The
Palintest®
System

Photometer 8000 System for Water Analysis

DIRECT-READING PHOTOMETER

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Contents

1 Contents

Contents

2   Introduction

2.1 The Palintest System

Water testing plays a vital role in our modern society. Moves to improve drinking water quality, heightened environmental concerns and increased use of water for industry and leisure all create the need for quick, accurate water test results.

In each and every case, the Palintest system provides the answer. Simple to use test equipment, and reagents in stable tablet form or predispensed tubes, mean that rapid reliable results can be obtained by all users – with or without formal laboratory training.

This is why the Palintest system is used in laboratories, treatment plants, leisure facilities and industrial premises throughout the world – you can rely on 35 years of Palintest experience for your water testing needs.

Palintest Photometer Systems offer a precise modern means of water analysis. The system features the Palintest Photometer 8000 – an advanced solid-state digital-readout colorimeter instrument.

The Photometer 8000 is integrated with the Palintest range of tablet reagents and Tubetests reagent tubes. It offers an instrumental method of analysis for an extensive range of water tests. (See Page 39 for a full list of Palintest reagents).

The Palintest Photometer 8000 accurately assesses the colour formed in the test sample and displays the reading as a digital readout. The Photometer 8000 is preprogrammed with test calibrations and gives a direct reading of the test result.

The following pages describe the use of the Palintest Photometer 8000, and give details of the wide range of water tests that can be performed using this instrument.

Booklets supplied with test kits contain the relevant test instruction sheets. Additional sheets describing other tests, test equipment or instruments may also be included.

2.2 Features of the Photometer 8000

The Palintest Photometer 8000 is a precision instrument with wide applications in colour measurement and analytical chemistry. The photometer is integrated with the Palintest system of analysis. It offers an instrumental method of analysis for an extensive range of water tests.

The Palintest Photometer 8000 features solid-state digital electronics and a unique static-optical system. It functions on mains or battery power and is therefore suitable for laboratory or on-site use.

The instrument features :-

o   Automatic wavelength selection
o   Automatic multi-size cell holder
o   Automatic test recognition for Tubetests methods
o   Large back-lit touch-screen display
o   Direct-reading of wide range of water tests
o   Automatic blank setting
o   Five language options.

Introduction

The intuitive, user-friendly interface guides the user through the wide range of set-up options to simplify routine analysis. These include :-

o   User's favourite test lists
o   User-entered calibrations
o   Choice of units for expression of results.

On-board help screens offer simplified test instructions and Health and Safety information on reagents used for each test.

Additional features provide a sample audit trail :-

o   User or site location record
o   Incorruptible data log for 1000 samples
o   Analysis date and time, and sample number record
o   Download to printer or computer.

The instrument optical performance is enhanced by :-

o   Performance self-check routine on start-up
o   Dual light source optical system
o   Multiple photodetectors
o   Optical compensation for repeatability.

The instrument maintenance is simplified by :-

o   Diagnostic error messages to alert user to misuse or malfunction
o   Availability of calibration standards traceable to NPL
o   Remote software upgrade with addition of new tests
o   Easy-clean optical assembly.

2.3 Using this Manual

The operator instructions are presented in three sections :-

Chapter 3:   The Quick Start Guide is for first-time users, and describes how to perform a test.

Chapter 4 to 8: General Operation describes the day-to-day usage of the instrument.

Chapter 9 to 10 Details additional facilities, for the professional user with more complex requirements.

2.3.1   Notation

The following special typefaces and icons are used throughout the manual :-

ⓘ   **Paragraphs in this typeface, marked with the ⓘ symbol, mark important information or advice, which must be followed for safety reasons or to protect the Photometer 8000 from damage.**

Touch screen button labels are shown in a highlighted typeface for clarity. For example :-

"Select ⬛ **System** ... ⬛ **Back Light** to turn the back light on and off"

means touch the area on the screen labelled 'System', then the area labelled 'Back Light'.

Introduction

2.4 Safety

Simple chemical safety information is provided through help screens.

For further information, consult the Health and Safety Data Sheets for each chemical reagent.

2.5 Care of the Instrument

Your Palintest Photometer 8000 is designed to give long and trouble-free operation. To ensure you get the best out of this photometer instrument, please read these instructions carefully and follow the procedures recommended.

The photometer is suitable for use in both the plant room and the laboratory, or for portable use at the waterside. It is sturdy and rugged but should always be regarded as a scientific instrument. Treat it in the same way that you would a laptop computer or a camera. It is designed to resist moisture and spills but careless use may result in damage or reduce the life of the instrument.

Here are 10 hints on keeping the photometer clean, free from contamination and in good working order :-

1 Prepare your workplace before use. Make sure that you have enough space to work with the photometer and with the reagent systems.
2 Do not pour out samples or prepare the tests directly over the photometer.
3 Always cap the test tubes after preparing the blank and test sample.
4 Wipe test tubes on a clean tissue to remove drips or condensation before placing in the photometer.
5 Do not leave tubes standing in the photometer test chamber. Remove the tubes immediately after each test.
6 Wipe up immediately any drips or spillages onto the photometer or into the test chamber with a clean tissue.
7 Keep the photometer clean. Clean the test chamber regularly using a moistened tissue or cotton tip.
8 Keep the photometer away from all chemicals and cleaning materials - do not place it on top of chemical drums or barrels.
9 Store the photometer in a clean, dry place when it is not in use. Keep it on a clean, dry bench away from chemicals, place it in a storage cupboard or keep it in a carrying case.
10 Keep the carrying case (where supplied) in a clean, dry condition. Make sure that any solutions that have spilled or drained into the carrying case are dried up before the case is closed up and the instrument is put away.

2.6 Obtaining Accurate Results

Success in obtaining accurate and consistent test results will depend on the care with which test procedures are carried out. Always follow the test instructions carefully and observe the stated standing periods and temperature conditions where applicable.

Wipe test tubes free from condensation before placing in the photometer. Test tubes should always be kept in a clean condition. Wash and dry carefully after use. Dirty tubes may be soaked in weak detergent solution if necessary. Tubes that become stained or scratched in use should be replaced.

Introduction

2.7 Blank and Sample Tubes

A BLANK TUBE is needed each time the photometer is used. This enables the instrument to be set automatically and compensates for any inherent colour in the test sample. It is important therefore to understand the meaning of the term 'BLANK TUBE'.

The BLANK TUBE is a test tube filled with the water being tested only. It is important to use the actual water to provide a true comparison for the test results.

The term 'SAMPLE TUBE' is used to describe the tube containing the water sample to which the reagents have been added in accordance with the appropriate test instructions. This tube is used to take the photometer reading.

The BLANK and SAMPLE TUBES must be of the same diameter, eg both 20 mm or both 16 mm.

2.8 Precautions for Use in Sunlight

The Photometer 8000 is designed to minimise the ingress of light through the cell holder. However, if the instrument is used in bright sunlight or directly under a bright light source, the light cap provided should be used. The light cap should be used with the directional arrow pointing towards the user. Place it over the Blank and Sample tubes while blanking and taking readings for optimum results.

Quick Start Guide

3   Quick Start Guide

3.1 Switch On

Press and hold the power switch, located near the base on the right-hand side at the rear of the instrument, until the instrument beeps.   After initial diagnostic checks, the main display will appear – see   Figure 1 :-
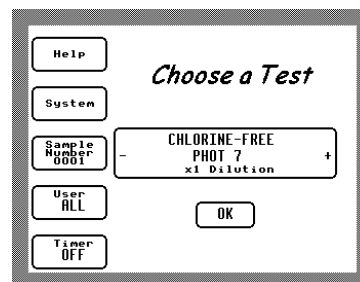
Figure 1 – Main Screen

3.2 Select Language

- Touch   **System**   then each touch of the   **Language**   button scrolls through the available language choices.

- Touch **OK** to select the displayed language option and return to the Main screen.

3.3 Select Test

- Touch **OK** to accept the test on display, or

- Use the **+** and **–** buttons on the main screen to select the test, or

- Touch the current test name for additional test features (see Page 11).
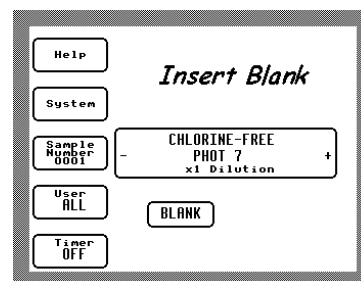
Figure 2 – Insert Blank

When the test required has been selected, the display will progress to 'Insert Blank' (Figure 2).

To take a reading using the selected test, proceed to Blank and Read.

3.4 Blank

- Insert the appropriate blank tube.

- Touch **Blank**.

The instrument will display 'Blanking' until the blank has been read correctly and then progress to 'Insert Sample' (Figure 3).

Remove the blank tube.
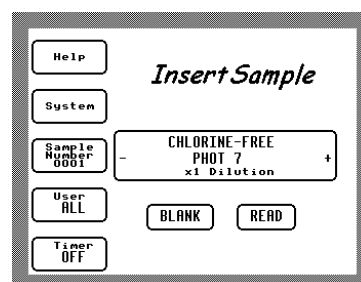
Figure 3 – Insert Sample

3.5 Read

- Insert the prepared sample tube.

- Touch **Read**.

The instrument will display 'Reading' until the sample has been read correctly.   The reading will be displayed on-screen and will also be stored automatically.

Remove the sample tube.

3.6 Switch Off

Press and hold the power switch until the instrument display goes blank.

4 General Operation of the Instrument

4.1 Using the Touch Screen

The Photometer 8000 incorporates a precision touch screen, which is used for all aspects of instrument operation except switching the instrument on and off.

Except for the power switch, all references to switches, buttons and keys in this manual refer to text and icons, which appear on the touch screen when required.

Unless the text states otherwise, all instructions begin from the 'main screen', which is displayed when the instrument is switched on or taking readings. Repeated selection of the OK or Cancel buttons from other screens always returns the display to the 'main screen'.

Only a light touch is required to activate a button or select an option from the touch screen. The screen may be touched with a fingernail or stylus to keep the screen free from marks and to allow small buttons to be selected reliably. It is not necessary to remove gloves before using the touch screen, unless the gloves are contaminated with a chemical that could damage the surface.

ⓘ **Do not use sharp or chemically contaminated objects to activate the touch screen (eg pen nibs or metal tools).**

ⓘ **It is important to keep the screen clean, grease will affect legibility and the performance of the anti-glare coating, and the upper surface of the touch screen may be scratched by grit particles.**

The screen may be gently wiped with a dry lint-free cloth to remove deposits. If necessary, the cloth may be dampened with mild detergent solution to remove marks. Dry the screen gently with a lint-free cloth after cleaning.

ⓘ **Do not attempt to use any abrasive material or polish to clean the touch screen surface.**

4.2 Controlling the Instrument

The instrument is controlled by touching an active area of the touch screen. The two main types of active area are illustrated below :-

Buttons:
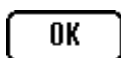
OK   Touch anywhere inside the button outline to select the letter, number or option displayed on it.

Scrollbars:

On some screens (eg Select User Name), there may be too much information to display, so only a section will be shown on the screen. You can use the scrollbar at the side of the information panel to move around the list of information.

Touch an arrow at one end of the bar to move in that direction through the displayed information. Touch a point on the bar to jump to that location in the document quickly.

The marker in the bar will change position to show your approximate position in the list.

To select an item from the list, touch the text of the item. The selected item will be highlighted.

General Operation of the Instrument

4.3 Power Supply

The Photometer 8000 is designed to run for extended periods on battery power if required. The quality of readings will be equally high whether the instrument is running from battery power or the supplied mains power supply.

To replace batteries :-

- Remove the battery compartment cover by removing the two screws on the right-hand side of the instrument, beside the rubber seal.
- Remove any batteries from the compartment. All batteries should be replaced together, do not mix old and new batteries.
- Fit 8 x 1.5v 'AA' alkaline cells (type MN1500, LR6, E91, AM3 or equivalent), with polarity as indicated on the base of the instrument.
- Carefully refit the battery compartment cover and tighten the screws. Take care that the battery compartment cover retains the rubber seal for the RS232 connector correctly.

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

ⓘ **Do not attempt to substitute an alternative mains power supply for the supplied unit. The instrument incorporates protection measures to reduce the risk of damage from incorrect voltage or polarity, but the supplied mains power supply has been carefully selected to ensure optimum performance. Replacement power supplies are available from Palintest Ltd if required, for worldwide mains socket standards and voltages.**

To run the instrument from the mains supply :-

- Ensure the photometer is switched off
- Connect the supplied power supply to the instrument power supply socket
- Connect the power supply mains plug to the local mains supply and switch the mains supply on (eg at the wall socket)
- Switch the photometer on using the power switch.

When the external power supply is connected, the internal batteries are automatically disconnected.

ⓘ **If battery power is not to be used for an extended period (more than a few months), it is recommended that the batteries be removed to avoid damage due to battery chemical leakage.**

ⓘ **If the mains supply is switched off, or the power supply connector removed, while the instrument is operating, loss of data and settings may result. Only insert and remove the external power supply connector when the instrument and the mains supply are switched off.**

5   Simplified Analysis Using Palintest Programs

5.1 Switch ON and OFF

To switch the instrument ON, press and hold the power switch, located near the base on the right-hand side at the rear of the instrument, until the instrument beeps. After initial diagnostic checks, the main display will appear – see Figure 4 :-
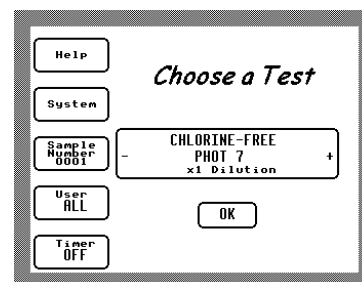
Figure 4 - Main Screen

All of the commonly used functions on the Photometer 8000 can be accessed quickly from the main screen, which appears when the instrument has started up. To switch the instrument OFF, press and hold the power switch until the display goes blank.

5.2 Palintest Program Options

The Photometer 8000 has many test programs for use with Palintest reagents stored in memory. Each test is identified by a two-digit number, the PHOT Number.

Users may also store their own calibrations in memory with an identifying three digit PHOT number (see Section 10).

The Photometer 8000 provides several ways of selecting the test program :-

- Touch $\boxed{+}$ and $\boxed{-}$ to increment the test by PHOT Number, (see Figure 4) or

- Touch the central panel where the test name is displayed to enter the 'Test Selection' screen (See Fig 5).
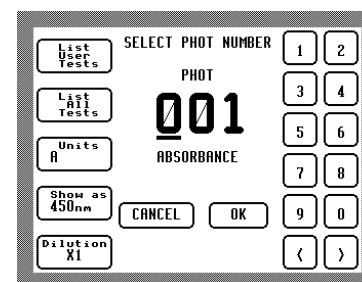
Fig 5 – Test Selection Screen

From this screen, the following test options can be specified :-

5.2.1   Select Test by PHOT Number

- Use the number keys and $\boxed{<}$ and $\boxed{>}$ buttons to enter the PHOT number of the required test method.

- If an invalid number is entered, the $\boxed{\textbf{OK}}$ button will disappear until the number is corrected.

5.2.2   Select Test from All Available Tests

- Touch $\boxed{\textbf{List All Tests}}$ to display all available tests.

- Select the required test and touch $\boxed{\textbf{OK}}$, or

- Touch $\boxed{\textbf{Cancel}}$ to revert to previous test

- Once the selection is made, the display automatically returns to the Test Selection screen (allowing selection of units, chemical symbol display and dilution factor, if required).

In 'All Tests' mode, $\boxed{+}$ and $\boxed{-}$ on the main screen will scroll through the full list of tests by PHOT Number.

Simplified Analysis Using Palintest Programs

5.2.3   Select Test from User Favourite Tests

- Touch $\boxed{\textbf{List User Tests}}$ to display the current user's list of favourite tests.

- Select a test and touch $\boxed{\textbf{OK}}$, or

- Touch $\boxed{\textbf{Cancel}}$ to revert to the previous test

- Once the selection is made, the display automatically returns to the main screen.

In 'User Tests' mode, $\boxed{\textbf{+}}$ and $\boxed{\textbf{–}}$ on the main screen will scroll through the user's favourite tests by PHOT Number.

If the same test options are used frequently, consider adding the test to the user test list - see Page 27. The user list may include several tests using the same PHOT Number, with different units, dilution factors and symbols.

5.3 Select Units

Test results may be expressed in different units. Typical options are g/l, mg/l, ppm, mmol/l, µmol/l and degrees of Hardness.

- Touch $\boxed{\textbf{Units}}$, to cycle through the available display units options for the selected test.

5.4 Select Expression of Results

Test results may be displayed in different chemical forms. For example, the result of a test for nitrate may be expressed as Nitrogen (N) or Nitrate (NO_3).

- Touch $\boxed{\textbf{Show as}}$ to cycle through the available options for expressing the test result.

5.5 Enter Sample Dilution

The sample dilution option enables a factor to be entered when samples have been diluted. For example, if a 10 times dilution of the sample has been made, (by diluting 10 ml of sample to 100 ml with deionised water) then the dilution factor $\boxed{\textbf{x10}}$ should be entered. The photometer will multiply the observed result by this factor so that the correct result for the original sample is displayed.
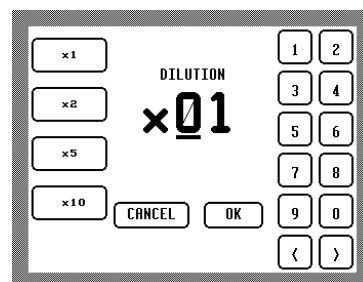
Fig 6 – Select Dilution

If the sample is undiluted, select factor $\boxed{\textbf{x1}}$. Samples should not be diluted prior to carrying out a pH test.

- Enter the required dilution using the numeric keypad, and the $\boxed{\textbf{<}}$ and $\boxed{\textbf{>}}$ keys, or

- Use the buttons on the left of the screen to select a common dilution factor. If a dilution factor button is pressed repeatedly, the dilution factor will be incremented by the number on the button. For example, touch $\boxed{\textbf{x2}}$ twice to select x4 dilution.

- Touch $\boxed{\textbf{OK}}$ to accept the new test settings or $\boxed{\textbf{Cancel}}$ to revert to the previous dilution factor.

5.6 Return to the Main Screen

Once the required test has been fully specified, select $\boxed{\textbf{OK}}$ to accept the settings or $\boxed{\textbf{Cancel}}$ to revert to the previously selected test settings.

Simplified Analysis Using Palintest Programs

5.7 Sample Identification

A 4-digit sample identification number can be used to identify each test result :-

- To enter a number, select │**Sample Number**│.

- Enter a number using the numeric keys, and use │**<**│ and │**>**│ to control the cursor.

- Select │**OK**│ to accept the changed sample number, or

- Select │**Cancel**│ to revert to the previous sample number.
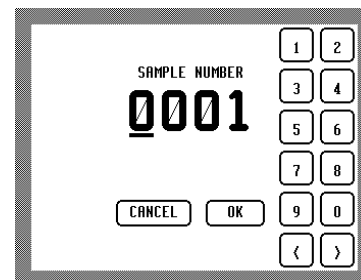
Fig 7 – Sample Number Entry

5.8 User Identification

The user or site name selected here will be recorded in the log with subsequent tests. The selected user's list of frequently used tests will also be available in the test selection screen.
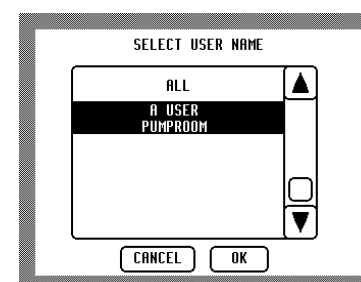
Fig 8 – Selection of User Name

From the main screen :-

- Touch │**User**│ to view or change the current user. The currently selected user name will be highlighted.

- Select a different name by touching it on screen and use the scrollbar to move around long lists of users.

- Select │**OK**│ to accept the newly selected user, or

- Select │**Cancel**│ to revert to the previous user.

If additional users need to be added, see Page 27. If user names are not required, select the default user 'All'.

5.9 Using the Timer

Some chemical procedures require the use of a timer. An integral countdown timer is provided to time chemical tests. From the main screen :-

- Touch │**Timer**│ to view the timer programming screen (Fig 9).

- Enter a time using the numeric keys on the right side, and use the │**<**│ and │**>**│ buttons to move the cursor to a different digit.
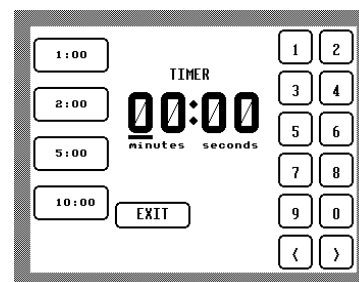
Fig 9 – Timer Programming Screen

- Or use the buttons on the left to select a multiple of the displayed times. For example, press │**2:00**│ once to set 2 minutes, press again to set 4 minutes, again for 6, etc.

Simplified Analysis Using Palintest Programs

Once a valid time has been entered, the Start button will appear, as shown in Fig 10.

Fig 10 – Timer Countdown Screen

- Touch Start to start the timer, or

- Touch Exit to return to the main screen with the timer switched off.

The countdown time will be displayed in the Timer button on the main screen.

- To pause the timer, from the main screen, touch Timer … Stop

- Touch Start to restart the timer

    The instrument will operate normally while the timer counts down. When the timer counts down to 00:00, the photometer beeps and a 'timer expired' screen is displayed
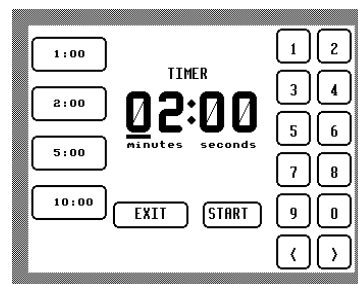
- Select Stop to return to the screen which was displayed when the timer expired.

ⓘ **Note that the time displayed will not be updated during certain operations (eg read and blank), but the timer will continue to run in the background, and the display will be updated to the correct time when the operation is finished.**

The Timer button may be used at any time to change the time settings, or to start or stop the timer. The timer setting screen will be displayed and can be edited as above. Either touch Start to start the timer and exit, or Exit to exit without starting the timer.

5.10   Performing a Test

- Prepare a Blank and Sample Tube by following the chemical procedures described in the Palintest test instructions.

- Touch Help … Test Method to view simplified test instructions on screen.

- Touch Sample Number to enter a 4-digit sample identification number.

- Insert the Blank tube and touch Blank . When the display progresses to 'Insert Sample', remove the Blank tube.

- Insert the Sample tube and touch Read . The reading will be displayed on screen and automatically stored in the data log.

- Remove the Sample tube.

- To test further samples on this test program, insert the new sample tube and touch Read .

5.11   Continuation Tests

Continuation test procedures are available for multi-stage tests and for frequently used test combinations, eg

The Zinc test (PHOT 35) may require a correction procedure in the presence of copper. The test may be continued with a follow-on procedure (PHOT 36) to measure the effect of copper. In this instance, the photometer carries out the necessary calculation and displays the correct result, or

The Free Chlorine (DPD) test (PHOT 7) is frequently progressed to a second stage to measure Total Chlorine (PHOT 8).

Simplified Analysis Using Palintest Programs

When a follow-on procedure is available, a new button, Follow On , appears on completion of the test.

- Touch Follow On to select the continuation procedure. The display will progress to the new PHOT number.

- Prepare the sample following the chemical procedures described in the Palintest test instructions.

- Insert the sample tube and touch Read . The result is displayed with any necessary correction applied.

- To revert to the original test program, touch Return .

5.12 Help with Palintest Reagent Tests

The Help function may be used to access simple test instructions or to view on-screen Health and Safety Data for Palintest reagents.

5.12.1 Test Instructions

The Photometer 8000 offers extensive onscreen help to guide the user through chemical tests.

From the Main screen :-

- Touch Help then Test Method .
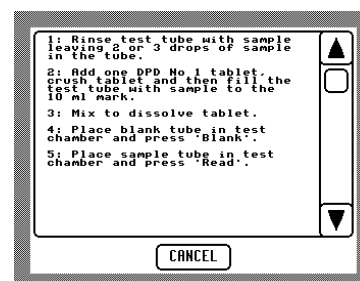
Fig 11 – Test Method Screen

The instructions for the currently selected test will appear in a scroll box.

Some tests have different instructions according to the conditions under which the test is carried out.

- Touch Test Method in these cases to show a list of options.

- Select the criteria which apply to the test and press OK to view the instructions.

5.12.2 Health and Safety Data

The Photometer 8000 includes simplified text of UK Material Safety Data Sheets (MSDS) for all Palintest reagents. These are available in English only. To read the MSDS for the currently selected test, from the Main screen :-

- Touch Help then Health and Safety , then

- Select a reagent from the list.

- Select an MSDS topic from the options provided.

Figure 12 – Reagent Selection

The required information will appear in a scroll box.

Simplified Analysis Using Palintest Programs

The two bars at the top of the screen enable simple navigation of the MSDS :-

- Touch $\boxed{+}$ and $\boxed{-}$ to go to the next or previous reagent or MSDS page.
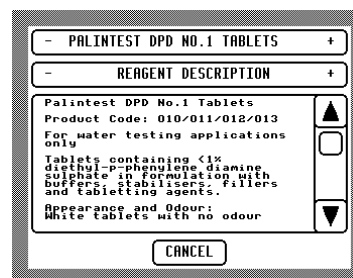
Fig 13 – Health and Safety Data

ⓘ **Note that, due to the wide variety of chemical regulations worldwide, the Health and Safety feature includes only UK MSDS. These are in the English language. These data sheets are available in the $\boxed{Help}$ screens, but are always presented in English, whatever the instrument language setting.**

5.13 Instant Data Capture

The instrument transmits audit trail data as each test is completed. This can be captured by an on-line printer or computer.

ⓘ **Always switch off the photometer before linking to a printer or PC.**

5.13.1 Using a Serial Printer

- To switch off the photometer, press and hold down power switch until the instrument display goes blank.
- Connect printer to photometer using cable PT 277.
- To re-start the photometer, press and hold down power switch until the instrument beeps.
- Select $\boxed{\textbf{System}}$, $\boxed{\textbf{More}}$ … $\boxed{\textbf{Download Format}}$.
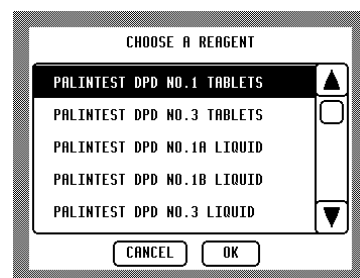- Select $\boxed{\textbf{8000}}$ from the download options. This option provides output suitable for a serial printer.
- Select $\boxed{\textbf{Download is ON}}$ to power the data transfer and $\boxed{\textbf{Baud}}$ option 1200.

After each test, four lines of data will be transmitted including date, time, user name, test number and name, result, unit and chemical symbols.

5.13.2 Using a PC

- To switch the photometer OFF, press and hold down power switch until the instrument display goes blank.
- Connect the photometer to the PC using cable PT 279.
- To re-start the photometer, press and hold down power switch until the instrument beeps.
- Select $\boxed{\textbf{System}}$, $\boxed{\textbf{More}}$ … $\boxed{\textbf{Download Format}}$.
- Select $\boxed{\textbf{S-Sheet}}$. This option provides transmission as comma separated variables suitable for capture with a PC terminal program and input into a PC spreadsheet package.
- Select $\boxed{\textbf{Download is ON}}$ to power the data transfer and $\boxed{\textbf{Baud}}$ option 38400.

After each test, the data will be transmitted to the computer.

Simplified Analysis Using Palintest Programs

5.13.3 RS232 Baud Rate

The baud rate determines the speed at which data is transferred between the photometer and a printer or computer. It can be selected to suit the equipment receiving the transmission. From the Main screen :-

- Touch **System**, **More** then **Baud** button to scroll through the options.

For example, 1200 baud is most likely for downloading to a serial printer, whereas a PC capture program would be able to handle a higher transmission speed, so 38400 baud would be more useful.

Using Automated Test Recognition

6   Using Automated Test Recognition

6.1 Automatic Test Recognition

Tubetests reagent sets are labelled with a unique code which prompts the instrument to select the appropriate test program, wavelength and calibration. The code reader may be activated for automatic recognition of Tubetests reagent tubes for speed and convenience in testing.

There are three options for code reader operation :-

• Touch **System** then use **Test ID** to scroll through the options.

• Select **Manual** if the code reader is not required.

• Select **SemiAuto** to allow the code reader to recognise the reagent tubes and set the test program (PHOT number). In semi-automatic mode, the blank and read functions are still activated by touching the **Blank** and **Read** buttons.

• Select **Auto** to allow the code reader to set the test program (PHOT number) and blank and read as appropriate

• Touch **OK** to confirm selection and return to the main screen.

6.2 Performing an Automatic Test

• Select **Auto** as above, and touch **OK** . The display reverts to the Main screen.

• Insert a Blank Tubetests Reagent Tube with coded label for the required test. The instrument will automatically set to the appropriate test program.

• Touch **Blank** to confirm that a BLANK tube is in place.

• Insert the SAMPLE tube when prompted.

• The instrument will display the reading and store the result to the data log.

Continue to insert sample tubes. Each time a new tube is detected, a new reading will be taken.

ⓘ   **The instrument continues to display** Blank **and** Read **buttons in this mode. Thus, the instrument may be optionally re-blanked during a long run of samples and sample readings may be repeated without removing and replacing the tube.**

7 Instrument Set-Up Options

7.1 Set-Up Features Available in System Mode

The System menu offers two screens of options. System 1 offers frequently used features and System 2 offers options which may be required occasionally.

From the main screen :-

- Touch **System** to display the System 1 menu.

- Touch **OK** to store selected options and return to main screen.
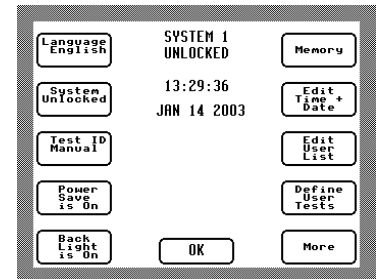
Figure 14 – System 1 Screen

From the System 1 screen :-

- Touch **More** to display the System 2 menu.

- Touch **OK** to store selected options and return to System 1 menu.

The options will be recalled when the instrument is switched on.
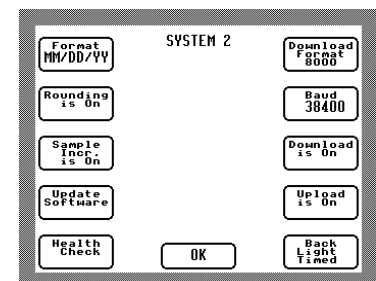
Figure 15 – System 2 Screen

7.2 Selecting a Language

Available languages are English, French, German, Spanish and Italian. Language changes take effect immediately.

- Touch **System** then **Language** to scroll through the language options.

- Touch **OK** to select language.

7.3 Protecting System Settings

It is possible to lock the chosen system settings so they cannot be tampered with or inadvertently altered. This feature is password protected.

To lock the settings :-

- Touch **System**. A code number entry screen will be displayed.

- Input the four digit number code to lock or unlock the system settings.

- Touch **OK** to accept the code and return to the System screen, or

- Touch **Cancel** to return to the System screen without changing the lock status.

The code will be provided to photometer owners or system administrators on formal request to Palintest Technical Services Department. The default setting for the instrument is with the system setting unlocked. If in use the system settings appear to be locked, refer in the first instance to your system administrator.

Instrument Set-Up Options

7.4 Setting Time and Date

The date and time is automatically stored with every test record to provide an audit trail. To set correct date and time :-

- Touch **System** then **Edit, Time and Date** to enter the 'Set Time and Date' screen.

- Use **<** and **>** arrows to highlight hours, minutes, day, month or year.

- Use **-** or **+** to change highlighted text.
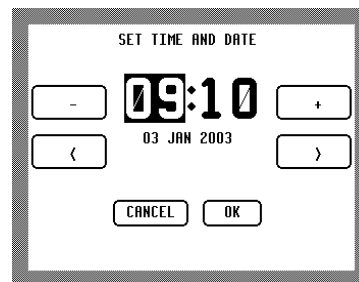
Figure 16 – Set Time and Date

- Select **OK** to save the changed date and time, or **Cancel** to revert to the previous date and time setting.

The internal clock will continue to run normally while the set-up screen is displayed. The date and time displayed will be updated automatically when another parameter is selected or the current parameter is changed.

7.5 Date Format Options

Four date format options are available, for UK or US style and two or four-digit year.

Options are: DD/MM/YY, MM/DD/YY, DD/MM/YYYY and MM/DD/YYYY.

The date and time will be displayed on screen and printed on the log download in the selected date format.

- Touch **System**, **More** then **Format** to scroll around the options.
- Touch **OK** to select option.

7.6 Rounding of Test Results

In the normal default setting, the photometer will round test results appropriately for the resolution of each test. This ensures optimum precision and accuracy for each test procedure.

For certain statistical evaluation, it may be useful to switch off the rounding and display the result in unrounded form.

To change the setting :-

- Touch **System**, **More** then **Rounding** to set the option ON or OFF.
- Touch **OK** to selection option.

7.7 Automatically Incrementing Sample Numbers

The instrument can be set to automatically increment the sample number for each test.

- Touch **System**, **More** then **Sample Increment**.
- Select **Sample Increment is ON** to automatically increment the sample number for each reading.
- Select **Sample Increment is OFF** if not required.

Instrument Set-Up Options

If the option is set to OFF, the sample number may be entered manually for each test. Otherwise, all samples will be allocated the last sample number used.

If a sample number is entered manually when increment is ON, the number will not be incremented when the first sample is read, but will be incremented on subsequent reads.

If auto-incremented sample numbers are required to start from a selected number :-

- Touch **System**, **More** then **Sample Increment is ON**.
- Touch **OK** to return to the Main Screen.
- Touch **Sample Number** to enter the first sample number required.

The next sample will be allocated this number and subsequent sample numbers will be incremented.

7.8 Upgrade Instrument Software

The Photometer 8000 software can be upgraded on-site with new software from Palintest. The new software will be supplied on disk and can be downloaded from a PC to the instrument via the RS232 connection.

- Select **System** then ensure that **Power Save** option is **Off**.
- Select **More** then ensure that **Upload is On** is selected.
- Continue selecting **Baud** until baud rate 38400 is displayed.
- Connect the instrument to a serial port on the PC with the RS232 cable provided (PT 279).
- Touch **Update Software**, and a confirmation screen will appear.
- Touch **Yes** to continue with the upload or **No** to cancel the operation.

The instrument waits 30 seconds for the PC to transmit the new software before reverting to the System Screen 2.

Run the download program on the PC. While the instrument is receiving the transmission, a progress bar will appear. If the software upgrade contains more than one file, the progress bar will reset and start again for each file uploaded.

If the new software has been successfully transmitted, the instrument will re-start. If unsuccessful, a message will appear on the screen, and the instrument should be switched off and the operation repeated.

7.9 Power Saving Measures for Battery Conservation

The Photometer is designed for laboratory and field use. The instrument may be powered from a mains adaptor or internal batteries. If batteries are in use, power saving strategies can be selected to make the most economical use of the available power.

From the main screen :-

- Touch **System** to display System 1 screen
- Select **Power save is On** to activate all selected power saving options, or
- Select **Power Save is Off** to switch off power saving and enable all instrument functions to operate.
- Touch **More** to enter System 2 menu to select power saving strategies.
- Select **Download is Off**, **Upload is Off** and **Back Light Timed** to maximise battery life.

Instrument Set-Up Options

Any combination of the power saving options can be selected.

- Touch OK to return to System 1 and touch OK again to return to the main screen.

7.10   Use of the Back Light

The Photometer 8000 features an optional back light to enhance the screen display. From the Main screen :-

- Touch **System** then select **Back Light is On** to turn the back light on.
- Select **Back Light is Off** to leave the back light off.

The back light may be set to illuminate for a short period when the instrument is in use. From the System 1 screen :-

- Touch **System** then **Back Light is On** to turn the back light on
- Then touch **More** to view the System 2 screen
- Select **Back Light Timed** .

The back light will come on for 30 seconds after each touch of a screen button, then remain off until the next touch.

8 Working with Stored Data

8.1 Data Stored in Memory

The Photometer 8000 can store up to 1000 data records. Each time a reading is taken, a complete record of the analysis is automatically stored in the log. Each record includes the time, date, sample number, result and units, and the user identity.

Log entries may be viewed on screen, selectively edited for transmission and downloaded to a serial printer or computer. The entire log may be erased.

8.2 To View the Stored Data

From the main screen :-

- Touch **System** … **Memory**

All of the entries in the log will be displayed in a scroll box, the most recent entry at the top. Use the scroll buttons to move through the log and view the data.
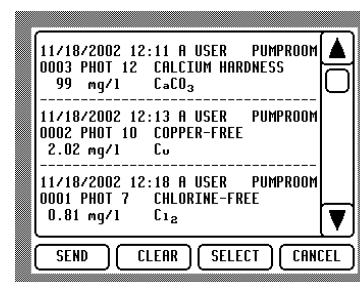
Figure 17 – Data Log

- Touch **Select** to edit the log for transmission.
- Touch **Send** to transmit the log to a printer or computer (see 8.4).
- Touch **Clear** to delete the entire log. A confirmation screen will allow the operation to be cancelled.
- Touch **Cancel** button to return to the System screen.

8.3 To Select Data for Transmission

Data may be selected by :-

> **User** - Select only results conducted by one user
>
> **Test** - Select only results of one PHOT Number
>
> **Date** - Select an inclusive date range
>
> **Sample** - Select an inclusive range of sample numbers.

From the Data Log screen :-

- Touch **Select** to edit the data for transmission.

The Data Selection screen will appear (Fig 18) :-

- Touch **OK** to revert to the Data Log, or
- Touch **All** to remove all options. With all options cleared, all of the log will be displayed.
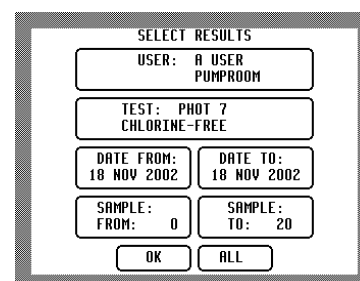
Fig 18 –
Data Selection for Transmission

Working with Stored Data

8.3.1   To Select Data by User

- Touch the User panel to select a user. The User Name Selection screen will appear (see Fig 8 Page 13).
- Touch the required user name to select.
- Touch OK to accept or Cancel to revert to previous selection.

The Screen display will revert to the Data Selection screen with the selected user shown in the user panel.

8.3.2   To Select Data by Test Identity

- Touch the Test panel to select a test. The Test Selection screen will appear (see Fig 5 Page 11).
- Select a test by entering the PHOT number or using the List all Tests or List User Tests options
- Touch OK to accept or Cancel to revert to previous selection.

The screen display will revert to the Data Selection screen with the selected test shown in the test panel.

8.3.3   To Select Data by Date

Date From :-

- Touch Date From to enter a date from which results will be displayed.
- Touch OK to accept or Cancel to reject the selection.
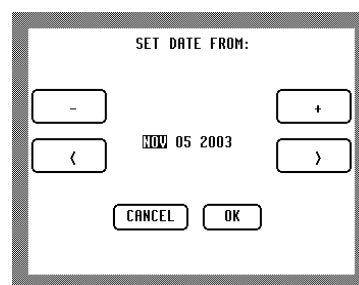
Fig 19 – Data Selection by Date

If Date from is undefined then all results in the log up to the date defined in Date To will be used.

Date To :-

- Touch Date To to enter a date up to which the results will be displayed.
- Touch OK to accept or Cancel to reject the selection.

If Date To is undefined then all results in the log after the dates defined in Date From will be used.

To select results for one day only, set both dates to the day required.

8.3.4   To Select Data by Sample Number

Sample From :-

- Touch Sample From to enter a sample number from which results will be displayed. The Sample Number Entry screen will appear (see Fig 7 Page 13).
- Enter the sample number.
- Touch OK to accept or Cancel to reject the selection.

If Sample From is left undefined then all the results in the log with sample numbers up to the Sample To selection will be displayed.

Sample To :-

- Touch ⌷ **Sample To** ⌷ to enter a sample number up to which results will be displayed. The Sample Number Entry screen will appear (see Fig 7 Page 13).

- Enter the sample number.

- Touch ⌷ **OK** ⌷ to accept or ⌷ **Cancel** ⌷ to reject the selection.

If ⌷ **Sample To** ⌷ is left undefined then all the results in the log with sample numbers from the ⌷ **Sample From** ⌷ selection will be displayed.

To select results for one sample number only, set both sample numbers to the same number.

8.3.5   Further Data Selection Options

From the Data Selection screen :-

- Touch ⌷ **OK** ⌷ to return to the Data log.

- The selected options will determine which sample records are displayed and transmitted.

- Touch ⌷ **Select** ⌷ again to change the selected options.

In this way, some of the options can be kept and others changed without setting all options. For example, if a date range is required for a particular user, but more than one test is required, set the options for the first test, transmit the results and use the ⌷ **Select** ⌷ button to set the next test number for transmission.

8.4 To Transmit Data to a Computer or Printer

8.4.1   Computer Interface

The Photometer 8000 incorporates a high speed RS232 compatible serial data port. This port can be used to download stored data from the instrument log for analysis and permanent storage, and to print immediate test results.

8.4.2   Connecting the Instrument

The Photometer 8000 should be switched off before connection to computer or printer :-

- Printer Connection – fit Printer Cable PT 277.

- Computer Connection – fit Computer Cable PT 279.

The RS232 socket is located at the right-hand side of the instrument under a protective rubber seal. This seal is hinged and may be opened by grasping the lip at the back and pulling towards the user. After transmission is complete, and the cable is disconnected, the seal should be firmly pushed back into position to protect the socket from moisture, etc.

8.4.3   Data Transfer

- Connect the cable, as above, and switch the instrument ON.

- Select ⌷ **System** ⌷ … ⌷ **More** ⌷ to progress to System 2 Menu.

- Touch ⌷ **Download is On** ⌷ to power the data transfer.

- Touch ⌷ **Baud** ⌷ to view the options on speed of data transfer. Scroll through the options and select 1200 for a serial printer or 38400 for download to a PC.

Working with Stored Data

- Touch $\boxed{\textbf{Download Format}}$ to select output format. For a serial printer, select $\boxed{\textbf{8000}}$ or for capture by a PC terminal program, select $\boxed{\textbf{S-Sheet}}$.

- When all options are selected, touch $\boxed{\textbf{OK}}$ to return to System 1 screen.

- Touch $\boxed{\textbf{Memory}}$. The Data Log (Figure 17) is displayed.

- Touch $\boxed{\textbf{Select}}$ to pre-select data for transmission or $\boxed{\textbf{Send}}$ to download the entire log.

When transmission is complete, the display will return to the Data Log.

ⓘ **Check that the data transfer has been successful BEFORE deleting the data from the log.**

8.5 To Delete Data from the Log

Data cannot be pre-selected for deletion. This action clears the whole data log. From the Data Log screen :-

Touch $\boxed{\textbf{Clear}}$ to delete the log. A confirmation screen is displayed.

Touch $\boxed{\textbf{Yes}}$ to delete or $\boxed{\textbf{No}}$ to cancel.

Touch $\boxed{\textbf{Cancel}}$ … $\boxed{\textbf{OK}}$ to return to the Main screen.

9   Working with Multiple Users or Locations

The Photometer 8000 may be used by several operators. The instrument records a user name with the test data for auditing purposes. Each user may store a list of favourite tests, for convenience and speed where a group of tests is frequently used.

The alphanumeric capability may alternatively be used to identify test location or site name instead of the user.

9.1 Adding a User Name

A user name or location of two words, each up to eight characters, may be stored.

From the Main screen :-

- Touch $\boxed{\textbf{System}}$ … $\boxed{\textbf{Edit User List}}$. The list of users will appear in the scroll box – see   Fig 20 :-
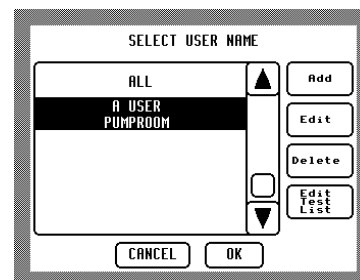
Fig 20 – Edit User List Screen

ⓘ   **If no users have been added, then $\boxed{\textbf{All}}$ will be displayed.**

- Touch $\boxed{\textbf{Add}}$ and the Text Input screen will appear – see Figure 21.

- Use the alphanumeric keypad to enter the name.

- To correct a mistake, use the $\boxed{\textbf{DEL}}$ button to delete the highlighted character.

- On completion, select $\boxed{\textbf{OK}}$ to return to the Select User Name screen.

- Select $\boxed{\textbf{OK}}$ again to save the changes.
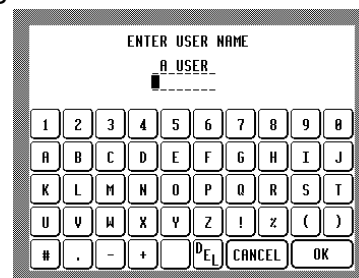
Figure 21 – Text Input

9.2 Editing or Deleting a User Name

From the main screen :-

- Touch $\boxed{\textbf{System}}$ ... $\boxed{\textbf{Edit User List}}$. The list of users will appear in the scroll box (see   Fig 20).

- To alter a user name, highlight the selected user and touch $\boxed{\textbf{Edit}}$.

- Use the alphanumeric, as above, to edit the name. Select $\boxed{\textbf{OK}}$ to return to the Select User Name screen.

- Select $\boxed{\textbf{OK}}$ again to confirm changes.

- To delete a user name, highlight the selected user and touch $\boxed{\textbf{Delete}}$. This action will delete the user name and any associated user test list.

ⓘ   **Use this option carefully – once the deletion is confirmed, the user test list cannot be retrieved.**

Working with Multiple Users or Locations

9.3 User's Favourite Tests

Each user may define a list of favourite tests. The list may be readily accessed from the Test Selection screen (See Fig 5 Page 11) for convenience in selecting frequently used tests.

Up to 20 tests can be added to each user's list. To add tests or edit the list, from the Main screen :-

• Touch $\boxed{\textbf{System}}$ … $\boxed{\textbf{Edit User List}}$ and $\boxed{\textbf{Edit Test List}}$. A scroll box of the current tests will be displayed – see Fig 22 :-
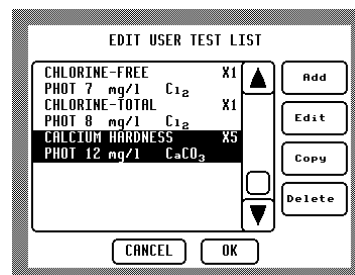
Fig 22 – Edit Test List Screen

9.3.1 Adding a Test to the List

• Touch $\boxed{\textbf{Add}}$ to add a test to the list. The Test Selection Screen will be displayed (see Fig 5, Page 11).

• Use the number buttons to input the PHOT number of the test or select from $\boxed{\textbf{List All Tests}}$ menu.

• Test units, expression of results or dilution may also be specified, as described in Sections 5.3 – 5.5, Page 12, if required.

• Touch $\boxed{\textbf{OK}}$ to add the test to the user list, or $\boxed{\textbf{Cancel}}$ to return to the list without changes.

ⓘ **If the list is full, the $\boxed{\text{Add}}$ button will not be displayed.**

9.3.2 Editing or Deleting a Test

• Use the scroll buttons to highlight the test to be edited or deleted.

• Touch $\boxed{\textbf{Edit}}$ to change the details of the selected test. The Test Selection screen will be displayed.

• Use the screen to make the required changes, then touch $\boxed{\textbf{OK}}$ to confirm the changes or $\boxed{\textbf{Cancel}}$ to revert to the original parameters.

• Touch $\boxed{\textbf{Delete}}$ to delete the highlighted test.

9.3.3 Copying a List of Tests

It is possible to copy a list of tests from one user to another, for example, if different operators are required to conduct the same suite of tests :-

• On the Main screen, select the current user.

• Touch $\boxed{\textbf{System}}$ … $\boxed{\textbf{Edit User List}}$ … $\boxed{\textbf{Edit Test List}}$ and $\boxed{\textbf{Copy}}$. The List of Users will be displayed.

• Select the user whose test list is to be copied to the current user and touch $\boxed{\textbf{OK}}$, or

• Touch $\boxed{\textbf{Cancel}}$ to return to the current test list without changes.

9.3.4 Moving a Test within the List

When conducting a suite of tests, touching $\boxed{+}$ or $\boxed{-}$ on the main screen will change to the next or previous test in the user list. The tests can be arranged in the most convenient order. From the Main screen :-

- Touch $\boxed{\textbf{System}}$ … $\boxed{\textbf{Edit User List}}$ and $\boxed{\textbf{Edit Test List}}$. A scroll box of the current test list will be displayed (see Fig 22 Page 28).

- Touch and hold the test to be moved. The instrument will beep when the test is ready to be moved.

- Still touching the test name, move up or down the list until the test is in the desired place.

- Touch $\boxed{\textbf{OK}}$ to confirm changes, or $\boxed{\textbf{Cancel}}$ to reject changes.

9.3.5 Confirming Changes to Users and Test Lists

New user names are not committed to memory permanently until $\boxed{\textbf{OK}}$ is selected on the Select User Name screen to confirm the changes. If changes have been made, a confirmation screen will be displayed.

To accept the changes, select $\boxed{\textbf{Yes}}$ to accept changes. To revert to the previous user details, select $\boxed{\textbf{No}}$ to cancel changes.

ⓘ **If users are deleted, and the deletion is confirmed, it is not possible to restore the user and associated test list later. Think carefully before selecting** $\boxed{\textbf{OK}}$ **!**

Custom Test Calibration

10 Custom Test Calibration

Users may wish to develop their own test methods and store the calibration data on the Photometer 8000. This will allow direct-reading of user tests.

The Photometer 8000 can store up to 50 user-defined calibrations.

To program user-defined calibrations :-

- Touch **System** … **Define User Tests** .

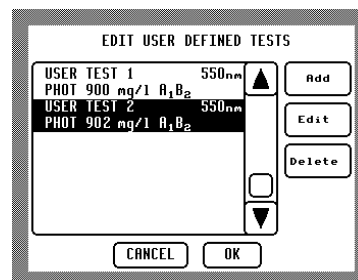A screen showing the list of currently defined tests will be shown – see Fig 23 :-

Fig 23 – Custom Test Calibrations

10.1 Adding a New Test Program

- Touch **Add** . The Add Custom Tests screen will be displayed – see Fig 24 :-
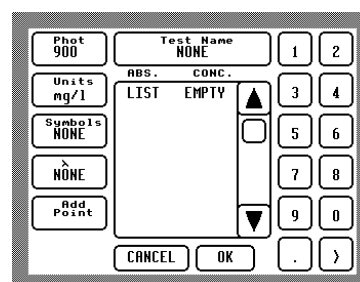
Fig 24 - Add Custom Tests

The next available PHOT number will be allocated to the new test. This may be edited :-

10.1.1 Allocating a Test Program Number

The 50 user-defined calibrations are allocated program numbers 900 – 949.

- Touch **PHOT** to highlight this function, then use the number buttons to amend the final two digits.

10.1.2 Entering the Test Name

Up to 18 characters can be used for the test name :-

- Touch **Test Name** to input the name. The Text Input screen will be displayed (see Figure 21 Page 27).
- Use the keypad to enter the test name.
- Touch **OK** to accept or **Cancel** to revert to previous name. If a test name that already exists is defined, a confirmation screen will be displayed.

10.1.3 Entering the Test Units

Up to eight characters can be used for the chemical symbols. Any numbers input will be subscripted.

- Touch **Symbols** to input the chemical symbols. The Text Input screen will be displayed (see Figure 21 Page 27).
- Use the keypad to enter the chemical symbols.
- Touch **OK** to accept or **Cancel** to revert to previous symbols.

10.1.4 Selecting a Test Wavelength

- Touch the wavelength button (λ symbol) to select a wavelength for the test. The option scrolls through available wavelengths.

10.1.5 Entering Calibration Data

Up to 20 data pairs can be used for each calibration.

- Touch **Add Point**. A new data pair, set to 0, will appear in the data scroll box.

- Use the number buttons to input the data pairs, Absorbance and Concentration.

- Use the **< >** button to toggle between Absorbance and Concentration Value.

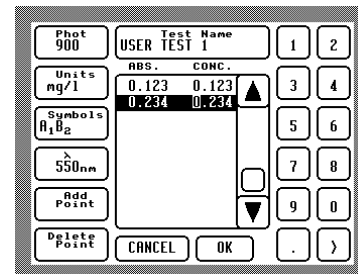- Repeat until all the data pairs are entered.

Figure 25 – Test Data Entry

The Absorbance Value has the standard format 0.000, and the decimal point position cannot be changed.

The Concentration Value accepts only one decimal point position per test. It may be entered using the **.** button. The data will reformat according to the last decimal place input.

The instrument uses the data pairs to construct the calibration graph, connecting the points with straight lines. The data pairs may be selected to optimise the accuracy of the calibration, by ensuring any non-linear sections of the calibration graph are defined by extra data pairs.

ⓘ **An error message will be shown if the same absorbance value is entered for two different concentrations.**

10.1.6 Editing and Deleting Calibration Data

- To edit an existing point, select the point in the scroll box and use the number buttons to edit.

- To delete the highlighted data pair, touch **Delete Point**.

10.1.7 Saving the New Test Program

- Touch **OK** to confirm the New Test Program or **Cancel** to wipe the changes made.

The display will return to the list of user-defined tests.

- Touch **OK** to save all changes made to the test. A confirmation screen will appear as a check, or

- Touch **Cancel** to wipe all changes made to user-defined tests.

10.1.8 Editing an Existing Test Program

- Touch **System** … **Define User Tests**.

- Use the scroll bar to highlight the test program to be edited.

- Touch **Edit**. The stored data for the test will be displayed (see Figure 25, Page 31).

Test parameters and data pairs can be amended as in Sections 10.1.1 to 10.1.7 above.

Maintenance

11 Maintenance

11.1 General Maintenance

The photometer is designed to give long and trouble-free operation. Care must be taken however to avoid test solutions being spilt over the instrument, and to prevent excessive amounts of moisture entering the instrument. Spillages or moisture should be wiped off immediately with a dry cloth. On no account should solvents or abrasive materials be used to clean the instrument. Care should be taken to keep the test chamber clean. Any build-up of dirt or deposits may interrupt light transmission and affect readings. Wipe the inside of the test chamber periodically with a damp tissue then dry.

11.2 Changing the Batteries

See Section 4.3 on Page 10.

11.3 Cleaning the Optical Parts

The Photometer has been designed to allow cleaning of the exposed optical surfaces. Before removing any components, place the instrument face down on a soft surface.

First, remove the four slot head servicing cover screws indicated in Figure 26. Turn over the case and remove the servicing cover.
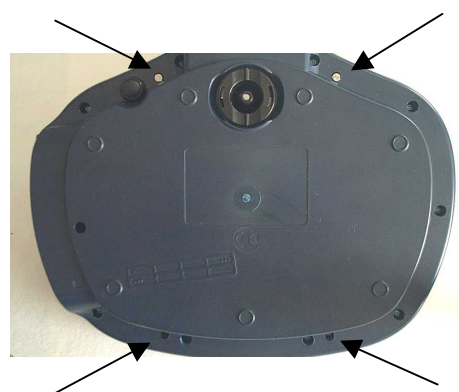
Figure 26 – Servicing Cover Screws

Next remove the light diffuser by removing the two slot head screws as indicated in Figure 27, and lifting off the diffuser. This will expose the ring gear and gear spurs.
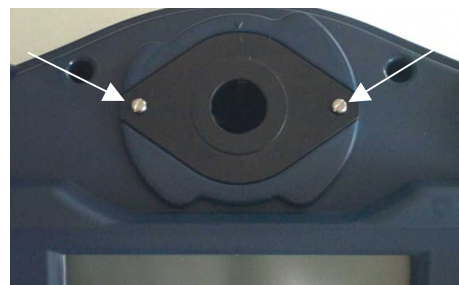
Figure 27 – Light Diffuser

Carefully remove the ring and then the three gear spurs, taking care not to allow the springs to jump out. See Figure 28.

Figure 28 – Ring Gear and Gear Spurs

Maintenance

After removing all the gear spurs, turn the instrument over to expose the base. Turn the base locator clockwise through 45°, and lift it out. See Figure 29.
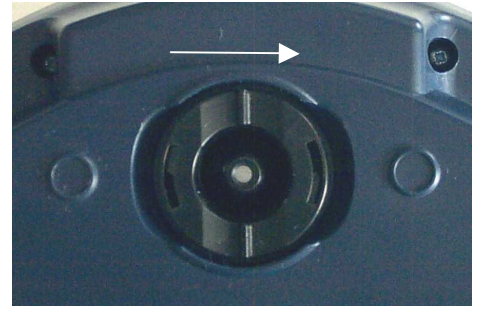
Figure 29 – Base Locator

Lastly, remove the optics sleeve from the centre of the optics by drawing it out through the bottom of the case, as shown in Figure 30.

Figure 30 – Optics Sleeve Removal

The exposed optical surfaces can now be cleaned using a lint-free cloth. If there are significant deposits, they can be removed with mild detergent solution. If there are scratches or excessive deposits, the photometer should be returned for service.

ⓘ **Do not attempt to remove scratches or deposits with abrasive materials, polishes or pads. Any damage to the optical surfaces could result in unexpected errors or variability in readings.**

After cleaning, reassemble the instrument. This is the reverse of disassembly.

When replacing the optics sleeve note the slot in the side and the three locating lugs on the top. (See Figure 31).

The slot lines up with the ridge inside the test-tube holder, and the three lugs with the slots in the top of the test-tube holder.
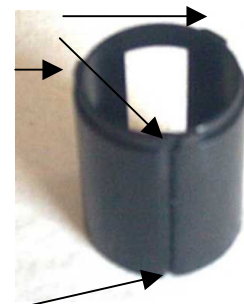
Figure 31 – Optics Sleeve

Next, refit the base locator. Place the locator in and turn it anticlockwise until it clicks firmly into position.

Turn the instrument over and refit the three gear spurs as shown in Figure 32. Place each gear over the spindle then push it back and lift slightly so that it sits behind the lugs.

It is important the gears sit behind the lug otherwise the test tubes will not be held accurately.
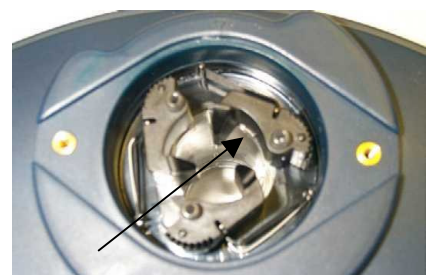
Figure 32 – Locating Lugs

Maintenance

Refit the ring gear, then the light diffuser using the two shorter screws, and finally refit the servicing cover using the four longer screws.

ⓘ   **Except as detailed above, the photometer contains no user-serviceable components.   If the instrument requires servicing or repair, this can be arranged through Palintest Technical Services Department.**

11.4 Troubleshooting

Problem	Solutions
Instrument will not switch ON	Fit new batteries, as described in Section 4.3. If the mains adaptor is not in use, unplug it from the instrument. Plugging the mains adaptor into the instrument automatically disconnects the internal batteries. If mains power is in use, ensure the correct power supply is being used, and that the supply is plugged in to a live socket.
Instrument fails to blank	Ensure that an appropriate blank is being used.
Instrument reads supplied check standards incorrectly	If ambient light levels are high (eg outdoors in bright sunlight), try again with the light cap fitted. The light cap should not be required in most laboratory conditions.
Other reading problems	If the test chamber has been cleaned, ensure that it was reassembled correctly – see Section 11.2.

The Photometer 8000 carries out extensive diagnostics during start-up and operation to ensure the instrument is functioning correctly.

If the above suggestions do not solve the problem, then :-

Select **System** , **More** … **Health Check** to view some of the results of these tests. These results may help Palintest Service Engineers to diagnose faults. In certain circumstances, this may enable repair to be 'in the field'.

Please return the instrument to your distributor for repair or recalibration.

11.5 Guarantee

Palintest photometers are guaranteed for a period of two years from the date of purchase, excluding accidental damage or damage caused by unauthorised repair or misuse.

The guarantee specifically excludes damage caused by water or by ingress of chemical solutions.

Should repair be necessary, contact Palintest Technical Services Department quoting the serial number shown on the back of the instrument. This guarantee does not affect statutory rights.

Technical Specifications

12 Technical Specifications

Application	For application in general water testing using Palintest tablet reagent systems and Palintest Tubetests reagents.
Instrument Type	Dual light source photometer offering direct-reading of pre-programmed test calibrations.
Peak Wavelengths	445 ± 5nm, 495 ± 5nm, 555 ± 5nm, 570 ± 5nm, 605 ± 5nm and 655 ± 5nm
Range	1 - 100%T
Wavelength Selection	Automatic
Accuracy	$\pm$ 0.8%T
Optical System	Multi-detector lensed system with optical compensation for optimal precision.
Display	320 x 240 pixel LCD with touch screen and optional back light.
User Interface	On-screen prompts available in English, French, Spanish, German and Italian.
Tests Available	Preprogrammed for Palintest tablet reagent and Tubetests format tests. Also operates in Absorbance and Transmittance and is programmable for user-entered calibrations.
Test Selection	Automatic and manual options available.
Test Cells	Multi-size cell holder automatically adjusts to accept cylindrical tubes of 13 – 20 mm OD.
Zeroing	Automatic zeroing on Blank tube, hold blank facility for series of tests.
Size	290 x 240 x 90 mm
Weight	1,648g

12.1 Power Supply

Batteries	8 x 1.5v 'AA' batteries
Lifetime	20 hours (typical use, backlight off, 'AA' alkaline cells)
Mains	Supplied 9v adaptor
Power Management	Auto-switch off or continuous operation
Power Saving	Power economy options available to maximise battery life.

12.2 Computer Interface

Electrical Standard	RS232
Instrument Socket	9-pin male-D connector
Required Cable for Computer Interface	9-pin female to 9-pin female, wired as 'null modem'. Order code PT 279
Data Download	To computer or serial printer
Data Rate	38.4 kbps
Data Format	8 bit, no parity, 1 stop bit

Technical Specifications

Software Upload   Remote software upgrade available by disc or e-mail.

Technical Specifications

12.3   Data Storage

Data Stored for	Date and time
Each Test	User name and test PHOT number
	Test units and chemical symbols
	Sample number and test result
Output Formats	Comma-delimited ASCII and plain text
Data Log Capacity	1,000 results
Multiple Users	Up to 11, including default user
User-Specific	
Test Lists	Up to 20 tests per user
Custom Test	
Calibrations	50 tests
Custom Tests	Up to 20 calibration points per test
Storage Format-Data	
Log and User	Non-volatile memory
Information	

12.4   Optional Serial Printer

Cable for Serial	25-pin male to 9-pin female, normal RS232 wiring. Order
Printer Interface	Code – PT 277
Baud Rate	1200

13 Palintest Photometer Reagents

TABLET REAGENT SYSTEM

INSTRUCTION SHEET NO	REAGENT SYSTEM	PARAMETER		PHOTOMETER PROGRAM NO
-	-	Transmittance (%)		Phot 0
-	-	Absorbance		Phot 1
PHOT.2.	ALKALINITY TOTAL (ALKAPHOT)	Total Alkalinity		Phot 2
PHOT.37.	ALKALINITY M (ALKAPHOT M)	Alkalinity M		Phot 37
PHOT.37.	ALKALINITY P (ALKAPHOT P)	Alkalinity P		Phot 38
PHOT.3.	ALUMINIUM	Aluminium		Phot 3
PHOT.4.	AMMONIA	Ammonia Nitrogen		Phot 4
PHOT.5.	BROMINE	Bromine – Total		Phot 5
		Bromine – Free	☆	(Phot 6)
PHOT.12.	CALCIUM HARDNESS (CALCICOL)	Calcium Hardness		Phot 12
PHOT.46.	CHLORIDE (CHLORIDOL)	Chloride		Phot 46
PHOT.7.	CHLORINE (DPD)	Chlorine – Free		Phot 7
		Chlorine – Total	☆	Phot 8
PHOT.7.1.		Chlorine – Free		Phot 71
		Monochloramine	☆	(Phot 72)
		Dichloramine	☆	(Phot 73)
PHOT.9.	CHLORINE HR	Chlorine		Phot 9
PHOT.74.	CHLORINE DIOXIDE LR	Chlorine Dioxide		Phot 74
PHOT.76.	CHLORINE DIOXIDE HR	Chlorine Dioxide		Phot 76
PHOT.55.	CHROMIUM (CHROMICOL)	Chromium – Hexavalent		Phot 55
		Chromium - Total		Phot 57
PHOT.47.	COLOUR	Colour		Phot 47
PHOT.10.	COPPER (COPPERCOL)	Copper – Free		Phot 10
		Copper – Total	☆	Phot 11
PHOT.13.	CYANURIC ACID	Cyanuric Acid		Phot 13
PHOT.14.	FLUORIDE	Fluoride		Phot 14
PHOT.15.	HARDNESS	Total Hardness		Phot 15
PHOT.41.	HYDRAZINE	Hydrazine		Phot 41
PHOT.16.	HYDROGEN PEROXIDE LR	Hydrogen Peroxide		Phot 16
PHOT.17.	HYDROGEN PEROXIDE HR	Hydrogen Peroxide		Phot 17
PHOT.18.	IRON LR	Iron		Phot 18
PHOT.39.	IRON MR	Iron		Phot 39
PHOT.19.	IRON HR	Iron		Phot 19
PHOT.21.	MAGNESIUM (MAGNECOL)	Magnesium		Phot 21
PHOT.20.	MANGANESE	Manganese		Phot 20
PHOT.42.	MOLYBDATE LR	Molybdate		Phot 42
PHOT.22.	MOLYBDATE HR	Molybdate		Phot 22
PHOT.53.	NICKEL (NICKELTEST)	Nickel		Phot 53
PHOT.23.	NITRATE (NITRATEST)	Nitrate Nitrogen		Phot 23
PHOT.24.	NITRITE (NITRICOL)	Nitrite Nitrogen		Phot 24
PHOT.43.	NITRITE (NITRIPHOT)	Nitrite $NaNO_2$		Phot 43
PHOT.44.	ORGANOPHOSPHONATE	Org-Phos (+Phos)		Phot 44
		Organophosphonate	☆	(Phot 45)
PHOT.25.	OZONE	Ozone (+Chlor)		Phot 25
		Ozone	☆	(Phot 26)
PHOT.27.	pH VALUE	pH-Phenol Red		Phot 27
PHOT.54.	PHENOL (PHENOLTEST)	Phenol		Phot 54
PHOT.52.	PHMB (PHMB-PHOT)	PHMB		Phot 52
PHOT.28.	PHOSPHATE LR	Phosphate		Phot 28
PHOT.29.	PHOSPHATE HR	Phosphate		Phot 29
PHOT.30.	POTASSIUM	Potassium		Phot 30
PHOT.31.	SILICA LR	Silica		Phot 31
PHOT.56.	SILICA HR	Silica		Phot 56
PHOT.32.	SULPHATE	Sulphate		Phot 32
PHOT.33.	SUPHIDE	Sulphide		Phot 33
PHOT.34.	SULPHITE (SULPHITEST)	Sulphite		Phot 34
PHOT.48.	TURBIDITY	Turbidity		Phot 48
PHOT.35.	ZINC	Zinc (+Copper)		Phot 35
		Zinc	☆	(Phot 36)

Programs marked ☆ are continuation stages in multi-part tests.

Continuation programs in parentheses ( ) cannot be accessed directly.

Palintest Photometer Reagents

13.1 Tubetests Reagent System

INSTRUCTION SHEET No	REAGENT SYSTEM	PARAMETER	PHOTOMETER PROGRAM No
PHOT. 85.	AMMONIA/12N/50N TUBETESTS (INDOPHENOL)	Ammonia Nitrogen (0 – 12 mg/l)	Phot 86
		Ammonia Nitrogen (0 – 50 mg/l)	Phot 85
PHOT. 93.	AMMONIA/15N (NESSLER) TUBETESTS	Ammonia Nitrogen	Phot 93
PHOT. 94.	AMMONIA/50N (NESSLER) TUBETESTS	Ammonia Nitrogen	Phot 94
PHOT. 77.	COPPER/20	Copper	Phot 77
PHOT. 80.	COD/150 TUBETESTS	Chemical Oxygen Demand	Phot 80
PHOT. 81.	COD/400 TUBETESTS	Chemical Oxygen Demand	Phot 81
PHOT. 82.	COD/2,000 TUBETESTS	Chemical Oxygen Demand	Phot 82
PHOT. 83.	COD/20,000 TUBETESTS	Chemical Oxygen Demand	Phot 83
PHOT. 79.	HEXAVALENT CHROMIUM	Chromium - VI	Phot 79
PHOT. 95.	IRON/25	Iron	Phot 95
PHOT. 96.	NICKEL/20	Nickel	Phot 96
PHOT. 87.	NITRATE/30N TUBETESTS	Nitrate Nitrogen	Phot 87
		Nitrate	Phot 88
PHOT. 90.	PHOSPHATE/12P TUBETESTS	Phosphate Phosphorus	Phot 90
PHOT. 78.	TOTAL CHROMIUM	Total Chromium	Phot 78
PHOT. 89.	TOTAL NITROGEN/30 TUBETESTS	Total Nitrogen	Phot 89
PHOT. 92.	TOTAL PHOSPHORUS/12 TUBETESTS	Total Phosphorus	Phot 92
PHOT. 97.	ZINC/7/35	Zinc (0 - 7 mg/l)	Phot 97
		Zinc (0 - 35 mg/l)	Phot 98
PHOT.107.	TT AMMONIA/100N	Ammonia Nitrogen (0-100mg/l)	Phot 107

13.2 CHEMetrics Vacu-Vial System

Dissolved Oxygen/1.4	PHOT.49.
Dissolved Oxygen/2	PHOT.50.
Dissolved Oxygen/20	PHOT.75.