Aquanova

Environmental Spectrophotometer

Operating Manual

637 015/REV A/10-05

Safety

This is important information; please read carefully before installing or using this instrument.

1. The Aquanova spectrophotometer is designed for operation by **trained personnel** that are aware of the principles and applications involved. For further help and advice please contact your local distributor,

2. The Aquanova spectrophotometer is a sensitive electronic and optical instrument designed for use in a laboratory environment. Careful adherence to the installation instructions must be observed. If in doubt contact a **relevant and competent authority** for advice before proceeding.

3. In addition to observing the instructions detailed in the Operating Manual and Service Manual for this instrument all installation, operating and service personnel must be aware of, and employ, **a safe system of work**.

4. Voltage levels hazardous to life are present in this instrument, for personal safety only **trained engineers** aware of the risk and avoidance of electric shock should remove protective covers from the instrument.

5. This instrument is designed for minimal maintenance, which must be carried out carefully following the **procedures detailed in this manual**. All safety instructions in these procedures, as well as those defined locally for the **area or environment** where the work is being carried out must be observed.

6. Other than for those items defined in the maintenance procedures herein there are **no user serviceable** items in this instrument. Removal of covers and attempted adjustment or service by unqualified personnel will invalidate any warranty and incur additional charges for repair.

7. Reference should always be made to the **Health and Safety Data** for any chemicals or reagents used. All available information, advice and warnings on the handling, storage, use and disposal of such must be carefully observed. When not available this data must be requested from the supplier before proceeding in any way.

8. It is important that **good laboratory practice** is observed when handling samples, chemicals, reagents and ancillary equipment in order to carry out measurement and analysis with this instrument. Suitable **safety and personal protective equipment** must be used at all times.

9. If it is suspected that safety protection has been impaired in any way, the spectrophotometer must be made **inoperative and secured** against any intended operation. The fault condition must be reported to the **appropriate servicing authority**. In all such reports the model number and serial number of the spectrophotometer must be quoted.

Contents:

Section 1

Introduction

1.1 Instrument Description

The Aquanova spectrophotometer and test kits offer the simplest and most convenient laboratory system for measuring a broad range of parameters in water, wastewater, effluent and environmental samples:

- Stores up to 300 test methods
- Compatible with most commercially available photometric test kits
- Pre-loaded with Jenway Test Kit methods for quick start up
- Drag and drop test methods from CD ROM or the Internet
- PC software included
- Create new tests using a simple factor or calibration curve with up to 6 standards
- True Spectrophotometer – no compromise on peak wavelengths
- Measure Absorbance and %T – aids method development and training

Test methods are identified by a meaningful name that can be up to 20 alphanumeric characters long - so there is no need to remember codes or refer to look up tables. Any one of the 300 test methods that can be stored is quickly recalled from memory by **Browsing** selected alphabetic files. A frequently used test is quickly recalled from the **Dynamic Journal** that always has the last eight test methods used available.

The **Test Manager** is dedicated to making it easy to select a test, edit an existing test, create a new test, or delete un-wanted tests, helping the user through the procedures in a step-by-step fashion.

The parameters stored for any selected test can be quickly viewed to confirm the current settings, while the **Instrument Manager** includes a lock against any changes to these settings without the entry of a security code. The user interface can also be displayed in either the English, French, German, Italian or Spanish languages.

All the functions on the Aquanova can be replicated on the **Included PC Software**. This further enhances the flexibility and functionality of the system by enabling tests to be downloaded, using simple **drag and drop** functions, from a CD ROM or the Jenway web site. Tests and results can also be stored on the PC enabling an almost limitless library of test files and result data to be created. Using the familiar **copy and paste** techniques results can be entered into spreadsheets for analysis and presentation.

Aquanova is supplied pre-loaded with all the Jenway Test Kit methods but it is compatible with almost all commercially available water and environmental test kits. Methods for these can be created on the instrument or a connected PC using the kit manufacturers data (the Test Manager will guide you through the procedure) or where available, methods for alternative kits may be supplied on optional CD ROMs.

Although dedicated to water and environmental analysis Aquanova can still be used as a standard single-beam visible spectrophotometer by selecting the Photometrics menu option. Absorbance, %T and wavelength are displayed giving added functionality and flexibility. This will be especially useful in method development as well as in areas where teaching and training is also carried out.

A multi-purpose sample holder, that will accept 10mm path length cuvettes as well as 16mm and 24mm diameter sample tubes, is fitted to Aquanova. Where longer path lengths are required the optional 10 to 100mm path length cuvette holder can be fitted. A range of alternative sample holders, cuvettes and test tubes are available to enhance the capabilities of Aquanova.

1.2 Good Practice Guidelines

1) For optimum performance the Aquanova spectrophotometer should be sited in a clean, dry, dust free atmosphere. When in use ambient temperature and light levels should remain as constant as possible.

2) Adherence to Standard Operating Procedures (SOP) and Good Laboratory Practice (GLP) should be monitored with regular calibration checks and a suitable Quality Control (QC) programme.

3) The sample chamber lid must be fully closed during measurement and before any readings are recorded or printed.

4) The correct selection and handling of sample containers is imperative for accurate and reproducible results:

   a) All sample containers must be handled with care, by the top and non-optical surfaces only. Any finger marks evident must be removed using a suitable cleaning process.
   b) Plastic disposable cuvettes and plastic test tubes should be used ONCE only.
   c) Glass test tubes and other glass sample tubes should be used with care. Where possible, matched tubes should be used and any index mark set to the correct position before measurements are made.
   d) Glass cuvettes and glass sample tubes should be thoroughly cleaned after use. Discard when scratches become evident in optical surfaces.
   e) Ensure any sample containers used are compatible with the constituents of the samples, reagents and standards they are to hold. Plastic cuvettes and plastic test tubes are not compatible with organic solvents.

5) The instructions supplied with test kits must be followed carefully and measurements made directly after any required incubation period. Once developed, colours may be subject to fading; so delayed measurement or re-measurement may produce inaccurate results.

6) Using the correct sample and reagent volumes will give the most accurate results. Ensure tablets and powders are dissolved according to the instructions.

7) Use the correct diameter tube or sample container for the test, as this defines the sample path length and hence the sensitivity and accuracy of the measurement. For non-standard tests ensure the final sample/reagent volume is sufficient to fill the sample container above the level of the light beam in the instrument.

8) Observe all Health and Safety information supplied with test kits and reagents. Use all required personal protective equipment and refer to relevant Material Safety Data Sheets (MSDS) for information on the safe handling, storage and disposal of all materials.

9) Samples and standards should not be stored in open cuvettes or sample tubes as evaporation will change the value and lead to staining of the walls which may be irreversible. If stored in stoppered and sealed cuvettes or sample tubes, they should be filled with little or no air space and the values regularly checked against a reference standard or quality control material.

10) Cold samples should be allowed to equilibrate to ambient temperature before they are measured (unless a suitable temperature controlled sample holder is in use). Temperature change during measurement may cause air bubbles to form on the walls of the sample holder. This is a common cause of drift during measurement.

11) In the preparation of samples and standards high-grade borosilicate glass and AR grade chemicals and reagents must be used. Good quality deionised water or other suitable solvent must be used for dissolving or diluting samples, chemicals and reagents.

Section 2

Getting Started

2.1 Unpacking

Remove the mains cable, interface cable and CD ROM from the carton with the cardboard tray.

Remove the Aquanova from the carton by lifting it in the centre between the two support cheeks; do not lift it by the support cheeks.

Place all items on a clean workbench then remove the support cheeks and the polythene bag from the spectrophotometer.

Any shortages or damage must be reported to your local distributor or the manufacturer as soon as possible.

Keep all packing materials in case the unit has to be re-shipped at a later date.
It is important that when re-packing the instrument it is first sealed in a strong, clean polythene bag to protect it from the dust and particles that are present in all packing materials.

2.2 Installation

2.21 Location

The Aquanova must be positioned within 1.5 meters of an electric supply socket.

In ideal circumstances the installation environment will be clean, dry and dust free with the instrument protected from extreme variations in ambient lighting and temperature change.

Where conditions are less than ideal, maintenance and cleaning must be carried out regularly and additional protection offered where possible. The optional dust cover should always be fitted when the unit is not being used or is stored for short periods.

2.22 Supply Voltage

The Aquanova is designed for operation on 115V or 230V ac supplies at 50 or 60Hz. To ensure that the instrument is correctly set for the local supply the indicator shown on the fuse holder on the rear panel should be checked. (See diagram opposite)

To change the voltage setting first ensure that the unit is switched off and remove the mains supply cable from the mains input socket on the rear panel.

Withdraw the fuse holder from the mains input socket on the rear panel, using two small screwdrivers or other pointed devices to push in the spring clips at either end while pulling it out.

Remove the fuse complete with the square, grey insert from the holder. Rotate the insert through 180 degrees and refit in the holder, ensuring the required mains voltage is indicated on the outside of the fuse holder.
Replace the fuse holder in the mains input socket on the rear panel.

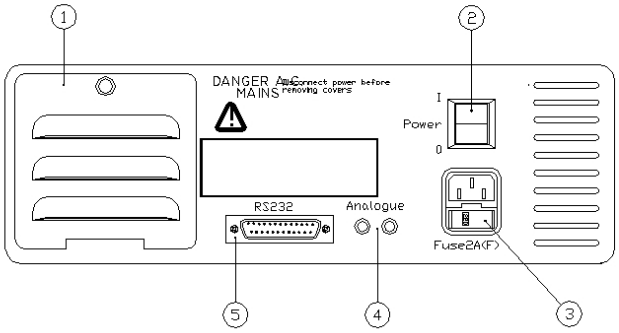
2.23 Mains Connections:

The unit is supplied with a moulded on plug. However, if this is removed for any reason the connection wired on the mains lead are colour coded to conform to the internationally recognised standard such that:

UK CONNECTIONS		US CONNECTIONS	
BROWN	**LIVE**	**BLACK**	**LIVE**
BLUE	**NEUTRAL**	**WHITE**	**NEUTRAL**
GREEN/YELLOW	**EARTH**	**GREEN**	**EARTH**

IMPORTANT: THE UNIT MUST BE EARTHED.
The green/yellow wire must be connected to a properly grounded terminal.

2.24 Rear Panel Layout



1. Lamp Access Panel — allows the user to gain access to the tungsten halogen lamp when replacement is necessary.

NOTE: The lamp access panel and all ventilation slots must not be covered or obstructed at any time.

2. Rocker Switch — On/Off switch for the unit.

3. Power In Socket — IEC type connection socket for mains cable.

4. Output Sockets — Analogue output.

5. Output Socket — Output socket for (25 way) RS232.

2.25 Power on and Self-Tests

Connect the mains supply cable to the rear panel mains input socket and plug the other end into a suitable mains supply socket.

Lift the sample chamber lid on the instrument and ensure that there is no sample or other item present in the sample holder, close the lid.

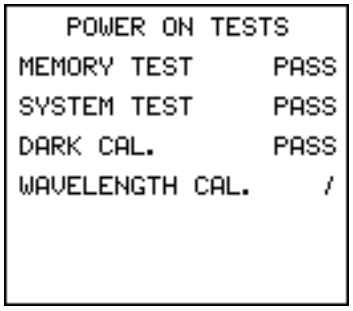
Switch on the supply socket, then the instrument, using the Power switch located on the rear panel.

Following the initial screens briefly displayed, the instrument will enter the Self-Test Mode; these tests follow four stages:

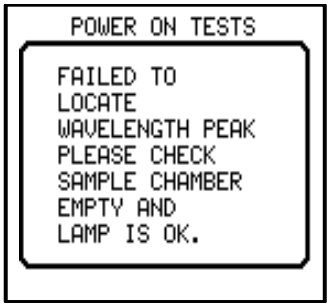
Memory Test -	when the internal memory is checked
System Test –	when the default settings are checked
Dark Cal -	when the detector dark current is being checked
Wavelength Cal –	when wavelength calibration is being verified (during this procedure the lamp intensity will change, this is normal operation)

On successful completion of these tests the Main Menu screen will be displayed. For optimum performance a 30-minute warm-up period is recommended, operation is possible prior to this but a calibration check should be made after EVERY sample measurement. The unit must be re-calibrated and sample measurement repeated if this calibration check shows excessive drift.

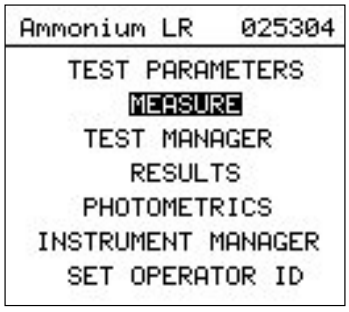
Should a problem occur during the self-tests an information box or error support message will be displayed. Follow this advice to see if it will resolve the problem, if not refer to the troubleshooting section in this manual.



Start up tests in progress



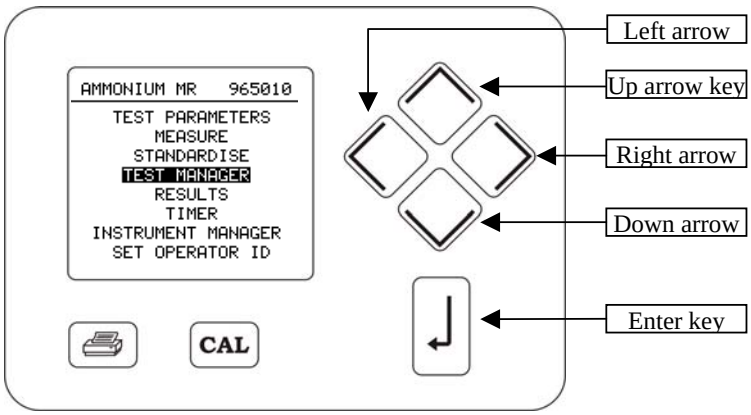
Error Support Message



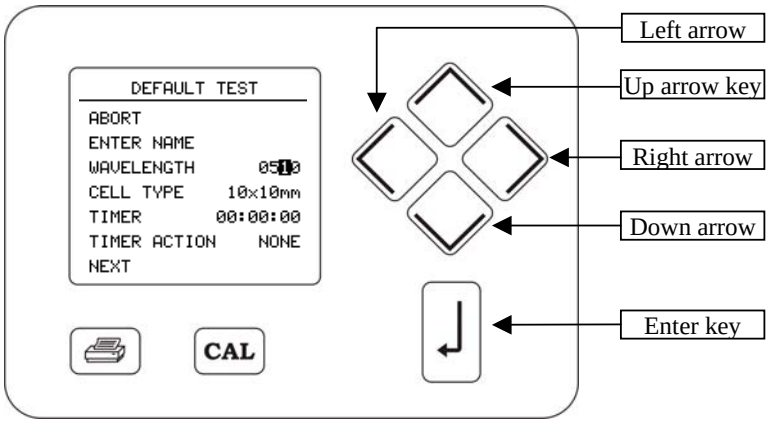
Main Menu Display

A common operating system is used throughout this and similar Jenway products, a brief overview of methods for navigating the menu system with the cursor keys follows;

Use the *up* and *down* arrow keys to highlight a menu option, press the *enter* key to confirm.

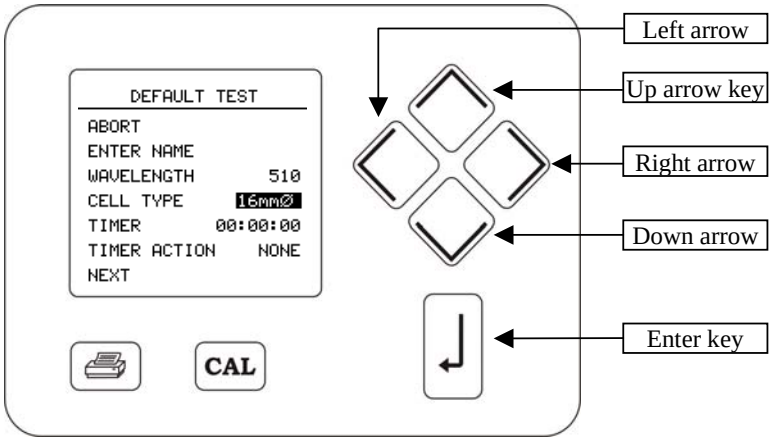


Use the *right* and *left* arrow keys to select a digit for adjustment with the *up* and *down* arrow



keys, press the *enter* key to confirm the setting when ALL digits have been correctly set.

Use the *up* or *down* arrow keys to browse through pre-set options, when the correct selection



is displayed press the *enter* key to confirm your choice.

Section 3

Making Measurements Using Pre-Loaded Tests

3.1 On Aquanova

Before commencing, ensure…

1) … that the test kit is compatible with the test method selected.
2) … that test kit and method are cross-referenced by part code and description.
3) … that the instructions supplied with the test kit are available and complete.
4) … that a sufficient quantity of the correct sample tubes/cuvettes are available
5) … that any other items required but not supplied with the test kit are available.
6) … that all relevant Material Safety Data has been reviewed.
7) … that all required personal protective equipment is available for use.
8) … that a safe means of disposal of waste materials is available.

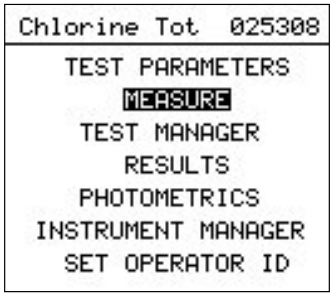
Measurement procedures and protocols vary with different test kits; these are defined for each test in the test kit instructions and in the equivalent test method stored in the Aquanova. For more information on this see Creating a New Test later in this manual.

By carefully following the test kit instructions and observing the prompts on the Aquanova display all the required steps for achieving the most accurate result will be carried out.

Selecting the Test Method

From the main menu screen shown below, follow one of the following three alternative procedures to select the desired test method from the Aquanova's memory.

1) If the required test was previously run on the Aquanova and was the last test used, its description and part code will appear in the information bar at the top of the main menu. In this case no further action is required and you can go directly to the **Making the Measurement** section that follows.

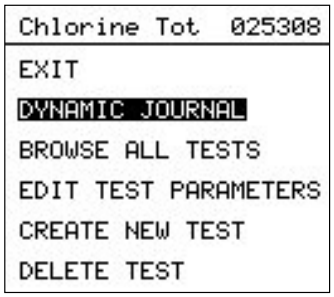


(Should you wish to view the specific settings for this method press the up arrow key to highlight [TEST PARAMETERS] then press the enter key.)

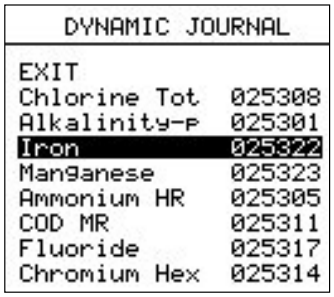
2) If the required test was previously run on the Aquanova and was one of the last eight tests to be used:

a) Press the down arrow key to highlight [TEST MANAGER] and press the enter key.

b) Then press the down arrow key to highlight [DYNAMIC JOURNAL] and press the enter key.



Use the down arrow key to highlight the required test from the list, and press the enter key.

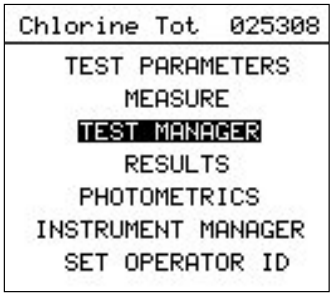


The main menu screen is returned with the description and part code of the test appearing in the information bar at the top of the screen. Continue with the **Making the Measurement** section that follows.

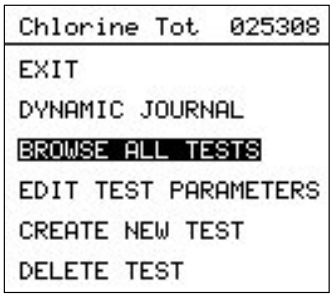
(Should you wish to view the specific settings for this method press the up arrow key to highlight [TEST PARAMETERS] then press the enter key.)

3) If the required test is stored on the Aquanova but has not been recently used, in which case it doesn't fall into either of the previous categories:

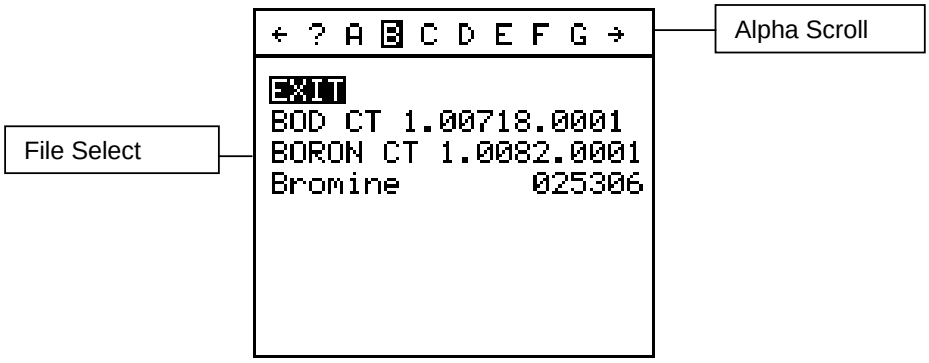
a) Press the down arrow key to highlight [TEST MANAGER] and press the enter key.



b) Then press the down arrow key to highlight [BROWSE ALL TESTS] and press the enter key.

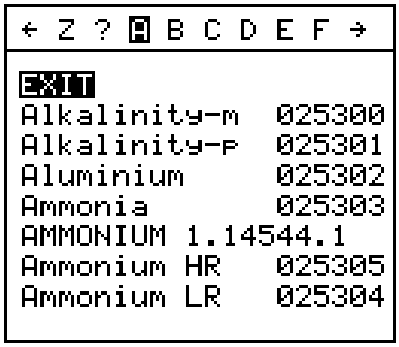


The Browse screen displayed consists of two areas, the Alpha Scroll bar at the top, controlled with the right and left arrow keys, and the File Select area at the

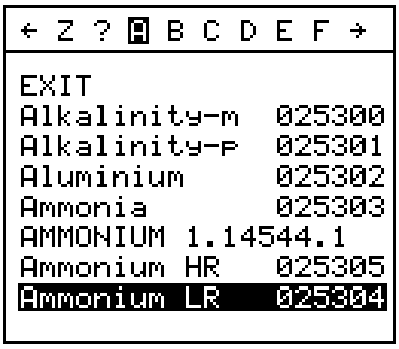


bottom, controlled with the up and down arrow keys.

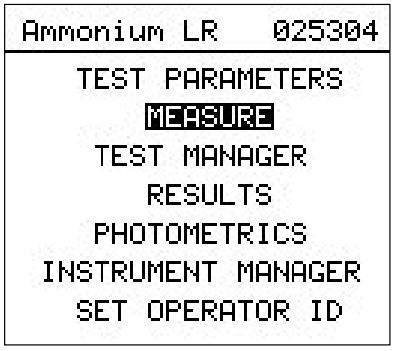
c) Press the right or left arrow keys to scroll along the Alpha Scroll bar to highlight the initial letter of the required test name (numeric and non-alpha initial characters are stored under the ? symbol).



d) Then press the up or down arrow keys to highlight the required test, in the list displayed for the selected initial letter, in the File Select area.



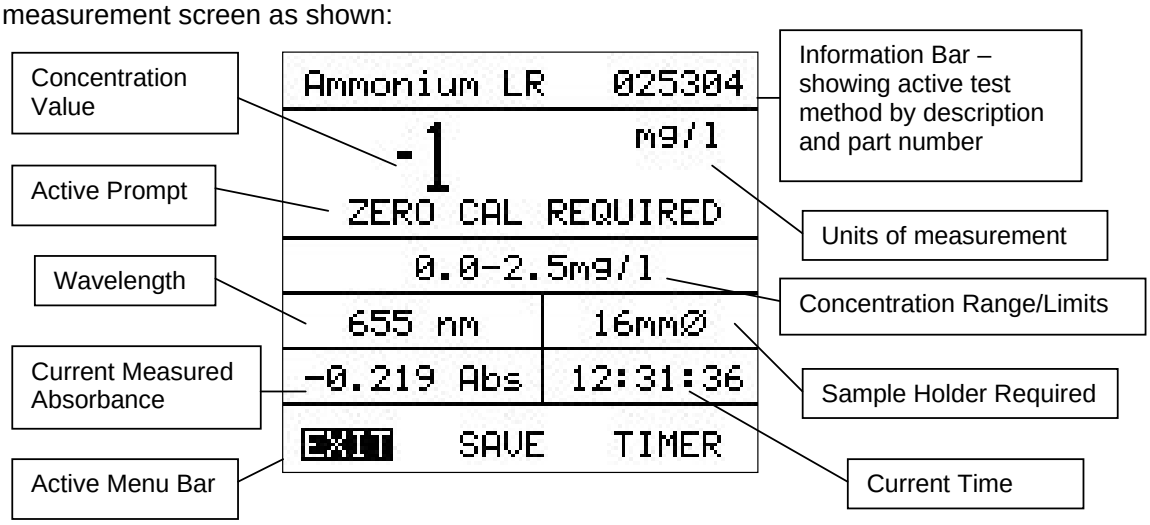
e) Press the enter key and the main menu screen is returned with the description and part code of the test appearing in the information bar at the top of the screen. Continue with the **Making the Measurement** section that follows.



(Should you wish to view the specific settings for this method press the up arrow key to highlight [TEST PARAMETERS] then press the enter key.)

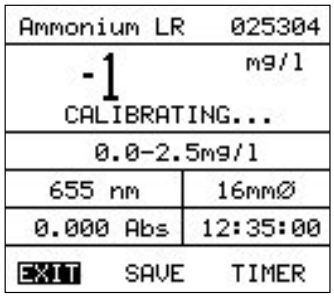
Making the Measurement

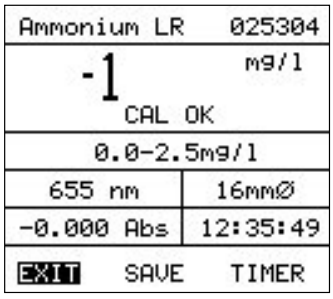
Having selected the required test, the [MEASURE] option is automatically highlighted on the main menu screen, simply pressing the enter key takes you to the measurement screen as shown:



The screen is divided into a number of areas, at the top is the information bar that shows the description and part number of the test selected, below that the main screen area shows the current concentration value in the units defined in the test method settings. Below that is the measuring range for the kit, with the wavelength and sample holder type indicated below that, this is followed by the currently measured Absorbance value and the time. At the bottom of the screen is the active menu bar.

a) Most tests will require an initial zero calibration, if this is the case the Active prompt will request this as shown above. Simply follow the test kit instructions to prepare the blank, insert it into the sample holder, close the sample chamber lid and press the CAL key on the keypad. (Where a period for colour development in the blank is required the timer function, with Cal on time out, may be initiated. This will be detailed in the kit instructions.)

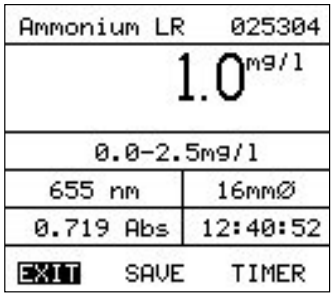




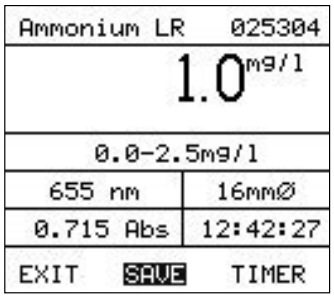
b) Initially the prompt will change to CALIBRATING… and on successful completion of the zero calibration it will change to CAL OK while the Absorbance value will be up-dated to 0.000 Abs (a zero calibration can be re-

run at any time by simply inserting the Blank and pressing the CAL key). With the zero calibration complete remove the Blank sample tube from the sample chamber.

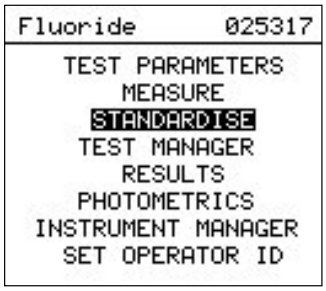
c) For many kits sample measurement can simply be made by inserting prepared sample tubes into the sample chamber, closing the lid, and recording/saving the displayed results. Where a period for colour development in the sample is required the timer function, with Save on time out, may be initiated. This will be detailed in the kit instructions.

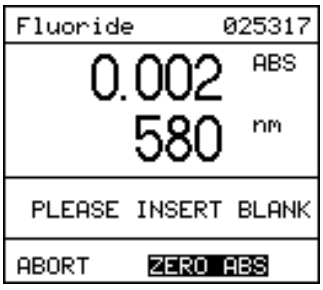


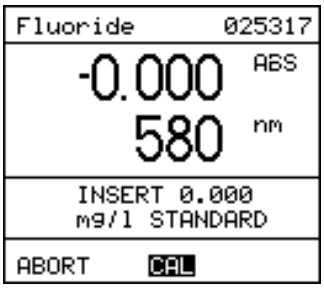
d) To manually save results to the internal memory use the right arrow key to highlight SAVE in the active menu bar, then press enter. The prompt will confirm the result has been saved.



NOTE: A few test kits may require calibrating at one or more concentration levels as well as the blank. This will be detailed in the kit instructions and is carried out by selecting the relevant test method then selecting the [STANDARDISE] option from the main menu.







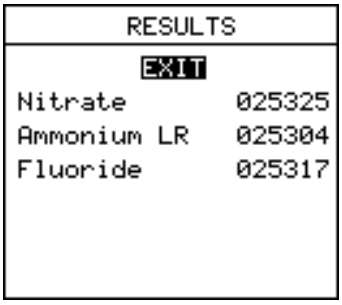
Follow the kit instructions and the on-screen prompts to complete the standardisation procedure when required.

Recalling Saved Results

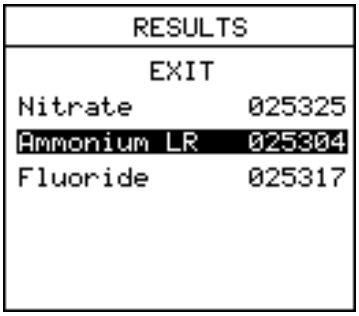
Results saved automatically or manually are stored in a file for the specific test method selected at the time. To access the results use the following procedure…

a) Press the down arrow key to highlight [RESULTS] in the main menu

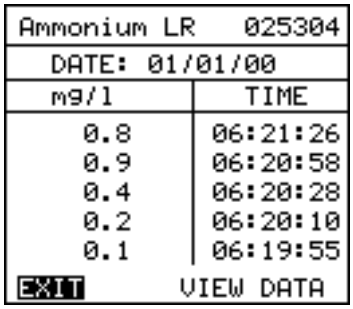
b) Press the enter key and a list of the results files available will be displayed



c) Use the down arrow to highlight the file containing the required results



d) Press the enter key to display all the results stored for this test



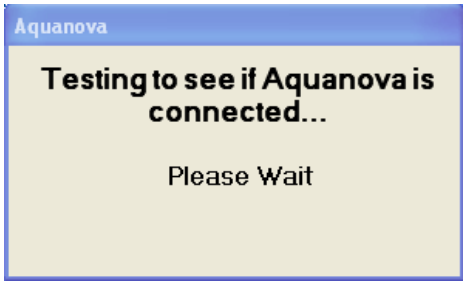
d) Use the up or down arrow keys to view results further up or down the list. Press the right arrow key to highlight [View Data] and then press the enter key to display details of the method, last calibration made, and review the

e) calibration curve used.

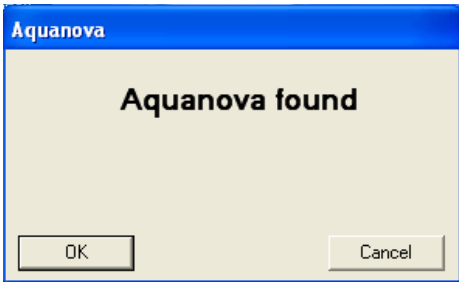
3.2 On a connected PC

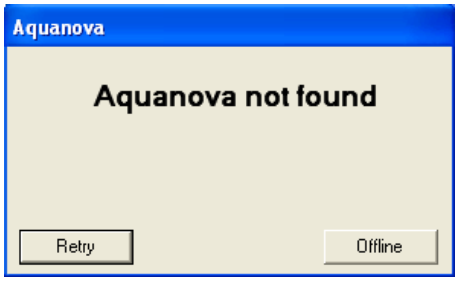
Follow the instructions supplied with the Aquanova CD to load the software onto your PC. Successful completion of this will generate an icon on your desktop – these instructions commence from opening the software from this icon. Should you experience problems loading or opening the software please see the troubleshooting section of this manual, visit www.jenway.com or email techsupport@jenway.com

Double click on the [Aquanova] icon on the desktop, the following information box will be displayed.

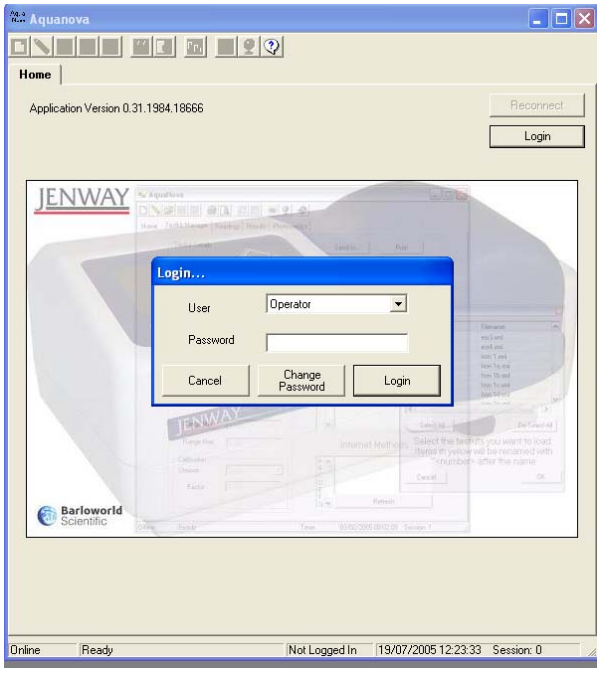


If communication with the connected instrument is successful the [Aquanova found] information box will be displayed. If communication is not possible the [Aquanova not found] information box will be displayed, in which case check the Aquanova is switched on and the interface cable connected correctly to the PC and the instrument. Click on [Retry] to check communication again, if problems persist refer to the troubleshooting and interfacing section of this manual. When communication is made click on [OK] to access the main log in screen.





Click on [Login] in the top right corner of the screen to display the log in data-entry portal. Here you can select the user level, enter and change passwords. Details on setting user levels and related privileges can be found under the [Setup] tab and in Section 8.2 of this Instruction Manual.



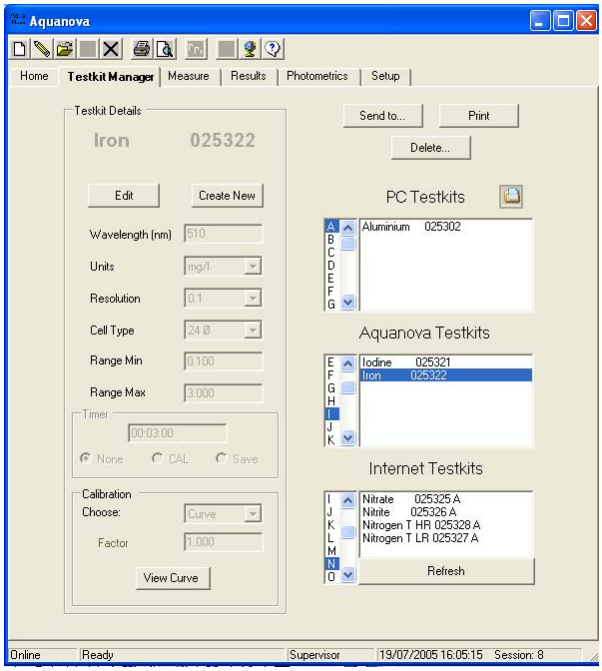
If user levels and passwords have been previously set, enter these as indicated below, if this is the first use or these settings have not been made simply click on the down arrow by the [User] selection box and select [Supervisor] from the options displayed, then click on [Login] to proceed.

To alter the user level click on the down arrow to the right of the [User] selection, the drop down box will give the options to choose between Supervisor or Operator privileges as set under the [Setup] tab.

Click in the [Password] entry box and type in the previously set password, then click on [Login].

From the Home page click on the [Testkit Manager] tab.

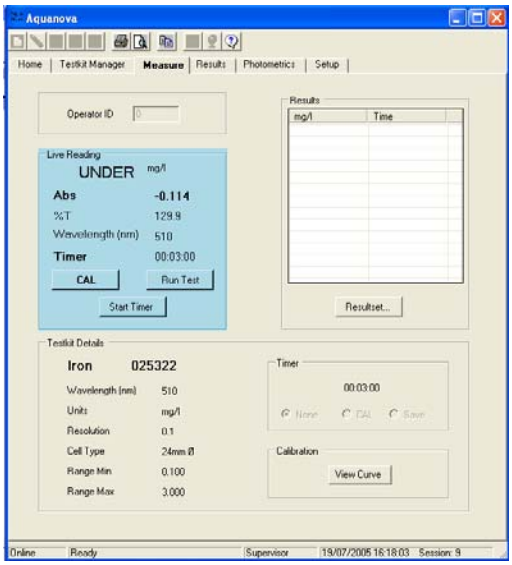
If the test kit method required is on the Aquanova click on its initial letter in the [Aquanova Testkits] selection area (using the arrows on the scroll bar as necessary) and then highlight it in the list displayed for tests with that initial letter. The [Testkit Details] area to the left will be up-dated with the information stored on the Aquanova for this test.



If the test kit method is on the PC, click on the file icon to the right hand side of the [PC Testkits] area and use the browse screen to identify the file that contains the required method. Use the above procedure to highlight the initial letter and test kit method to up-date the [Testkit Details] in the left hand column.

If the test kit method is on the Jenway web site and an internet connection has already been made click on [Refresh] below the [Internet Testkits] selection area to up-date the list of tests available. Use the above procedure to highlight the initial letter and test kit method to up-date the [Testkit Details] in the left hand column.

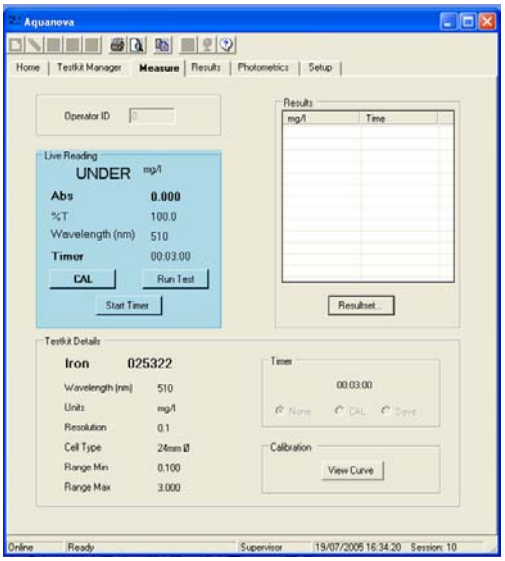
With the [Testkit Details] area up-dated check that the test kit description and part number are correct and that the settings match those required.



Click on the [Measure] tab to display the measure screen.

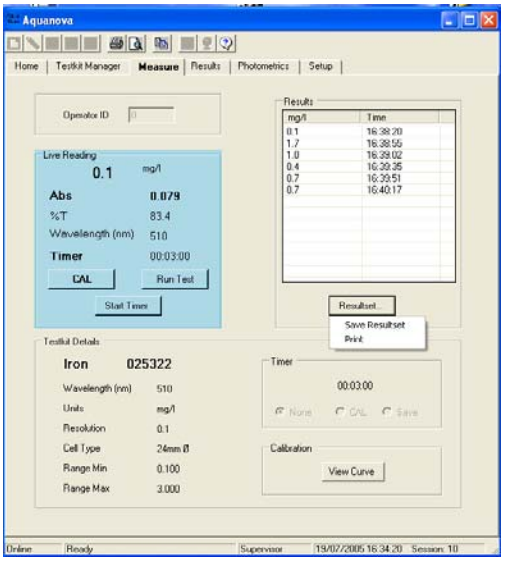
Follow the test kit instructions to prepare the blank, (standards where required) and samples.

Insert the Blank in the Aquanova sample holder, taking care to handle carefully and position it correctly, close the chamber door.



Click on [CAL], or [Start Timer] if a Cal on time out function is included in the method settings.

When the blank calibration is completed the Abs display will be set to zero. Remove the blank from the sample chamber and insert the first sample, taking care to handle carefully and position it correctly, close the chamber door.



Click on [Run Test], or [Start Timer] if a Save on time out function is included in the method settings.

The reading in the Live Display area will be stored in the Results window on the right hand side with the time the reading was taken.

The results may be saved on the computer or printed to a connected printer by choosing the required option after clicking on [Resultset] Alternatively a group of results can be highlighted by dragging the mouse pointer across them, clicking on the copy icon on the toolbar, and then simply pasting them into a spreadsheet for further processing, display or filing. For additional help on these features at anytime click on the Help icon on the toolbar.

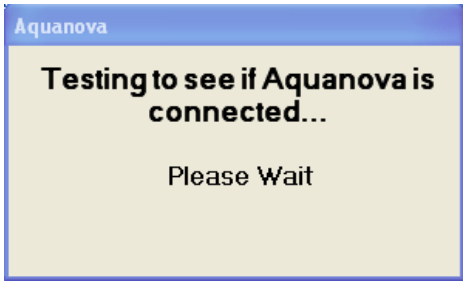
Section 4

Down-Loading New Tests

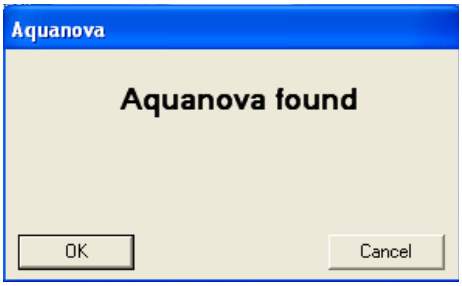
4.1 From CD ROM

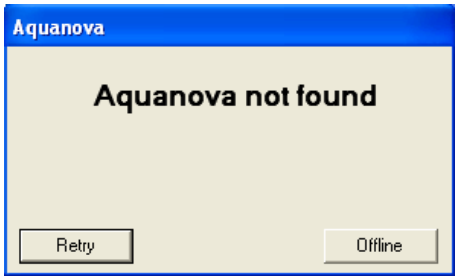
Follow the instructions supplied with the Aquanova CD to load the software onto your PC. Successful completion of this will generate an icon on your desktop – these instructions commence from opening the software from this icon. Should you experience problems loading or opening the software please see the troubleshooting section of this manual, visit www.jenway.com or email techsupport@jenway.com

Double click on the [Aquanova] icon on the desktop, the following information box will be displayed.

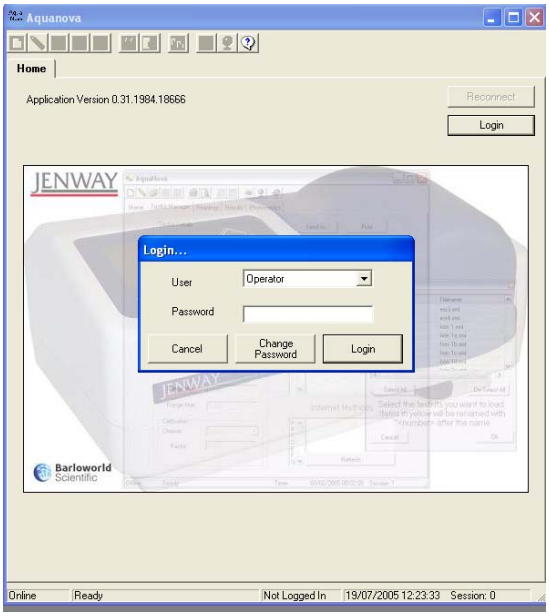


If communication with the connected instrument is successful the [Aquanova found] information box will be displayed. If communication is not possible the [Aquanova not found] information box will be displayed, in which case check the Aquanova is switched on and the interface cable connected correctly to the PC and the instrument. Click on [Retry] to check communication again, if problems persist refer to the troubleshooting and interfacing section of this manual. When communication is made click on [OK] to access the main log in screen.





Click on [Login] in the top right corner of the screen to display the log in data-entry portal. Here you can select the user level, enter and change passwords. Details on setting user levels and related privileges can be found under the [Setup] tab and in Section 8.2 of this Instruction Manual.



If user levels and passwords have been previously set, enter these as indicated below, if this is the first use or these settings have not been made, simply click on the down arrow by the [User] selection box and select [Supervisor] from the options displayed, then click on [Login] to proceed.

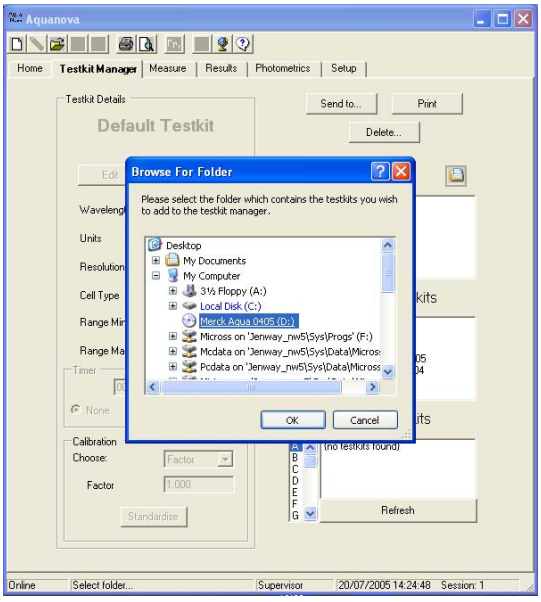
To alter the user level click on the down arrow to the right of the [User] selection, the drop down box will give the options to choose between Supervisor or Operator privileges as set under the [Setup] tab.

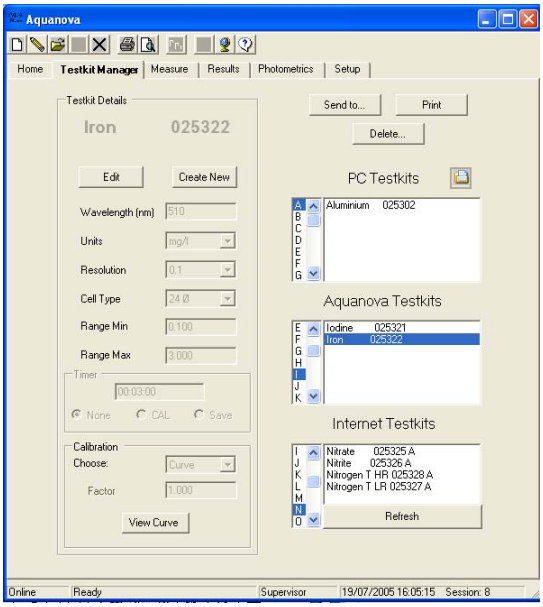
Click in the [Password] entry box and type in the previously set password, then click on [Login].

From the Home page click on the [Testkit Manager] tab.

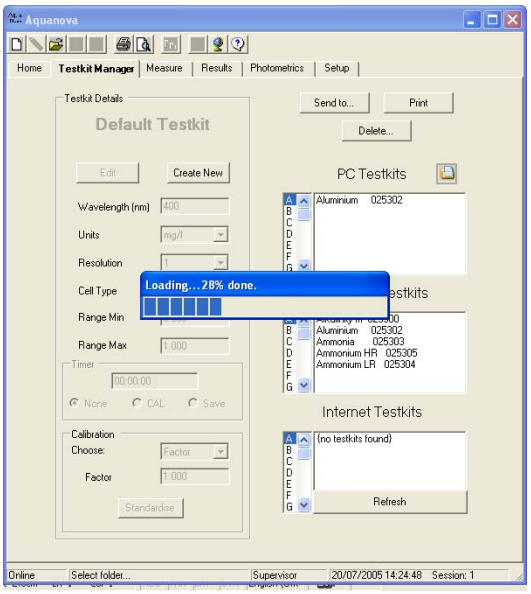
Insert the CD ROM, containing the test kit methods required, into the CD ROM drive on the PC.

Click on the File select icon above the PC Testkits information area to the right of the screen.





Click on the CD ROM icon in the [Browse For Folder] screen. Then click on [OK]



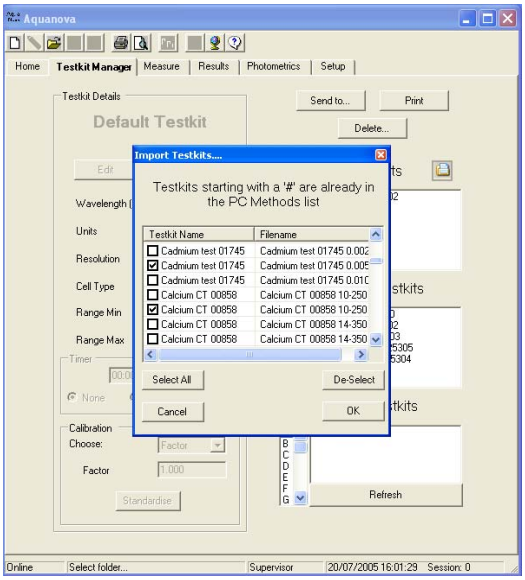
The CD ROM drive should operate. The [Loading…] information box will be displayed showing the progress of loading the test kit methods, this will take longer depending on the number of methods found on the CD ROM.

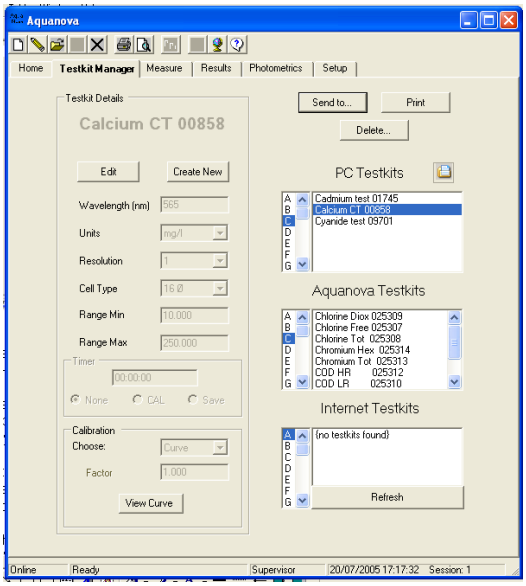
Click in the box alongside each test kit method required to show a tick; for a ticked method not required click again to de-select.

If all test kit methods shown are required click on [Select All]. Should you need to clear all selections at anytime click on [DeSelect].

If any test kit methods shown in the list are already in the PC Methods List the tick box will be replaced by a # symbol.

When all required test kit methods are selected click on [OK].





The required test can be selected and measurements made as described in Section 3.2.

To save the method in an alternative file on the PC hard disk, click [Edit] then [Save] then [Save As…] the explorer window will help you save the method in the file of your choice.

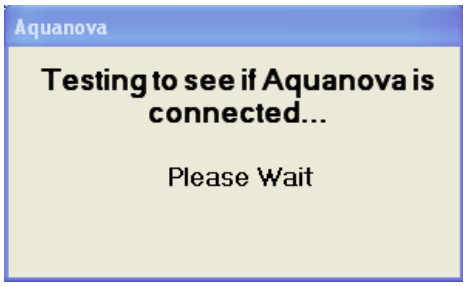
If it is required to make the selected method available on the Aquanova it can simply be dragged from the PC Testkits area and dropped in the Aquanova Testkits area. Alternatively with the test highlighted in the PC Testkits area, click on [Send to…] and select the [Aquanova] option.

4.2 From the Internet

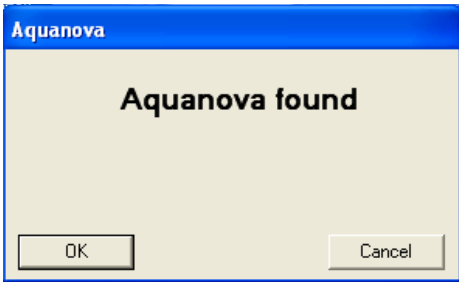
Before opening the Aquanova software you will need to establish an internet connection.

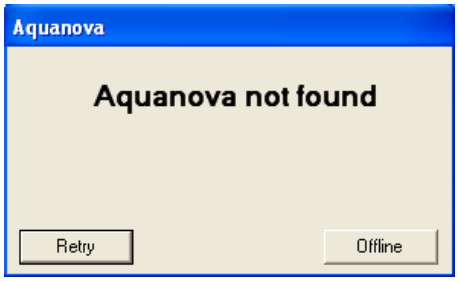
Follow the instructions supplied with the Aquanova CD to load the software onto your PC. Successful completion of this will generate an icon on your desktop – these instructions commence from opening the software from this icon. Should you experience problems loading or opening the software please see the troubleshooting section of this manual, visit www.jenway.com or email techsupport@jenway.com

Double click on the [Aquanova] icon on the desktop, the following information box will be displayed.

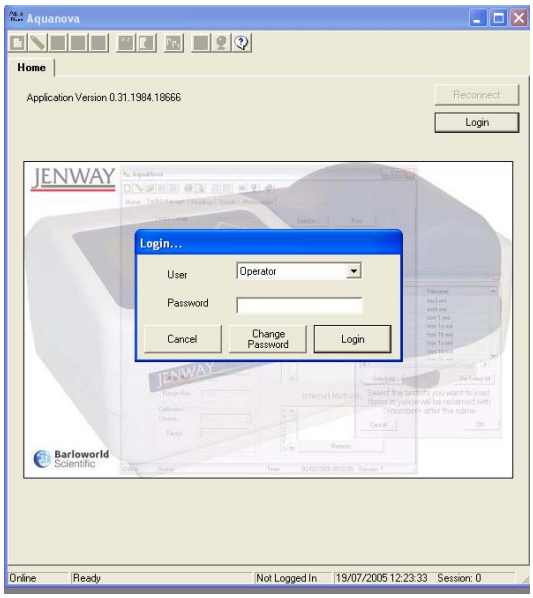


If communication with the connected instrument is successful the [Aquanova found] information box will be displayed. If communication is not possible the [Aquanova not found] information box will be displayed, in which case check the Aquanova is switched on and the interface cable connected correctly to the PC and the instrument. Click on [Retry] to check communication again, if problems persist refer to the troubleshooting and interfacing section of this manual. When communication is made click on [OK] to access the main log in screen.





Click on [Login] in the top right corner of the screen to display the log in data-entry portal. Here you can select the user level, enter and change passwords. Details on setting user levels and related privileges can be found under the [Setup] tab and in Section 8.2 of this Instruction Manual.



If user levels and passwords have been previously set, enter these as indicated below, if this is the first use or these settings have not been made, simply click on the down arrow by the [User] selection box and select [Supervisor] from the options displayed, then click on [Login] to proceed.

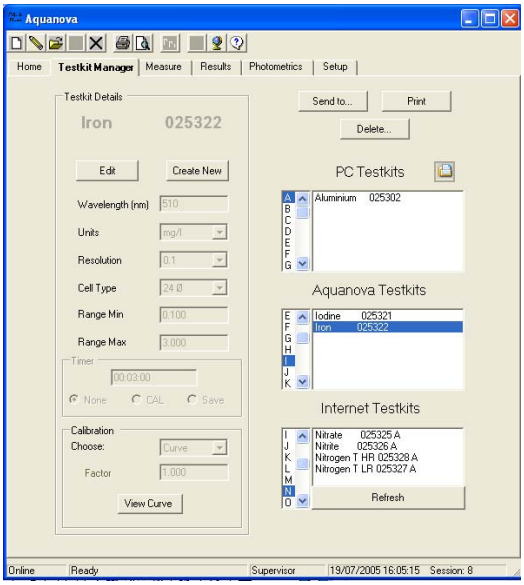
To alter the user level click on the down arrow to the right of the [User] selection, the drop down box will give the options to choose between Supervisor or Operator privileges as set under the [Setup] tab.

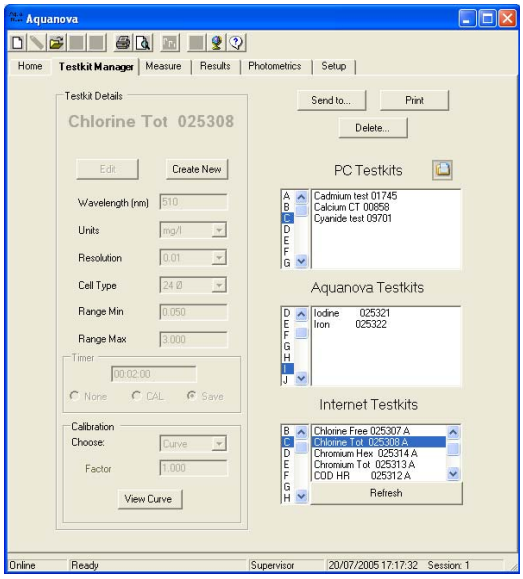
Click in the [Password] entry box and type in the previously set password, then click on [Login].

From the Home page click on the [Testkit Manager] tab.

Ensure an internet connection is active and click on [Refresh].

All the kits currently available on the Jenway web site will be downloaded and displayed in the Internet Testkits area





The required test can be selected and measurements made as described in Section 3.2.

To save the method in an alternative file on the PC hard disk, click [Edit] then [Save] then [Save As…] the explorer window will help you save the method in the file of your choice.

If the method is also required on the Aquanova it can simply be dragged from the Internet Testkits area and dropped in the Aquanova Testkits area. Alternatively with the test highlighted in the Internet Testkits area, click on [Send to…] and select the [Aquanova] option.

Section 5

Creating New & Editing Existing Tests

5.1 On Aquanova

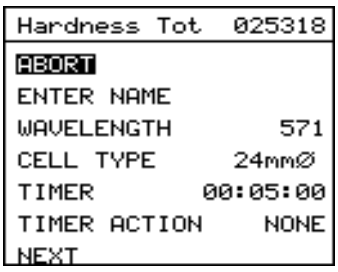
1) Carry out the relevant procedures to select the required test for editing as detailed in Section 3.1. or proceed to step 2 if creating a new test.

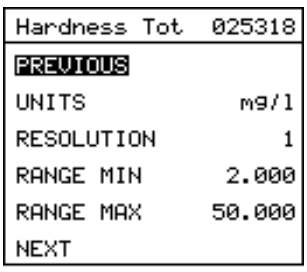
2) Having selected the required test, the [MEASURE] option is automatically highlighted on the main menu screen, press the down arrow key to select [TEST MANAGER] and press the enter key.

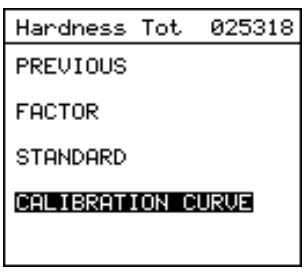
3) Press the down arrow key to highlight [EDIT TEST PARAMETERS] or [CREATE NEW TEST] and press the enter key, the first page of data stored for the selected test or the Default Test when creating a new test, is shown and each option in the list can be edited or set as described in the following paragraphs.

The three consecutive pages run in the order below, the modified or new test is not saved until the last page is completed and the main menu screen returned. However when editing a test if the test name is changed you will be asked if this is just a name change, in which case the old test is overwritten, or if you want to keep the old test with the old name and create a new copy with the new name. At any time you can use the [PREVIOUS] option to return to the first page and select [Abort] to return to the main menu with no changes made.

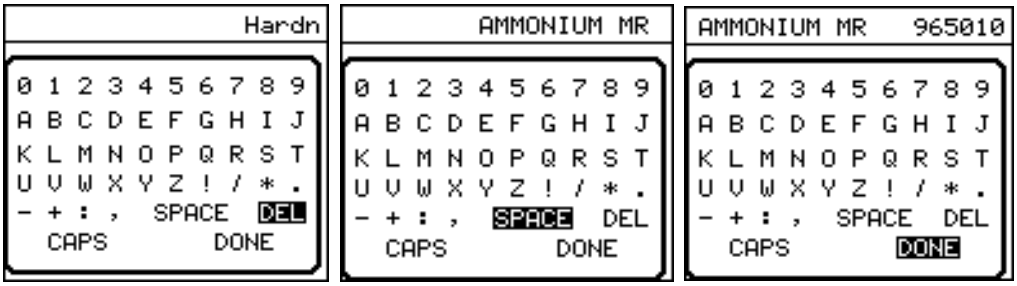
No changes are saved until the Factor, Standard or Calibration Curve options have been entered, use ABORT to return to the main menu with no changes.





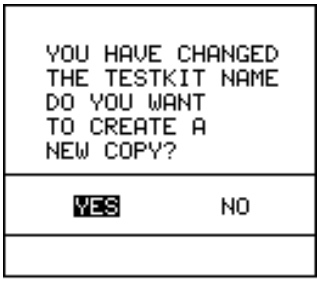


[ENTER NAME] – Up to 20 alphanumeric characters can be entered as the new name for the test. When creating a new test the new name is entered directly using the on-screen keyboard. When editing a test move the highlight to [DEL], the delete key, by pressing the up arrow key, then press the enter key to delete un-wanted characters in the test name displayed at the top of the screen, starting from the right hand character. Then use the up, down, right and left keys to move the highlight over each required character in turn, confirming it by pressing the enter key, until the full



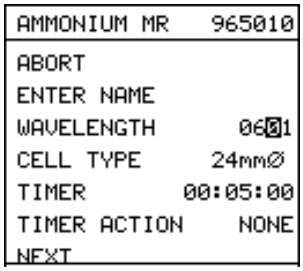
name of the test, including any required part number or id, appears in the top line of the display.

Move the highlight over [DONE] and press the enter key when completed. When



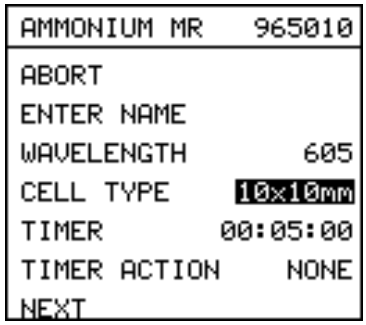
editing existing tests you will be asked if this is just a name change or an alternative method. Select [YES] to keep the old test and save the new settings as an additional new testkit method – you can select [ABORT] at anytime to return to the main menu without making any changes.
Select [NO] to overwrite the old test settings with the new ones – you can select [ABORT] at anytime to return to the main menu without making any changes.

[WAVELENGTH] – This is the wavelength at which the test is carried out and any value between 320 and 1000nm can be entered in 1nm steps. Use the up or down arrow keys to highlight the [WAVELENGTH] option then press the enter key. The highlight will move across to the most significant digit, which can be adjusted with the up or down arrow keys to the desired value. Use the right arrow key to move to each of the other digits in turn, setting them with the up or down arrow key to the desired



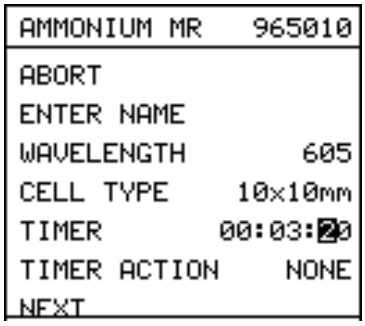
value. When all the digits have been set to display the correct wavelength press the enter key to confirm the setting and return the highlight to the left column of the menu.

[CELL TYPE] – This specifies the type of sample holder needed for the test which in turn determines the path length used in the calculation of the concentration value from the basic absorbance signal. Incorrect results will be returned if the wrong type is entered and/or used. Use the up or down arrow keys to highlight the [CELL TYPE] option then press the enter key. The highlight will move across to the right hand side of the menu where the up or down arrow keys can be used to cycle through the options of, 16mm diameter sample tube, 24mm diameter sample tube, 10 x 10mm square cuvette, 10 x 20mm rectangular cuvette, 10 x 40mm rectangular cuvette, 10 x 50mm rectangular cuvette and10 x 100mm rectangular cuvette. When the required



option is highlighted on the display press the enter key to confirm your selection and return the highlight to the left column of the menu.

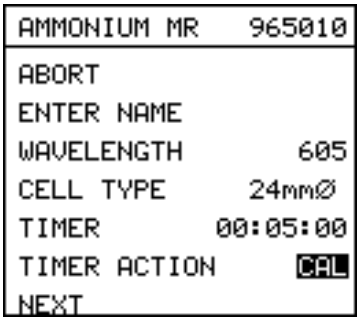
[TIMER] – Where the blank or sample requires a period of time for colour development or other reaction this can be controlled from the instrument by entering the required time and defining the action when the count down timer reaches zero. Use the up or down arrows to highlight [TIMER] and press the enter key. The highlight will move across to the most significant digit for the hours setting on the timer display, this can be adjusted with the up or down arrow keys to the desired value. Use the right arrow key to move to each of the other digits in turn, setting them with the up or down arrow key to the desired value. When all the digits have been set



to display the correct period for the timer, press the enter key to confirm the setting and return the highlight to the left column of the menu.

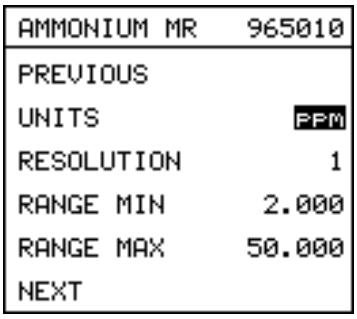
[TIMER ACTION] – This will determine what action is taken when the count down timer reaches zero. Use the up or down arrows to highlight [TIMER ACTION] and press the enter key. The highlight will move across to the right hand side of the menu where the up or down arrow keys can be used to cycle through the options of; NONE, where no action will be taken but the timer can be viewed as a stop watch and manual calibration or measurement made, SAVE, where the active reading will be saved to the internal memory, CAL, use for a blank to automatically set the Absorbance to zero on time out.

When the required option is highlighted on the display press the enter key to confirm your selection and return the highlight to the left column of the menu.



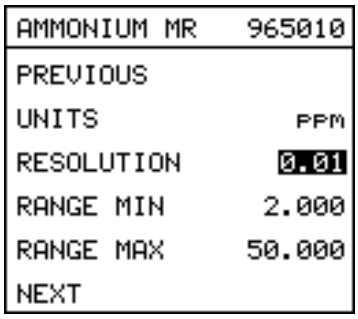
Use the down arrow to highlight [NEXT] and press enter to display the next page of settings.

[UNITS] – A wide range of measuring units is available here to append to the results displayed and saved. Use the up or down arrows to highlight [UNITS] and press the enter key. The highlight will move across to the right hand side of the menu where the up or down arrow keys can be used to cycle through the options of, g/l, mg/l, µg/l, ng/l, g/dl, mg/dl, µg/dl, mg/ml, µg/ml, M/l, mM/l, µM/l, U/l, mU/l, U/ml, mEq, HZ, IFZ, mg/kg, pH, ppm, % and no units. When the required option is highlighted on the



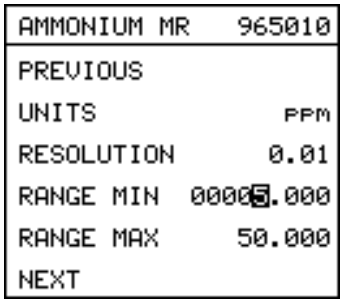
display press the enter key to confirm your selection and return the highlight to the left column of the menu.

[RESOLUTION] – This setting determines the resolution of the concentration results displayed on Aquanova. Use the up or down arrows to highlight [RESOLUTION] and press the enter key. The highlight will move across to the right hand side of the menu where the up or down arrow keys can be used to cycle through the options of, 1, 0.1,



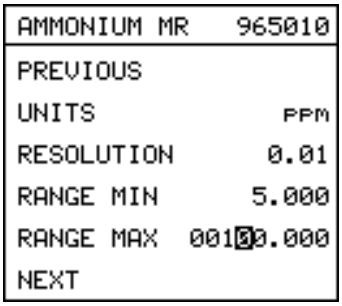
0.01, 0.001. When the required option is highlighted on the display press the enter key to confirm your selection and return the highlight to the left column of the menu.

[RANGE MIN] – This defines the minimum limit of the measuring range and is displayed on the main measuring screen to alert the operator to samples that are outside the measuring range and may require other pre-treatment or measurement procedures. Use the up or down arrows to highlight [RANGE MIN] and press the enter key. The highlight will move across to the most significant digit for the measuring range setting this can be adjusted with the up or down arrow keys to the desired value or the right arrow key can be used to select other digits for adjustment



with the up or down arrow keys to give the desired value. When all the digits have been set press the enter key to confirm your setting and return the highlight to the left column of the menu.

[RANGE MAX] – This defines the maximum limit of the measuring range and is displayed on the main measuring screen to alert the operator to samples that are outside the measuring range and may require other pre-treatment or measurement procedures. Use the up or down arrows to highlight [RANGE MAX] and press the enter key. The highlight will move across to the most significant digit for the measuring range setting this can be adjusted with the up or down arrow keys to the desired value, or the right arrow key can be used to select other digits for adjustment

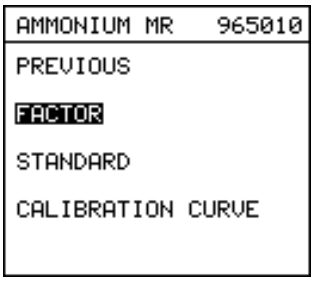


with the up or down arrow keys to give the desired value. When all the digits have been set press the enter key to confirm your setting and return the highlight to the left column of the menu.

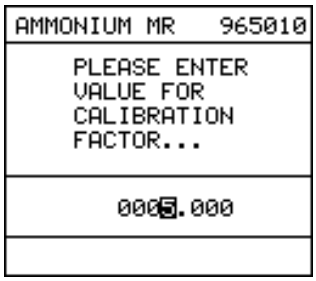
Use the down arrow to highlight [NEXT] and press enter to display the last page of settings. This page offers three alternative methods for the Calibration required for the test kit. Each assumes a blank with the options for a factor, a single standard value or a full calibration curve based on up to 6 standard solutions, on completion of the selected option the edited or new method will be saved.

[FACTOR] – This is the value of m defined as the slope of the straight line in $Y = mX + C$, where Y = the concentration value, m = the slope factor, X = the sample absorbance and c = the blank absorbance. From this it can be seen that the test kit must exhibit a linear response between range min and range max.

Press the down arrow key to highlight [FACTOR] then press the enter key

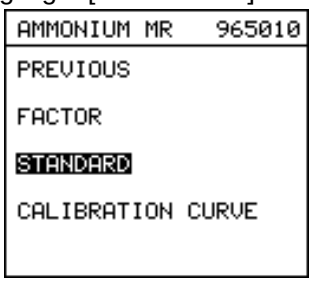


Use the right or left arrow keys to highlight each digit in turn for adjustment with the up or down arrow keys to set the value required.

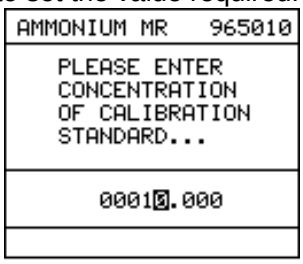


When all digits are set and the required value for the factor is displayed press the enter key to confirm your setting. The main menu will be returned with the new test kit selected and [MEASURE] highlighted ready for the test kit method to be used.

[STANDARD] – Entry of a standard value will set up a simple two point calibration for the test kit with an absorbance blank and a concentration standard. In a normal measurement the initial prompt for a blank will be followed by a prompt for the entered standard, the [STANDARDISE] option will also be enabled on the main menu when this test is selected so that a two point calibration can be run at any time. Press the down arrow key to highlight [STANDARD] then press the enter key.

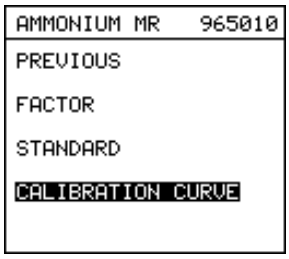


Use the right or left arrow keys to highlight each digit in turn for adjustment with the up or down arrow keys to set the value required.

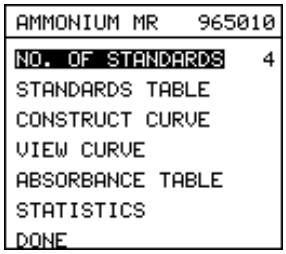


When all digits are set and the required value for the standard is displayed press the enter key to confirm your setting. The main menu will be returned with the new test kit selected and [MEASURE] highlighted ready for the test kit method to be used.

[CALIBRATION CURVE] – This option enables up to six calibration standards to be selected to produce a calibration curve to replicate the response of non-linear test kits. The curve is plotted against the number of points selected using linear regression. In normal measurement only a blank is required with the measurements made against the stored calibration curve. The [STANDARDISE] option on the main menu is enabled so that the calibration curve can be re-validated at any time. Press the down arrow key to highlight [CALIBRATION CURVE] then press the enter key.

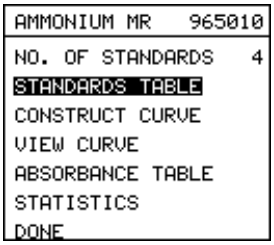


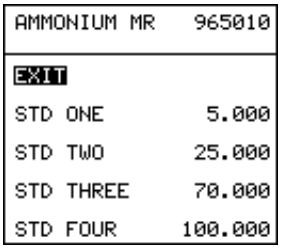
A list of seven options is displayed. The top three must be completed to create a calibration curve, the following three return information and statistics useful in verifying the curve, finally select [DONE] to save the test kit method and return to the main menu.



[NO. OF STANDARDS] – Simply enter the number of standards that will be used to create the calibration curve, this does not include the absorbance blank. With [NO. OF STANDARDS] highlighted press the enter key. Use the up and down arrows to select from 1 to 6 on the display, with the required number highlighted on the display press the enter key to confirm your selection.

[STANDARDS TABLE] – This option returns a table containing the number of standards selected above. Against each numbered standard the relevant concentration value should be set.

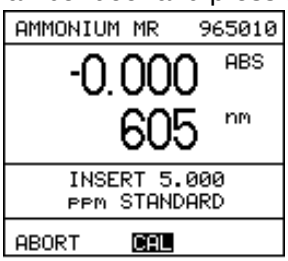




Use the down arrow key to highlight [STANDARDS TABLE], then press the enter key. Use the down arrow key to highlight [STD ONE] and press the enter key to move the highlight to the right hand side of the menu. The most significant digit of the concentration value of standard one is highlighted. Use the up or down arrow keys to adjust this digit, or use the right arrow key to move to other digits in turn for adjustment with the up or down arrow key, until the concentration value for standard one is displayed. Press the enter key to confirm your setting and return the highlight to the left hand side of the menu.

Use the down arrow key to select each of the standards in turn for adjustment of the concentration values as above, until the selected number of standards (up to six) are set. Use the up or down arrows to highlight [EXIT] and press the enter key to return to the Calibration Curve menu.

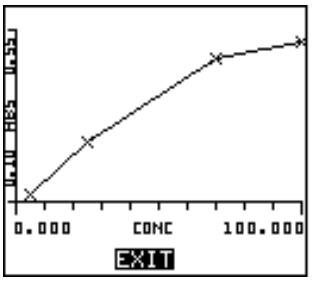
[CONSTRUCT CURVE] – Press the down arrow key to highlight [CONSTRUCT CURVE] then press the enter key and simply follow the on-screen prompts. Insert the blank, close the sample chamber door and press the enter key to confirm, the prompt



will then request the first standard, remove the blank, insert the first standard, close the sample chamber door and press the enter key to confirm, the prompt will then request each of the standards in turn returning the Calibration Curve menu on completion.

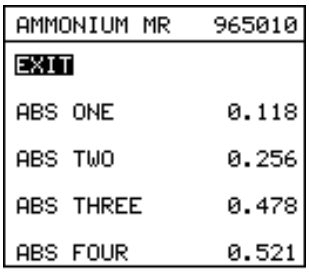
It is possible to finish at this stage and select [DONE] to return to the main menu and the [MEASURE] option. However it is worth viewing the Calibration Curve, Absorbance Table and Statistics screens to verify the settings made and enable adjustments or re-settings to be made.

[VIEW CURVE] – This option enables you to view the constructed calibration curve. Press the down arrow key to highlight [VIEW CURVE] and press the enter key.



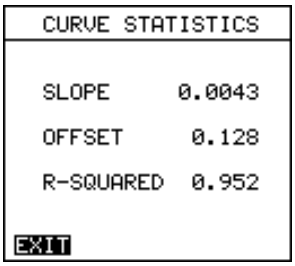
With [EXIT] highlighted in the bottom menu bar simply press the enter key again to return to the Calibration Curve menu.

[ABSORBANCE TABLE] – This table gives the measured absorbance value of each of the standards set in the Standards Table. Press the down arrow key to highlight [ABSORBANCE TABLE] and then press the enter key.



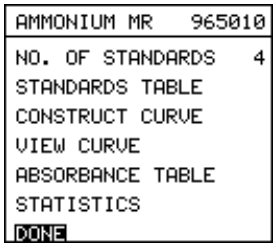
With the [EXIT] option highlighted simply press the enter key to return to the Calibration Curve menu.

[STATISTICS] – The statistics screen details the Slope, Offset and R-squared (correlation coefficient) values derived from the calibration curve. Press the down arrow key to highlight [STATISTICS] and then press the enter key.



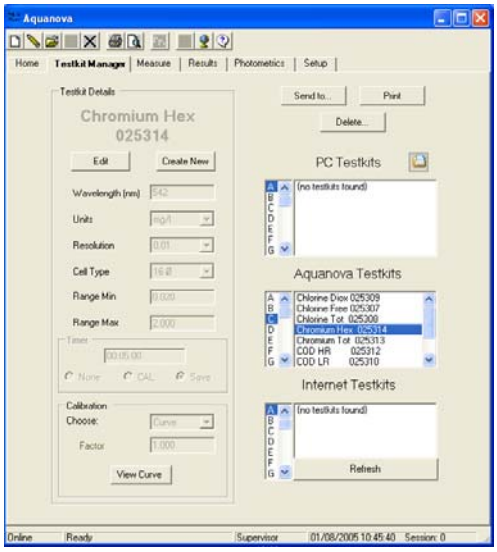
With the [EXIT] option highlighted in the bottom menu bar simply press the enter key to return to the Calibration Curve menu.

[DONE] - When all the settings have been made and the information and statistics verified press the down arrow to highlight [DONE] in the Calibration Curve menu then press the enter key to save the settings and return to the main menu.



The [MEASURE] option will be highlighted enabling measurement of the new/edited method to be undertaken straight away if required.

5.2 On a connected PC



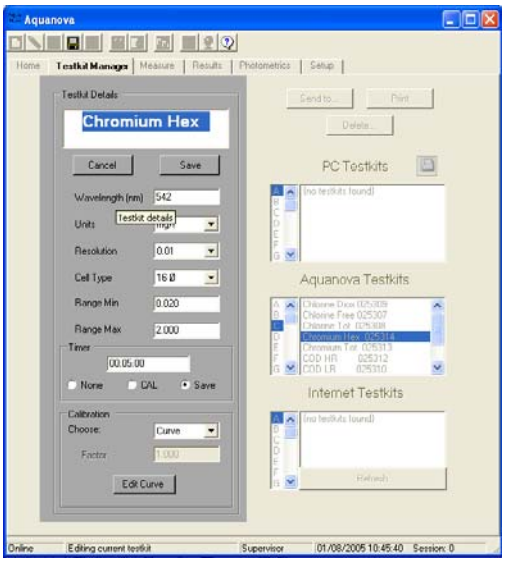
In the Test Manager screen select the required test from either the PC Testkits, Aquanova Testkits or Internet Testkits areas.

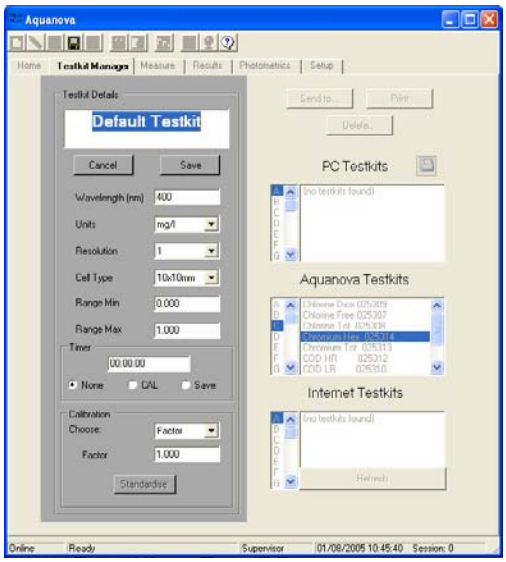
The Testkit Details area will be up-dated with the stored parameters for the highlighted test kit.

To edit the parameters of the highlighted test kit, click on [EDIT].

The Testkit Details area becomes active with the testkit name immediately editable by simply typing in an alternative name.

The other parameters can be edited in the same manner as described for creating a new test.

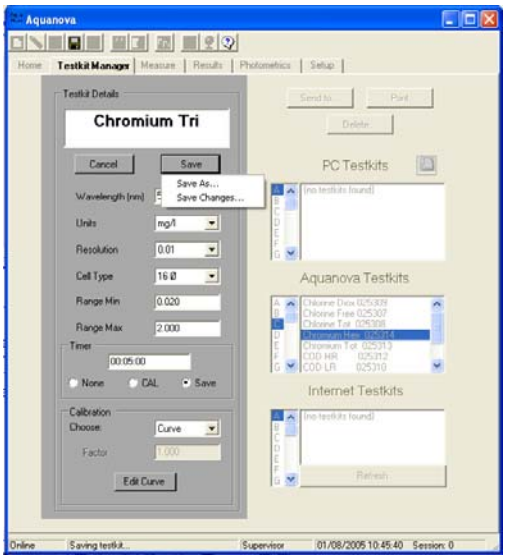




To create a new test method click on [CREATE NEW].

The Testkit Details area becomes active with the ‘Default Testkit’ name and parameters.

The Default Testkit name is immediately editable by simply typing in a suitable name for new test kit.



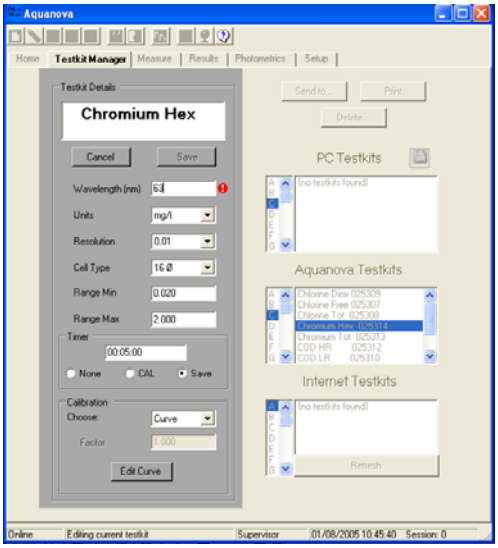
The only differences between editing existing tests and creating new tests is that in creating a new test the Testkit Details are set to default levels whereas when editing they are set as the selected test kit.

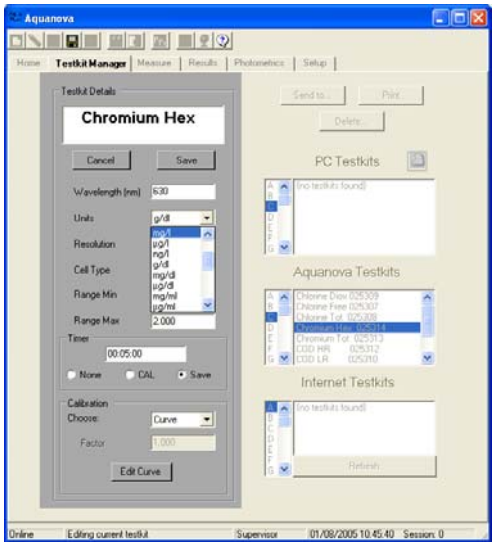
All other settings and selections are made in the same way except for when these are completed and the new/edited test method is saved.

When Editing an existing method clicking on [SAVE] will bring up two options:
Save As… enables you to save the edited version as a separate method keeping the original method intact.
Save Changes… enables you to overwrite the original method with the changes made during editing.

Wavelength Setting: Click in the box next to [Wavelength nm]. You can drag the cursor across one or more digits to highlight them and type in the required digits, or use the delete or backspace keys on the keyboard to delete digits and then type in the corrections.

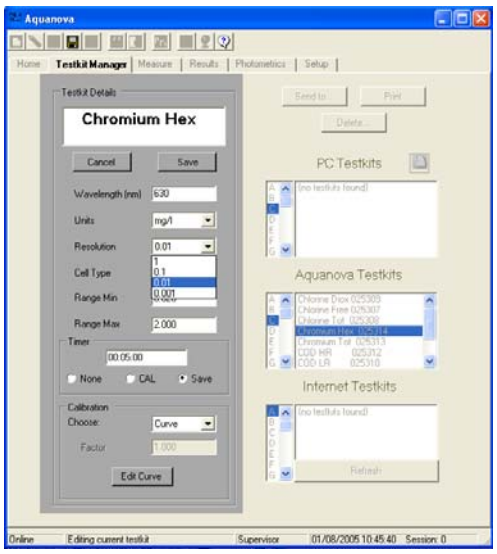
During adjustment or if an invalid entry is made the red exclamation mark will be visible, hovering the mouse pointer over this mark will give a prompt for the acceptable range.





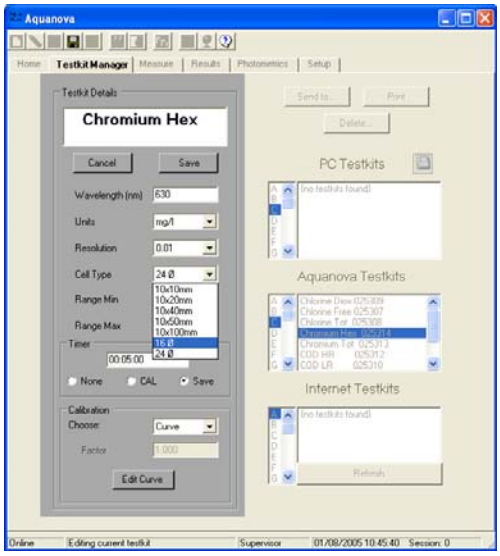
Units: Click on the down arrow to the right of the box next to [Units], this will produce a drop down list that can be viewed in its entirety by using the built-in scroll bar.

Click on the desired units of measurement to close the drop down list and enter the selection in the Testkit Details display.



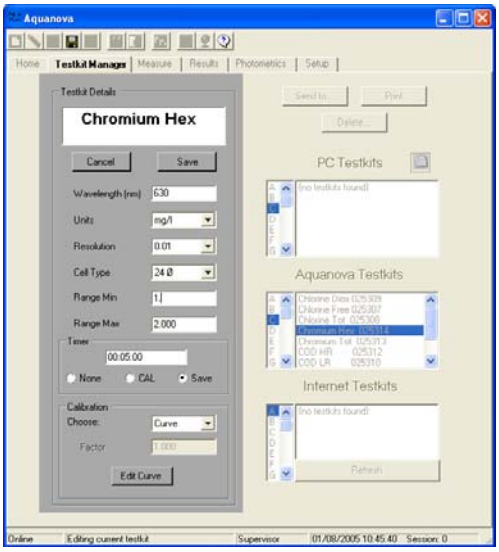
Resolution: Click on the down arrow to the right of the box next to [Resolution], this will produce a drop down list of the available Resolution options.

Click on the desired Resolution for your results to close the drop down list and enter the selection in the Testkit Details display.



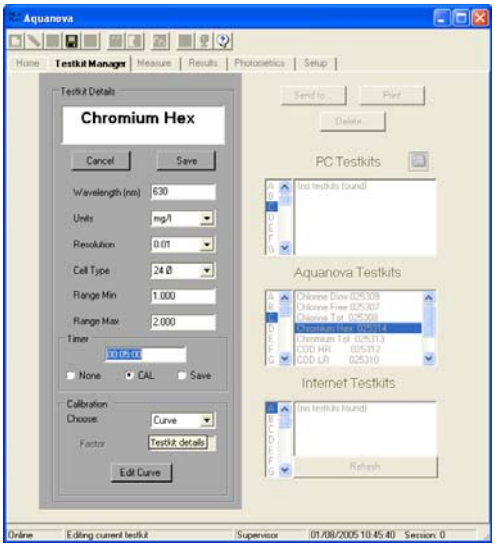
Cell Type: Click on the down arrow to the right of the box next to [Cell Type], this will produce a drop down list of the alternative cell types.

Click on the desired cell type for use with your samples (and blank etc) to close the drop down list and enter the selection in the Testkit Details display.



Range Min/Range Max: Click in the box next to either [Range Min] or [Range Max]. You can drag the cursor across one or more digits to highlight them and type in the required digits, or use the delete or backspace keys on the keyboard to delete digits and then type in the corrections.

During adjustment or if an invalid entry is made the red exclamation mark will be visible, hovering the mouse pointer over this mark will give a prompt for the acceptable range.



Timer: Click in the box next to [Timer] You can drag the cursor across one or more digits to highlight them and type in the required digits, or use the delete or backspace keys on the keyboard to delete digits and then type in the corrections.

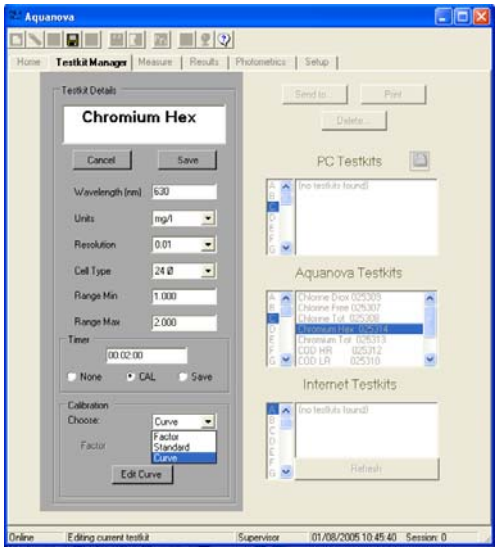
During adjustment or if an invalid entry is made the red exclamation mark will be visible, hovering the mouse pointer over this mark will give a prompt for the acceptable range.

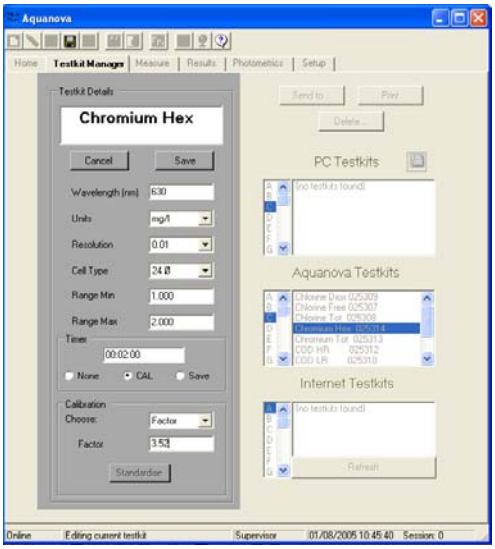
Click on the relevant button next to [None], [Cal] or [Save] to confirm the action you require carried out when the timer has counted down to zero.

Calibration: Click on the down arrow to the right of the box next to [Choose], this will produce a drop down list of the alternative calibration methods.

Click on the desired calibration method for your test kit to close the drop down list and enter the selection in the Testkit Details display.

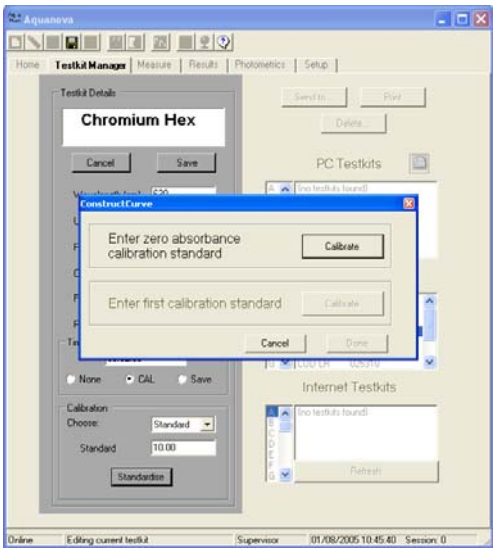
Additional information required for each of the alternative selections follows…





FACTOR: This is the value of m defined as the slope of the straight line in Y = mX + C, where Y = the concentration value, m = the slope factor, X = the sample absorbance and c = the blank absorbance. From this it can be seen that the test kit must exhibit a linear response between range min and range max.

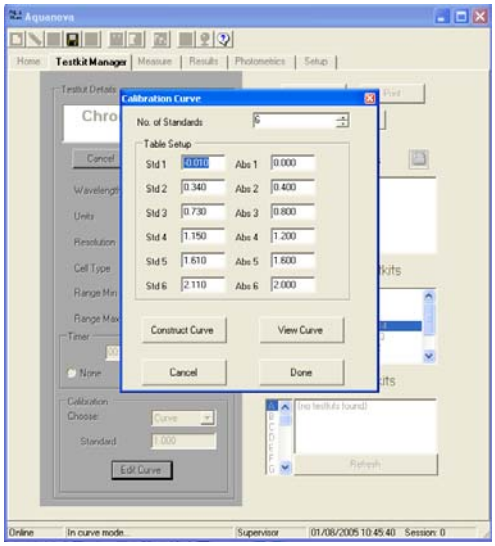
With Factor selected as above, the Factor entry box becomes active. Click in the box next to [Factor], you can drag the cursor across one or more digits to highlight them and type in the required digits, or use the delete or backspace keys on the keyboard to delete digits and then type in the corrections. Following this the method can be saved.



Standard: Selecting Standard enables a single standard solution to be used for calibration along with the blank, effectively storing a straight line calibration curve based on these two points.

With Standard selected, the Standard entry box becomes active. Click in the box next to [Standard] to enter the value for the standard solution to be used. You can drag the cursor across one or more digits to highlight them and type in the required digits, or use the delete or backspace keys on the keyboard to delete digits and then type in the corrections.

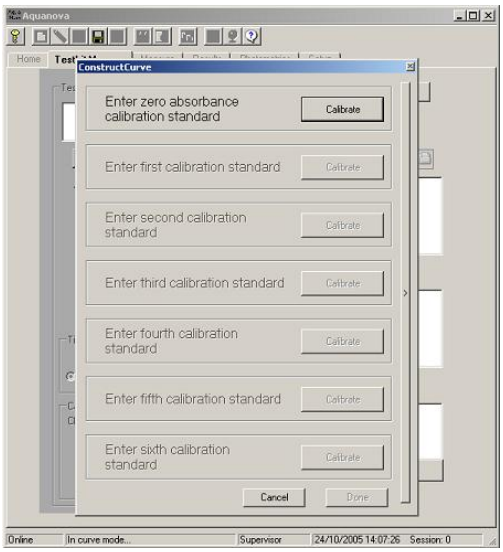
Click on [Standardise] to construct the two point calibration curve. A prompt box will request first a zero absorbance calibration and then a calibration against the chosen standard. Following this the method can be saved.



Curve: Selecting Curve enables up to six calibration standards to be used to construct and store a calibration curve, enabling test kits with a non-linear response to be used as well as extending the measuring range of other kits into predictable non-linear areas.

The Edit Curve button is only available when the Calibration by Curve option is selected. Clicking on [Edit Curve] to enable the Calibration Curve screen.
The number of Standards which are being used can be entered here using the up/down buttons.
Table Setup allows standard and absorbance values to be changed manually.

If the instrument is connected the [Connect Curve] key will take you into the screen detailed below.



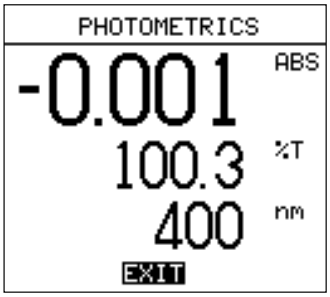
[Enter zero absorbance calibration standard] performs a calibration on the instrument.
Enter the desired number of calibration standards and these will be calibrated in turn. At any point, clicking on the > arrow shown on the right hand bar will allow you drag the box across to display the graph for the curve. Clicking > again hides the graph.
[View Curve] will allow you to review the curve.
When all the values are entered click the [Done] key. All the entered values will be displayed and the instrument will return to the Edit Screen display.

Section 6

Making Photometrics Measurements

6.1 On Aquanova

1.) Select [PHOTOMETRICS] in the main menu, then press the enter key.



The photometrics measurement screen is displayed, this shows the absorbance value at the top followed by the transmittance value and then the selected wavelength. The absorbance and transmittance values displayed are continuous live readings at the wavelength displayed. Measurements may be made using the following procedure.

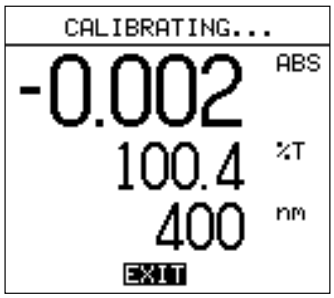
Setting Measurement Wavelengths

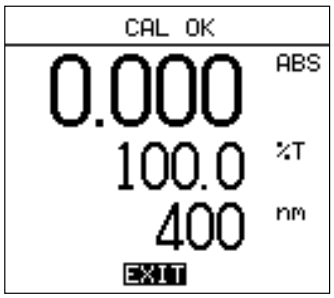
1 Press the *up* arrow key to increase the wavelength, press the *down* arrow key to decrease the wavelength.
2 A single press will step the wavelength up or down by 1nm.
3 Holding down either key will rapidly change the display, adjustment to the selected wavelength being completed when the key is released.

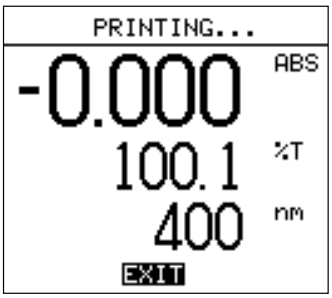
NOTE: At certain wavelengths stray light filters may be heard switching in or out. If wavelengths above 1000nm or below 320nm are selected the display will start again from the opposite end of the range; it may take some seconds for the internal adjustments to track these changes.

Photometric Calibration

1 Insert a cuvette containing the blank solution in the sample holder and close the sample chamber lid. (Test tubes or other sample containers may be used depending on the sample holder accessory fitted).
2 Press the **CAL** key, the '**Calibrating…**' information box will be displayed and then the readout up-dated to zero absorbance and 100%T.





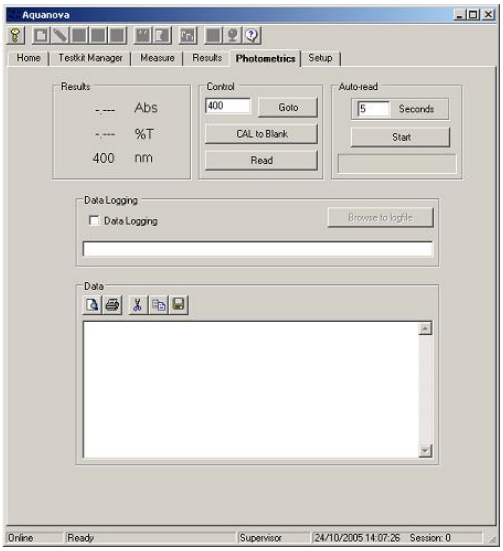


NOTE: In general the blank solution should contain everything that is in the sample except the colour-producing component, for specific information, reference should be made to the procedure or application being followed. For enhanced reproducibility matched cuvettes should be used.

Absorbance and %T Measurement

1 Remove the cuvette containing the blank solution, then insert the cuvette containing the first sample into the sample holder and close the sample chamber lid.
2 Allow the reading on the display to settle and record this as the first result.
3 If the optional printer is connected, simply press the *print* key to print the first result. This will be printed along with the header text, giving details of the instrument, the operator ID and the time and date of the last calibration. The sample number will increment for each result printed, being re-set to 001 following a subsequent calibration.
4 Further samples can be measured by inserting them in the sample holder as above.

6.2 On a connected PC



The Photometrics screen displays the live reading from the instrument.

The Control menu allows the wavelength to be changed to the desired value. Clicking on [Goto] will change the wavelength. [CAL to Blank] allows a blank standard to be performed.

[Read] should be clicked each time a sample is placed in the chamber and a reading is taken.
When [Read] is pressed the information comes into view in the Data area.
This information can be printed, saved or copy and pasted by using the icons situated above the data window, Full details are provided in the help file.

[Autoread] allows readings to be performed at user selected specified times.

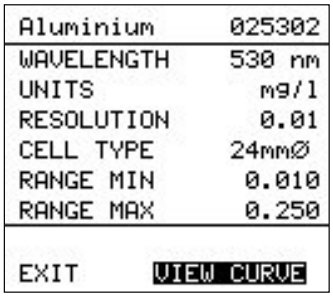
[DataLogging] – a file name is given and the results will be logged automatically to the specified file.

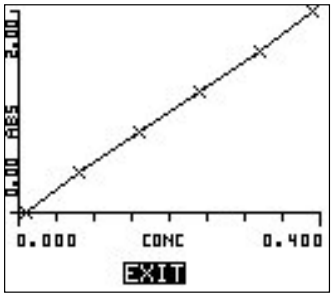
Section 7

Changing Other Settings

7.1 Using Aquanova

Test Parameters





Select [TEST PARAMETERS] from the main menu using the arrow keys and then press the Enter key. This option allows the user to view the currently loaded test parameters. If the test uses a Calibration Curve and not a Factor, the display will show an option to view the curve. This can be selected by highlighting [VIEW CURVE] and then pressing the Enter key.

Using the Timer

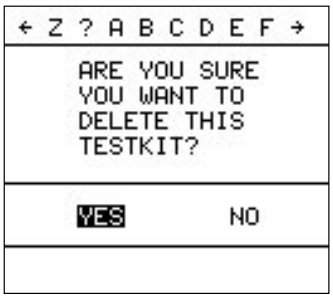
Select [MEASURE] from the main menu using the arrow keys and then press the Enter key.
Select [TIMER]. (Timer countdown period and Timer Action will have been set previously – refer page 25).
Select [START] and the timer will begin to count down on the screen. Once the timer has expired the instrument will return to the measurement screen. To observe the measurement during the timer process, select [EXIT] and the display will return to the measurement screen.

When the timer expires the instrument will perform the pre-selected action (calibration, save or no action).

To pause the timer during measurement, select [STOP}. To restart the timer press RESET.

Test Manager – Deleting Tests

Select [TEST MANAGER] from the main menu using the arrow keys and then press the Enter key. Select [DELETE TEST] from the main menu using the arrow keys and then press the Enter key. Highlight the test to be deleted using the arrow keys and then press the Enter key. The following message will be displayed:



Highlight either [YES] or [NO] and then press the Enter key to confirm.

Instrument Manager

Scroll down the main menu to [INSTRUMENT MANAGER] using the arrow keys and then press the Enter key.

INSTRUMENT LOCK – this toggles between on and off and is used for security purposes to prevent unauthorised changes being made to instrument parameters.

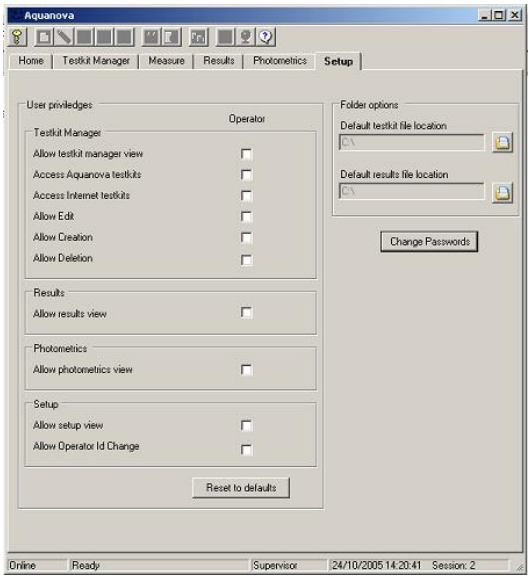
SECURITY CODE – Enter the security code number using the arrow keys (from 000 to 999) and press the Enter key to confirm. This number has to be entered to allow access to the setup parameters for the test. If the incorrect code is given the operator will be locked out of the Test Manager to prevent any changes being made to the current test kit.

LANGUAGE, TIME, DATE and DATE FORMAT can also be set using the arrow keys and the Enter key to confirm.

Setting Operator ID

Scroll down the main menu to [SELECT OPERATOR ID] using the arrow keys and then press the Enter key.
Enter the Operator ID number using the arrow keys (from 000 to 999) and press the Enter key to confirm. This information will be shown on the printout as a record of the operator who performed the tests.

7.2 Using a connected PC



The [Setup] option is only available to supervisors.

[User privileges] gives the supervisor the ability to select Operator access to specified functions by clicking on the appropriate box. If selected, a tick will appear in the box to indicate that this function is available.

The [Reset to defaults] button can be clicked at any time. This will clear the ticked boxes and return all settings back to default.

[Folder options] has two buttons:

[Default testkit file location] allows the default file locations where test kits are stored and loaded to be changed.

[Default results file location] allows the default file locations where results are stored and loaded to be changed.

[Change Password] button allows the password to be changed.

Section 8

Maintenance & Troubleshooting

8.1 General

The Aquanova is designed to give optimum performance with minimum maintenance. It is only necessary to keep the external surfaces clean and free from dust. The sample area should always be kept clean and any accidental spillage should be wiped away immediately.
To give added protection when not in use, the unit should be disconnected from the mains supply and covered with the optional dust cover (630 028).
For longer term storage or re-shipment it is recommended that the unit be returned to the original packing case.

NOTE: The Aquanova monochromator is a non-serviceable unit and no attempt should be made to repair this item. Failure to observe this recommendation will result in the loss of any Warranty Claim on this product. In the unlikely event of the monochromator requiring service or calibration, it is essential that the Manufacturer or your local Distributor be contacted immediately for advice.

8.2 Light Source Replacement

The only routine maintenance which may be required is the replacement of the light source if this fails. Failure should be suspected if the lamp failure indicator appears on the display. This can be confirmed by looking in the sample chamber. The tungsten halogen lamp is available from the Manufacturer or your local Distributor (refer Section 10.2 Spares). Only genuine replacement lamps should be used. Similar lamps may have different filament configurations or be wavelength restricted for domestic or commercial use and will give errors if used.

WARNING: Disconnect the unit from the mains supply prior to replacing the lamp. Care should be taken when removing the lamp from the holder. Ensure the lamp is cool prior to handling.

1. Access to the tungsten halogen lamp can be gained via the lamp access panel, located at the rear of the unit (refer Section 2.24).

2. Slacken off the thumbscrew from the lamp access panel located at the rear of the Aquanova.

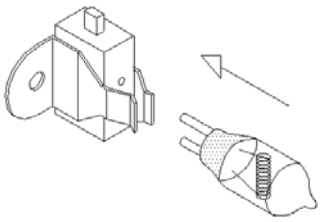
3. Remove the old lamp from the holder. The lamp is a plug-in fit and should be removed by gently easing it from the holder.

IMPORTANT: When fitting the replacement lamp it is essential that the glass envelope is not touched. Finger marks will damage the lamp and give a reduced wavelength. Should accidental damage with finger marks occur, the surface of the lamp may be cleaned using iso-propyl alcohol.

4. Carefully remove the replacement lamp from the packaging, ensuring the glass portion of the lamp is not touched.

5. Insert the lamp into the holder, as illustrated, ensuring it is fully pushed home.

Fig. 8.2.1 Lamp Fitting



6. Close the lamp access panel and re-tighten the thumbscrew.

NOTE: It is essential that only the specified replacement lamp is used. Accuracy of optical alignment and performance cannot be guaranteed if alternative manufactured lamps are used.

Section 9

Optional Accessories

9.1 Accessories

The following list of items is available as optional accessories:

037 601	Digester for COD determinations (includes 2 blocks for 12 COD tubes each). For use on 230V
037 602	Digester for COD determinations (includes 2 blocks for 12 COD tubes each). For use on 110V
037 603	Block for 12 COD tubes
637 057	16mm diameter COD tube holder
630 005	Adjustable path length cuvette holder (10 – 100mm)
634 001	4 position cuvette holder
060 426	16mm Sample Tubes (pack 20)
060 425	24mm Sample Tubes (pack 24)
035 078	Pack of 100 disposable plastic cuvettes , 100mm path length
060 331	Pack of 100 disposable glass test tubes (12x75mm)
060 179	Pack of 100 disposable plastic test tubes (12x75mm)
060 335	Pack of 50 disposable glass test tubes (24x150mm)
035 027	Visible (glass) 10mm path length cuvette
035 086	Visible (glass) 20mm path length cuvette
035 029	Visible (glass) 40mm path length cuvette
035 087	Visible (glass) 50mm path length cuvette
035 079	Visible (glass) 100mm path length cuvette
035 026	Pour in/Suck out cell
035 088	Visible Calibration Set
012 041	DC/AC Power Converter
543 001	40 Column Printer
033 290	Storage Case
630 028	Dust Cover

Test Kits

Order Code	Description	Range	No. of Tests
025 300	Alkalinity m	5 - 200mg/l $CaCO_3$	100
025 301	Alkalinity p	5 - 300mg/l $CaCO_3$	100
025 302	Aluminium	0 - 0.25mg/l Al	100
025 303	Ammonia	0.02 - 1.0mg/l N	100
025 304	Ammonium LR	0 - 2.5mg/l N	50
025 305	Ammonium HR	1 - 50mg/l N	50
025 306	Bromine	0.1 - 6.5mg/l Br	100
025 307	Chlorine (free)	0.05 - 3mg/l Cl	100
025 308	Chlorine (total)	0.05 - 3mg/l Cl	100
025 309	Chlorine Dioxide	0.5 - 2.5mg/l ClO_2	100
025 310	COD (LR)	0 - 150mg/l COD	25
025 311	COD (MR)	1500mg/l COD	25
025 312	COD (HR)	15000mg/l COD	25
025 313	Chromium (total)	0.02 - 2mg/l Cr	100
025 314	Chromium (Hex)	0.02 - 2mg/l Cr^{6+}	100
025 315	Copper (total)	0.5 - 5mg/l Cu	100
025 316	Copper (free)	0.5 - 5mg/l Cu	100
025 317	Fluoride	0.02 - 1.5mg/l	100
025 318	Hardness Total	2 - 50mg/l $CaCO_3$	100
	Hazen Colour	0 - 500mg/l PtCo	-
025 320	Hydrogen Peroxide	0.5 - 1.5mg/l H_2O_2	100
025 321	Iodine	0.05 - 3.5mg/l I	100
025 322	Iron (soluble)	0.1 - 3mg/l Fe	100
025 323	Manganese	0.05 - 4mg/l Mn	100
025 324	Molybdate	0.5 - 30mg/l MoO_4	100
025 325	Nitrate	1 - 30mg/l N	50
025 326	Nitrite	0.01 - 0.5mg/l N	100
025 327	Nitrogen Total (LR)	0.5 - 25mg/l N	50
025 328	Nitrogen Total (HR)	5 - 150mg/l N	50
025 329	Oxygen Active	0.25 – 15mg/l O_2	100
025 330	Phosphate – Ortho	0.05 - 4mg/l PO_4	100
025 331	pH	6.5 - 8.4pH	100
025 332	Potassium	0.5 - 12mg/l K	100
025 333	Silica	0.05 - 3mg/l SiO_2	100
025 334	Sulphate	2 - 100mg/l SO_4	100
025 335	Sulphide	0.04 - 0.5mg/l S	100
025 336	Sulphite	0.05 - 4mg/l SO_3^{2-}	100
025 337	Zinc	0.02 - 1mg/l Zn	100

9.2 Spares

630 204 10mm cuvette holder (supplied as standard with product)
012 075 Tungsten halogen lamp
060 084 10x10mm plastic cuvettes (pack 100)
060 229 10x10mm plastic cuvettes (pack 500)
060 287 Paper roll for printer
060 288 Printer Ribbon

Section 10

Specification & Data

10.1 Technical Specification

Ranges	Test methods Photometrics (Abs / %T)
Test Name	Up to 20 alphanumeric characters
Test Memory	300 methods
Results Memory	50 Results
Timer	1 second to 24 hours / 1 second resolution / cal or save on time out
Factor	9999.999 to 0.001
Calibration Curve	Up to 6 standards
Clock	Time **(**24 hour) and date
Communication	RS232 – PC application software included. Down load tests from PC or website
Wavelength Range	320 to 1000nm
Resolution	1nm
Accuracy	±2nm
Bandwidth	8nm
Transmittance Range	0 to 199.9%T
Resolution	0.1%T
Accuracy	±1%T
Stray Light	<0.5%T
Absorbance Range	-0.300 to 1.999A
Resolution	0.001A
Concentration Range	-300 to 1999
Selectable Resolution	1, 0.1, 0.01 or 0.001
Units	mg/l, g/l, blank, %, ppm, pH, mg/kg, IFZ, HZ, MEq, U/ml, mU/l, u/l,µM/l, mM/l, M/l, µg/ml, mg/ml, µg/dl, mg/dl, g/dl, ng/l, µg/l
Photometric Noise Levels	<1%
Photometric Stability	<1%/hr
Readout	Custom LCD graphics
Outputs	Analogue (0 to 1999V d.c.) / RS232 serial port
Light Source	Tungsten halogen
Input Voltage	115/230V a.c. –20% +10% 50/60Hz
Input Power	<50W
Size	365(w) x 272(d) x 160(h) mm
Weight	6Kg

10.2 Analogue Output

This is available via the 4mm rear panel sockets. The level is proportional to the displayed reading, depending on the measurement mode:

Absorbance	1mV per 0.001ABS
Concentration	1mV per concentration unit

10.3 RS232 Serial Interface

The Aquanova has a bi-directional RS232 interface set to:

1200 baud
7 data bits
odd parity
1 stop bit

The 25 way D connector allows a standard one-to-one interconnection lead to be used, as supplied with the 40 column printer.
A printout is initiated by pressing the PRINT key. If the sample number is unity, then the printout will include a header block. The sample number is incremented every time the print key is pressed.

The following commands can also be sent to the Aquanova via the serial interface.

ASCII **TRANS** Outputs transmission and wavelength separated by an ASCII TAB character, regardless of the Aquanova operating mode.
For example: 100.0 540

ASCII **ABS** Outputs absorbance and wavelength separated by an ASCII TAB character, regardless of the Aquanova operating mode.
For example: 0.001 540

ASCII **CONC** Outputs concentration and wavelength separated by an ASCII TAB character, regardless of the Aquanova operating mode.
For example: 123.4 540

ASCII **VOLTAGE** Outputs a voltage proportional to the monochromatic light level passing through the sample and wavelength separated by an ASCII TAB character.
For example: 123.4 540

ASCII **GOTO** Commands the Aquanova to go to the wavelength nnm.
For example: GOTO 540<CR> will set the wavelength to 540nm. 'OK' is returned by the GOTO command. Each character should be sent within 260mS of the previous character, otherwise the instrument responds with TXERR and preceding characters are discarded.

The bi-directional RS232 interface is available on the rear panel 25 way D type connector.

The connections are as follows:

TXD 2	- INPUT TO Aquanova
RXD 3	- OUTPUT FROM Aquanova
RTS 4	- LINKED TO CTS
CTS 5	- LINKED TO RTS
DSR 6	- OUTPUT FROM Aquanova
DCD 8	- OUTPUT FROM Aquanova
DTR 20	- INPUT TO Aquanova (must be active)
GND 7	

Suggested interconnections are detailed below:

Aquanova		**IBM PC XT (25 way "D")**
TXD 2	2	TXD (From PC)
RXD 3	3	RXD (To PC)
RTS 4	4	RTS (From PC)
CTS 5	5	CTS (To PC)
DSR 6	6	DSR (To PC)
DCD 8	8	DCD (To PC)
DTR 20	20	DTR (From PC)
GND 7	7	GND

Aquanova		**IBM PC XT (9 way "D")**
TXD 2	3	TXD (From PC)
RXD 3	2	RXD (To PC)
RTS 4	7	RTS (From PC)
CTS 5	8	CTS (To PC)
DSR 6	6	DSR (To PC)
DCD 8	1	DCD (To PC)
DTR 20	4	DTR (From PC)
GND 7	5	GND

NOTE: The interface cable kit (order code 542 009) can be used to implement the above interconnections.

EC Declaration of Conformity

Jenway Aquanova Spectrophotometer complies with the following European Standards:

EN 50081–1: 1992 Electromagnetic compatibility – Generic emission standard

EN 50082-1: 1992 Electromagnetic compatibility – Generic immunity standard

EN 61010-1: 2001 Safety requirements for electrical equipment for measurement, control and laboratory use

Following the provision of:

EMC Directive – 89/336/EEC and Low Voltage Directive – 73/23/EEC

Thank you for reading this data sheet.

For pricing or for further information, please contact us at our UK Office, using the details below.

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