)
6   **%** - Percentage
7   **pH** - pH mode
8   **°C °F** - Temperature mode
9   **pH** - pH buffer selection
10   **ATC** - Automatic Temperature Compensation
11   **MEM** - Memory location
12   **ERR** - Error
13   Low battery
14   Electrode status
15   Calibration buffer
16   **ON - READY**/Auto **HOLD** set up enable
     OFF - READY set up disable
17   **HOLD** - Hold indicator
18   **READY** - Ready indicator

5.2 Keypad Operation

Some buttons have several functions depending on mode of operation.

ON/OFF - powers on and shuts off the meter.
The meter will start in the measurement mode it was in when last switched off.

- **CAL/MEAS** - Choose calibration or measurement mode.

  CAL - activates the pH or Relative mV calibration mode and when used with the MODE key, it activates the temperature calibration mode.

  MEAS - Allows return to measurement mode when cancelling or terminating any operation.

- **HOLD/ENT**

  HOLD - activates/deactivates freezing of the measured reading while in measurement mode

  ENTER - Confirms the calibration values and the selection in SETUP and Print Function mode. Scroll through the memory location and the stored data during memory recall.

- **MI** (Memory Input) - Captures the measured readings of the pH or Relative mV with corresponding temperature, stores them in the memory.

- **MR** (Memory Recall) - Retrieves the stored data from memory.

• Sets the calibration values during Relative mV or Temperature calibration. Scroll through each SETUP and its sub group menu. Scroll through Print Function menu and its parameters.

SETUP - Activates the parameter setting menu to allow you to customise meter configuration, view calibration points and electrode offset data, select auto power off, reset meter and clear memory.

MODE - Select the measurement parameter option between pH, Relative mV or mV.

PRINT - Allows transfer of current measurement or stored data to either the printer or the computer.

5.3 Meter Preparation

Inserting the Batteries

This meter is packaged with 4 "AAA" alkaline batteries required for its operation. To insert the batteries into the meter, follow the procedure outlined below.

1 Open the battery compartment by pressing down the catch of the battery cover.

2 Insert the batteries correctly according to the marked polarity of the battery compartment.

3 Close the battery cover, ensuring the catch is locked in position. Your hand held meter is now ready for operation.

Connecting the Electrode and Temperature Probe

The meter uses any standard pH, ORP, or ISE electrode with BNC connector. For Automatic Temperature Compensation (ATC), the meter requires a temperature probe with a phono jack connector. Use either:

• Electrode with BNC connector and separate temperature probe with phono jack connector (PH5-TEM01 PI 35613-05).

• A "3-in-1" combination pH electrode with temperature probe.

Connecting pH, ORP or ISE Electrode

1 Slide the probe's BNC connector over the meter's BNC connector socket.

2 Rotate and push the connector clockwise until it locks.

3 To remove electrode, push and rotate the connector counter clockwise and pull it away from the meter.

Connecting Temperature Probe

1 Insert the phono jack connector of the electrode to the connector on the meter.

2 To remove pull away gently for a complete removal.

CAUTION: Do not pull on the electrode cord to avoid internal wire breakages.

Attaching the Electrode Holder to the Meter

Two electrode holders are provided.

1 Locate the slot on the right-hand side of the meter.

2 Slide the flange of the holder into the slot.

To attach a second electrode holder:
One holder can be attached onto another.

1 Align the flange of the second holder with the slot of the first holder

2 Slide the flange of the second holder into the slot of the first holder.

NOTE: Holders are designed for probes 12mm in diameter.

NOTE: Forcing the electrode into the opening may damage the holder or your electrode.

Connecting the AC/DC Adapter

The meter can also operate on mains power using an AC/DC power adapter (sold separately).

IMPORTANT: Switch off the meter and the power source of adaptor before plugging in.

1 Switch off the meter and power sources.

2 Select the correct AC/DC Adaptor either at 120/220V AC (output Voltage:9 to 15V DC, Current:>=50mA).

3 Insert the power adapter D.C. jack into the meter power socket.

4 Switch on the power source of the adaptor followed by the meter.

5.4 Calibration

Important Information on Meter Calibration

When re-calibrating, existing pH/R.mV and mV calibration points are replaced on a point by point basis.

Example: if previous calibration was at pH 4.01, 7.00, and 10.01, and you re-calibrated pH 7.00 only, the old calibration data at pH 4.01 and pH 10.01 will be retained.

See Program P2.0 in the SETUP to view current calibration points. To completely re-calibrate, or after replacing the probe, it is best to reset the meter to factory defaults and re-calibrate at all points.

Preparing the Meter for Calibration

Before starting calibration, make sure you are in the correct measurement mode.

Temperature Calibration

The temperature sensor is factory calibrated. Calibrate your sensor only if you suspect temperature errors may have occurred over a long period of time or if you have a replacement probe.

1 Connect the temperature sensor.
2 Switch the meter on. ATC will appear at the bottom right-hand corner of the LCD.

3 Press **MODE** to select pH mode.
4 Press **CAL/MEAS**. The CAL indicator appears.
5 Press **MODE** to enter temperature calibration mode.
6 Dip the electrode into a solution of known temperature (i.e. a temperature bath). Allow time for the built-in temperature sensor to stabilise.
7 Scroll with **Mil** or **MRI** to set the correct temperature value (i.e. the temperature of the temperature bath).
8 Press **ENTER** to confirm. The meter will be calibrated and return to the measurement mode.

Note: To exit without confirming the temperature calibration value, press **CAL/MEAS**.

NOTE: If the ATC does not light up, see SETUP menu Program P1.3 to switch it on.

NOTE: The maximum temperature offset is ±5°C from original reading.

5.5 Error Messages and Troubleshooting

Error message/Problem	Possible Cause	Corrective Action
Err. Annunciator	Wrong input in selected mode	Release key. Select valid operations depending on mode
Secondary Display toggles continuously between Calibration Buffer Values, Electrode icon blinks and Err Annunciator lights up	Incorrect buffer used in calibration or contaminated buffer solution	Check if correct buffer used, replace with fresh buffer if where necessary
Battery icon illuminated	Low battery	Replace with new batteries as soon as possible
Blank display when ON/OFF key is selected	1 Batteries not in place 2 Batteries not aligned to correct polarity 3 Low level batteries	1 Insert batteries 2 Insert batteries to correct polarity position 3 Replace batteries or connect to AC adaptor
Unstable reading	1 Insufficient reference electrolyte in electrode 2 Broken electrode 3 External electrical noise caused by nearby motor 4 Dirty electrode	1 Refill electrode with reference electrolyte 2 Replace electrode 3 Move location or switch off interfering device 4 Clean or rejuvenate electrode. Recalibrate meter after cleaning electrode
Slow response	Dirty/oily electrode	Clean electrode. Rejuvenate if necessary
Meter not responding to key press	1 HOLD mode in operation 2 Internal program error	1 Cancel HOLD mode 2 Reset all internal programs by re-inserting batteries

5.6 Technical Specification

pH Range	-2.00 to 16.00
Resolution	0.01pH
Accuracy	± 0.01pH
Slope Range	80% to 120%
mV Range	-1999 to +1999mV
Resolution	0.1mV (Between ±199.9mV); 1mV (beyond ±199.9mV)
Accuracy	0.2mV (Between ±199.9mV); 2mV (beyond ±199.9mV)
Temperature Range	-10.0 to 110.0°C
Resolution	0.1°C
Accuracy	± 0.5°C
Compensation	Automatic/Manual (from 0 to 100°C)
Calibration Points	2 to 5 points
pH Buffer Values	USA: pH 1.68,4.01,7.00, 10.01 & 12.45. NIST: pH 1.68,4.01, 6.86, 9.18, & 12.45
pH Slope & Offset Display	Yes
Memory	50 Data Sets
Auto Off	Selectable
Auto Off Time	20 minutes after last key operation
HOLD Function	Yes
Power Requirements	4 'AAA' Batteries; AC/DC Adapter 9V, 200mA
Battery Life	> 700hrs (Alkaline Batteries)
Environmental Requirements	0 to 50°C (32 to 122°F) 0 to 50°C (32 to 122°F)
Weight & Dimensions (meter)	18.7 x 9 x 4cm; 290g
Boxed	24 x 23 x 7 cm; 650g
Meter Warranty	3 years

6.0 Introduction

The Digital Conductivity Meter is part of a range of microprocessor-based instruments that are designed to be easily handled, capable of allowing one-handed operation. Each has a large custom dual display LCD for clear and easy reading. It is a unique and intelligent instrument that has the capability to cater to the preferences of the discerning individual.

The meter has many user-friendly features - all of which are accessible through the splash-proof membrane keypad.

Your meter includes a temperature probe, electrode holder, built-in meter stand and batteries. Palintest offers a wide selection of pH and ORP electrodes. The advanced model is the CON 11, which is capable of measuring Conductivity, TDS and Temperature.

For power requirements either use 4 AAA-sized batteries or an AC/DC power adapter (sold separately).

Please read this manual thoroughly before operating your meter.

6.1 Display

The LCD has a primary and secondary display. The primary display shows the measured pH, mV or Relative mV values.

The secondary display shows the measured temperature.

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

It has the following indicators:

1   **SETUP** - Setup mode
2   **MEAS** - Measurement mode
3   **CAL** - Calibration
4   **MR** - Memory recall
5   **mS** - milliSiemens
6   **µS** - microSiemens
7   **ppt** - parts per thousand
8   **ppm** - parts per million
9   **°C °F** - Temperature mode
10   **ATC** - Automatic Temperature Compensation
11 **ERR** - Error
12 Low battery
13 Electrode status
14 Calibration solution
15 **ON - READY**/Auto **HOLD** set up enable
      OFF - READY set up disable
16 **K=** Cell constant
17 **HOLD** - Hold indicator
18 **READY** - Ready indicator

6.2 Keypad Operation

Some buttons have several functions depending on mode of operation.

ON/OFF - powers on and shuts off the meter.

Note: The meter will start in the measurement mode it was in when last switched off.

• **CAL/MEAS** - Choose calibration or measurement mode.

  CAL - activates the pH or Relative mV calibration mode and when used with the MODE key, it activates the temperature calibration mode.

  MEAS - Allows return to measurement mode when cancelling or terminating any operation.

• **HOLD/ENT**

  HOLD - activates/deactivates freezing of the measured reading while in measurement mode

  ENTER - Confirms the calibration values and the selection in SETUP and Print Function mode. Scroll through the memory location and the stored data during memory recall.

• **MI** (Memory Input) - Captures the measured readings of the pH or Relative mV with corresponding temperature, stores them in the memory.

• **MR** (Memory Recall) - Retrieves the stored data from memory.

- Sets the calibration values during Relative mV or Temperature calibration. Scroll through each SETUP and its sub group menu. Scroll through Print Function menu and its parameters.

  SETUP - Activates the parameter setting menu to allow you to customise meter configuration, view calibration points and electrode offset data, select auto power off, reset meter and clear memory.

  MODE - Select the measurement parameter option between conductivity, Total Dissolved Solids

  RANGE - Allows manual range selection

  PRINT - Allows transfer of current measurement or stored data to either the printer or the computer.

6.3 Meter Preparation

6.3.1 Inserting the Batteries

This meter is packaged with 4 "AAA" alkaline batteries required for its operation. To insert the batteries into the meter, follow the procedure outlined below.

1 Open the battery compartment by pressing down the catch of the battery cover.

2 Insert the batteries correctly according to the marked polarity of the battery compartment.

3 Close the battery cover, ensuring the catch is locked in position. Your hand held meter is now ready for operation.

6.3.2 Conductivity Electrode Information

Your meter includes a conductivity electrode.

Stainless Steel electrodes with an electrode constant of K = 1.0. This conductivity/TDS electrode features a built-in temperature sensor for Automatic Temperature Compensation (ATC).

Wetted parts include:

1 Polyetherimide PEI (Ultem®)

2 Polybutylene Terephthalate PST 58 (Valox®)

3 Stainless Steel (SS 304)

The removable protective plastic electrode guard is meant for simple periodic maintenance and it must be kept intact during measurement and calibration. Always immerse the electrode beyond upper steel band.

NOTE: DO NOT remove the protective electrode guard during measurement and calibration as it may affect your readings.

NOTE: We recommend that you do not submerge the electrode above the protective yellow cap. You can submerge the cable for brief

6.3.3 Connecting the Electrode to the Meter

1 Insert the 6 pin female connector of the electrode to the 6 pins male connector on the meter. Rotate the locking ring clockwise until it locks.

2 To remove the electrode, simply rotate the connector's locking ring counter clockwise and pull away gently for a complete removal.

CAUTION: Do not pull on the electrode cord to avoid internal wire breakages.

6.3.4 Attaching the Electrode Holder to the Meter

Two electrode holders are provided:

1 Locate the slot on the right-hand side of the meter.

2 Slide the flange of the holder into the slot.

To attach a second electrode holder:

One holder can be attached onto another.

1 Align the flange of the second holder with the slot of the first holder

2 Slide the flange of the second holder into the slot of the first holder.

NOTE: Holders are designed for probes 12mm in diameter.

NOTE: Forcing the electrode into the opening may damage the holder or your electrode.

6.3.5 Connecting the AC/DC Adapter

The meter can also operate on mains power using an AC/DC power adapter (sold separately).

IMPORTANT: Switch off the meter and the power source of adaptor before plugging in.

1 Switch off the meter and power sources.

2 Select the correct AC/DC Adaptor either at 120/220V AC (output Voltage:9 to 15V DC, Current:>=50mA).

3 Insert the power adapter D.C. jack into the meter power socket.

4 Switch on the power source of the adaptor followed by the meter.

6.4 Calibration

Important Information on Meter Calibration:

Your meter has five measuring ranges. You have an option of calibrating your meter in a single point calibration for all the five ranges or for better accuracy; you can calibrate one point in each of the measuring ranges (up to five points). This selection of single point calibration and multi point calibration can be set in the SETUP menu Program P9.2.

When you perform a single point recalibration, the old calibration will be replaced by the new one even if the new calibration is done in a different range from the old calibration. For example, if you have previously calibrated at 1413μS in 0 to 2000μS range, and you re-calibrate at 12.88 mS in 0 to 20.00 mS range, the new calibration will override the previous calibration in 0 to 2000μS range.

In the case of multi point calibration, when you perform a multipoint recalibration, old calibrations are replaced only on a range basis. For example, if you previously calibrated at 1413μS in 0 to 2000μS range and you re-calibrate at 1500μS (also in 0 to 2000μS range), the meter will replace only the old calibration data (1413μS) in that range.

The meter will retain all calibration data in other ranges. To completely recalibrate your meter, or when you use a replacement electrode, it is best to clear all calibration data.

6.4.1 Preparing the Meter for Calibration

Before starting calibration, make sure you are in the correct measurement mode. For best results, select a standard value close to the sample value you are measuring.

6.4.2 Temperature Calibration

Your electrode features a built-in temperature sensor which is factory calibrated. Calibrate your sensor only if you suspect temperature errors may have occurred over a long period of time or if you have a replacement electrode.

1 Connect the electrode.
2 Switch the meter on. ATC will appear at the bottom right-hand corner of the LCD.
3 Press CAL/MEAS. The CAL indicator appears.
4 Press MODE to enter temperature calibration mode.

5 Dip the electrode into a solution of known temperature (i.e. a temperature bath). Allow time for the built-in temperature sensor to stabilise.
6 Scroll with **MI/** or **MR/** to set the correct temperature value (i.e. the temperature of the temperature bath).
7 Press **HOLD/ENTER** to confirm. The meter will be calibrated and return to the measurement mode.

NOTE: To exit without confirming the temperature calibration value, press CAL/MEAS.

NOTE: If the ATC does not light up, see SETUP menu Program P1.3 to switch it on.

NOTE: Since temperature affects the accuracy of conductivity/TDS, it is recommended to carry out a conductivity/TDS calibration after a temperature calibration is done.

6.4.3 Automatic or Manual, Single or Multi point Calibration (P9.0)

Choose automatic conductivity calibration or manual conductivity/TDS calibration. In the automatic calibration mode, the meter automatically detects and verifies the appropriate known calibration standards solutions before accepting these particular calibration standards as one of its calibration values in a specific measurement range.

The known calibration standards used for automatic calibration are:

At 25.0°C: 841μS, 14131μS, 12.88mS, 111.8mS

At 20.0°C: 761μS, 12781μS, 11.67mS, 102.1mS

In the manual calibration, non-standard calibration values can be used. You can manually input the appropriate values as your desired calibration standards in each specific range.

6.4.4 Selection of Automatic or Manual Calibration (P9.1)

Automatic calibration is applicable in conductivity measurement mode only, manual calibration is applicable in both conductivity and TDS mode.

Only from the conductivity measurement mode;

1 Press **SETUP**.
2 Press **MI/** or **MR/** until you view parameter P9.0 (ASC).
3 Press **HOLD/ENTER**. The upper display will show "ACA".

4 Press **HOLD/ENTER**

5 Press **MI/** or **MR/** to select. "YES" activates automatic calibration, "NO" activates manual calibration.

6 Press **HOLD/ENTER** to confirm.

7 Press **CAL/MEAS** key twice to return to measurement mode.

NOTE: Parameter P9.1 will only be in the Set Up menu if you enter from the conductivity measurement mode. If you enter from the TDS measurement mode, Parameter P9.1 will not be displayed.

6.4.5 Selection of Single or MultiPoint Calibration (P9.2)

Single point calibration lets you have a single calibration factor for all five ranges by calibrating one point in either one of the ranges, this factor is applied to all the five ranges.

Multi point calibration gives better calibration accuracy by letting you calibrate in each of the five ranges, this calibration factor would only be applicable in the particular range where the calibration is done.

1 Press **SETUP**.

2 Press **MI/** or **MR/** until you view parameter P9.0 (ASC).

3 Press **HOLD/ENTER**. The upper display will show "SPC".

4 Press **HOLD/ENTER**.

5 Press **MI/** or **MR/** to select. "YES" activates single point calibration, "NO" activates multi point calibration.

6 Press **HOLD/ENTER** to confirm.

7 Press **CAL/MEAS** to return to measurement mode.

6.4.6 Automatic Calibration

(For Conductivity Calibration Only)
This procedure describes the method for calibration to a 1413µs calibration standard.

NOTE: Select automatic or manual calibration as described in Selection of Automatic or Manual Calibration.

NOTE: Select single -or multi point calibration as described in Selection of Single or MultiPoint Calibration (P9.2).

NOTE: To exit without confirmation, press CAL/MEAS to go back to measurement mode.

1 If necessary, press MODE to select conductivity mode.

2 Rinse the electrode with deionised water or a rinse solution, then rinse with a small amount of calibration standard.

3 Dip the electrode into the calibration standard. Immerse the electrode tip beyond the upper steel band. Stir the electrode gently to create a homogeneous sample. Allow time for the reading to stabilise.

4 Press CAL/MEAS to enter calibration mode.

The CAL indicator will appear in the upper corner of the display. The primary display shows the current measured value, the secondary display shows the calibration standard value.

5 Press HOLD/ENTER to confirm. The meter will now return to the measurement mode. Multi point calibration: repeat step 1 to 5 for every calibration point in each measuring range using the known calibration solutions until all points have been calibrated.

6.4.7 Manual Calibration (For Conductivity & TDS Calibration)

This procedure describes calibration to a 12.00mS calibration standard.

NOTE: Select automatic or manual calibration as described in Selection of Automatic or Manual Calibration.

NOTE: Select single -or multi point calibration as described in Selection of Single or Multipoint Calibration.

NOTE: To exit without confirmation, press **CAL/MEAS** to go back to measurement mode.

1 Repeat step 1 to 4 from Automatic Calibration.

2 Wait for the value to stabilise and press. **MI/** or **MR/**, adjust the value in the upper display to the calibration standard used.

3 Press **HOLD/ENTER** to confirm and return to measurement mode. Multi point calibration: repeat step 1 to 6 for every calibration point in each range using the calibration solutions until all points have been calibrated.

6.4.8 TDS Calibration

Calibrating TDS with conductivity standards & adjusting TDS factor Instead of calibrating for TDS directly using TDS calibration standard solutions, you can calibrate by using the conductivity calibration method and enter the appropriate TDS conversion factor into the meter.

6.4.9 Setting the TDS Conversion Factor

The factory default setting for TDS conversion factor is 0.5. If your solution has a different TDS factor, you can improve accuracy by setting the TDS factor prior to calibration.

1 Press **MODE** to select TDS mode.
2 Press Setup.
3 Press **HOLD/ENTER** five times to scroll until you view P1.4 (tdS).
4 Press **HOLD/ENTER**. The upper display shows a value and the lower shows "tdS".
5 Press **MI/** or **MR/** to select your calculated TDS conversion factor.
6 Press the **HOLD/ENTER** key to confirm.
7 Press the **CAL/MEAS** key to return to measurement mode.

6.4.10 Calibrating for TDS using TDS Standards

After setting the correct TDS Factor, you can calibrate in the TDS mode.

1 Press **MODE** to select the TDS mode.
2 Follow the instructions in Manual Calibration for the rest of the calibration process, this time using the TDS calibration standards.

NOTE: You can offset the TDS reading up to ± 40% from the default setting. If your measured value differs by more than ± 40%, clean or replace electrode as needed.

6.5 Measurement

6.5.1 Temperature Compensation

This meter can take measurements with automatic (ATC) or manual (MTC) temperature compensation.

Factory default is ATC on. For ATC, attach the **conductivity/TDS** electrode to the meter. The ATC indicator will light on the LCD. If the **conductivity/TDS** electrode is not properly attached to the meter

or it has been damaged, the ATC indicator will blink and the temperature display will show **'Ur'**. If the ATC indicator does not light and the temperature display shows a reading, the meter might be in MTC mode.

6.5.2 Selecting Temperature Compensation mode

1 Press **SETUP**
2 Press **HOLD/ENTER** 3 times to scroll until you view P1.3 (AtC)
3 Press **HOLD/ENTER**. The upper display shows "ATC" and the lower display shows "YES".
4 Press **MI/** or **MR/** to select: **'YES'**, ATC is on or **'NO'**, ATC is off.
5 Press **HOLD/ENTER** to confirm selection.
6 Press **CAL/MEAS** to return to measurement mode.

6.5.3 Setting Manual Temperature Compensation Value

MTC enables you to enter the temperature value of your sample into the meter. This is the value at which the readings will be temperature compensated.

1 Set temperature mode to **MTC** and go through step 1 to 6.
2 Press **CAL/MEAS**. The **CAL** indicator will appear above the primary display.
3 Press **MODE**.
4 Press **MI/** or **MR/** to offset the temperature to your preferred settings.
5 Press **HOLD/ENTER** to confirm

NOTE: To exit this program without confirming the **MTC** value, press **CAL/MEAS**.

6.5.4 Taking Measurements

1 Rinse the electrode with deionised or distilled water before use. Shake or air dry. To avoid contamination or dilution of your sample, rinse electrode with a small volume of your sample liquid.
2 Press ON to switch on meter.
3 Dip the electrode into the sample. When dipping the electrode into the sample, ensure that the liquid level is above its upper steel band. Stir the electrode gently in the sample to create a homogenous sample.
4 Allow time for the reading to stabilise.
5 Press **MODE** to toggle between conductivity and TDS readings (if necessary).

6.5.5 HOLD Function

Let's you freeze the display and hold the measured value.

1 Press **HOLD/ENTER** to hold a measurement. **'HOLD'** will appear on the display.

2 Press **HOLD/ENTER** again to release the held value.

NOTE: If the meter is shut off the HOLD value will be lost. For longer storage, use the memory functions.

6.5.6 Selection of READY (P1.1)

The **'READY'** display indicates the measurement stability during a measuring process.

From measurement mode:

1 Press **SETUP**.

2 Press **HOLD/ENTER**.

3 Press **MI/** or **MR/** to select the configuration you require (left display).

a. **'ON'** activates the **READY** function.

b. **'OFF'** deactivates the **READY** function.

4 Press **HOLD/ENTER** to confirm selection.

5 Press **CAL/MEAS** twice to return to measurement mode.

6.5.7 Range Setting and Option

Your meter automatically selects the range in which your readings appear.

The manual ranging function lets you select the specific range you want to work in.

6.5.8 Selecting Manual or Auto Ranging

1 Press **RANGE** while in measurement mode. Display will show either **'r1'** to **'r5'**, indicating the range you are in. The range selected will appear and **'MEAS'** blinks.

2 Press **RANGE**, until desired range is selected. Digital Conductivity Meter 65

3 To re-select the auto-ranging, repeatedly press **RANGE** until **'MEAS'** stops blinking.

NOTE: If the measured value is higher than the range selected, **'Or'** will appear. Press **RANGE** until the correct range is selected.

NOTE: The meter resets to the Autoranging once it is turned off. Manual ranging needs to be reset each time you turn the meter on.

6.6 Memory Function

The **CON 11** meter stores up to 50 set of data respectively. Data sets include conductivity, TDS and temperature values.

6.6.1 Memory Input

Press **MI/** during measurement to input data into the memory. MEM, "StO" and memory number will appear for a moment.

If necessary, measure the next sample solution and press Mil key to input the next data into the memory.

NOTE: If the memory is full, the display will flash "FUL" momentarily. The first value stored will be overwritten.

6.6.2 Memory Recall

1 Press **MR/** once to retrieve the last reading stored.

2 Press **HOLD/ENTER** to recall the reading.

3 Press **HOLD/ENTER** to return. The display automatically moves to the next memory location screen.

4 Press **MI/** or **MR/** to scroll to a specific memory location, press **HOLD/ENTER** to select.

5 Press **CAL/MEAS** to exit Memory Recall.

NOTE: Readings stored in memory are retained even if the unit is turned off.

6.6.3 Memory Clear (P6.0)

1 Press **SETUP**.

2 Press **MI/** (5x) or **MR/** (4x) until you view the parameter P6.0 (CLr).

3 Press **HOLD/ENTER**.

4 Press **MI/** or **MR/** to toggle between NO and YES. **'NO'** retains current memory, **'YES'** clears all memory.

5 Press **HOLD/ENTER** to confirm selection.

6 Press **CAL/MEAS** to return to measurement mode.

6.7 Other Functions

6.7.1 Viewing calibration data (P2.0)

1 Press **SETUP**.

2 Press **MI/** (1x) or **MR/** (8x) until you view parameter P2.0 (CAL).

3 Press **HOLD/ENTER** repeatedly to view the previous calibration data on each of the five measuring ranges.

4 When you have scrolled through all calibration data, you will automatically return to the subgroup menu.

5 Press **CAL/MEAS** key to return to the measurement mode.

NOTE: If there is no calibration data at a particular point, the primary display will show "----".

6.7.2 Viewing Electrode Data (P3.0)

1 Press **SETUP**.

2 Press **MI/** (2x) or **MR/** (7x) until you view parameter P3.0 (ELE).

3 Press **HOLD/ENTER** repeatedly to view the effective cell constant for each range.

4 When you have scrolled through all the electrode data, you will automatically return to the subgroup menu.

5 Press **CAL/MEAS** to return to measurement mode.

6.7.3 Auto Off (P4.0)

You can activate the **Auto Off** option to automatically switch off the instrument 20 minutes after the last key selection.

1 Press the **SETUP** key to enter Set Up mode.

2 Press **MI/** (3x) or **MR/** (6x) until you view parameter P4.0 (AtO).

3 Press **HOLD/ENTER**.

4 Press **MI/** or **MR/** to select: YES - activates the Auto Off function or NO - deactivates the Auto Off function.

5 Press **HOLD/ENTER** to confirm and return to subgroup menu.

6 Press the **CAL/MEAS** key to return to measurement mode.

6.7.4 Reset to factory defaults (P5.0)

Either reset calibration data only (P5.1 CAL) or reset all to factory default (P5.2 Usr).

6.7.5 Calibration Reset (P5.1)

1 Press **SETUP**.

2 Press **MI/** (4x) or **MR/** (Sx) until you view parameter P5.0 (rSt).

3 Press **HOLD/ENTER**.

4 Press **HOLD/ENTER**.

5 Press **MI/** or **MR/** to select: NO retains current settings or YES clears all calibrations and its data.

6 Press **HOLD/ENTER** to confirm and return to subgroup menu.

7 Press **CAL/MEAS** to return to measurement mode.

6.7.6 User Reset (P5.2)

1 Repeat step 1 to 4

2 Press **HOLD/ENTER** to enter parameter P5.2 (Usr).

3 Press **HOLD/ENTER**

4 Press **MI/** or **MR/** to select: NO retains current settings or YES resets to factory default settings.

5 Press **HOLD/ENTER** to confirm and return to subgroup menu.

6 Press **CAL/MEAS** to return to measurement mode.

6.7.7 Setting the Temperature Coefficient (P7.1)

The temperature coefficient is the amount of change in conductivity per degree of temperature; it is expressed in percent per DC.

Entering the exact temperature coefficient of your solution lets you accurately compensate temperature for almost any solution. You can adjust 0.0 to 10.0% per DC.

Meter default is 2.1% per DC. By setting the temperature coefficient to 0.0%, the meter will not apply any compensation but will display actual temperature.

1 Press **SETUP**.

2 Press **MI/** (6x) or **MR/** (3x) until you view parameter P7.0 (tPr).

3 Press **HOLD/ENTER**.

4 Press **HOLD/ENTER**.

5 Press **MI/** or **MR/** to select the temperature coefficient of your solution.

6 Press **HOLD/ENTER** to confirm and return to subgroup menu.

7 Press **CAL/MEAS** twice to return to the measurement mode.

6.7.8 Setting the Normalisation Temperature (P7.2)

Your meter will normalise its conductivity measurements to a standard temperature that you can select. You can adjust the normalisation temperature either at 20.0°C or 25.0°C. Meter default is 25.0°C.

1 Repeat step 1 to 4
2 Press **HOLD/ENTER**.
3 Press **HOLD/ENTER**.
4 Press **MI/** or **MR/** to select either 20.0°C or 25.0°C as the normalisation temperature.
5 Press **HOLD/ENTER** to confirm and return to subgroup menu.
6 Press **CAL/MEAS** to return to measurement mode.

6.7.9 Selection of Cell Constant (P8.0)

The meter lets you select a cell constant of K = 1.0, 10, or 0.1. The cell included with your meter has a cell constant of K=1.0.

1 Press **SETUP**.
2 Press **MI/** (7x) or **MR/** (2x) until you view parameter P8.0 (CEl).
3 Press **HOLD/ENTER**.
4 Press **MI/** or **MR/** to select the cell constant between K = 1.0, 0.1, or 10.
5 Press **HOLD/ENTER** to confirm selection and return to the subgroup menu.
6 Press **CAL/MEAS** to return to measurement mode.

6.8 Error Messages and Troubleshooting

Error message/Problem	Possible Cause	Corrective Action
Err. Annunciator	Wrong input in selected mode	Release key. Select valid operations depending on mode
Secondary Display toggles continuously between Calibration Standard Values	Incorrect solution used in calibration or contaminated calibration solution	Check if correct solution used, replace with fresh solution if where necessary
Battery icon illuminated	Low battery	Replace with new batteries as soon as possible
Blank display when ON/OFF key is selected	1 Batteries not in place 2 Batteries not aligned to correct polarity 3 Low level batteries 4 No AC power to adapter (if used)	1 Insert batteries 2 Insert batteries to correct polarity position 3 Replace batteries or connect to AC adaptor 4 Check power supply to AC adaptor
Unstable reading	1 Air bubbles in electrode 2 Dirty electrode 3 Electrode not deep enough in sample 4 External electrical noise caused by nearby motor 5 Electrode guard not attached	1 Tap electrode to remove bubbles. Reposition electrode away from bubbles in sample 2 Clean electrode and recalibrate 3 Immerse electrode to cover electrode sensors 4 Move location or switch off interfering device 5 Attach guard
Slow response	Dirty/oily electrode	Clean electrode
Meter not responding to key press	HOLD mode in operation	Cancel HOLD mode
ATC indicator blinks and temperature shows "Ur"	1 Improper attachment of electrode to meter 2 Electrode temperature sensor cable connection has broken	1 Check that the electrode is properly connected to the meter 2 Replace electrode

6.9 Technical Specification

|	
Conductivity Range	0 - 19.99; 20.0 - 199.9; 200 - 1999 µS/cm; 2.00 - 19.99; 20.0 - 199.9 mS/cm
TDS Range	0.00 to 9.99 ppm; 10.0 to 99.9 ppm; 100 to 999 ppm; 1.00 to 9.99 ppt; 10.0 to 99.9 ppt
Resolution	0.05% Full Scale
Accuracy	±1% F.S. +1 digit
Temperature Range	-10.0 to 110.0°C
Temperature Resolution	0.1°C
Temperature Accuracy	± 0.5°C
Temperature Compensation	Automatic/Manual (from 0 to 100°C)
Temperature Coefficient	0.0 to 10.%/°C
TDS Factor	0.40 to 1.00
Calibration Points (Automatic)	84.0, 1413µs/cm; 12.88, 111.8mS/cm
Calibration Points (Manual)	User defined standard/1 per range up to 5 points
Single/Multi point calibration	Selectable
Calibration Range	10% to full scale
Auto-ranging	Yes (manual select available)
HOLD Function	Yes
Memory	50 Data Sets 100 Data Sets
RS232	Yes No
Auto Off	Selectable
Auto Off Time	20 minutes after last key operation
Meter Warranty	3 years

7.0 Introduction

The **Digital Arsenator** is designed for field or laboratory determination of Arsenic in the range 2-100µg/l As.

Using the modified Gutzeit method and the unique tri-stage filter assembly, the Digital Arsenator will provide accurate and safe measurement of Arsenic.

7.1 Operating Method

1 Take the tri-filter assembly and load a Hydrogen Sulphide filter in the base of the assembly.
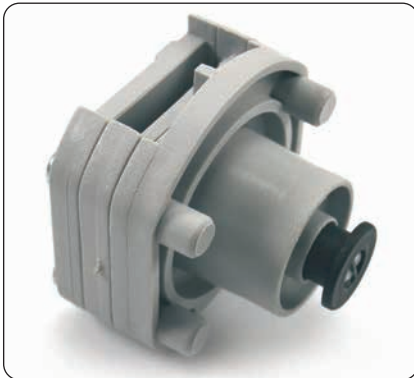
2 Take a red filter paper holder and load with a destruction paper.

3 Take a black filter paper holder and load with a detection paper.

4 Switch the Arsenator on by pressing any key.

5 Place the loaded black filter paper holder into the Arsenator to blank and start the 20 minute timer.

6 Load the tri-filter assembly with the red and black filter paper holders.

7 Add 50ml of sample and add to the conical flask.

8 Add the contents of the A1 (Sulphamic Acid) sachet and swirl to dissolve.

9 Drop one A2 tablet into the flask.

NOTE: the sample will fizz significantly.

Immediately insert the tri-filter assembly into the conical flask neck to prevent any Arsine gas escaping.

10 Wait for 20 minutes for reaction to proceed to completion.

11 Upon completion, insert the black filter paper holder into the Arsenator and the result will be displayed in µg/l.

12 Results higher than 100µg/l will require the colour comparison chart to determine the approximate value.

13 For more accurate results dilute the sample and repeat the testing.

14 Dispose of used materials carefully - they may contain Arsenic.

Hints and Tips

• Never use a broken filter paper holder - the seal will not be gas tight and results will be affected.

• Never insert the red filter paper holder into the Arsenator.

• Insert filter paper holders fully for maximum sensitivity.

• Replace the Hydrogen Sulphide filter when it is completely black.

• If low battery is shown on the Arsenator, replace the battery within 10 tests.

7.2 Technical Specification

Measurement Range	2 to 100µg/litre
Test Duration	20 minutes
Power Requirements	1 x 9V battery
Dimensions	127 x 115 x 40mm
Weight	220g

Part Number	Description
APW 152	Ammonia, 200 tests, Polypropylene Carton
APW 179	Fluoride, 200 tests, Polypropylene Carton
APW 031	Free and Total Chlorine (DPD 1 & 3), 250 tests, Polypropylene Carton
APW 163	Nitrate (Nitratest), 200 tests, Polypropylene Carton
APW 109	Nitrite (Nitricol), 200 tests, Polypropylene Carton
AP 152	Ammonia, 200 tests, Refill Pack
AP 179	Fluoride, 200 tests, Refill Pack
AP 031	Free and Total Chlorine (DPD 1 & 3), 250 tests, Refill Pack
AP 163	Nitrate (Nitratest), 200 tests, Refill Pack
AP 109	Nitrite (Nitricol), 200 tests, Refill Pack
PT 595/5	Photometer cuvettes, pack of 5
PT 663	Cuvette Brush
PT 502	Crush/Stir Rods, pack of 10
PT 512	Dilution Tube/Sample Tube
66103485	Black Arsenic Filter Papers, 400 pack
66103486	Red Arsenic Filter Papers, 200 pack
66104155	A1 Powder (Sulphamic Acid), 200 sachets
66109647	A2 Tablets (Sodium Borohydride), 4 pots of 50
66103651	Hydrogen Sulphide removal filters, 5 pack
PTC 090	Compact Turbimeter Calibration Set
PT 121	4000 NTU Formazin Standard, 100mls
PT 555	Turbimeter cuvettes with caps, pack of 5
PT 120	Silicone Oil, 10mls
PT 142/15	pH 4 buffer solution, 60mls
PT 142/12	pH 7 buffer solution, 60mls
PT 142/13	pH 10 buffer solution, 60mls
PT 142/7	Conductivity solution, 60mls

Palintest Ltd

Palintest House, Kingsway, Team Valley,
Gateshead, NE11 0NS
Tel: +44 (0)191 491 0808
Fax: +44 (0)191 482 5372
sales@palintest.com (UK)
export@palintest.com (International)

Palintest Australia and Asia Pacific

1/53 Lorraine Street,
Peakhurst Business Centre,
Peakhurst, NSW 2210, Australia
Tel: +61 1300 131516
Fax: +61 1300 131986
palintest@palintest.com.au

Palintest USA

1455 Jamike Avenue (Suite 100),
Erlanger, Kentucky, 41018, USA
Tel: +1 859 341 7423
Toll Free: 800 835 9629
Fax: +1 859 341 2106
info@palintestusa.com

Palintest China

Room 1711, Fanli Mansion,
22 Chaowai Street, Chaoyang District,
Beijing, 100020, PRC
Tel: +86 10 6588 6200
Fax: +86 10 6588 8311
china@palintest.com

Palintest Middle East

PO Box 27709, Engomi 2432,
Nicosia, Cyprus
Tel: +357 226 66080
Fax: +357 226 60355
sales@palintest.me

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