MODELS 6500/6505
SPECTROPHOTOMETERS
OPERATING MANUAL

650 050/REV A/09-99

CONTENTS

SAFETY

Please read this information carefully prior to installing or using this equipment.

1. The units described in this manual are designed to be operated only by trained personnel. Any adjustments, maintenance or repair must be carried out as defined in this manual, by a person qualified to be aware of the hazards involved.

2. It is essential that both operating and service personnel employ a safe system of work, in addition to the detailed instructions specified in this manual.

3. The covers on the units should only be removed by personnel who have been trained to avoid the risk of shock.

4. References should always be made to the Health & Safety data supplied with any of the chemicals used. Generally accepted laboratory procedures for the safe handling of chemicals should be employed.

5. If it is suspected that safety protection has been impaired in any way, the unit must be made inoperative and secured against any intended operation. The fault condition should be immediately reported to the appropriate servicing authority.

SECTION 1

INTRODUCTION

1.1 INSTRUMENT DESCRIPTION

The Models 6500 and 6505 incorporate a wide range of features designed to satisfy the needs of users seeking to maximise the efficiency of routine and specialised UV and Visible spectroscopy tasks.

Menu based operation guides the user through all the available modes and ensures that unfamiliar operators are able to complete satisfactory analyses. Multi-language capability allows screen instructions to be presented in a choice of English, French, German, Italian, Spanish, Swedish or Portuguese.

The 6500/6505 spectrophotometer incorporates an innovative optical system which reduces stray light and enhances overall reliability by minimising the number of optical elements employed. The sample chamber allows total sample presentation flexibility with cells from 100mm path length down to micro-sample capacity. Sipper pump and temperature controlled Peltier Heated Cell Systems accessories are available, either factory fitted or as user installable option.

A scanning facility is provided on the 6500/6505. The scan range, speed and resolution can be user adjusted and the resultant scan, which appears in real time on the graphics display, can be auto scaled to give enhanced visibility. Peaks and valleys are labelled with wavelength and absorbance values and can be readily down loaded to the optional internal printer, via the serial interface, to a PC or to a Centronics printer. A cursor facility allows the user to interrogate specific parts of the scanned data.

Full kinetics capability is incorporated into each unit and allows, usually in conjunction with the Peltier cell block, full analysis of timed reactions.

Methods producing non-linear results can also be accommodated by using powerful in-built software in conjunction with the multi-cell changer. Up to twenty data points (standards), or up to seven when used with a multi-cell changer, can be determined automatically and used to construct a curve. A variety of statistical methods are available to ensure a close correlation to all curve shapes.

Design of the units is such that minimal routine maintenance will be necessary in normal use.

This manual has been produced to help guide you through the many operating modes and features available on the 6500 series. Our hope is that operation of the units is such that reference to this manual will be required only rarely. It is however our aim to ensure that all information needed to operate these products satisfactorily is contained within. If however you experience any difficulties please contact the Manufacturer or your local Distributor for guidance.

1.2 INSTRUMENT SPECIFICATIONS

Transmittance

Range:	0 to 199.9%T
Resolution:	0.1%T
Accuracy:	±0.1% @ 10%T
Stray Light:	<0.05% @ 340nm

Absorbance

Range:	-0.300 to 3.000A
Resolution:	0.001A
Photometric Accuracy:	±0.005A @ 1.0A
Drift:	<±0.001A/hour after 15 minute warm up

Concentration

Range:	-300 to 9999 (resolution dependant)
Resolution:	0.001/0.01/0.1/1
Units:	ppb, ppm, µg/l, mg/l, g/l, M, %, blank
Factor:	0.000 to 9999.99

Wavelength

Range:	320 to 1100nm (Visible 6500) 190 to 1100nm (UV/Visible 6505)
Resolution:	0.1nm
Accuracy:	±1.0nm
Spectral Bandwidth:	1.8nm
Maximum Scan Speed:	1400nm/min
Lamp Changeover Wavelength:	320 to 390nm (UV version)
Display:	¼ VGA back lit monochrome liquid crystal display LCD contrast and back light
Languages:	English, French, German, Italian, Portuguese and Spanish
Operation:	Tactile keypad and Two button mouse
Outputs:	Analogue / RS232 serial port
Light Source:	Tungsten Halogen (and Deuterium - UV version only)
Input Voltage:	115Va.c. / 230Va.c. ±20%
Input Power:	200VA
Size:	520 x 330 x 180mm
Weight:	15Kg

SECTION 2

INSTALLATION

2.1 UNPACKING

Remove the spectrophotometer from the packaging and ensure the following items are present:

1. Model 6505 with 8 position motorised cell changer fitted OR
   Model 6500 with standard single cell holder
2. Mains cable
3. Pack 100 disposable cuvettes
4. Two button mouse
5. Mouse mat
6. Optional accessories or factory fitted items (as ordered)

Any shortages or damage should be reported immediately to the manufacturer or your local Dealer.

2.2 INSTALLATION

The 6500/6505 is designed to operate on 230V or 115V (50/60Hz) mains supply.
The standard 2 metre cable supplied with the unit is fitted with an IEC type connector which can be plugged directly into the POWER IN socket on the rear panel.
The mains fuse is housed within the POWER IN socket. When replacing the fuse the unit should be disconnected from the mains supply.
In the event of the fuse failing after replacement, it is advisable to consult with the Manufacturer or your local Distributor before proceeding further.

Fuse rating: 1.6A (T-type) for 230V operation
3.15A (T-type) for 115V operation

NOTE: The unit should be positioned within 1.5 metres of an earthed mains supply.

VOLTAGE SELECT

NOTE: When changing the voltage select switch position always ensure the fuse rating is correct.

Before attempting to change the voltage select, disconnect the unit from the mains supply. Withdraw the fuse holder from the power input socket and remove the fuse. Extract the grey fuse retainer and rotate so that the correct voltage is visible through the aperture in the fuse holder. Replace the fuse retainer in its holder, fit the correct fuse and push the assembly back into the power input socket.

MAINS CONNECTIONS

The unit may have been supplied with a moulded connector suited for use with your local supply outlet. If, however, it has been supplied without a plug fitted, a suitable plug for your local supply should be wired as follows:
The wires are colour coded to conform to the internationally recognised standard such that:

BROWN	**LIVE**
BLUE	**NEUTRAL**
GREEN/YELLOW	**EARTH**

IMPORTANT: THE UNIT MUST BE EARTHED

The green/yellow wire in the a.c. supply must be connected to a properly grounded terminal.

2.3 CONTROLS

Print key - Provides a mode dependent printout.

Cal key - performs a photometric calibration at the current wavelength.

Goto key - used to set wavelength.

used to select the displayed menu option and for entering values.

uses differ depending on context:
in normal mode the keys will move the cursor. In pop-up and setup menus they will move the highlight and allow numerical and alphanumerical data entry. On a selectable option list the up/down arrow keys will change the selection and the left/right arrow keys will toggle between Ok and Cancel.

Icons

The following icons may appear on the instrument display during operation.

UV lamp on

Tungsten Halogen lamp alight. If the lamp(s) fail the symbol will not be shown.

Current cell holder position in multi-cell holder.

2.4 MOUSE OPERATION

General

The 6500/6505 feature a Graphical User Interface (GUI). Due to the nature of the instrument, the primary mode of control is the mouse, however, keypad operation is available irrespective of the mouse status. The mouse supplied with the instrument is a Microsoft compatible device. It is left and right button operation and has no drag or drop function.

Left Button

The left button is responsible for implementing the majority of the user activated controls. These controls can be split into three basic types - graphical, menu and data.

1. Graphical

Selecting a graphical option can be performed by placing the pointer over the chosen graphic and then clicking with the left mouse button. The resulting action can be the display of a pop-up menu or numeric keypad or the performing of a specific function e.g; a calibration. If the user wishes to abort the selected option this can be carried out by either:

i) placing the pointer over the Cancel key and then clicking the left button,

or ii) by moving the pointer onto the main screen area outside the Options menu then clicking the left button. This will remove the menu from the screen with no user selection having been made.

Clicking on Ok or Enter (depending on type of menu) will accept the user selection.

2. Menu

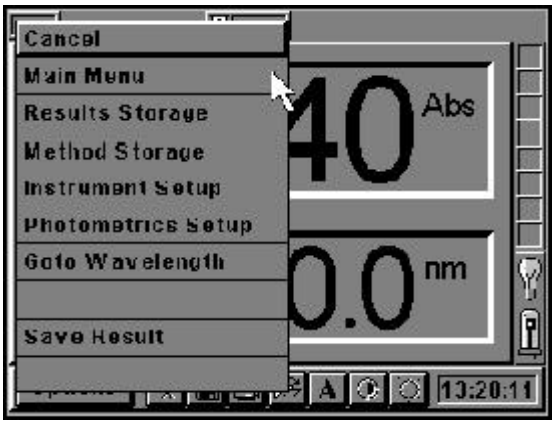
Menus can be split into two categories, pop-up and setup.

i) pop-up menus contain a list of options which, when selected, gain access to other screens or functions.

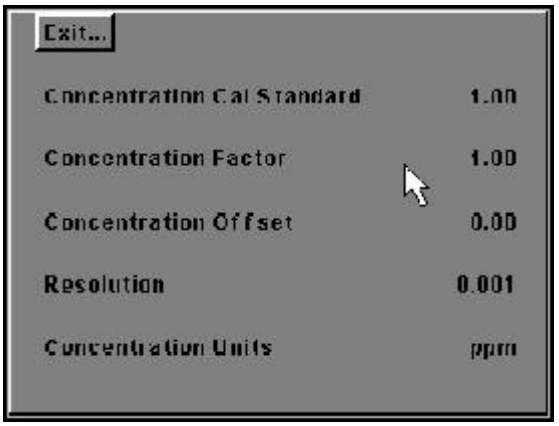
ii) setup menus prompt the user with a selection of adjustable instrument parameters. These parameters are displayed on the lefthand side of the screen with their associated values shown on the righthand side.

Selecting either parameter allows access to data entry.

i)



ii)



3. Data

When prompted with a setup menu, the specific parameter to be adjusted can be selected by clicking the left mouse button whilst the pointer is over either the menu option or its associated value.

Clicking the left button on a data entry option (on the righthand side of the display) will highlight the existing text or numerical option. To exit this selection the pointer should be placed over the Cancel key and clicking the left button.

Clicking on Ok or Enter (depending on type of menu) will accept the user selection.

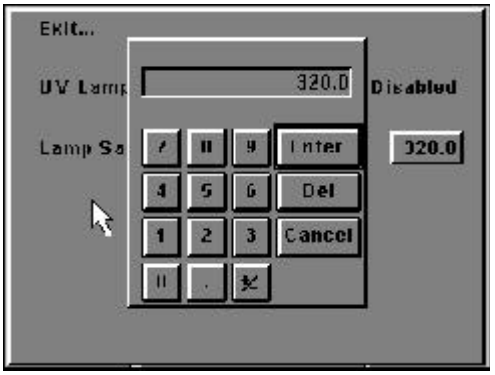
a) Numerical Data

It should be noted that once the numerical/alphanumerical menus are displayed the arrow keys cannot be used to control the position of the pointer.

b) Alphanumerical Data

This menu contains both alphabet keys and numbers and is operated in the same way as for numerical data.

a)



b)

Selection is made by moving the pointer over the required digit and clicking with the left button:

Numerical keys (0 to 9) - the selected digit is added to the right of the digits already contained within the display area.

Alphanumerical keys (A to Z) - the selected letter is added to the right of the digits/letters already contained within the display area.

Decimal point key - if no decimal point exists, one can be added to the right of the digits already in the display area.

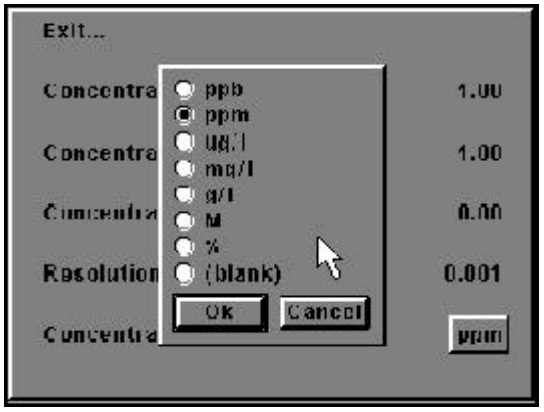
Caps key - clicking on this key will allow capital (upper case) letters to be entered.

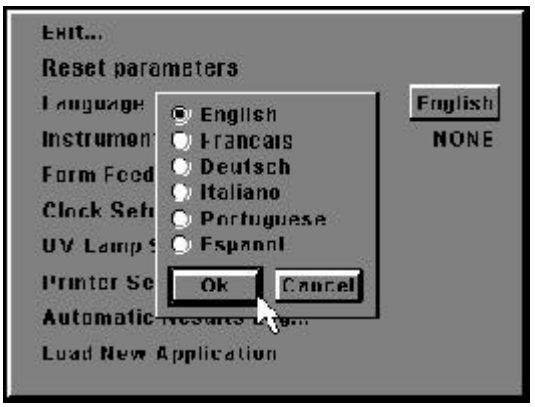
Del key - clicking on this key will remove the rightmost character from the display. This can be performed until no characters remain in the display area.

Enter key - when the required parameter has been set clicking on the Enter key will accept the value. The menu will be removed from the screen and the entered value will be checked for validity.

Cancel key - clicking this key will remove the menu from the screen and the original setup parameter value is re-instated.

c) Multiple Choice Data (option buttons)
If the parameter to be adjusted is one of a series of pre-defined options, a multiple choice menu is displayed:





Selection of the preferred option can be made using the mouse or the (up/down) keys and pressing  on the instrument keypad or clicking the Ok button with the mouse. (Selecting a new option removes the indicated setting of the previous one). A cancelled operation returns the parameter back to its original value. If the new selection is accepted, it will be entered into the setup menu field as the user's selection.

Right Button
Specifically used as a shortcut to the Options Menu.

Keypad Operation
Keypad operation can be used in place of mouse operation by using the four way  arrow keys and the  key. The enter key emulates the left mouse button.

Standard operating mode screens, e.g. photometrics mode, allow the arrow keys complete freedom of pointer movement. Pressing and holding down an arrow key will cause the movement of the pointer to accelerate up to its maximum speed in the direction pointed to by the arrow(s). Short, successive key presses will produce very fine movements.

Setup screens containing a series of graphical options, e.g. a list of option buttons, dictate that the arrow keys operate differently to that within a standard operating screen. The arrow keys are used to select an alternative option. Arrow keys within setup screens highlight adjacent options but do not move the pointer.

Enter Key
The enter key controls can be split into three basic types - graphical, menu and data.

1. Graphical

Selecting a graphical option can be performed by placing the pointer over the chosen graphic using the arrow keys and then pressing the  key. The resulting action can be the display of a pop-up menu or numeric keypad or the performing of a specific function e.g; a calibration. If the user wishes to abort the selected option this can be carried out by placing the highlight over the Cancel key and then pressing the  key,

Moving the highlight over the Ok or Enter option (depending on type of menu) using the arrow keys and pressing the  key will accept the user selection.

2. Menu
Menus can be split into two categories, pop-up and setup.

i) pop-up menus contain a list of options which, when selected, gain access to other screens or functions.
ii) setup menus prompt the user with a selection of adjustable instrument parameters.
These parameters are displayed on the lefthand side of the screen with their associated values shown on the righthand side.

Arrow key operation within pop-up and setup menus is different to that within operating mode screens. Pop-up menus contain a series of options which, when selected, gain access to other instrument screens or functions. Menu setup screens contain a series of pre-defined menu options and associated parameters. The selected option is represented by a highlight. The arrow keys are used to select an alternative menu option.

When an arrow key is pressed the next adjacent menu option in that direction is highlighted. If there is no adjacent menu option the selection will wrap around to highlight the option at the opposite extreme within the list.

Pressing the  key will accept the new selected option.

3. Data

When prompted with a setup menu, the specific parameter to be adjusted can be selected by successive arrow key presses.

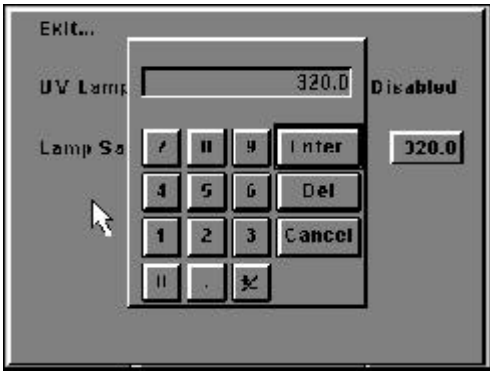
Selecting a data entry option (on the righthand side of the display) will highlight the existing text or numerical option. To exit this selection the highlight should be placed over the Cancel key and then press the  key.

Moving the highlight over the Ok or Enter option (depending on type of menu) using the arrow keys and pressing the ↵ key will accept the user selection.

a) Numerical Data

It should be noted that once the numerical menu is displayed the arrow keys cannot be used to control the position of the cursor.

If the parameter to be adjusted is purely numerical the following menu will be displayed:



Selection is made by using the arrow keys. When an arrow key is pressed the next command button in that direction is highlighted. This will be shown as a black border surrounding the selected button. If there is no adjacent command button in any given direction, the selection will wrap around to highlight the command button at the opposite extreme. Pressing the ↵ key will accept the user selection.

Numerical values can be entered directly via the instrument key pad. The highlighting surrounding the current command button will not move to reflect this. If a correction needs to be made to the last numerical value entered, the Del key must be selected via the arrow keys and then press the ↵ key.

If the *Cancel* command button is highlighted and the ↵ key is pressed, no updating of the setup parameter is performed. The data entry window is removed, returning the setup parameter to its original value.

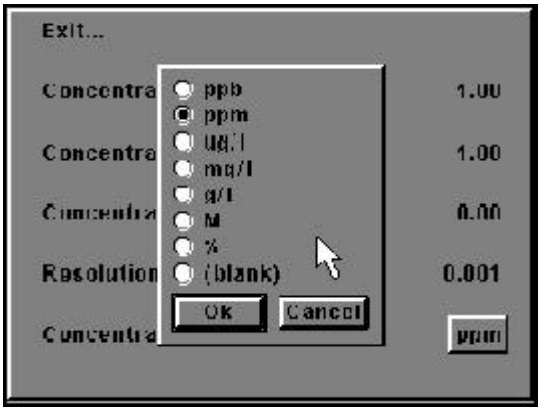
If the *Enter* command button is highlighted and the keypad ↵ key is pressed, the value held in the display area is entered into the setup menu field as the user's selection. Any validation of the value is performed at this time. The numerical data entry window is subsequently removed from the screen.

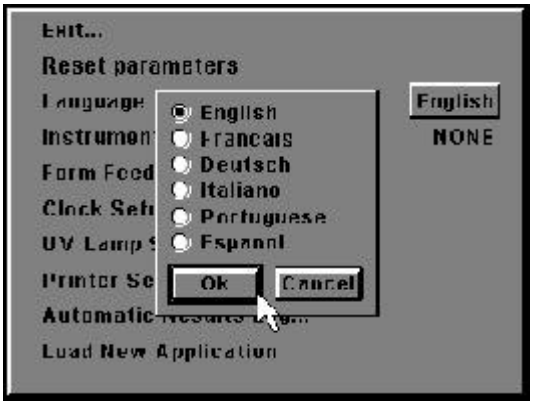
b) Alphanumerical Data

This menu contains both alphabet keys and numbers and is operated in the same way as for numerical data.

c) Multiple Choice Data

If the parameter to be adjusted is one of a series of pre-defined options, a multiple choice menu is displayed:





Selection of one of the available graphical option buttons can be made using either the up or down arrow keys. Selecting a new option removes the indicated setting of the previous one.

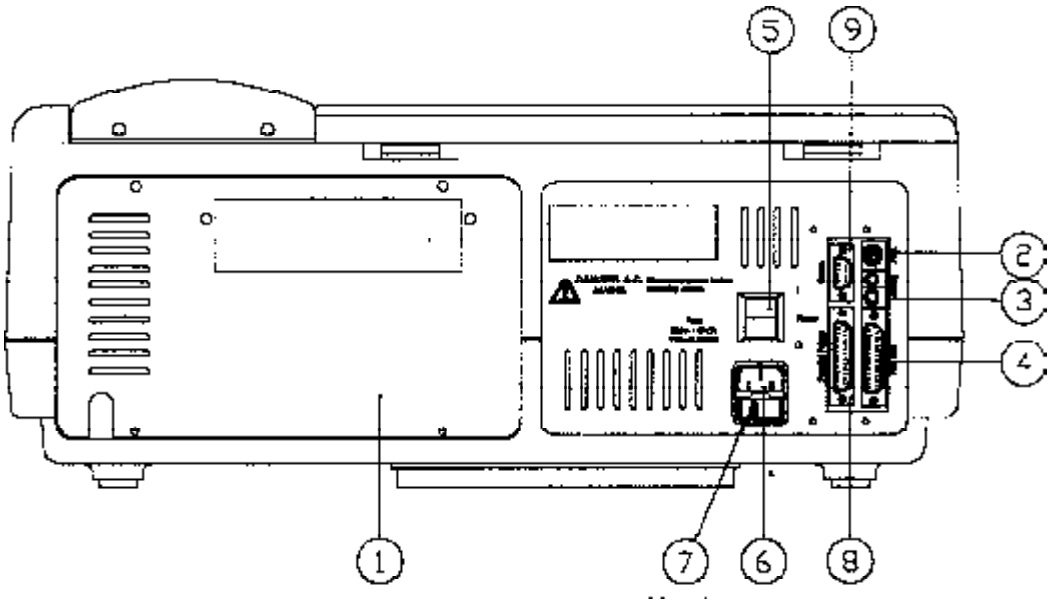
When either the left or right arrow keys are pressed the next option button in that direction is indicated. If there is no adjacent option button in any given direction, the selection will wrap around to indicate the option button at the opposite extreme. If the new selection is accepted by pressing the key, it will be entered into the setup menu field as the user's selection.

If the Cancel command button is highlighted and the key is pressed, no updating of the setup parameter is performed. The data entry window is removed, returning the setup parameter to its original value.

If the Enter command button is highlighted and the keypad key is pressed, the value held in the display area is entered into the setup menu field as the user's selection. Any validation of the value is performed at this time. The numerical data entry window is subsequently removed from the screen.

2.5 INPUTS / OUTPUTS

Fig. 2.5.1 Rear Panel Layout



1. **LAMP ACCESS PANEL** — This panel allows the user to gain access to the lamps when replacement is necessary.

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

2. **Aux. SOCKET** — 7 pin DIN socket. Serial communications port for the auxilliary peltier control unit.

3. **Analog SOCKETS** — 2 x 4mm pin sockets for analogue output.

4. **RS232 SOCKET** — 25 way output socket for RS232.

5. **ROCKER SWITCH** — On/Off switch for the unit.

6. **POWER IN SOCKET** — IEC type connection socket for mains cable.

7. **FUSE HOLDER** — Fuse ratings - 1.6A T-type for 230V
   3.15A T-type for 115V

8. **PRINTER SOCKET** — 25 way socket for parallel printer output.

9. **MOUSE SOCKET** — 9 way input socket for two button serial mouse.

SECTION 3

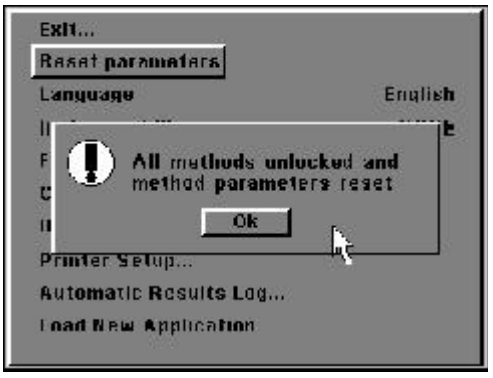
OPERATION

3.1 GLOBAL SETUP PARAMETERS

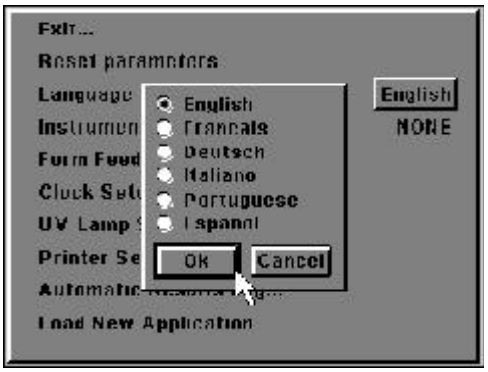
Instrument Setup

This option allows all instrument related setup (i.e. non mode specific) operating parameters to be set up. The options available through Instrument Setup are as follows:

Reset Parameters allows the user to remove the password protection from the instrument and return the parameters to default. When this option is chosen a message will be displayed:



Language allows the user to select the appropriate language via the pop-up menu (English, French, German, Italian, Portuguese and Spanish).

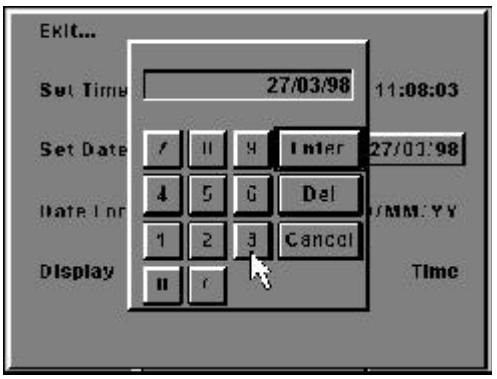


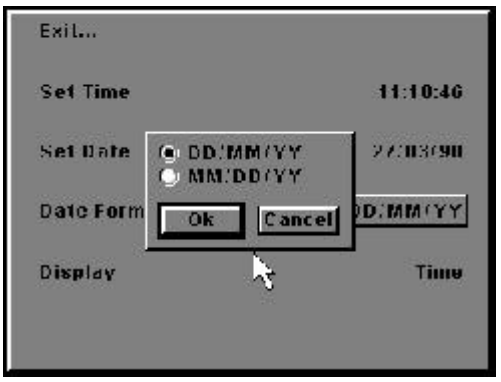
Instrument ID allows the user to enter an alphanumeric operator identifier of up to 20 characters via the pop-up alphanumeric keypad or directly from the instrument keypad.

Form Feed will perform a form feed of the internal printer. Used when fitting a new paper roll to the printer. This can also be used to eject the current sheet of paper from a Centronics printer. The following options produce sub-menus:

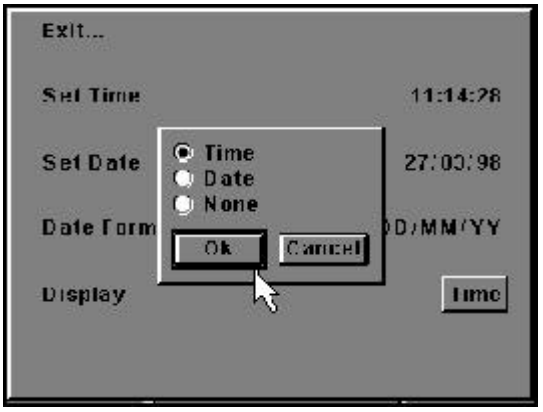
Clock Setup...

Set Time allows the user to set the current time into the instrument in the form of HH:MM:SS.
Set Date allows the user to set the current date into the instrument in the form of either DD/MM/YY or MM/DD/YY depending on the setting of the date format field.
Date Format allows the user to choose between either the DD/MM/YY formatting of dates or the MM/DD/YY formatting. The selected format is applicable to all displayed dates.

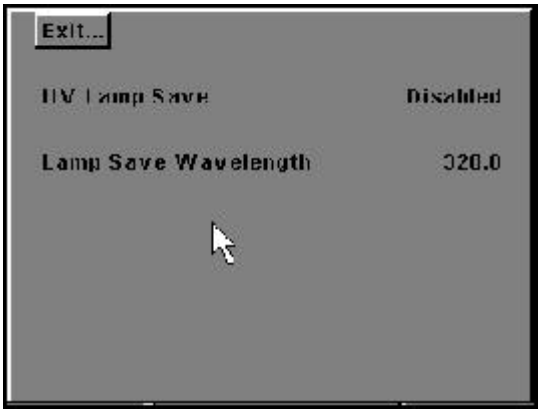




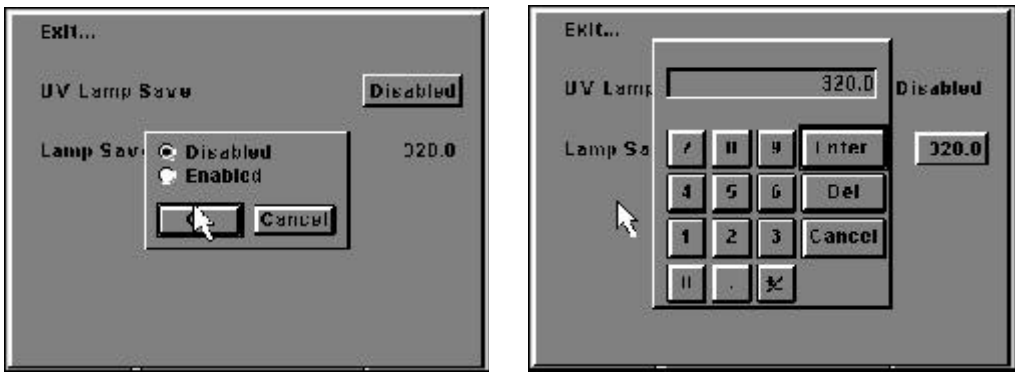
Display allows the user to decide whether the real-time clock area of the LCD will display the Time, Date or None.



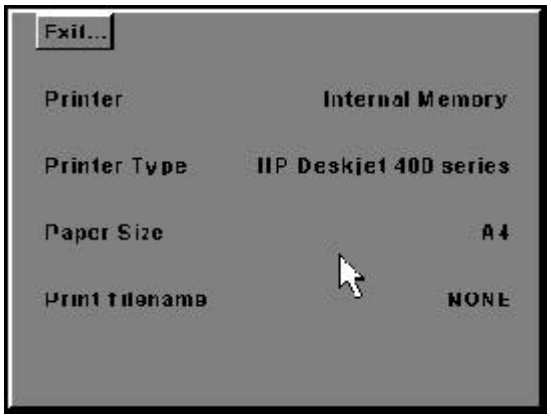
UV Lamp Save...



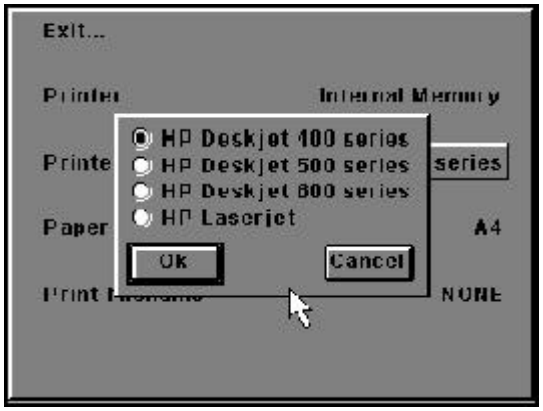
UV Lamp Save allows the user to either enable or disable the UV lamp save facility. When on, the deuterium lamp will only be switched on when the wavelength (or scan range in Spectrum mode) falls below the wavelength set in this menu. When off, the deuterium lamp is permanently on.
Lamp Save Wavelength allows the user to set the wavelength at which the UV Lamp Save facility operates.

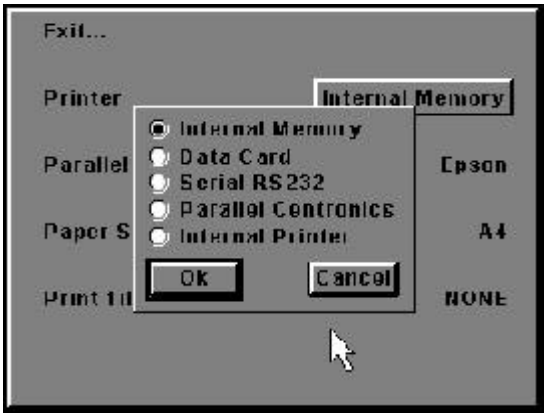


Printer Setup...

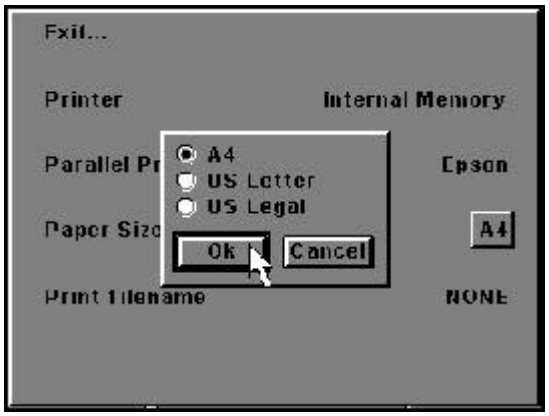


Printer allows the user to select, via the pop-up selection menu, where printing is to be directed (external or internal).
Parallel Printer Type allows the user to select, via the pop-up selection menu, the type of printer which is to be connected to the parallel port (HP Deskjet, HP Laserjet).





Paper Size allows the user to select, via the pop-up selection menu, the paper size required (A4, US Letter, US Legal).
Print filename allows the user to enter an alphanumeric identifier of up to 8 characters via the pop-up alphanumeric keypad or directly from the instrument keypad.



Accessory Setup…

If a Sipper Pump, Temperature Controlled Cell Block or Heated Sipper Pump is fitted, an additional menu item appears on the instrument setup menu.
In this Accessory Setup Menu there may be up to two sub-menu options – ***Sipper Pump Setup*** and ***Temperature Cell Block Setup***. (The options will appear if the appropriate accessory is fitted).

Sipper Pump Setup

Flush Direction – forwards or backwards. This sets in which direction the sipper pump will pump when performing a sample flush.

Continuous – this option should be selected for continuous pumping of the sipper pump in the direction of the Flush Direction. (A message box will appear, clicking Ok will stop the pumping).

Calibrate Option – Sample or Sample & Air. This determines how the sipper pump is to operate.
If ***Sample*** is selected, the sipper pump sequence will be *Takeup Sample* then *Flush* (i.e. the sample is pumped into the flow-through cell and then flushed to waste).
If ***Sample & Air*** is selected, the sipper pump sequence will be *Takeup Sample, Takeup Air & Flush*. This is useful if there is only a small amount of sample available and it is advantageous to take up the sample, then take up an air gap to move the sample into the flow-through cell. The flush operation will then flush the sample in the chosen direction.

Calibrate takes the user through a calibration sequence to calibrate the amounts of sample and air to take up in normal sipper operation. Holding down the right arrow on the keypad, or holding the mouse down on the right arrow icon takes up an initial amount of sample. Once the arrow key or mouse button has been released, the user is then given the chance to nudge the sipper pump in either a backwards (left key/icon) or forwards (right key/icon) direction. When the required amount of sample has been pumped, this can be confirmed by clicking the Ok button or pressing the enter key. If the *Calibrate Option* is set to *Sample & Air*, then the same sequence is performed for the calibration of an air gap.

Flush performs a flush in the direction determined by the *Flush Direction* setting.

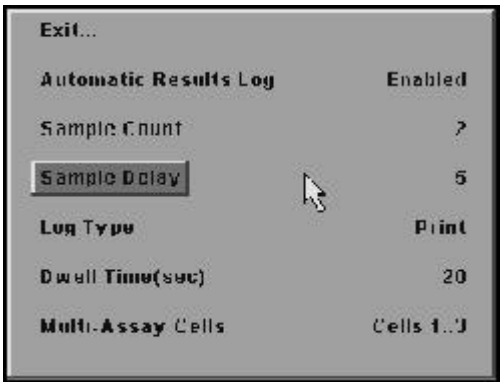
Temperature Cell Block Setup Menu

There are two parameters to be set up:

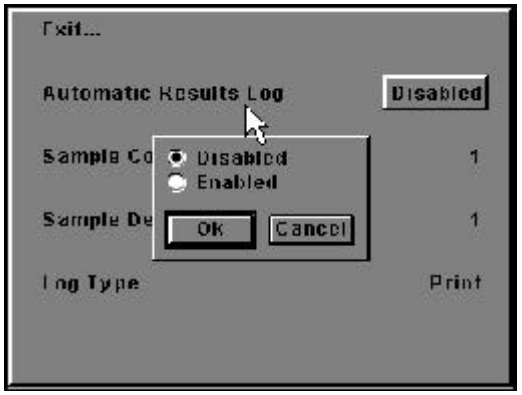
Temperature allows the setting of the temperature to which the cell block is to be set. Ranges are 20 to 50°C at 0.1°C intervals and 68 to 122°F at 1°F intervals.

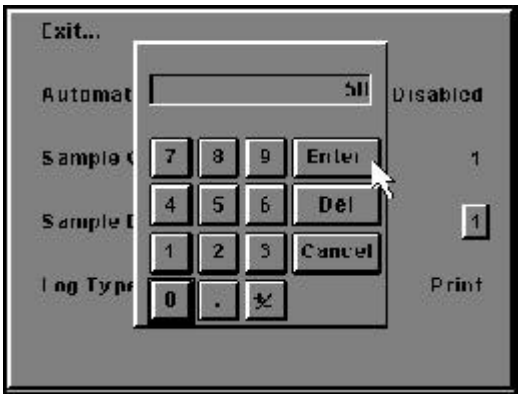
Temperature Units as available as centigrade or Fahrenheit.

Automatic Results Log...

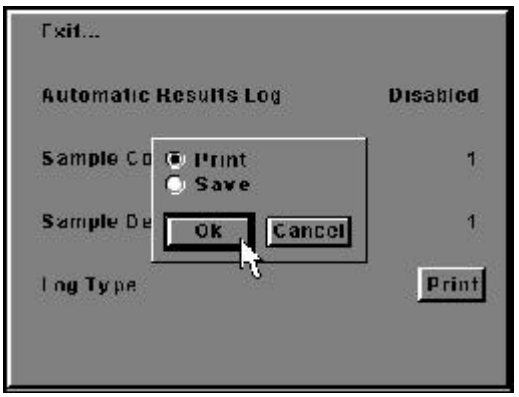


Automatic Results Log allows the user to Enable or Disable the automatic results logging.
Sample Count allows the user to specify the number of times the particular option is to be performed. Settings can be chosen from 1 to 9999 times. Selection can be made via the pop-up numeric keypad or directly from the instrument keypad using the numeric keypad.
Sample Delay allows the user to set the delay (in seconds) between one sample completing and the next sample starting. A value of between 0 and 9999 can be selected via the pop-up numeric keypad or directly from the instrument keypad.





Log Type specifies how a reading is stored once it is taken. This can be set to either Save or Print, which relates to if the reading is stored using the Results Storage parameters (the Save option), or the Printer Setup parameters (the Print option). This is the same as taking a reading and selecting manually between the Save and Print icon on the main Photometrics display.



NOTE: If the multi-position cell holder is fitted, two additional menu options will appear to the foot of the Automatic Results Log setup menu. These only appear in modes when the multi-position cell holder is not an integral part of the mode (i.e. Kinetics and Multi-Wavelength Modes).

In *Multi-Assay* mode, the multi-position cell holder can be configured so that a measurement is taken from one cell before automatically moving onto the next, and the same measurement is performed. For this there are two extra parameters, *Dwell Time* (sec) and *Multi-Assay Cells*.
The *Dwell Time* is the delay between finishing the measurement on one cell and moving onto the next. The *Multi-Assay Cells* allow the user to choose between None (i.e. no change of cell location between measurements) and Cells 1-2 to Cells 1-7.

If *Multi-Assay Cells* is set to None, then the number of readings taken will equal the *Sample Count* value with a *Sample Delay* between the end of one measurement and the start of the next.

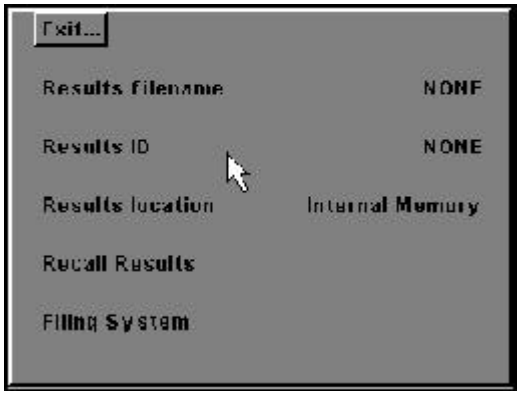
In Cells 1..x mode, one complete cycle will consist of measurements at each of the 1..x cells with a delay of *Dwell Time* between each one. At the end of one cycle, at cell x, the sample delay value will then pass before returning to cell 1. The whole cycle is repeated the same number of times as the *Sample Count* parameter. Therefore, if the *Sample Count* is set to 3 and *Multi-Assay Cells* is set to 1..4, then a total of twelve readings will be taken, Cells 1 to 4 three times.

Load New Application should only be used if the user wishes to load a new application card into the instrument. If there is no card or an invalid card currently inserted into the instrument an appropriate message is displayed:

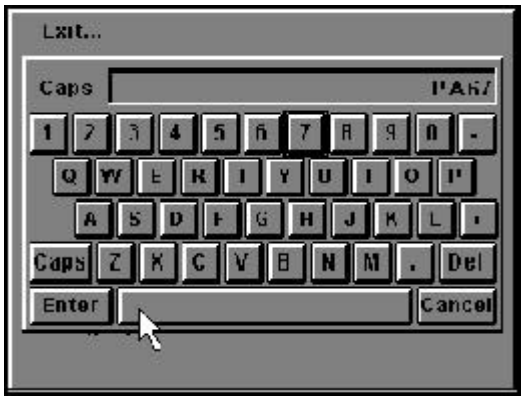
If there is a valid application card inserted or the user selects Yes, another message will be displayed:

If the user selects Yes the instrument will reset and prompt the user to select Ok to begin loading the new application card. Loading will take place and, after a short interval, the new application will run.

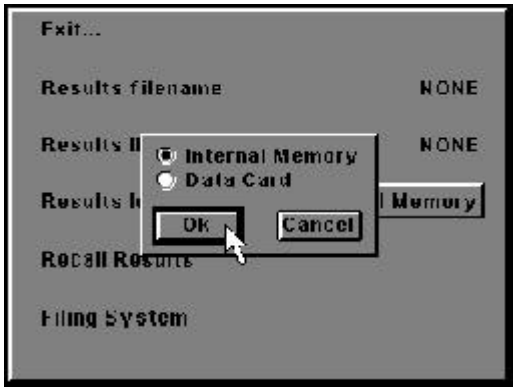
Results Storage



Exit allows the user to exit this menu.
Results filename will allow the user to enter an alphanumeric identifier of up to 8 characters.
Results ID will allow the user to enter an alphanumeric identifier of up to 20 characters .



Results location will allow the user to select whether to store results on either Internal Memory or on a Data Card, via the pop-up menu. If Data Card option is selected results will be stored on the Data Card which is inserted into the instrument at the time of storing the result(s).



Recall Results allows the user to recall to the instrument any results that were saved either automatically or manually by the Save option. When the option is selected only relevant files will be listed on the selected media. In the case of Photometrics, Multi-Wavelength and Quantitation Modes, this is in the form of a text file that can be viewed on the screen and printed, if necessary.
In the case of Spectrum and Kinetics Modes, this allows the user to recall the data to the instrument as if the Spectrum scan or Kinetics run had just been performed. The usual post-scan / post-run options can then be carried out on the recalled data.

Filing System allows the user to manage their storage and media devices. Within the filing system files can be deleted, copied or viewed, and media can be formatted. The main part of the screen is taken up by a list of available files. All files on the media are listed, together with a description of the file type.

View File - if the selected file is a text file (either listed as a text file or as Photometrics, Multi-Wavelength or Kinetics results) then this will load the file into the file viewer, where it can be paged up and down to view the whole file, or printed to either Internal Printer (if fitted), the RS232 port or the Parallel Centronics Printer.

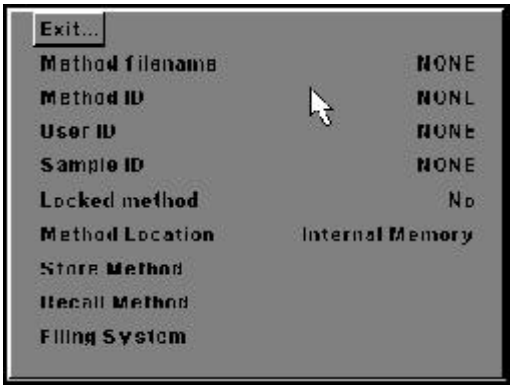
Change media toggles between the two available media - Internal Memory or Data Card (selected media shown by the icon in the top status bar and textually in the top right hand
corner). Any files selected on the current media are automatically de-selected when the media is changed.

Delete file(s) allows any selected file(s) to be deleted (*it should be noted that files cannot be recovered once deleted*). The number in the top left hand corner of the display shows how many files are selected (and will be deleted). Only files on the active media (shown in the top right hand corner) can be selected to be deleted.

Copy file(s) allows the selected file(s) to be copied to the other media (i.e. if files selected are on the internal memory then they can be copied to the Data Card and vice versa).

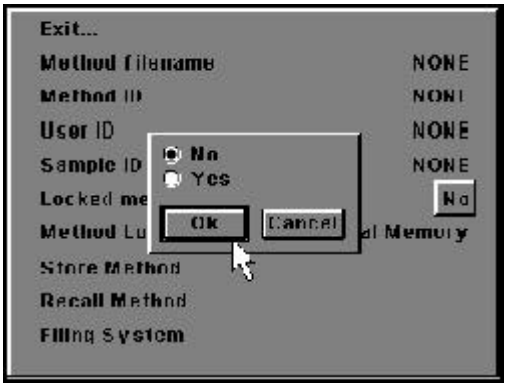
Format media allows the selected media to be formatted and any files on it will be lost, and cannot be recovered.

Method Storage



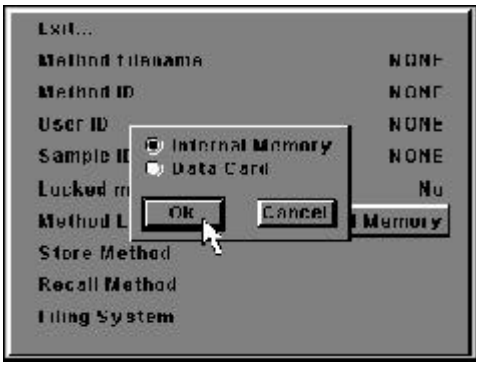
Exit allows the user to exit this menu.
Method filename will allow the user to enter an alphanumeric identifier of up to 8 characters.
Method ID will allow the user to enter an alphanumeric identifier of up to 20 characters.
User ID will allow the user to enter an alphanumeric identifier of up to 20 characters.
Sample ID will allow the user to enter an alphanumeric identifier of up to 20 characters.

Locked Method can be selected/deselected via the pop up menu. Selecting this option will prevent any changes being made.

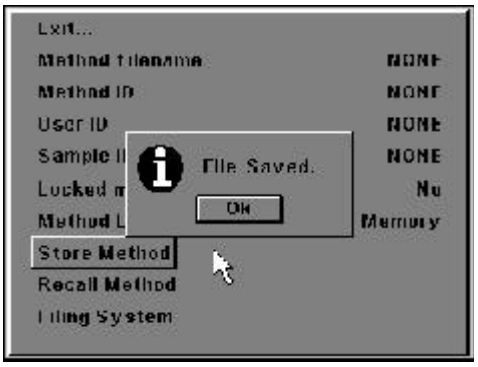


If the method is not locked, after locking, the alphanumeric keyboard is displayed and a password is entered. This same password needs to be entered to unlock the method. If the password is forgotten, the Reset Parameters option of Instrument Setup will unlock any locked modes and reset all parameters to defaults.

Method Location will allow the user to select whether to store results on either Internal Memory or on a Data Card, via the pop-up menu. If Data Card option is selected results will be stored on the Data Card which is inserted into the instrument at the time of storing the result(s). If a file already exists at this location, a message will be displayed, giving the user the option to overwrite the existing file.

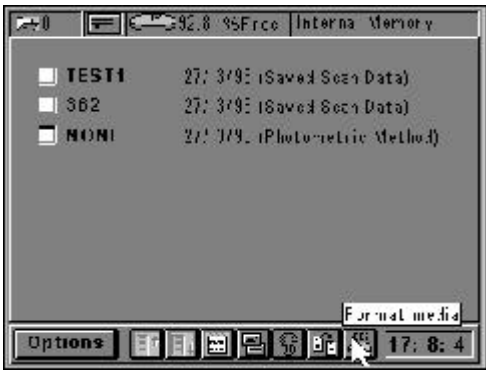


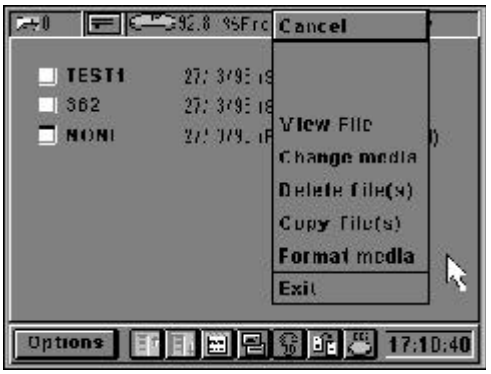
Store Method allows the operating parameters, set in the current operating mode, to be saved for future use. Files can be saved to either Internal Memory or to a Data Card and can be recalled on another instrument. If there is any problem with storing the method then the user is informed.



Recall Method allows a stored method to be recalled. Any operating parameters in the method are updated to reflect the stored method. The only exceptions to these may be global operating parameters (such as those relating to accessories). If a method in another operating mode is locked, then by definition of this, so are the global operating parameters (i.e. accessories). Recalling a method will update the mode-specific operating parameters from the method, but not the global operating parameters. The user is informed if this is the case.

Filing System allows the user to manage their storage and media devices. Within the filing system files can be deleted, copied or viewed, and media can be formatted. The main part of the screen is taken up by a list of available files. All files on the media are listed, together with a description of the file type.





View File - if the selected file is a text file (either listed as a text file or as Photometrics, Multi-Wavelength or Kinetics results) then this will load the file into the file viewer, where it can be paged up and down to view the whole file, or printed to either Internal Printer (if fitted), the RS232 port or the Parallel Centronics Printer.

Change media toggles between the two available media - Internal Memory or Data Card (selected media shown by the icon in the top status bar and textually in the top right hand corner). Any files selected on the current media are automatically de-selected when the media is changed.

Delete file(s) allows any selected file(s) to be deleted (*it should be noted that files cannot be recovered once deleted*). The number in the top left hand corner of the display shows how many files are selected (and will be deleted). Only files on the active media (shown in the top right hand corner) can be selected to be deleted.

Copy file(s) allows the selected file(s) to be copied to the other media (i.e. if files selected are on the internal memory then they can be copied to the Data Card and vice versa).

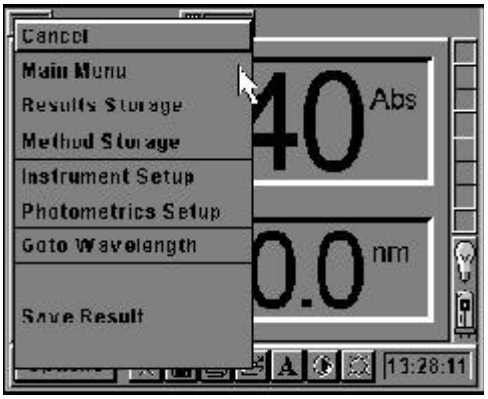
Format media allows the selected media to be formatted and any files on it will be lost, and cannot be recovered.

3.2 PHOTOMETRICS MODE

Having selected the Photometrics Mode from the Application Main Menu the following display will be shown:

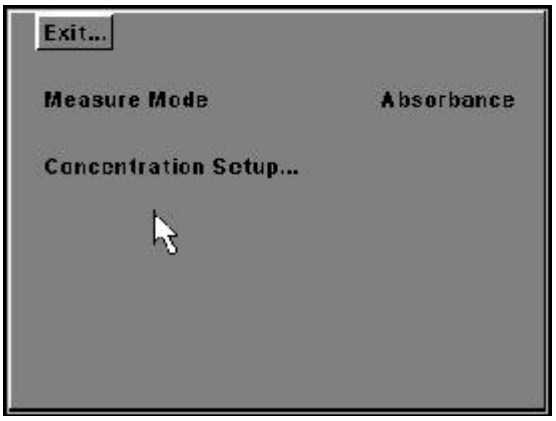
It is recommended that set-up parameters be reviewed prior to calibration or measurement to ensure the selected measurement mode and values are correct.

Select ***Options*** - a pop-up menu will appear:

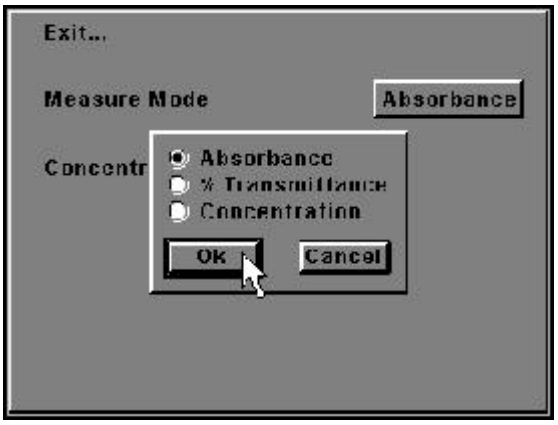


Cancel allows the user to exit this menu.
Main Menu... allows the user to return to the Application Main Menu window.
Results Storage - refer to Global Setup Parameters.
Method Storage - refer to Global Setup Parameters.
Instrument Setup allows all instrument related set up parameters to be adjusted.
Photometrics Setup allows photometrics specific parameters to be set up.
Goto Wavelength allows the user to enter the preferred wavelength value via the pop-up menu.
It should be noted that the wavelength value can also be adjusted by using the up/down arrow button located to the left of the wavelength reading on the display, or by using the Goto key on the instrument keypad. Using the Goto key allows the user to adjust the value via a pop-up numeric keypad, or by using the toolbar selection as detailed in *Toolbar Selections*.
Save Result will save the current reading the current reading to the device specified in the Results Storage Setup Menu.
Takeup Sample is visible here if a Sipper Pump is fitted. Selecting *Takeup Sample* makes the sipper pump take up the precalibrated amount of sample. If the sipper pump is configured to take up *Sample & Air* , this option will change to *Takeup Air*, otherwise it will go to *Flush*. Selecting *Takeup Air* causes the pre-calibrated airgap to be pumped. On selecting *Flush*, the sample is flushed in the pre-determined flush direction.
Initiate Auto Sampling. If a multi-position cell holder is fitted, and auto results enabled then this option becomes available and is used to initiate an automatic sampling sequence. Once the sequence is stated, this changes to *Stop Auto Sampling* and is used to stop auto sampling taking place.

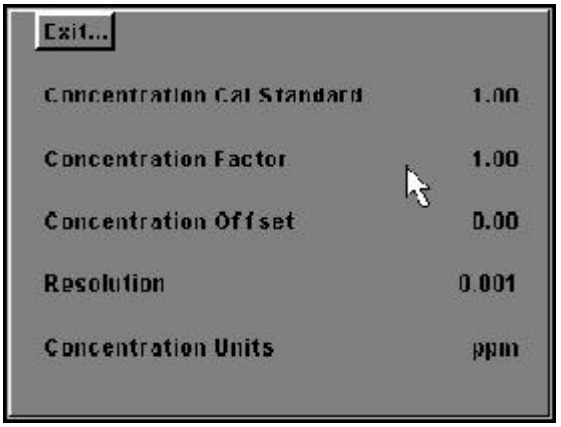
Select Photometrics Setup...



Exit allows the user to exit this menu.
Measure Mode allows the user to specify if the photometric reading is to be displayed as either Absorbance, % Transmittance or Concentration. Selection is made via the pop-up menu.



Concentration Setup...

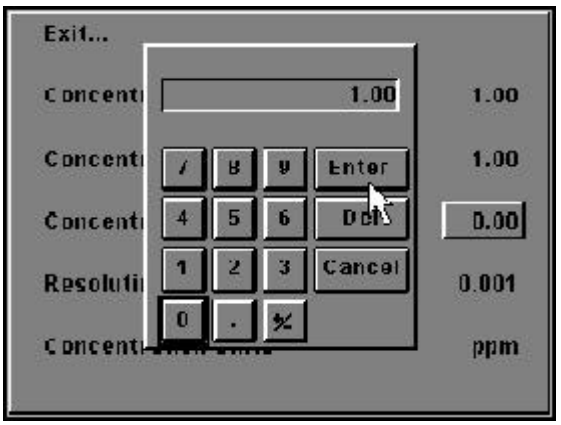


650 050/REV A/09-99***Exit*** allows the user to exit this menu.

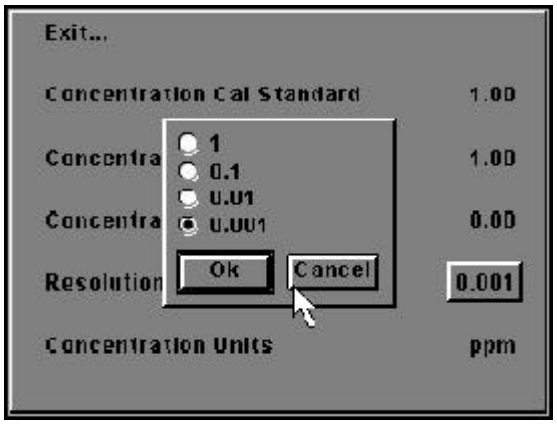
Concentration Cal Standard allows the user to specify a concentration calibration standard via the pop-up numeric keypad or directly from the instrument keypad. Absorbance is calibrated to this standard by calculating the multiplication factor that produces the calibration standard concentration.

Concentration Factor allows the user to specify the absorbance multiplication factor for concentration measurement mode via the pop-up numeric keypad or directly from the instrument keypad .

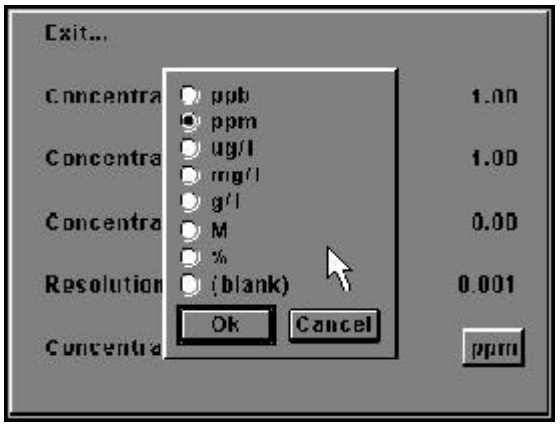
Concentration Offset allows the user to specify a concentration offset via the pop-up numeric keypad or directly from the instrument keypad. This allows the zero absorbance concentration to be offset by the value entered. The offset is set to zero by calibration to a standard.



Resolution allows the user to specify the resolution of the displayed reading via the pop-up selection menu. The maximum resolution that concentration readings are displayed to can be set up to three decimal places. The instrument will automatically display concentration readings to the maximum possible resolution using this parameter. For example, a concentration value of 1 can be displayed as 1, 1.0, 1.00 or 1.000, depending on the resolution set. This parameter does not affect the measuring range for concentration: a concentration value of 1999 will be displayed as 1999, regardless of the resolution setting.



Concentration Units allows the user to specify the units of measurement for concentration readings via the pop-up selection menu.



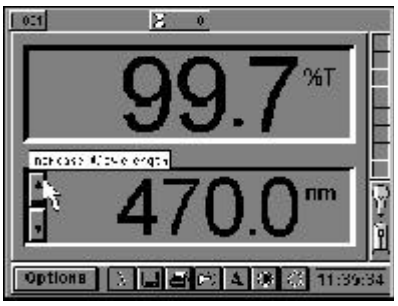
Preparing to make a Measurement

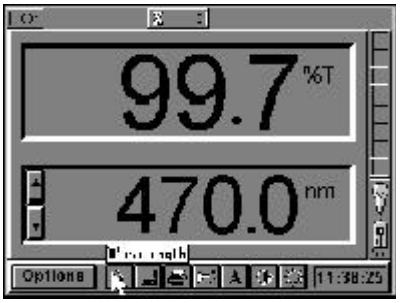
It is recommended that set up parameters be reviewed prior to calibration or measurement to ensure the selected measurement mode and values are correct.

Using the Multi-Cell Holder

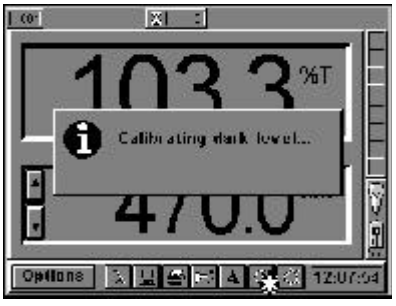
When fitted, this cell holder can be used to perform calibration and sample measurement without the need to remove individual cuvettes during each stage. Blank or sample position will be highlighted in the boxes shown to the right hand side of the main display window. Blank or sample selection can be made by either moving the cursor onto the appropriate box and clicking with the left hand mouse button or by using the numeric keypad.

Select the required wavelength by using the Cal key, or the Goto key to select the pop-up numeric keypad, or one of the screen options shown below:





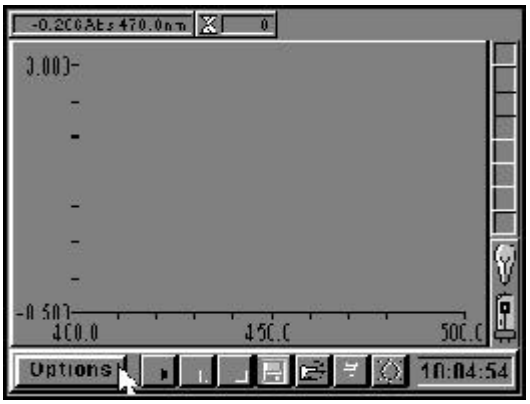
Place the blank and sample cuvettes in position in the multi-cell holder and close the sample chamber lid. Move to the blank position and select either the Cal key on the main keypad or the Calibrate toolbar selection to initiate a calibration. When performing a calibration the display will momentarily show – Calibrating Dark Level and then Calibrating Light Level and, if the calibration is successfully completed, the display will then update to show 100.0%T or 0.000Abs or Concentration, depending on the mode selected.



The instrument is now ready to perform a measurement. Select the appropriate sample position. The display will show the sample value directly as %T, Absorbance or Concentration, as appropriate.

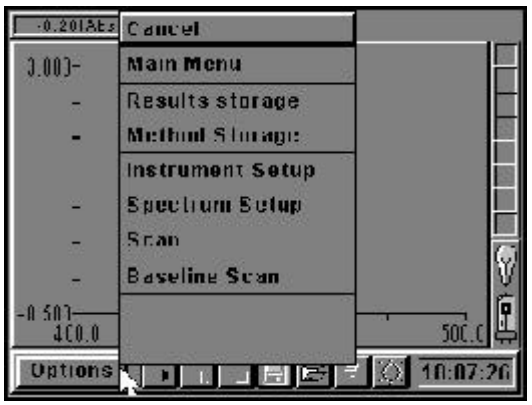
3.3 SPECTRUM MODE

Having selected the Spectrum Mode from the Applications Main Menu options the following display will be shown:



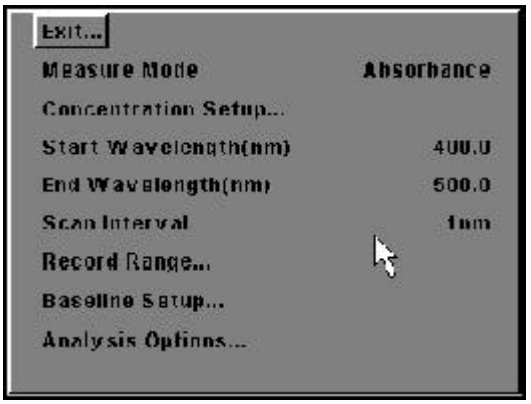
Spectrum Mode Pre-Scan

Select ***Options*** - a pop-up menu will appear:



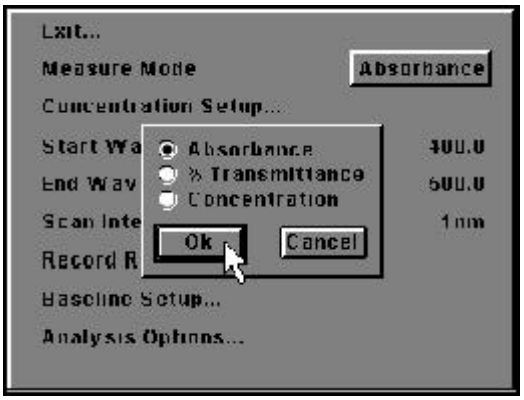
Cancel allows the user to exit this menu.
Main Menu... allows the user to return to the Application Main Menu window.
Results Storage - refer to Global Setup Parameters.
Method Storage - refer to Global Setup Parameters.
Instrument Setup allows all instrument related set up parameters to be adjusted.
Spectrum Setup allows photometrics specific parameters to be set up.
Scan allows the user to initiate a scan.
Baseline Scan allows the user to initiate a baseline scan.
Takeup Sample is visible here if a Sipper Pump is fitted. Selecting *Takeup Sample* makes the sipper pump take up the pre-calibrated amount of sample. If the sipper pump is configured to take up *Sample & Air*, this option will change to *Takeup Air*, otherwise it will go to *Flush*. Selecting *Takeup Air* causes the pre-calibrated airgap to be pumped. On selecting *Flush*, the sample is flushed in the pre-determined flush direction.
Post Scan Analysis allows certain Post Scan Analysis options to be performed. This is only available once a scan is completed.

Select ***Spectrum Setup***

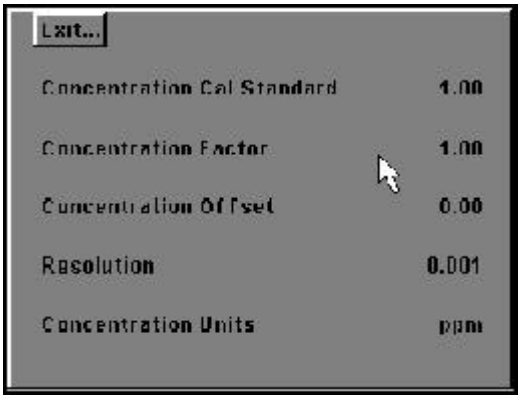


Exit allows the user to exit this menu.

Measure Mode allows the user to select between absorbance, transmittance or concentration for the scan y-axis, via the pop-up menu.



Concentration Setup...



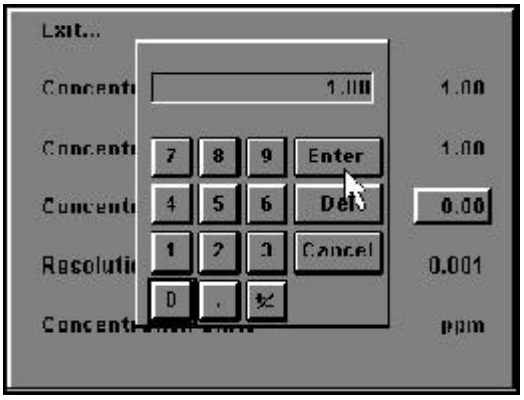
Exit allows the user to exit this menu.

Concentration Cal Standard allows the user to specify a concentration calibration standard via the pop-up numeric keypad or directly from the instrument keypad. Absorbance is calibrated to this standard by calculating the multiplication factor that produces the calibration standard concentration.

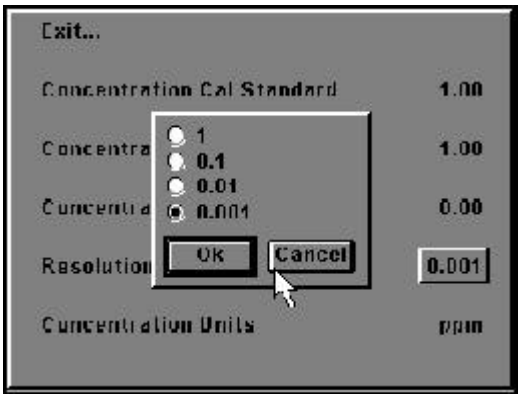
Concentration Factor allows the user to specify the absorbance multiplication factor for concentration measurement mode via the pop-up numeric keypad or directly from the instrument keypad .

Concentration Offset allows the user to specify a concentration offset via the pop-up numeric keypad or directly from the instrument keypad. This allows the zero absorbance concentration to be offset by the value entered. The offset is set to zero by calibration to a standard.

Start Wavelength(nm) allows the user to specify the starting wavelength for a Spectrum scan to be performed. Valid range is 190 to 1100nm at 0.1nm resolution. This value can be set via the pop-up numeric keypad.

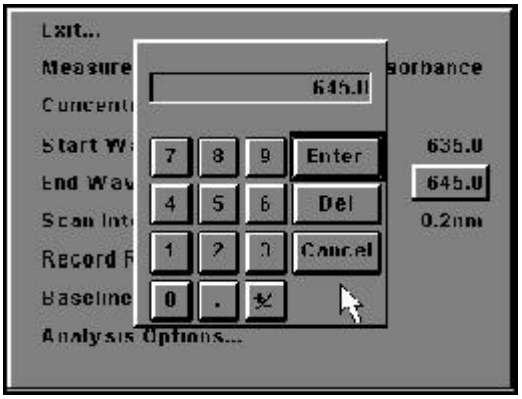


Resolution allows the user to specify the resolution of the displayed reading via the pop-up selection menu. The maximum resolution that concentration readings are displayed to can be set up to three decimal places. The instrument will automatically display concentration readings to the maximum possible resolution using this parameter. For example, a concentration value of 1 can be displayed as 1, 1.0, 1.00 or 1.000, depending on the resolution set. This parameter does not affect the measuring range for concentration: a concentration value of 1999 will be displayed as 1999, regardless of the resolution setting.



Concentration Units allows the user to specify the units of measurement for concentration readings via the pop-up selection menu.

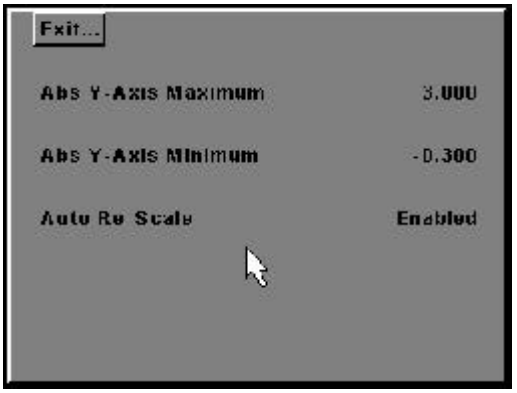
End Wavelength(nm) allows the user to specify the ending wavelength for a Spectrum scan to be performed. Valid wavelength range is 190 to 1100nm at 0.1nm resolution. This value can be set via the pop-up numeric keypad.



Scan Interval allows the user to control the speed at which a scan is performed. Four scan intervals are allowed, 0.2nm (slow), 1nm (medium), 5nm (fast) and 10nm (turbo), all selectable via the pop-up menu.

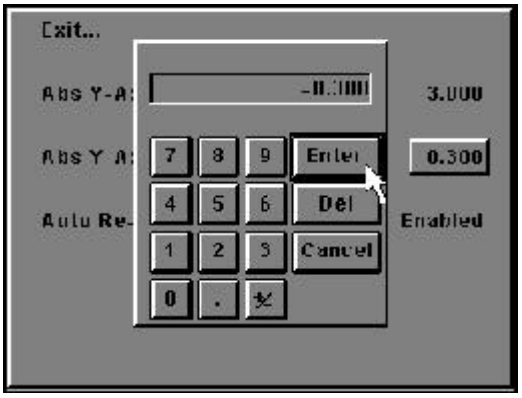
These three parameters will be validated to ensure a valid set of operating parameters are available after one of them has been edited. For example; a scan from 320.0 to 320.8nm at 10nm intervals is not allowed.

Record Range... allows access to the spectrum record range menu option which allows the y-axis range to be set.



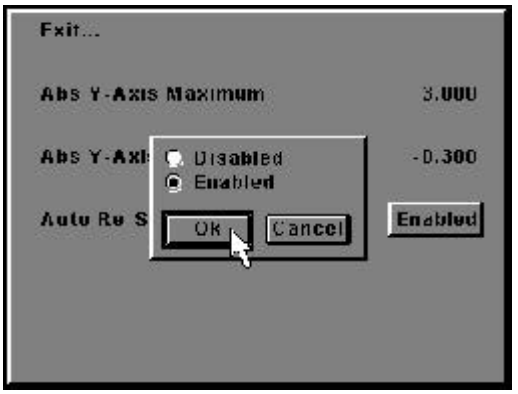
Y-Axis Maximum - the highest absorbance, transmittance or concentration (depending on the measurement mode) that is displayed on the scan axis. The required value can be entered via the pop-up numeric keypad.

Y-Axis Minimum the lowest absorbance, transmittance or concentration (depending on the measurement mode) that is displayed on the scan axis. The required value can be entered via the pop-up numeric keypad.



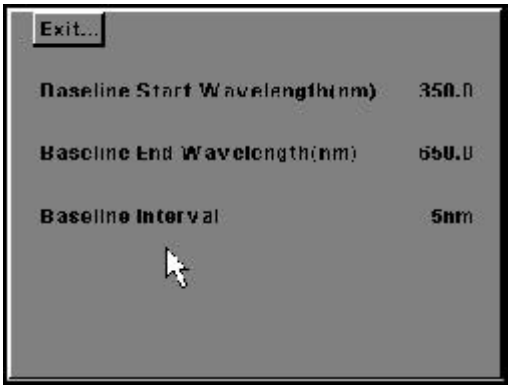
Auto Re-Scale

This feature can be turned on or off. When auto re-scale is set to "on", the instrument will automatically change the Y-Axis minimum and maximum points to display the scan to its greatest resolution. If set to "off" the Y-Axis will use the user set maximum and minimum points. Selection is made via the pop-up menu.



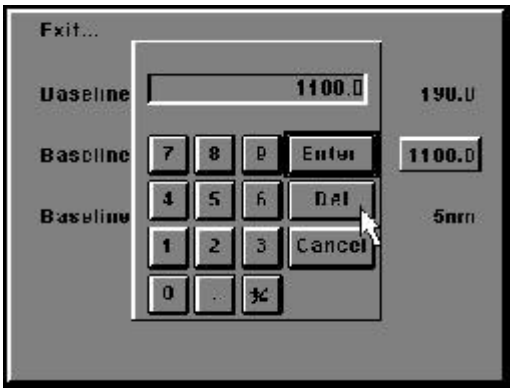
Baseline Setup...

This allows the user to perform a baseline scan over a specified range and resolution.

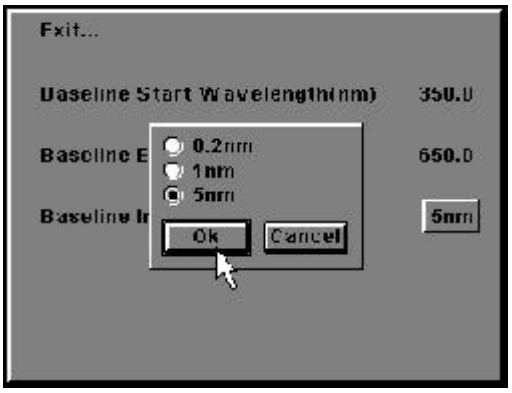


Baseline Start Wavelength(nm) allows the user to set the start wavelength of the area in which they wish to perform a baseline scan. The required value can be entered via the pop-up numeric keypad.

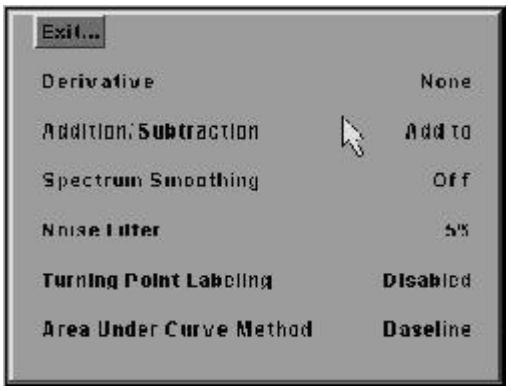
Baseline End Wavelength(nm) allows the user to set the end wavelength of the area in which they wish to perform a baseline scan. The required value can be entered via the pop-up numeric keypad.



Baseline Interval allows the user to set the interval at which they wish to scan the baseline. Four scan intervals are allowed, 0.2nm (slow), 1nm (medium), 5nm (fast) and 10nm (turbo), all selectable via the pop-up menu.
These three parameters will be validated to ensure a valid set of operating parameters are available after one of them has been edited.

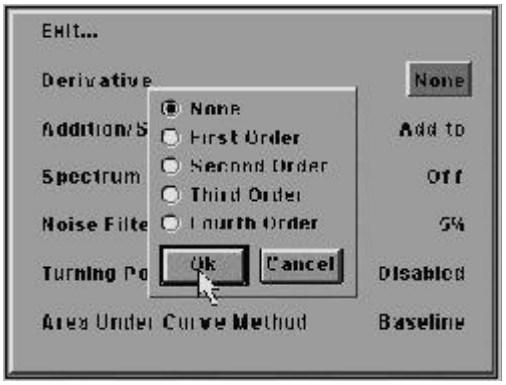


Analysis Options... allows the user to set up the parameters for performing any post-run analysis on a performed or recalled scan. The options available are:

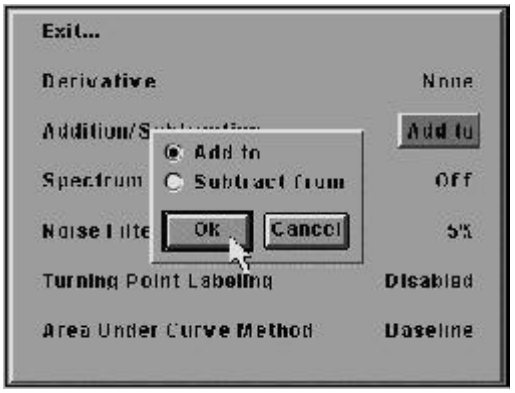


Derivative

Allows the user to specify any of the derivatives 1st, 2nd, 3rd and 4th where it is noted that the fundamental data is not the same as the 1st derivative. In addition to the four derivatives, a *none* option will allow the user to perform no derivative analysis once the scan is performed. Selection is made via the pop-up menu.



Addition/Subtraction allows the user to specify if they wish to add or subtract from one scan to another.



Spectrum Smoothing can be set to the following levels:

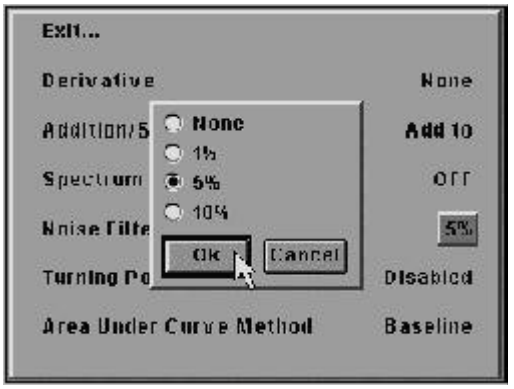
OFF
1 (MINIMUM)
2
3
4
5 (MAXIMUM)

The smoothing function operates when a scan is completed (it cannot be used to "smooth" a scan already performed) and is used to reduce the effects of background noise. Smoothing is accomplished by using linear regressionto fit a line of best fit between data points either side of a scanned point and then using the linear relationship to re-calculate the centre data point. This process is repeated for each point in the scan (data points at the start and end of a scan are extrapolated to preserve the scan range).

The number of data points used for the line of best fit is set by the Smoothing menu option, hence a smoothing level of 1 will use a line of best fit through 1 data point either side of each scanned point (3 data points in total). Similarly, a smoothing level of 5 will use a line of best fit through 5 data points either side of each scanned point (11 points in total). The smoothed wavelength range depends on the scan interval, for example, smoothing level 2 will use 5 data points for each line of best fit, which at a scan interval of 0.2nm equates to a 1nm smoothed range.

The higher the level of smoothing the more the effects of noise will be reduced. However, peak and valley heights will also be reduced with higher levels of smoothing. The smoothing function over writes the original scan data, and therefore can be used in conjunction with any other scan analysis option.

Noise Filter - the post-scan statistical feature will list all turning points (peaks and valleys) when the noise filter is set to "None". If the noise filter is set to 1% (fine), 5% (medium) or 10% (coarse), then peaks and valleys which deviate from the preceding peak or valley by a percentage of the total excursion of the scan (the difference between the highest peak and the lowest valley) are omitted from the statistical peaks and valleys tables. More peaks and valleys will be omitted if the noise filter is set to coarse (only those peaks and valleys which exceed 10% of the total excursion) than for medium (5%) or fine (1%).



Turning Point Labelling allows the user to enable or disable turning point (peaks and valleys) labelling. If enabled, up to 10 peaks or troughs will be labelled on the displayed scan. Selection is made via the pop-up menu.

Area Under Curve allowsthe user to calculate the area under a curve selected from the fundamental scan. The left and right markers can be placed in the required positions. The grey marker is the one which can be moved with the < or > toolbars or by clicking the mouse on the appropriate part of the spectrum. To move the marker not selected (black) click on the *Line Selection* toolbar. The second marker can then be positioned as required. To move both markers simultaneously, click the *Line Selection* marker again and both markers will become grey. The top of the display shows the area calculated under the selected curve (calculated as either Baseline or Tangent).

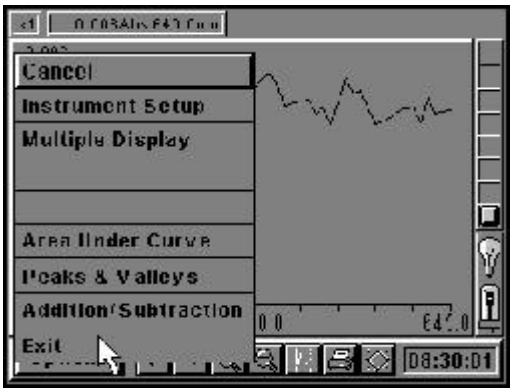
Performing a Scan

It is recommended that setup parameters be reviewed prior to calibration or measurement to ensure the selected measurement mode and values are correct and that a new baseline scan is carried out prior to performing a spectrum scan. Performing a baseline can be initiated by clicking with the righthand mouse button to recall the *Options* menu and then selecting Baseline Scan. A baseline scan will now be executed. During the scan the Pause (show key) and the Abort (show key) keys will be activated. On completion the display will update to show the completed scan. Once the baseline scan is completed, open the sample chamber lid and place the sample in position (refer to 8 cell changer and give details). Close the sample chamber lid.

Performing a scan can be initiated by clicking with the righthand mouse button to recall the options menu and then selecting Scan or, by clicking on the first toolbar key (show key) with the lefthand mouse button. During the scan the Pause (show key) and the Abort (show key) keys will be activated. On completion the display will update to show the completed scan.
Once a scan has been performed, it can be saved to either Internal Memory or to a Data Card. The details of where a scan is saved and what it is called can be found in the Results Storage Setup Menu.
A scan can be saved by clicking on the Save icon. If there is any problem with the save i.e. no data card is present or the file already exists, a warning message will appear on the screen.
To recall a scan as the fundamental click on the Load icon. The display will list all the available files on the selected media.

Spectrum Mode Post-Scan
This mode allows the user to perform any post-run analysis on a performed scan, as well as being able to change the settings of the scan and perform it again. All the Pre-Scan options are available together with the following additional options.

Select ***Options*** and then the ***Post-Scan Analysis*** Menu. Clicking the righthand mouse button or clicking on the Options key with the lefthand mouse button will select the pop-up menu.



Cancel removes the menu from the screen.

Instrument Setup allows access to all instrument setup parameters.

Multiple Display allows more than one spectra to be displayed on the same graph axis. Up to three additional spectra can be recalled and displayed with the fundamental. The fundamental remains coloured in black.

Recall Scan... is only available in *Multiple Display* or *Addition/Subtraction* mode. Allows selection of a file from Internal Memory or Data Card to either overlay with the current spectrum (*Multiple Display*) or to be added to, or subtracted from, the fundamental (*Addition/Subtraction* mode).

Moving Line Cursor allows a moving-line cursor to be displayed on the spectrum. The point at which the cursor is displayed at the top of the screen showing the current wavelength and its associated photometric reading.

Area Under Curve allows the user to calculate the area under a curve selected from the fundamental scan. The left and right markers can be placed in the required positions. The grey marker is the one which can be moved with the < or > toolbars or by clicking the mouse on the appropriate part of the spectrum. To move the marker not selected (black) click on the ***Line Selection*** toolbar. The second marker can then be positioned as required. To move both markers simultaneously, click the *Line Selection* marker again and both markers will become grey. The top of the display shows the area calculated under the selected curve (calculated as either Baseline or Tangent).

Peaks & Valleys - displays a table of the peaks and valleys detected on the fundamental spectum using the current *Noise Filter* value. If more than one page is available, the *Page Up* and *Page Down* icons will scroll through the pages. The *Print* icon allows the table of peaks and valleys to be printed to the device selected at the time of printing.

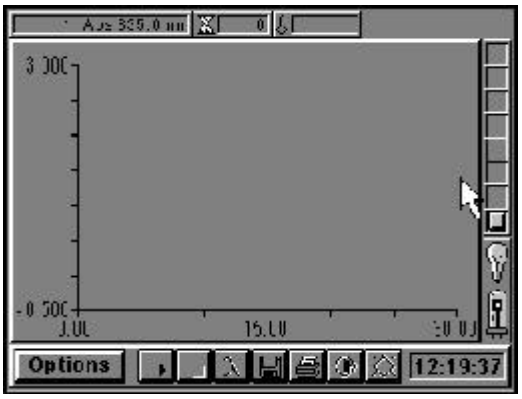
Addition/Subtraction allows a stored spectrum to be either added or subtracted from the fundamental with the resulting spectrum being displayed on the screen.

Exit allows the user to exit this menu.

If automatic results logging is enables, the scan icon/menu option will instigate the automatic logging sequence. The egg timer icon counts down the delayed periods between measurements. At any point during the automatic sequence the STOP icon can be used to stop the automatic operation.

3.4 KINETICS MODE

Having selected Kinetics Mode from the Application Main Menu the following display will be shown:



It is recommended that setup parameters be reviewed prior to performing measurements to ensure the selected measurement mode and values are correct.

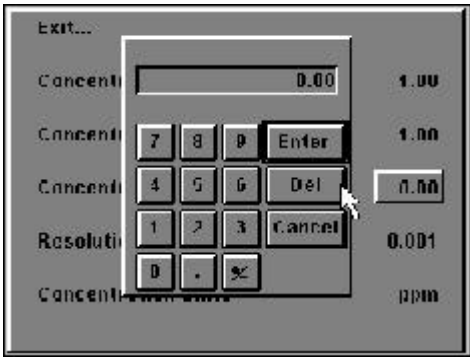
Select ***Options*** and a pop-up menu will appear:

Cancel allows the user to exit this menu.
Main Menu allows the user to return to the Application Main Menu window.
Results Storage - refer to Global Setup Parameters.
Method Storage - refer to Global Setup Parameters.
Instrument Setup allows all instrument related parameters to be adjusted.
Kinetics Setup allows kinetics specific parameters to be set up.
Start Run - starts measurement sequence.

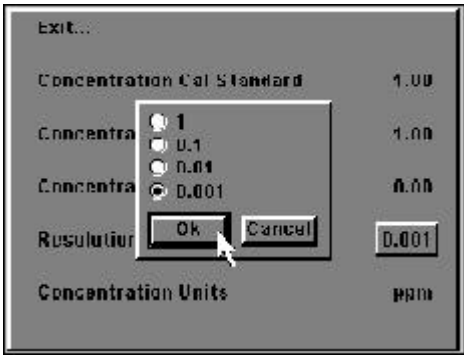
Select ***Kinetics Setup***

Exit... allows the user to exit this menu.
Measure Mode allows the user to specify the kinetics graph Y-Axis is to be displayed as either Absorbance, %Transmittance or Concentration. Selection is made via the pop-up menu.
Concentration Setup...

Exit allows the user to exit this menu.
Concentration Cal Standard allows the user to specify a calibration standard via the pop-up numeric keypad or directly from the instrument keypad. Absorbance is calibrated to this standard by calculating the multiplication factor that produces the calibration standard concentration.
Concentration Factor allows the user to specify the absorbance multiplication factor for concentration measurement via the pop-up numeric keypad or directly from the instrument keypad.
Concentration Offset allows the user to specify a concentration offset via the pop-up numeric keypad or directly from the instrument keypad. This allows the zero absorbance concentration to be offset by the value entered. The offset is set to zero by calibration to a standard.

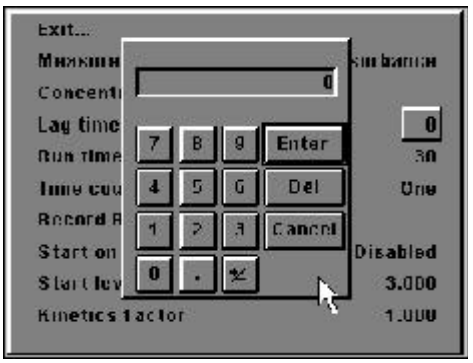


Resolution allows the user to specify the resolution of the displayed reading via the pop-up selection menu. The maximum resolution that concentration readings are displayed to can be set up to three decimal places. The instrument will automatically display concentration readings to the maximum possible resolution using this parameter. For example, a concentration value of 1 can be displayed as 1, 1.0, 1.00 or 1.000, depending on the resolution set. This parameter does not affect the measuring range for concentration: a concentration value of 1999 will be displayed as 1999, regardless of the resolution setting.

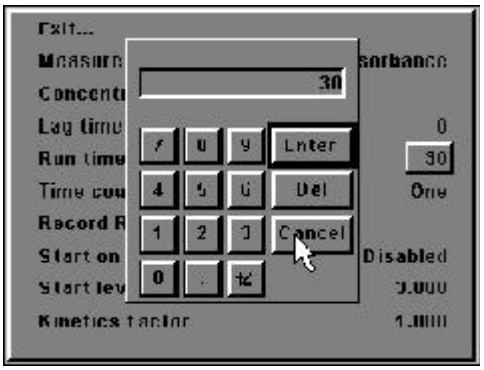


Concentration Units allows the user to specify the units of measurement for concentration readings via the pop-up selection menu.

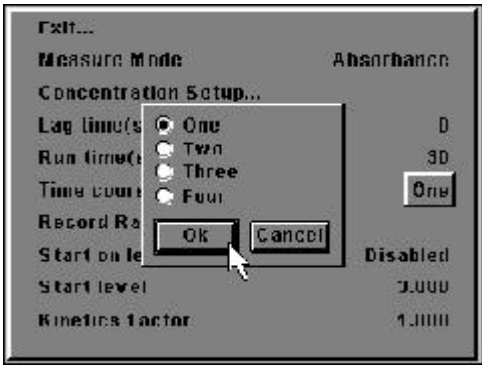
Lag Time(sec) the time (in seconds) that the instrument waits to commence taking run time readings after the user starts a kinetics measurement. If the instrument is set to start on a level, then this time is ignored. The user can specify a time interval between initiating a kinetics run and taking the first measurement between the values of 0 and 9999 seconds via the pop-up numeric keypad or directly from the instrument keypad.



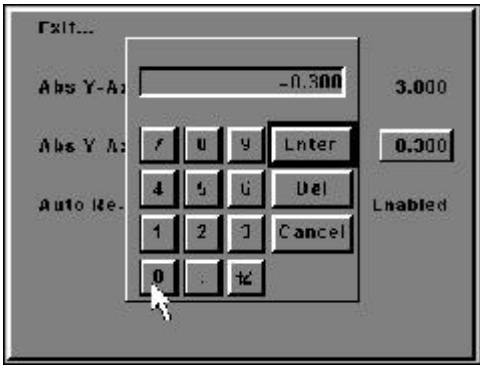
Run Time(sec) the time period over which the instrument performs the kinetics run. Results taken during this period are used for the post measurement statistical calculations. The user can specify the time taken over a period of 10 seconds (minimum) to 9999 seconds (maximum) via the pop-up numeric keypad or directly from the instrument keypad.



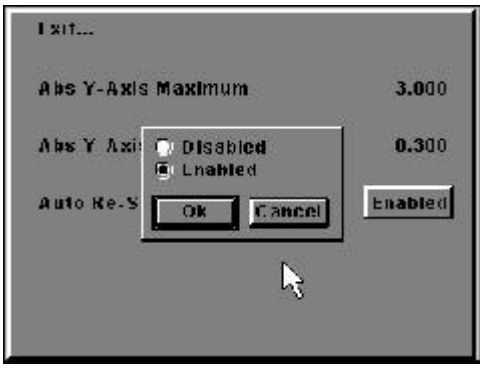
Time Course - the number of simultaneous kinetics samples that can be measured within one kinetics run.



Record Range... allows the user to specify a limit for the y-axis, or to have it calculated automatically:
Y-Axis Maximum sets the maximum y-axis value for the kinetics run about to be performed. The range of this parameter will depend on the measure mode. The required value can be entered via the pop-up numeric keypad.
Y-Axis Minimum sets the minimum y-axis value for the kinetics run about to be performed. The range of this parameter will depend on the measure mode. The required value can be entered via the pop-up numeric keypad.

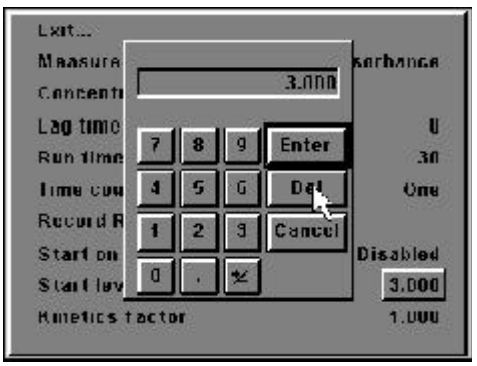


Auto Re-Scale allows the user to set whether the to use the y-axis limits set with the two previous parameters or whether to automatically scale the y-axis after a scan has been taken to maximise the available y-axis space when plotting a graph.

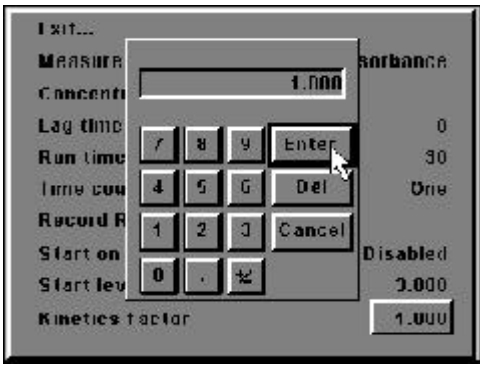


Start on level allows the user to enable or disable the option to specify if they wish a kinetics run to commence when the reading reaches a particular threshold.

Start level allows the user to specify the actual photometrics value to be used as a trigger level via the pop-up numeric keypad or directly from the instrument keypad.



Kinetics Factor - this value is multiplied by the average changing rate to give the enzyme value (EV). Values can be set via the pop-up numeric keypad or directly from the instrument keypad.

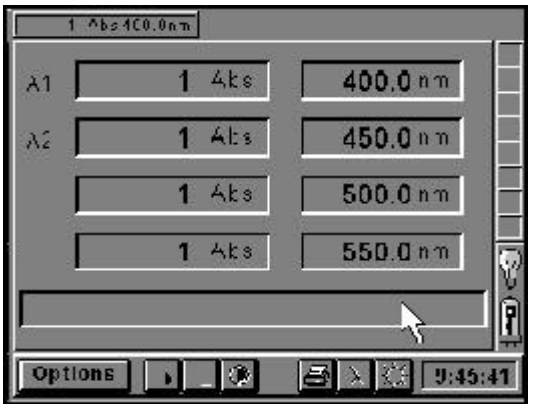


Start Run begins a kinetics run. This commences with a lag time wait, or wait for the reading to reach a user set level (if this feature is enabled). After the lag time, or when the level is reached (if enabled) then the run time commences. Readings are taken and displayed graphically at a time interval of 0.5% of the user set run time, until the total run time has expired. For example, if the run time is set to 60 seconds, readings will be taken every 1 second.

Statistics- this option will only appear when a valid kinetics run has been taken or recalled.This will allow the user to view the statistics of the current kinetics run. The statistics shown are the Initial value, Final value, Mean changing rate, Concentration and Best Fit Equation.
Toolbar options - page up and page down, cancel and exit

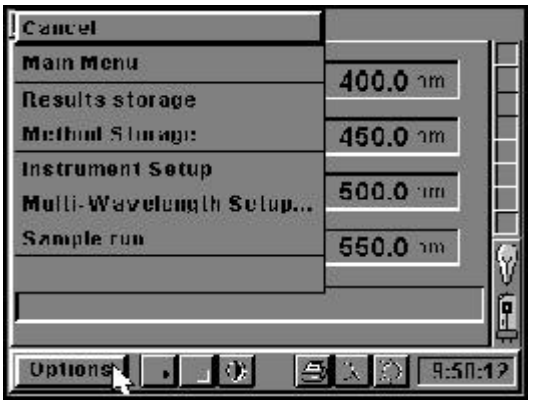
3.5 MULTI-WAVELENGTH MODE

Having selected the Multi-Wavelength Mode from the Application Main Menu the following display will be shown:



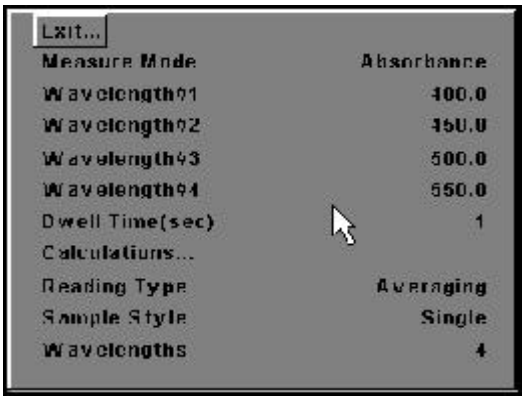
It is recommended that set up parameters be reviewed prior to performing measurements to ensure the selected measurement mode and values are correct.

Select ***Options*** and a pop-up menu will appear:



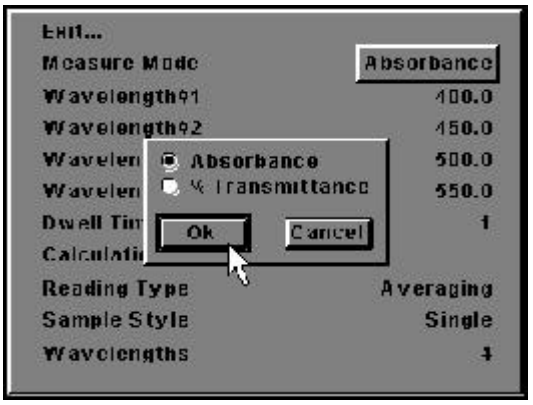
Cancel allows the user to exit this menu.
Main Menu allows the user to return to the Application Main Menu window.
Results Storage - refer to Global Setup Parameters.
Method Storage - Refer to Global Setup Parameters.
Instrument Setup allows all instrument related parameters to be adjusted.
Multi-Wavelength Setup... allows multi-wavelength specific parameters to be set up.
Sample Run initiates a sample measurement sequence. This measures the absorbance, transmittance or concentration at the first user set wavelength, followed by the measurement of the absorbance, transmittance or concentration at the second, thrid and fourth wavelength (as applicable). All measurements are displayed, together with the result of the equation determined by the "sum" setup parameter.

Select ***Multi-Wavelength Setup***:



Exit allows the user to exit this menu

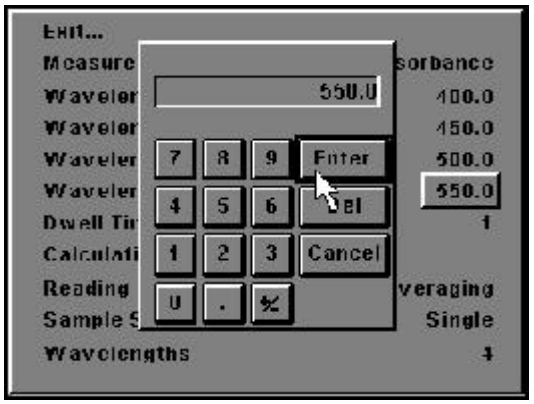
Measure Mode selects between absorbance or transmittance display of readings (at both wavelengths) and the difference and ratio displays. Measurement mode selection is made via the pop-up menu.



Wavelength #1, #2, #3 and #4

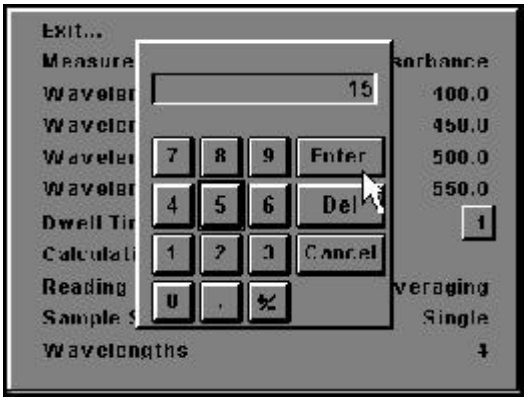
Up to four wavelength values can be set for each measurement parameter. The Primary and Secondary wavelengths can be selected using any combination e.g. Wavelength #1 as the primary and Wavelength #3 as the secondary.

Wavelength value can be set via the pop-up numeric keypad or directly from the instrument keypad.



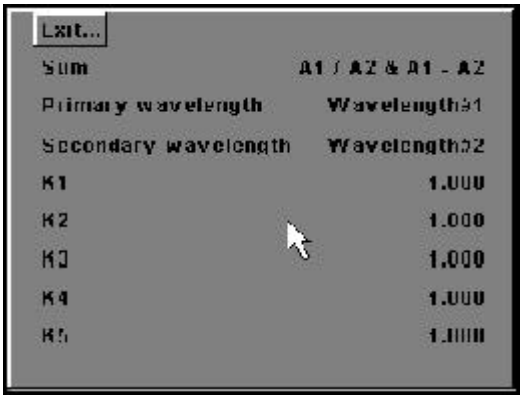
Dwell Time(sec)

The time between taking a measurement at one wavelength and moving on the next wavelength. 0-99 seconds is permissible here.



Calculations...

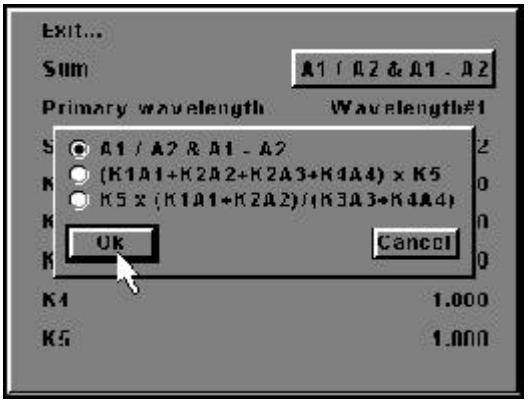
The calculations option will allow the user to specify which calculations they would like to see performed with the readings taken at selected wavelengths and with specific samples.



Sum will allow the user to specify which of the following sums is performed: Ratio and Difference will allow the user to see the ratio between any two readings - in this case the primary value divided by the secondary value, and the difference between two readings - the primary value minus the secondary value. The second option is (K1A1 + K2A2 + K3A3 + K4A4) X K5.

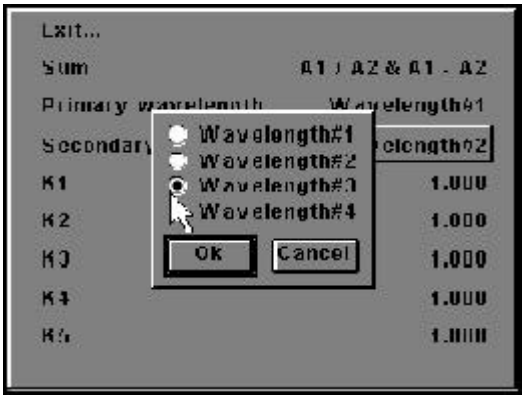
The third option is K5 X (K1A1 + K2A2) / (K3A3 + K4A4). If the number of Sample Count is less than four only the ratio and difference will be selectable.

The constants K1 to K5 are set with the options below:

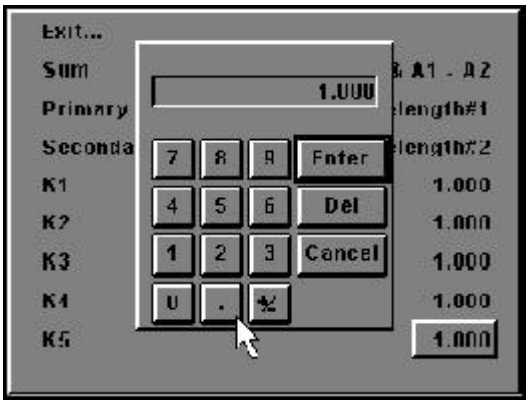


Primary Wavelength will allow the user to select which of the (up to) four wavelengths selected (using the Sample Count option) is to be used as the primary wavelength in the Ratio and Difference calculation.

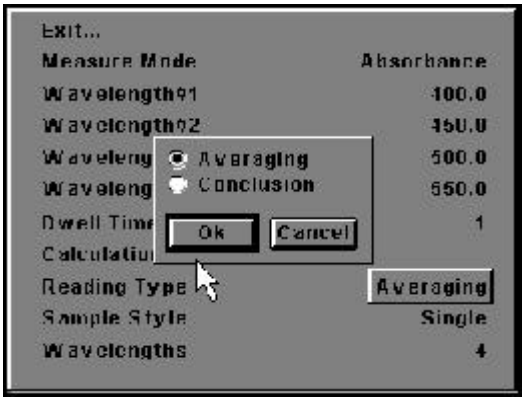
Secondary Wavelength will allow the user to select which of the (up to) four wavelengths selected (using the Sample Count option) is to be used as the secondary wavelength in the Ratio and Difference calculation. It will not be permissible to set the primary and secondary wavelengths to the same value.



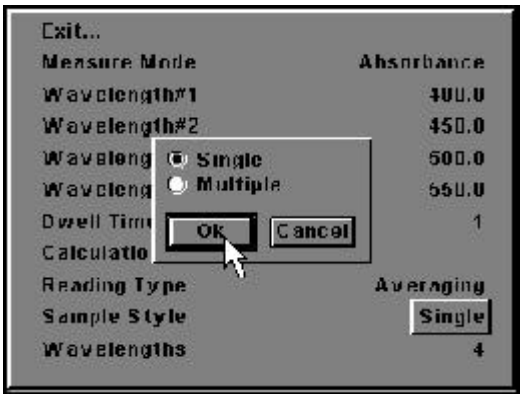
The following 5 values (between -99.9999 to 99.9999 are allowed) can be set via the pop-up numeric keypad or directly from the instrument keypad.
K1 allows the user to set the K1 constant for the calculations.
K2 allows the user to set the K2 constant, *K3* allows the user to set the K3 constant, *K4* allows the user to set the K4 constant and *K5* allows the user to set the K5 constant.



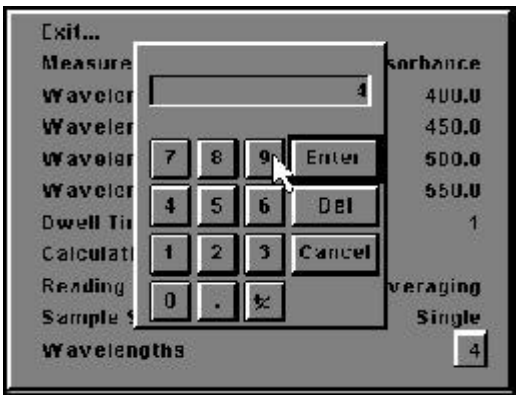
Reading Type allows the user to determine if, after the dwell time, they take the reading then or if it is averaged over all readings taken during the dwell time. The options for this parameter are Average (for taking the average reading during the dwell time) or Conclusion (for taking single sample at the conclusion of the dwell time).



Sample Style allows the user to select to measure one sample at up to four wavelengths, or to measure up to four samples at different wavelengths when the eight position cell holder is fitted. This parameter is used with *Wavelengths*, to determine how to specify how many samples to read at how many wavelengths.
The options for this parameter are Single or Multiple. For example: to measure the same sample at three wavelengths, select *Single*, set *Wavelengths* to 3 and enter the appropriate wavelengths in the fields above. To measure 2 samples at the same wavelength, select *Multiple*, set *Wavelengths* to 2 and enter the appropriate wavelengths. When used in *Multiple* mode, the samples need to be placed in positions 1 to n in the multi-position cell holder where n is the number set by the *Wavelengths* property.

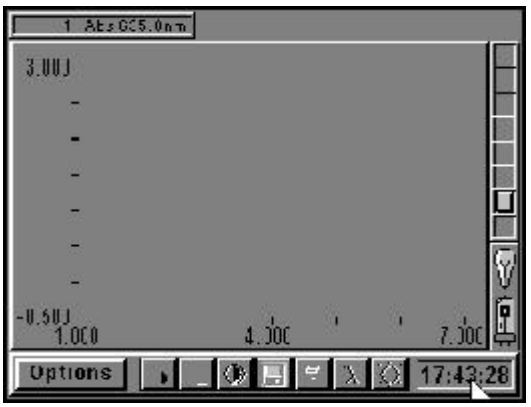


Wavelengths is used with the above parameter for determining the number of samples under test. As this mode is multi-wavelength, the minimum value permitted is 2.



3.6 QUANTITATION MODE

This mode can only be accessed when using the Multi-Cell Holder: Having selected the Quantitation Menu from the Application Main Menu the following display will be shown:

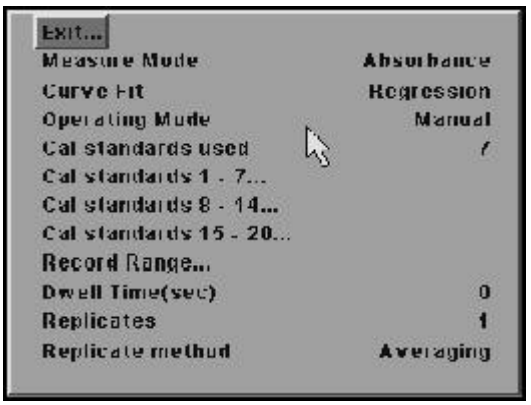


It is recommended that set up parameters be reviewed prior to performing measurements to ensure the selected measurement mode and values are correct.

Select ***Options*** and a pop-up menu will appear:

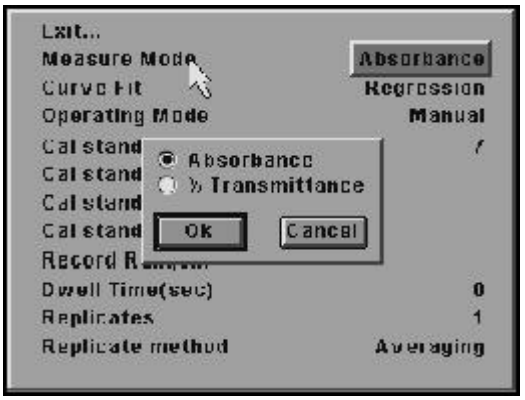
Cancel allows the user to exit this menu.
Main Menu allows the user to return to the Application Main Menu window.
Results Storage - refer to Global Setup Parameters.
Method Storage - refer to Global Setup Parameters.
Instrument Setup allows all instrument related parameters to be adjusted.
Quantitation Setup allows quantitation specific parameters to be set up.
Calibrate run - initiates a calibration.
Takeup Sample is visible here if a sipper pump is fitted. Selecting *Takeup Sample* makes the sipper pump take up the pre-calibrated amount of sample. If the sipper pump is configured to *Takeup Sample & Air*, this option will change to *Takeup Air*, otherwise it will go to *Flush*. Selecting *Takeup Air* causes the pre-calibrated air gap to be pumped. On selecting *Flush*, the sample is flushed in the pre-determined flush direction.
Initiate Auto Sampling is availble when a calibration curve has been constructed or recalled. It will perform a *Print* or *Save* of the current Quantitation reading at the specified time intervals.

Select ***Quantitation Setup***

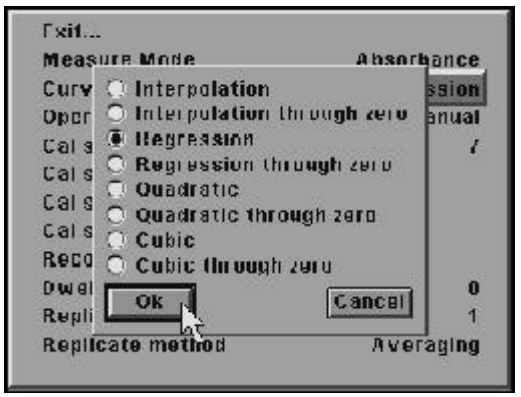


Exit allows the user to exit this menu.

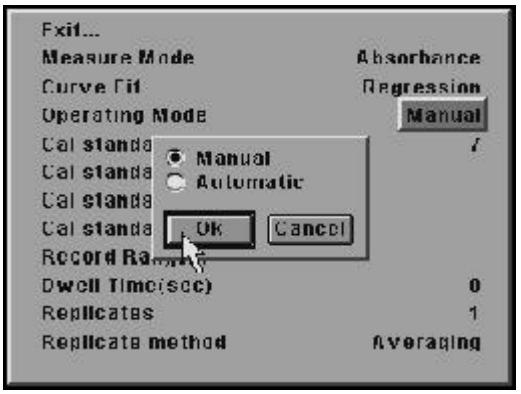
Measure Mode selects between absorbance, transmittance or concentration display on the quantitation graph Y-Axis via the pop-up menu.



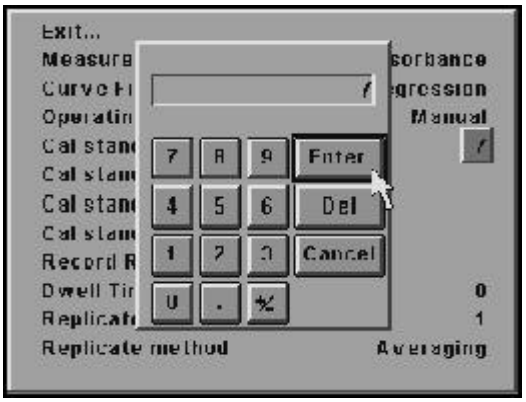
Best curve fit allows selection of the curve fit method for constructing the calibration curve. The options are linear Interpolation (straight lines between calibration points), linear Regression (line of best fit) or linear regression through zero (line of best fit that passes through point 0,0). Displayed sample concentrations are calculated from the relationship of absorbance or transmittance using the selected curve fitting method.



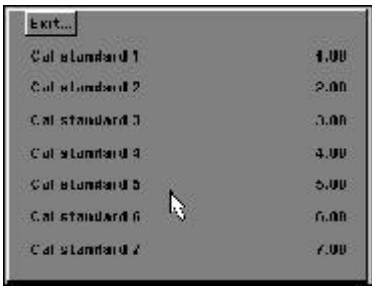
Operating Mode allows the user to specify automatic or manual operation.If no multi position cell holder is fitted, this property will constantly set to manual.

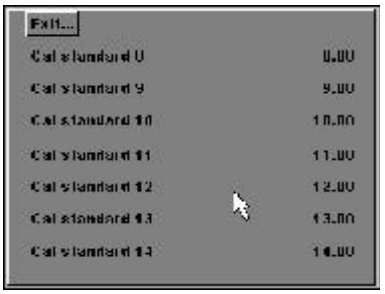


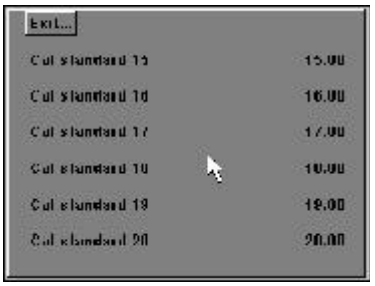
Cal standards used allows entry of the number of concentration standards that are to be used to construct the calibration curve.



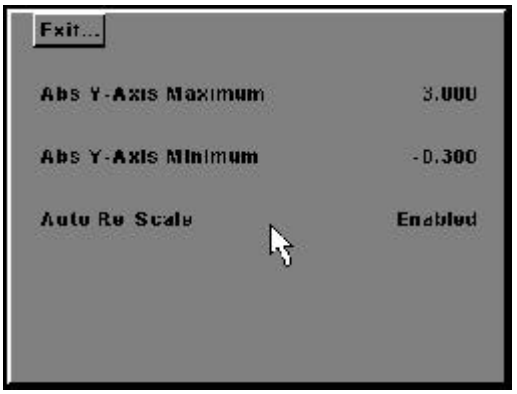
Cal standards 1 - 7... - this sub-menu allows the user to access up to the first 7 calibration standards.
Cal standards 8 - 14... - this sub-menu allows the user to access up to the 14th calibration standard.
Cal standards 15 - 20... - this sub-menu allows the user to access up to the 20th calibration standard.







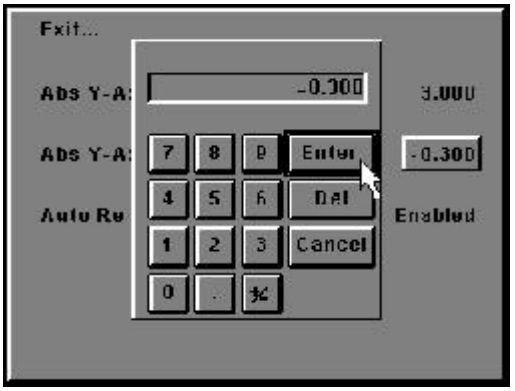
Record Range... allows access to the quantitation record range menu option which allows the y-axis range to be set.

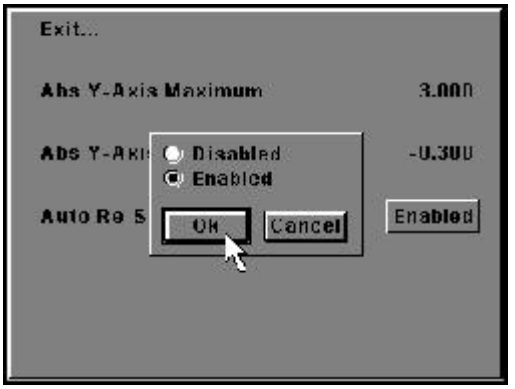


Y-Axis Maximum - the highest absorbance, transmittance or concentration (depending on the measurement mode) that is displayed on the scan axis.

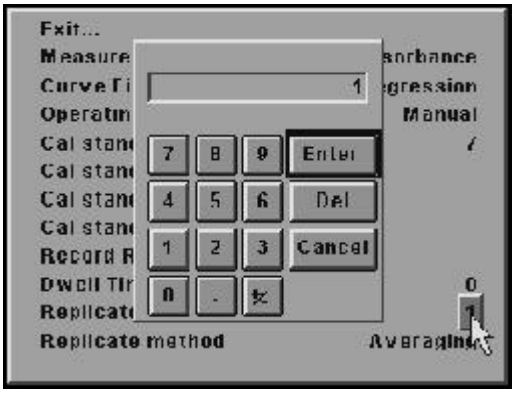
Y-Axis Minimum - the lowest absorbance, transmittance or concentration (depending on the measurement mode) that is displayed on the scan axis.

Auto Re-scale - this feature can be turned on or off. When auto re-scale is set to "on", the instrument will automatically change the Y-Axis minimum and maximum points to display the scan to its greatest resolution. If set to "off" the Y-Axis will use the user set maximum and minimum points. Selection is made via the pop-up menu.

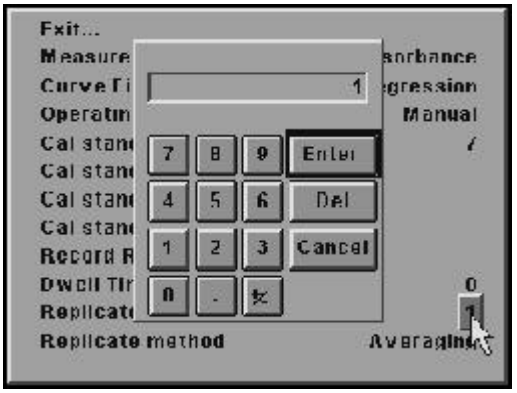




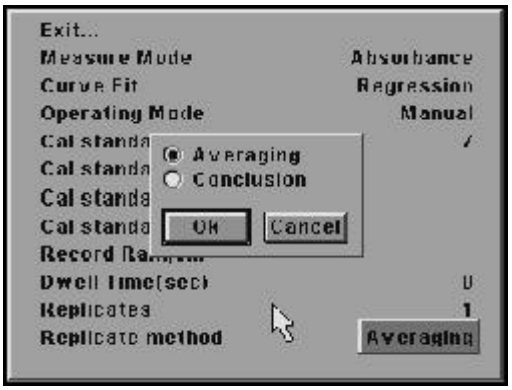
Dwell Time allows the user to specify a time for the instrument to dwell on a particular sample. This value can be between 0 and 99 seconds. The value taken at the end of this dwell period can be either averaged over the dwell period or the final reading taken.



Replicates allows the user to specify if they wish to create the calibration curve based on up to 5 replicates using the average of the (up to) five readings. The replication of sampling takes place after a complete set of samples has been taken. So, if 20 calibration points have been selected with 5 replicates, there could be around 100 sample changes occurring in the calibration process. If no replicates are required, a value of 0 can be entered here.



Replicate Method allows the user to specify between Averaging (average readings) or Conclusion (final value).



3.7 GOOD PRACTICE GUIDELINES

1. For optimum performance blank and sample calibration should be carried out at the beginning and end of every sample batch.
2. To ensure accurate results are obtained the sample area lid should be kept in the closed position during measurement.
3. The styrene cuvettes are disposable (i.e. ideally they should be used once and thrown away). Some repeat use is possible providing extreme care is taken during cleaning to ensure no damage occurs to the polished surface.

   NOTE: The standard plastic cuvettes are not suitable for use below a wavelength of 310nm. Other grades of UV plastic cuvettes can be used down to 275nm. If the unit is being used below this wavelength, UV grade quartz glass cuvettes must be used.
4. UV quartz glass cells should be used for measurements below 310nm.
5. Plastic cuvettes are not suitable for use with organic solvents.
6. Glassware used in the preparation of standards should be made of a high grade borosilicate glass. The use of soda glass should be avoided wherever possible as leaching can occur during prolonged contact, giving erroneous results.
7. Glass cuvettes should be thoroughly cleaned after use. Discard when scratches become evident in polished surfaces.
8. Chemical reagents should, wherever possible be of high grade quality. Contamination can cause problems, even at very low levels. Diluents (i.e. water or solvents) must be free from impurities.
9. There are some substances which do not follow Beer's Law. When attempting a new method it is advised that linearity checks should be performed over the range of concentrations being used. This can be carried out by preparing a quantity of known strength solutions and checking the results.

   a) Deviations from Beer's Law may occur at high concentrations by association of molecular ionic species.
   b) Deviations from Beer's Law may occur at low concentrations by variation in hydration, introducing changes in the nature of complex ions.
   c) Absorption which does not obey Beer's Law will require a graph of known standards to be plotted. This should indicate Reading vs Concentration. The reading obtained from the unknowns can then be related to the concentration from the graph.

10. Samples and standards can "outgas" when left in the cuvette. Bubbles formed on the cuvette walls will cause reading errors.
11. When entering the SPECTRUM mode it is recommended that a baseline scan should be carried out.

SECTION 4

MAINTENANCE

4.1 GENERAL

The 6500/6505 are designed to give optimum performance with minimal maintenance. It is only essential to keep the external surfaces clean and free from dust. The sample area lid should be kept clean and 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 (640 133). For longer term storage or re-shipment, it is recommended that the unit be returned to the original packing case.

NOTE: The 6500/6505 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 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.

4.2 TUNGSTEN HALOGEN LAMP REPLACEMENT

If the lamp fails during operation the lamp symbol on the right hand side of the display will extinguish. Replacement tungsten halogen lamps are available from the Manufacturer or your local Distributor.

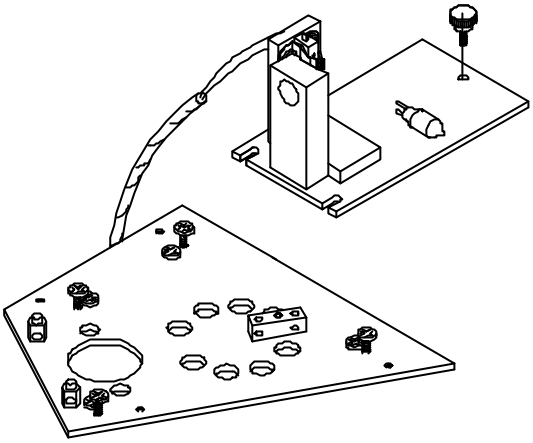
CAUTION: The following safety precautions should be observed prior to attempting the light source replacement procedure:

1. **The lamp runs at high temperatures, therefore, care should be taken to allow the lamp and mounting parts to cool prior to handling.**
2. **Do not touch the glass envelope when fitting the lamp as finger marks will damage the lamp. Should accidental finger marks occur, the surface of the lamp may be cleaned carefully using iso-propyl alcohol.**
3. **A supply of 400 volts is present. All normal safety precautions must be observed.**

1. Disconnect the unit from the mains supply. Access to the tungsten halogen lamp can be gained via the lamp access panel located at the rear of the unit. Lamp replacement should be carried out by removing the 4 slot head screws from the panel.
   NOTE: The panel is attached to the unit case via a short earthing cable. Do not strain or attempt to remove this cable.

2. To remove the lamp carrier assembly loosen off the thumbscrew and carefully withdraw the complete assembly, as far as the connecting wires will allow.

3. Remove the old lamp from the ceramic base and discard safely.



4. Carefully remove the new lamp from it's box and cut the end of the protective plastic sleeve. Gently slide the lamp to this end and whilst holding the lamp by the plastic sleeve, insert into the ceramic base, taking care to push the lamp fully home.

5. Carefully remove the plastic sleeve.

6. Refit the lamp carrier assembly into the rear panel compartment, making sure the lamp carrier slots into the appropriate spigots on the lamp housing base.

7. Refit the lamp access panel to the rear of the unit, taking care not to trap the earthing cable in the casework. Secure into position using the 4 fixing screws.

4.3 DEUTERIUM LAMP REPLACEMENT

The deuterium lamp has an extended life of 2000 hours. Should the lamp need to be replaced the following procedure should be carried out:

If the lamp fails during operation the front panel symbol will extinguish.

Replacement deuterium lamps are available from the Manufacturer or your local Distributor.

CAUTION: The following safety precautions should be observed prior to attempting the light source replacement procedure:

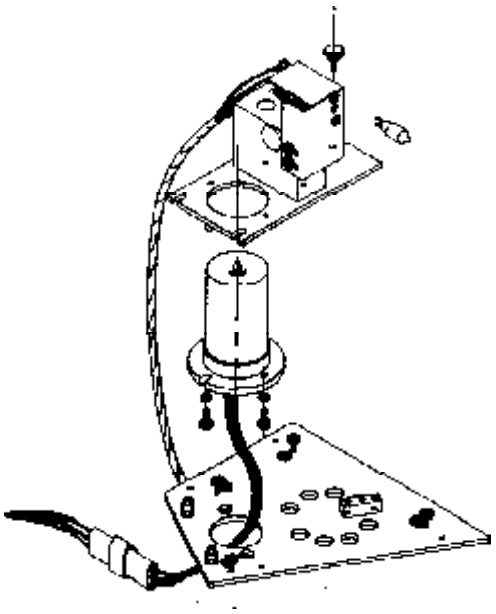
1. **The lamp runs at high temperatures, therefore, a heat resistant glove should be worn.**
2. **Safety glasses must be worn when UV emissions are present.**
3. **Protective gloves should be worn when handling the replacement lamp to prevent damage from finger marks.**
4. **A supply of 400 volts is present. All normal safety precautions must be observed.**

1. Disconnect the unit from the mains supply. Access to the deuterium lamp can be gained via the lamp access panel located at the rear of the unit. Lamp replacement should be carried out by removing the 4 slot head screws from the panel.

NOTE: The panel is attached to the unit case via a short earthing cable. Do not strain or attempt to remove this cable.

2. To remove the lamp carrier assembly loosen off the thumbscrew and carefully withdraw the complete assembly, as far as the connecting wires will allow.

3. The deuterium lamp is attached to the lamp carrier by a white connecting socket and 2 fixing screws on the under side of the lamp. Carefully turn the plate, taking care not to strain any of the wires, and disconnect the lamp from the white connecting socket. Remove the 2 fixing screws from the lamp and place carefully to one side. Remove the lamp from the carrier and dispose of safely.



4. Carefully remove the new lamp from it's box and carefully fit into the lamp carrier, noting the position of the locating spigot. Secure into place using the 2 fixing screws. Refit the plug into the white connecting socket.

5. Refit the lamp carrier assembly into the rear panel compartment, making sure the lamp carrier slots into the appropriate spigots on the lamp housing base.

6. Refit the lamp access panel to the rear of the unit, taking care not to trap the earthing cable in the casework. Secure into position using the 4 fixing screws.

SECTION 5

ACCESSORIES

5.1 ACCESSORIES

The following list of items are available for use as optional accessories for use with the 6500/6505 as specified:

Order Code	Description
641 001	Printer Unit Assembly
060 287	Printer Paper Roll - qty 1
060 288	Printer Ribbon - qty 1
642 001	Sipper Pump Assembly
643 001	(Peltier) Heated Cell System European 230V - comprising heated cell block and external power supply module.
643 031	(Peltier) Heated Cell System U.S. 115V - comprising heated cell block and external power supply module.
644 001	Eight position motorised multi-cell changer
645 001	Vacuum Pump
645 100	Vacuum Pump Tubing Kit
035 026	Pour in/suck out Cell
646 001	Universal Test Tube Holder
060 331	12mm dia. x 75mm Glass Test Tubes - Pack 100
060 179	12mm dia. x 75mm Plastic Test Tubes - Pack 100
060 335	24mm dia. x 150mm Glass Test Tubes - Pack 50
647 001	(Peltier) Heated Sipper Pump System European 230V - comprising heated cell block for flow-through cells and external power supply module.
647 031	(Peltier) Heated Sipper Pump System U.S. 115V - comprising heated cell block for flow-through cells and external power supply module.

The 5 accessory items listed below are for use with the standard Sipper Pump 642 001 & the Peltier Heated Systems 647 001 / 647 031:

642 100	Sipper Pump Tubing Kit
035 025	Visible Flow-through Cell 1.8ml
035 045	Visible Flow-through Cell 80µl
035 044	UV Flow-through Cell 1.8ml (6505)
035 047	UV Flow-through Cell 80µl (6505)

Order Code	Description
644 003	Eight Cell Rack for 10mm Cells
Special	Eight Cell Rack for 40mm Cells
648 001	Water Heated Single Cell Block
037 001	External Peltier Cooler for use with 648 001, 4-50ºC ±0.2º, 230V
037 302	External Peltier Cooler for use with 648 001, 4-50ºC ±0.2ºC, 110V
037 201	Water Refridgerant (Circulator) for use with 648 001, -20-+50ºC, 230V
037 202	Water Refridgerant (Circulator) for use with 648 001, -20-+50ºC, 110V
630 005	Universal Cell Holder (20 to 100mm path length)
035 027	Visible (glass) 10mm path length Cell
035 028	UV (quartz) 10mm path length Cell (6505)
035 086	Visible (glass) 20mm path length Cell
035 029	Visible (glass) 40mm path length Cell
035 030	UV (quartz) 40mm path length Cell (6505)
035 087	Visible (glass) 50mm path length Cell
035 079	Visible (glass) 100mm path length Cell
035 078	Plastic 100mm path length Cell - Pack 100
060 229	Plastic standard Cuvettes (3.5ml) - Pack of 500
060 230	UV Plastic standard Cuvettes (3.5ml) - Pack of 100 (6505)
060 232	UV Plastic standard Cuvettes (3.5ml) - Pack of 500 (6505)
060 087	Plastic semi-micro Cuvettes (1.6ml) - Pack of 100
060 231	UV Plastic semi-micro Cuvettes (1.6ml) - Pack of 100
035 088	Visible Calibration Standards
035 091	UV/Visible Calibration Standards (6505)
542 009	Interface Cable Kit
640 133	Dust Cover

SPARES

Order Code	Description
012 075	Tungsten Lamp - 1
640 508	Deuterium Lamp (with plug fitted) - 1

SECTION 6

INTERFACING

6.1 SERIAL INTERFACE

The 6500/6505 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.

The RS232 serial interface allows data to be read from the 6500/6505 by sending simple ASCII character commands. Similarly, this interface can also be used to remotely operate the basic functions of the instrument. There are two levels of commands which can be sent to the instrument:

1. Single ASCII character commands, which instruct the instrument to send back data. These commands can be used during normal operation of the instrument at any time and are detailed in Table 1.

2. Commands that are terminated by the ACSII carriage return character. These commands can be used to remotely control the instrument and are only acted upon when the instrument is put into remote control mode. Remote control mode is enabled by sending an ASCII R followed by a carriage return (<cr>) *when the instrument is displaying in the operating mode menu.* Table 2 details the remote control commands.

Table 1 - Normal Operation Serial Commands

Command	Action	Serial Response	Notes
D or D	Print displayed reading	Dependent on instrument operating mode	Same function as pressing the print key.
V or v	Request photometrics voltage	xxxx.xxx<cr>	Returns a voltage (mV) proportional to optical transmission.
W or w	Request wavelength	xxx.x<cr>	Returns the current wavelength (nm).

Table 2 - Remote Control Mode Serial Commands (<cr> is ASCII carriage return)

Command	Action	Serial Response	Notes
R<cr>	Enter remote control mode	none	Switches the instrument into remote control mode. This command is only accepted when the instrument is displaying the operating mode menu. Instrument display will indicate remote control mode enabled.
X<cr>	Exit remote control mode	none	Returns the instrument to normal keypad operation.
Gxxx.x<cr>	Go to wavelength	none	Sets the wavelength to the value of xxx.x in the command string.
ZA<cr>	Zero absorbance	none	Calibrates the current wavelength to zero absorbance (100%T).
ZT<cr>	Zero transmittance	none	Calibrates the current wavelength to 0%T (dark calibration).
A<cr>	Request absorbance	xx.xxx<cr>	Returns the current absorbance value, based on the last photometrics calibration.
T<cr>	Request transmittance	xxx.x<cr>	Returns the current transmittance based on the last photometrics calibration.
C<cr>	Request concentration	xxxx.xxx<cr>	Returns the current concentration based on the last photometrics calibration and concentration factor and offset values.
CO±xxxx.xxx<cr>	Set concentration offset	none	Sets the concentration offset (±9999.99) to the value specified by ±xxxx.xxx in the command string.
Fxxxx.xx<cr>	Set concentration factor	none	Sets the concentration factor (9999.99) to the value specified by xxxx.xx in the command string.
PB<cr>	Perform a baseline scan	none	Acquires a spectrum baseline scan over the operating wavelength of the instrument.
SBxxx.x<cr>	Set the scan start wavelength	none	Sets the start wavelength for a spectrum scan to the value specified in xxx.x in the command string.
SExxx.x<cr>	Set the scan end wavelength	none	Sets the end wavelength for a spectrum scan to the value specified by xxx.x in the command string.
SIx.x<cr>	Set the scan wavelength interval	none	Sets the spectrum scan interval to the value specified by x.x in the command string.Valid intervals are 0.2, 1.0 and 5.0 nm.

Command	Action	Serial Response	Notes
SMA<cr>	Set the scan measurement mode to absorbance	none	Scans will return absorbance values
SMT<cr>	Set the scan measurement mode to transmittance	none	Scans will return transmittance values
SS<cr>	Start scanning	www.w,xxx.xxx<cr>	Returns the wavelength (www.w) and absorbance or transmittance xxx.xxx at each scanned point as specified by the current scan start wavelength, scan end wavelength, scan interval and scan measurement mode.
SP<cr>	Scan pause	none	Pause the current scan.
SR<cr>	Resume scan	none	Resume a paused scan.
SA<cr>	Abort scan	none	Abort the current scan.
UV0<cr>	Deuterium lamp off	none	Turns the deuterium lamp off.
UV1<cr>	Deuterium lamp on	none	Turns the deuterium lamp on.
SC<cr>	Close the dark shutter	none	Closes the dark shutter to block light entering the sample chamber.
SO<cr>	Open the dark shutter	none	Opens the dark shutter to allow light to enter the chamber.
ACxxx,yyy,zzzz<cr>	Accessory control	xxx,yyy,zzzz<cr>	Allows remote control of active accessories. Contact Jenway for details of the accessory control commands.

6.2 RS232 OUTPUT

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 6500/6505
RXD 3	- OUTPUT FROM 6500/6505
RTS 4	- LINKED TO CTS
CTS 5	- LINKED TO RTS
DSR 6	- OUTPUT FROM 6500/6505
DCD 8	- OUTPUT FROM 6500/6505
DTR 20	- INPUT TO 6500/6505 (must be active)
GND 7	

Suggested interconnections are detailed below:

6500/6505		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

6500/6505		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.

6.3 RECORDER OUTPUT

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

Transmission	1mV per 0.1%T
Absorbance	1mV per 0.001ABS
Concentration	1mV per concentration unit

SECTION 7

WARNING AND ERROR MESSAGES

a) Messages relating to Power On Self Test

Warning - Default Operating Parameters Have Now Been Loaded
This warning is reported during the power-on system tests if the instrument detects that data stored in the system non-volatile memory is no longer valid. This may occur if the instrument has not been used for several months, or if the battery backup supply is not functioning correctly. The instrument will operate as normal after this warning is reported, but all system parameters will be restored to their default settings and any stored data lost. The instrument requires a user key press to clear the warning message and proceed with the remaining system tests.

Warning - Tungsten Lamp Failure
This warning is reported when the instrument detects that the tungsten lamp has failed.

Warning - Deuterium Lamp Failure
This warning is reported if the deuterium lamp fails to strike during the power-on system tests. The warning message can be cleared by pressing a key, and will allow the instrument to operate in the visible spectrum as normal. Once the warning message has been cleared, the instrument will continue to attempt to strike the deuterium lamp (as a deuterium lamp ages, it is possible that the time allowed for the lamp to strike during the UV lamp test will be insufficient).

Error - Dark Level Too High
During the system tests, the instrument reads the zero transmittance (dark) level. This error will be displayed if the level is above a pre-set threshold. The most likely cause is that the sample chamber has been left open. The test can be repeated by pressing a key. The instrument cannot be operated until this test has been successfully completed.

Critical Error- Calibration Data Failure. **Please consult your dealer**.
This error is reported if the instrument detects that the calibration data required for accurate measurements has been corrupted or cannot be read. This information is stored on the detector board. Therefore, this error will occur if an internal connector has failed, or if there has been a failure on the detector board. The instrument cannot be operated if this error is detected.

Critical Error - Wavelength Failure. **Please consult your dealer**.
This error occurs if the instrument cannot perform a successful wavelength calibration by finding the peak transmittance at 0nm as part of the power-on system test. The error is associated with a serious system failure probably caused by failure of an internal connection to the monochromator or associated control circuitry. The instrument cannot be operated if this error is detected.

Remote Control Enabled... Select Ok to Resume Normal Operation...
This message is displayed on the operating mode menu display when the instrument is put into remote control mode. In remote control mode, the instrument is controlled by commands sent over the RS232 serial interface rather than via the keypad. Remote control mode can be disabled by the appropriate serial command or by pressing the Enter key. The instrument will then operate as normal via the keypad.

Unable to Acquire Peak Light Level
During the wavelength calibration system test, the instrument finds the peak transmittance at 0nm. This error is reported if the 0nm peak transmittance does not exceed a pre-set threshold. The most likely cause is that a sample has been left in the sample chamber that absorbs too much zero order light, or that the tungsten lamp has failed. The test can be repeated by pressing a key if the cause of the failure has been corrected. The instrument cannot be operated until this test has been successfully completed.

Dark Level Too High
This error occurs during a photometrics calibration when the instrument is calibrating to zero transmittance (dark). If the light level is above a pre-set threshold, normally caused by leaving the sample chamber open, then the calibration is aborted and this message displayed. Since the instrument calibrates zero transmittance by blocking the monochromatic light entering the sample chamber using a solenoid, it is possible that failure of this mechanism will also cause this error.

b) Photometrics, Spectrum, Multi-Wavelength, Kinetics and Quantitation Modes

Dark Level Too High
This error occurs during a photometrics calibration when the instrument is calibrating to zero transmittance (dark). If the light level is above a pre-set threshold, normally caused by leaving the sample chamber open, then the calibration is aborted and this message displayed. Since the instrument calibrates zero transmittance by blocking the monochromatic light entering the sample chamber using a solenoid, it is possible that failure of this mechanism will also cause this error.

Light Level Too Low
This error occurs during a photometrics calibration when the instrument is calibrating to 100% transmittance (zero absorbance). If the light level is below a pre-set threshold then the calibration is aborted and this message displayed. This usually occurs if the blank sample has high absorbance at the current wavelength, for example, if a sample has inadvertently been left in the sample chamber instead of the blank standard. This error can also occur if the lamp has failed, or, in the case of the 6405, if the deuterium lamp has failed to strike or is in the process of warming up (deuterium lamp symbol flashing).

c) Photometrics Mode

Calculated Factor Outside Limits
This error is reported when the resulting multiplication factor required for a photometrics mode concentration calibration is calculated to be outside of the instrument limits.

d) Spectrum Mode

An Invalid Scan Range Has Been Entered
This warning message occurs when one of the parameters that defines the scan range and scan interval is set to a value that cannot be scanned or which is beyond the scanning range of the instrument. For example, the instrument cannot scan between 540nm and 544nm at 5nm intervals (the interval must be less than the scan range, in this example, either 1nm or 0.2nm). Similarly, if the scan start or end wavelength will not be reached at the scan interval, then the instrument changes either the start or end wavelength to fall on an exact number of scan intervals. For example, with a scan interval set to 1nm, and the start wavelength set to 540.5nm, an attempt to enter an end wavelength of 640nm will produce an invalid scan range warning, and the end wavelength will be changed to 640.5nm.

e) Multi-Wavelength Mode - please refer to a)

f) Quantitation Mode

Insufficient Run Data to Generate Statistics
This warning message is displayed if the user aborts a quantitation calibration before two or more calibration points have been performed. The instrument cannot construct a calibration curve with less than two calibration points so will display a blank axis.

h) Accessories

This Operation is Unavailable Whilst Continuous Pumping is Enabled
This message is displayed if the sipper pump accessory is fitted and the user attempts to take up a sample (or flush) when the sipper pump has been set to continuous pumping (from within the sipper pump set-up menu).

Still Pumping...
This message is displayed if the sipper pump accessory is fitted and the user attempts to perform a sipper pump operation before the sipper pump has completed the last operation. For example, if the user selects the flush menu option whilst the sipper pump is still taking up the sample.

Thank you for reading this data sheet.

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

UK Office
Keison Products,
P.O. Box 2124, Chelmsford, Essex, CM1 3UP, England.
Tel: +44 (0)330 088 0560
Fax: +44 (0)1245 808399
Email: sales@keison.co.uk