Model 6315
Spectrophotometer

Operating Manual

631 550 / REV A/08-08

Safety

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

1. The Model 6315 spectrophotometer is designed for operation by **trained personnel** that are aware of the principles and applications involved. For further help and advice please contact your local distributor,

2. The Model 6315 spectrophotometer is a sensitive electronic and optical instrument designed for use in a laboratory environment. Careful adherence to the installation instructions must be observed. If in doubt contact a **relevant and competent authority** for advice before proceeding.

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

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

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

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

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

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

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

Contents

Section 1

Introduction

1.1 Instrument Description

The Model 6315 is a general-purpose UV/visible range spectrophotometer suited to a wide variety of applications in Education, Quality Control, Environmental and Clinical analysis. The Model 6315 offers a wide range of features and functions including:

- Photometric measurements in Absorbance and Transmittance
- Concentration measurements by direct factor entry or against a blank and standard
- Quantitation using up to 6 standards including calibration curve display
- Kinetics with real time graphical display of sample and standard runs
- Spectrum scanning over any range from 198 to 1000nm with peak and valley identification
- Method storage for up to 50 methods in each mode (except photometrics)

The novel customisable menu system enables the functions that are not immediately required to be hidden; thus simplifying operation and reducing the opportunity for error. A supervisor security code can be used to restrict access to the set-up menus ensuring that correct and uncorrupted methods are always used. The fully open operating system ensures compatibility with reagent kits from most manufacturers, as well as enabling full customisation to the operator's choice of chemistries and operating procedures.

The Model 6315 is based on the established and successful Model 6300. The optical system is controlled by the microprocessor with a stepper-motor driven grating and automatically selected stray light and second order filters. A long-life pulsed xenon lamp is used and the optics optimised to cover the wavelength range of 198 to 1000nm with a spectral bandwidth of 8nm.

1.2 Display and Controls

The Model 6315 uses a dot matrix LCD to enable spectrum and kinetic graphics to be displayed smoothly and clearly, this also enables a flexible menu operating system to be used. Further advantages can be seen in the enhanced display of results and the use of 'pop up' message and information boxes. The keypad used on the Model 6315 offers a simple but effective method of navigating the menu system, making selections, entering values, recording and storing results and methods.

1.3 Outputs

The Model 6315 has both analogue and serial RS232 outputs.
The analogue output can be used to drive chart recorders with a real time output of the value displayed on the spectrophotometer, it can also be used as an input to analogue data loggers or other monitoring or control devices that require an analogue signal. Detail of the output voltage level is given in Section 11.2.
The RS232 output can be used for connection to serial printers, PCs and other computing devices. For many applications the serial interface cable supplied may be suitable, if in doubt seek competent advice, connection and configuration data is given in Section 11.3.

1.4 Sampling Accessories

The programmable sipper pump option makes sample handling simple and safe, while the choice of either water or electrically heated cell holder options ensures that the optimum sample conditions are maintained throughout analysis. (See section 10.1 for more details.)

A long path-length cuvette holder can easily be fitted to replace the standard 10x10mm cuvette holder. This enables cuvettes up to 100mm in path-length to be used. A full range of test tube holders is available that will cater for tubes from 12mm to 25mm diameter.

Cuvettes suitable for all applications are available including, disposable plastic, glass and quartz versions to cater for macro, semi-micro and micro sample volumes. Flow through and pour-in suck-out cuvettes are also available for automated sample handling.

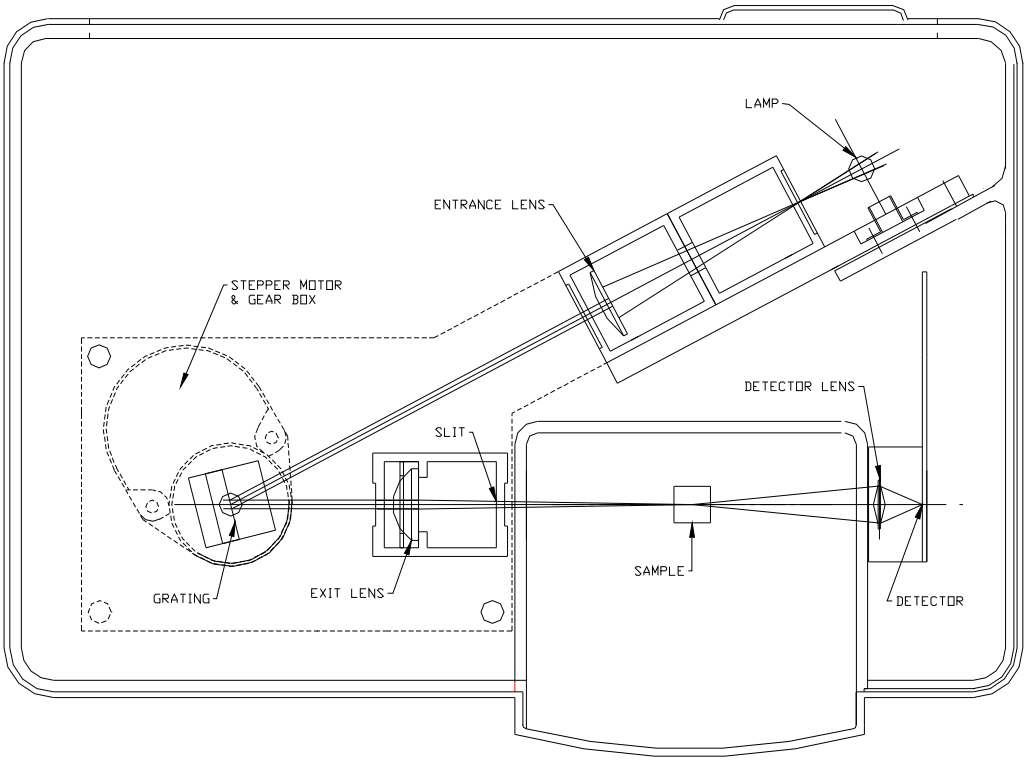


Figure 1. Optical Layout

The optical layout of the Model 6315 spectrophotometer showing the lamp with the light focussed onto the grating. The monochromatic light is then shown passing through the sample chamber, from left to right, before reaching the detector.

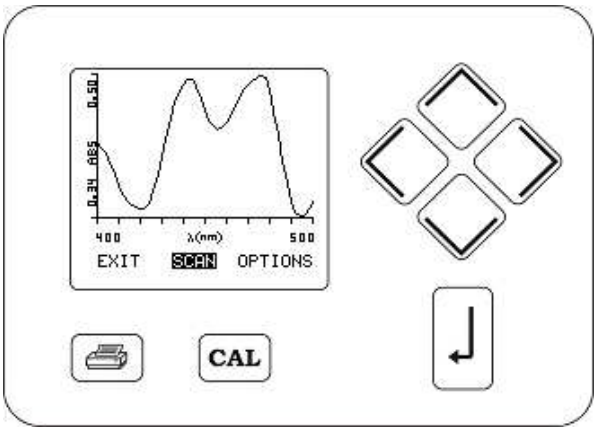


Figure 2. A spectrum scan

The Model 6315 spectrophotometer keypad and display showing a spectrum scan:

1.5 Good Practice Guidelines

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

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

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

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

    a) Plastic disposable cuvettes should be used ONCE only.

    b) Glass cuvettes should be thoroughly cleaned after use. Discard when scratches become evident in optical surfaces.

    c) Care should be taken when selecting semi-micro or micro cuvettes. The cuvette window on the inner chamber (the area filled with sample) must be wider than the aperture in the sample holder or light will reach the detector without passing through the sample. In this case, semi-micro or micro cuvettes with self-screening black surrounds must be used or, alternative holders for these cuvettes fitted.

    d) Glass test tubes and other sample tubes should be used with care. Where possible, matched tubes should be used and any index mark set to the correct position before measurements are made.

    e) Ensure any sample containers used are compatible with the constituents of both the samples and standards they are to hold. i.e. Plastic cuvettes are not compatible with organic solvents.

f) All sample containers must be handled with care; by the top and non-optical surfaces only. Any finger marks evident must be removed using a suitable cleaning process.

g) Flow-through cuvettes must be selected with care and consideration for the sample type, sample volume, pumping system, rinse, sample and waste handling to be used.

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

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

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

8. All measurements require calibration to a blank, for maximum accuracy this should be prepared with care using the same deionised water or solvent used for dissolving or diluting the sample. Where reagents are added to the sample to produce a colour proportional to its concentration a ‘sample based’ blank should be used. In this case the blank should consist of the sample plus any reagents or chemicals to be used, ***except*** those that produce the colour to be measured.

9. Deviations from the Beer-Lambert Law may occur at high and low concentrations giving non-linear response during sample concentration measurements. For all new methods a linear range should be defined by the preparation of a calibration curve. The quantitation mode may be used to construct such a curve against which sample results are automatically measured.

10. Cuvettes and sample holders must be filled to a minimum level, which covers the light path.

Section 2

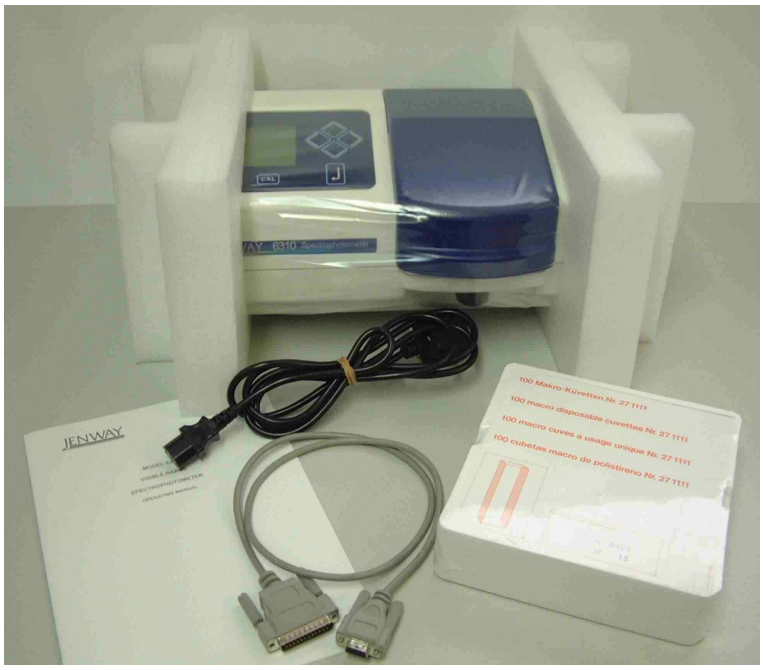
Getting Started

2.1 Unpacking

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

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

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



Unpacking the Model 6315

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

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

2.2 Installation

2.21 Location

The Model 6315 must be positioned within 1.5 meters of an electric supply socket.

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

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

2.22 Supply Voltage

The Model 6315 is designed for operation on 115V or 230V ac supplies at 50 or 60Hz. To ensure that the spectrophotometer is correctly set for the local supply the indicator shown on the fuse holder on the rear panel should be checked. (See diagram opposite).

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

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

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

Fuse rating – 2A ‘F’ (fast blow type)

In the event of the fuse failing after replacement it is advisable to consult with the Manufacturer or your local Distributor before proceeding further.

Replace the fuse holder in the mains input socket on the rear panel.

2.23 Mains Connections:

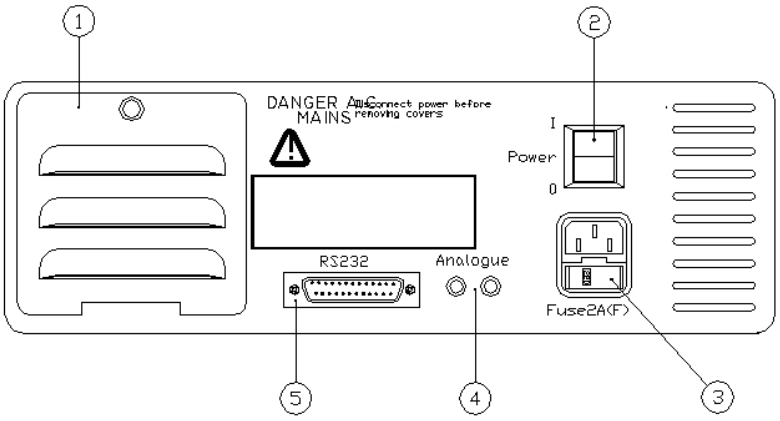
The mains cable supplied may be fitted with a moulded plug suitable for the local supply socket, where this is not the case a suitable plug will need to be fitted.

Note: The wires in the mains cable 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 must be connected to a properly grounded terminal.

2.24 Rear Panel Layout



1. Lamp Access Panel	Allows access to the pulsed xenon lamp when replacement is necessary.
2. Rocker Switch	On/Off switch for the unit.
3. Power In Socket	IEC type connection socket for mains cable.
4. Output Sockets	Analogue output.
5. Output Socket	Output socket for (25 way) RS232.

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

2.25 Power on and Self-Tests

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

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

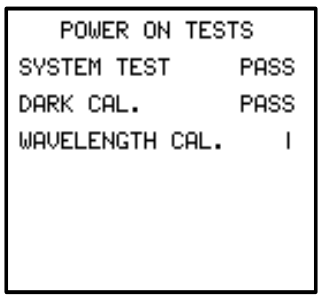
Switch on the supply socket, then the instrument, using the Power switch located on the rear panel.

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

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

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

Should a problem occur during the self-tests an information or error support message will be displayed. To resolve any problems first follow the error support message, if this fails to fix the problem refer to the troubleshooting section in this manual.



Start up tests in progress

Main Menu Display

Error Support Message

Section 3

Instrument Settings

3.1 Time, Date and Language

With the Main Menu displayed, press the *down* arrow key to move the highlight on the display to cover **INSTRUMENT SETUP**, then press the *enter* key.

3.11 Time Setting

1. Press the *down* arrow key to highlight **TIME** and press the e*nter* key.
2. Use the *up* and *down* keys to set the highlighted digit of the time to the correct value. Use the *right* and *left* arrow keys to highlight each digit in turn for adjustment with the *up* or *down* keys until the correct time is set. The clock uses the 24-hour system.
3. Press the *enter* key to confirm the setting.

3.12 Date Setting

1. Press the *down* arrow key to highlight **DATE** and press the *enter* key.
2. Use the *up* and *down* keys to set the highlighted digit of the date to the correct value. Use the *right* and *left* arrow keys to highlight each digit in turn until the correct date is set.
3. Press the *enter* key to confirm the setting.
4. Use the *down* arrow key to select **DATE FORMAT**. Press the *up* or *down* arrow keys to view the two alternative date formats. Press the *enter* key to confirm your selection.

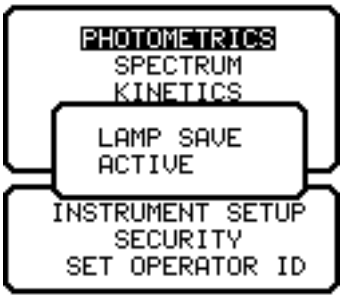
3.13 Language Setting

1 Press the *down* arrow key to highlight **LANGUAGE** and press the *enter* key.
2 Press the *up* or *down* arrow keys to view the alternative languages available. Press the *enter* key to confirm your choice when this is highlighted. The language used on the display changes to match your selection.

3.14 Lamp Save

1. Press the *down* arrow key to highlight **LAMP SAVE** and press the *enter* key.
2. The lamp save function can be turned on or off by use of the *up* or *down* arrow keys.
3. With the lamp save function set to **On** the Model 6315 will conserve lamp life by automatically returning to the Main Menu from a measurement mode screen after 15 minutes of inactivity.
4. After returning to the Main Menu *Lamp Save Active* will be displayed (see below). To remove this message press the *enter* key, the 6315 can now be used as required

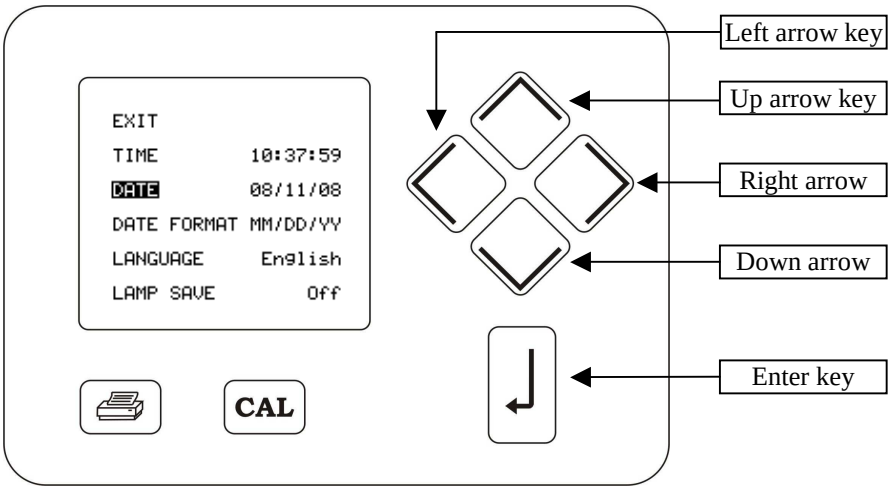
Note: If lamp save is activated whilst the 6315 is connected to a PC it will be necessary to reconnect the unit.



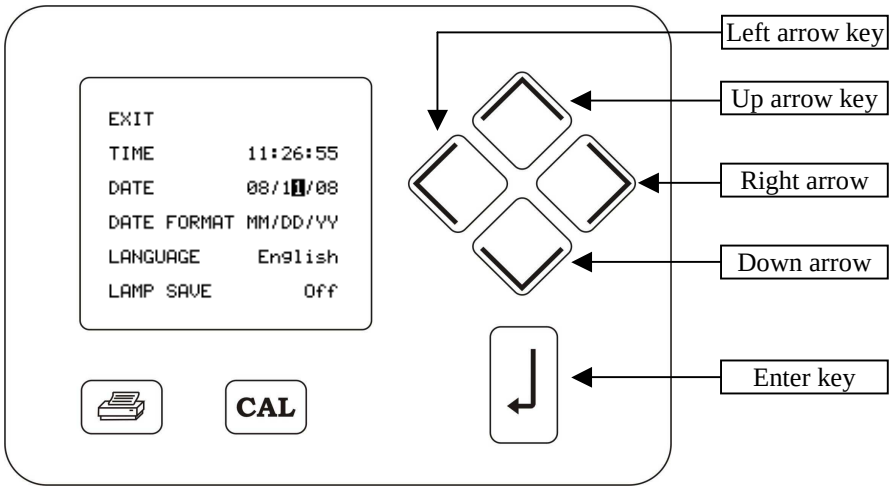
Main Menu screen after activation of the *Lamp Save* option.

Note: With the lamp save function set to **Off** the Model 6315 will remain in the measurement mode screen at all times.

3.15 User Interface of the Model 6315



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



Use the *right* and *left* arrow keys to select a digit and adjust using the *up* and *down* arrow keys. Press the *enter* key to confirm the setting when ALL digits have been correctly set.

For pre-set options i.e. Language use the *up* or *down* arrow keys to browse through the options, when the correct selection is displayed press the *enter* key to confirm your choice.

Note: To return to the Main Menu at anytime use the *up* or *down arrow* keys to highlight **EXIT** and press the *enter* key.

Note: The *enter* key must be used to confirm any changes. Using the *left* arrow key will abort any adjustments you have made and return the value or selection to the previous setting.

3.2 Security

The Security option on the Model 6315 offers a number of important functions to control or restrict use of the instrument. This can be useful in developing GLP procedures or for controlling usage in multi-user installations.

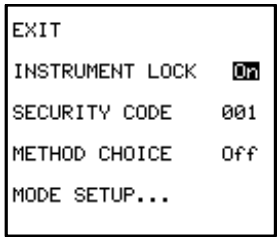
INSTRUMENT LOCK restricts all access to the Set up menus without the entry of a security code.

METHOD CHOICE further restricts operation to an individual method in each mode. This allows measurements to be made with the minimal risk of corruption or deviation from the specified test method.

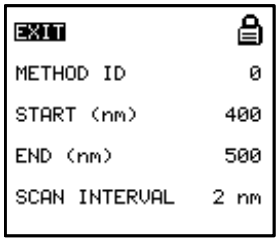
MODE SETUP allows functions shown in the main menu to be hidden if they are not currently required. This further simplifying operation and ensures the Model 6315 can grow to fit any future needs.

3.21 Instrument Lock

1 Use the *up* or *down* arrow key to select **SECURITY** from the Main Menu and press the *enter* key.
2 Use the *down* arrow key to select **INSTRUMENT LOCK** and press the *enter* key.
3 The instrument lock can be turned on or off by using the *up* or *down* keys.
4 With the instrument lock set to **Off** all functions of the instrument are available to all users.
5 With the instrument lock set to **On** all methods will be locked and the parameters cannot be adjusted. A padlock icon will be displayed at the top of the method settings to indicate this.
6 With instrument lock set to **On** access to the **SECURITY** mode from the main menu requires entry of the security code.
7 To alter a method select **SECURITY** from the Main Menu, enter the security code and set **INSTRUMENT LOCK** to **Off**.
8 To set or change the security code, press the *down* arrow key to select **SECURITY CODE**, then press the *enter* key.
9 Adjust the highlighted digit using the *up* or *down* arrow keys, then select the other digits using the *right* or *left* arrow keys and adjust each in turn until the desired code is displayed. Press the *enter* key to accept. Ensure that you can remember the number selected.
10 Either use the *up* arrow key to select **EXIT** and press the *enter* key to return to the main menu or continue with Method Choice below.



Instrument Lock 'On'



A Locked Method

Security Code Request

3.21 Method Choice

1 Select **SECURITY** from the main menu, enter the correct security code (if requested) and press the *enter* key. Use the *down* arrow key to select **METHOD CHOICE** and press the *enter* key.

2 The method choice function can be turned on or off by use of the *up* or *down* keys.

3 With the method choice function switched **Off** only one method is available in each mode. This will be the last method selected or worked on before the instrument lock and method choice were set.

4 With the method choice set to **On** any method can be selected in any mode but the settings can not be altered (as indicated by the padlock icon). Use the *up* or *down* arrow keys to scroll between the methods.

5 With the relevant setting highlighted confirm your choice by pressing the *enter* key. Continue with **MODE SETUP** below or use the *up* arrow key to select **EXIT** and press the *enter* key to return to the main menu.

3.3 Mode Setup

1 From the main menu select **SECURITY**, enter the correct security code (if requested) and press the *enter* key.

2 Use the down arrow key to select **MODE SETUP** and press *enter* to display the mode set up sub-menu.

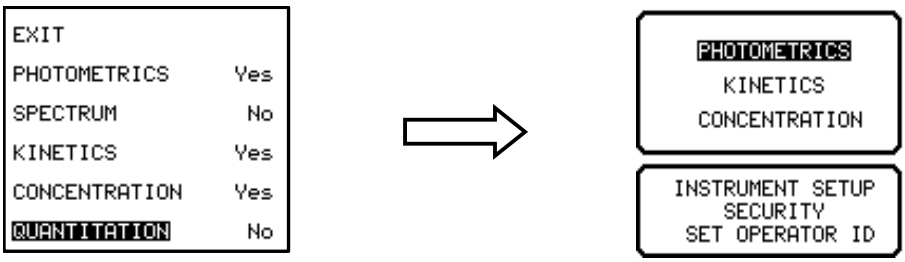
3 This sub-menu lists all the operating modes that appear on the main menu. Each mode has a **Yes** or **No** option.

4 The default setting is **Yes** which confirms that mode will be displayed in the main menu. Selecting **No** will hide that particular mode in the main menu.

5 To hide a mode in the main menu use the *down* arrow key to select the mode and press the *enter* key. Use the *up* or *down* arrow key to set the option to **No** then press the *enter* key.

6 Return to the main menu by selecting **EXIT** then pressing the *enter* key, on both the **MODE SET UP** sub menu and the **SECURITY** menu. The edited mode will no longer appear on the main menu.

7 All hidden modes can be restored when required by following the above procedure and selecting the **Yes** option.

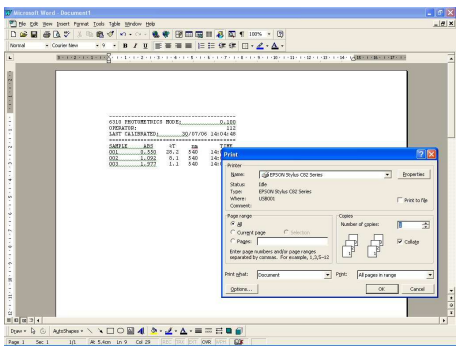


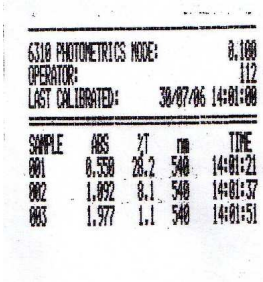
Selecting **No** hides the mode in the main menu (see above). This simplifies operation and aids the development of standard operating procedures (SOPs).

3.4 Set Operator ID

The operator ID is a three-digit code that can be quickly and easily entered from the main menu. This ID will appear in the header of all results printed or downloaded from the Model 6315, identifying the operator. When using this facility all potential users should be allocated individual three-digit codes. Operator ID is set as described below:

1. Use the *up* or *down* arrow keys to select **SET OPERATOR ID** from the main menu and press the *enter* key.
2 A pop-up box opens on the display showing the ID that was entered previously or the default ID of 000. Use the *right* and *left* arrow keys to highlight each digit in turn and adjust with the *up* or *down* keys to set the desired operator ID.
4. The operator ID number is confirmed by pressing the *enter* key, this also closes the pop-up box.





This current ID will be used in the header of all result printouts and result data transferred to a PC or other serial device.

Section 4

Photometrics Mode

Select the **PHOTOMETRICS** mode from the main menu and press the *enter* key. The photometrics measurement screen displays the absorbance and transmittance values as continuous live readings along with the selected wavelength. Photometric measurements are made as below:

4.1 Setting Measurement Wavelengths

1 The wavelength can be increased or decreased by pressing the *up* or *down* arrow keys, respectively.
2 A single press will step the wavelength up or down by 1nm.
3 Holding down either key will change the display rapidly. Releasing the key will stop the adjustment.
4 The 6315 stores the selected wavelength when the instrument is switched off. This wavelength will be recalled when the unit is switched on.

NOTE: At certain wavelengths stray light filters may be heard switching in or out. If wavelengths above 1000nm or below 198nm are selected the display will start again from the opposite end of the range. At any selected wavelength the internal adjustments may take a short time to track any wavelength changes.

4.2 Photometric Calibration

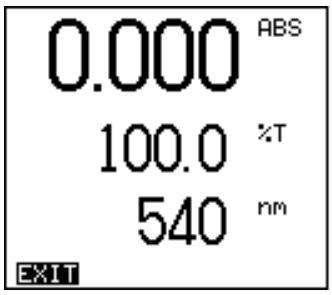
1 Insert a cuvette containing the blank solution in the sample holder and close the sample chamber lid. (Test tubes or other sample containers may be used depending on the sample holder accessory fitted).
2 Press the **CAL** key, the '**Calibrating…**' information box will be displayed and the readout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

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

4.3 Absorbance and %T Measurement

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

Calibration in progress



Calibrated display

Sample measurement

Section 5

Spectrum Mode

Select **SPECTRUM** from the main menu and press the *enter* key. The spectrum scan screen will be displayed alongside an information box stating *Baseline Required* (this appears briefly). The settings for this screen are based on the last spectrum method opened. If the experimental parameters do not need to be altered then a baseline and sample measurement can be made immediately (see 5.3 Running a Scan). If alternative settings are required see section 5.1 Creating and saving a method or 5.2 Recalling a method.

5.1 Creating and saving a method

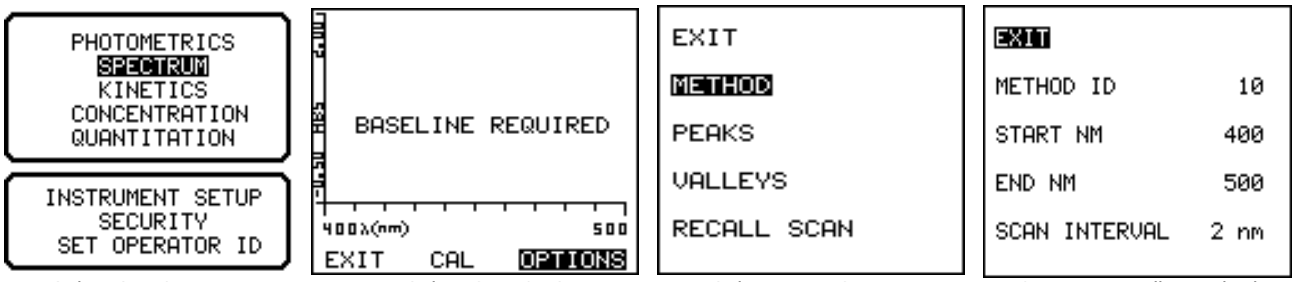
1. Select **SPECTRUM** from the main menu and press the *enter* key.
2. Use the *right arrow* key to select **OPTIONS** at the bottom of the scan display screen, then press the *enter* key.
3. Use the *down* arrow key to select **METHOD** in the spectrum options display screen then press the *enter* key.
4. Use the *down* arrow key to select **METHOD ID** then press the *enter* key.
5. Use the *right* and *left* arrow keys to highlight each digit in turn (adjust with the *up* or *down* keys) to set a method number under which the new method will be stored. Press the *enter* key to confirm your settings.

NOTE: Take care not to select the number for a method that has already been set, as any changes will overwrite the earlier method. Using the 6315 PC software up to eight alphanumeric characters can be used to name a stored method.

6. Use the *down* arrow key to select **START NM** and press the *enter* key.
7. Use the *right* and *left* arrow keys to highlight each digit in turn (adjust with the *up* or *down* keys) to set the wavelength at which the scan will start (lowest wavelength). When set press the *enter* key to confirm your settings.
8. Use the *down* arrow key to select **END NM** and press the *enter* key.
9. Use the *right* and *left* arrow keys to highlight each digit in turn (adjust with the *up* or *down* keys) to set the wavelength at which the scan will end (highest wavelength). When set press the *enter* key to confirm your settings.
10. Use the *down* arrow key to select **SCAN INTERVAL** and press the *enter* key. Use the up or down arrow keys to select from the pre-set scan intervals of 1nm, 2nm or 5nm. When set press the *enter* key to confirm your selection.
11. Use the *up* or *down* arrow keys to select **EXIT**, then press the *enter* key. New settings are saved under the designated method ID. Press the *enter* key again to exit from the spectrum options screen and return to the scan display screen.

NOTE: The Scan Interval is the step between the data points that are recorded during the scan. Choosing 5nm results in a coarse but fast scan, choosing 1nm results in a smoother but slower scan.

Parameter	Maximum Value	Minimum Value	Adjustment	Default Value
Method ID	50	0	1	0
Start nm	998	198	1nm	400
End nm	1000	200	1nm	500
Scan Interval	5nm	1nm	1 or 2 or 5nm	2nm



Select SPECTRUM | Select OPTIONS | Select METHOD | Create or recall a method

5.2 Recalling a Method

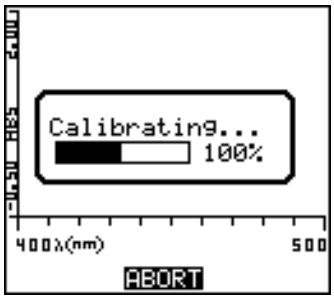
1. Select **SPECTRUM** from the main menu then press the *enter* key.
2. Use the *right* arrow key to select **OPTIONS** at the bottom of the scan display screen, then press the *enter* key.
3. Use the *down* arrow key to select **METHOD** in the spectrum options display screen then press the *enter* key.
4. Use the *down* arrow key to select **METHOD ID** then press the *enter* key. Use the *right* and *left* arrow keys to highlight each digit in turn (adjust with the *up* or *down* keys) to select the method number that contains the desired settings. Press the *enter* key to confirm selection of the method number displayed.
5. Check the settings shown are correct, then press the *enter* key to exit the method set-up screen. Press the *enter* key again to exit from the spectrum options screen and return to the scan display screen.

5.3 Running a Scan

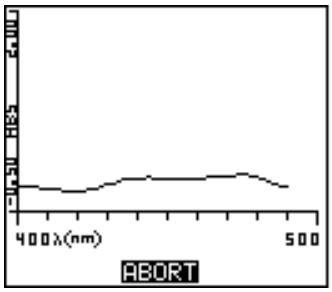
Having returned to the scan display screen (from either the method creation or method recall procedures above) a baseline scan must be run against the updated settings.

1. Insert a cuvette containing the blank solution in the sample holder and close the sample chamber lid. (Test tubes or other sample containers may be used depending on the sample holder accessory fitted).
2. Use the *right* arrow key to select **CAL** and then press the *enter* key. The ‘Calibrating…’ information box will be displayed. When the bar reaches 100% the information box will close.
3. On completion of the baseline scan the **CAL** option automatically updates to **SCAN**. Remove the blank and insert the sample in the holder closing the sample chamber lid. Press the *enter* key to initiate a scan of the sample.
4. During the scan the **ABORT** option will be highlighted, pressing the *enter* key will halt the scan immediately. The scan display screen will then be returned with the completed portion of the scan displayed.
5. The scan can be saved as described over (5.4 Saving and Recalling a Scan) and/or further samples run by repeating step 3. If further samples use different solvents or diluents the calibration step should be repeated (Step 2).

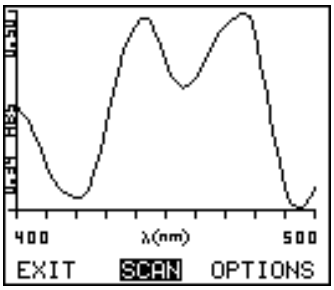
NOTE: To ensure that all spectrum scan readings have fully stabilised before performing a measurement please wait at least five seconds after closing the sample chamber lid before selecting **CAL** or **SCAN**.



Baseline calibration in progress



Initial scan



Optimised scaling

NOTE: During the scan the Absorbance axis is based on the maximum range of the instrument, so the result may appear flatter than expected. On completion, the Absorbance axis will be automatically re-scaled to show the scan at its optimum resolution.

NOTE: A baseline can be run at any time against the blank by inserting it in the sample holder, closing the sample chamber door and pressing the **CAL** key.

5.4 Saving and Re-calling a Scan

Saving a scan

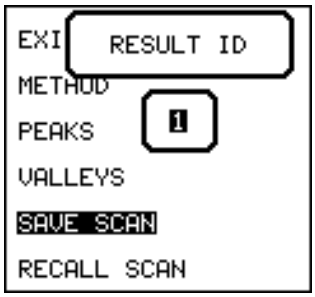
1. On completion of the scan use the *right* arrow key to select **OPTIONS** and press the *enter* key.
2. Use the *up* or *down* arrow keys to select **SAVE SCAN** and press the *enter* key.
3. Use the *up* or *down* arrow keys to adjust the number in the pop-up box, from 1 to 3; this will be the Result ID for this scan. Press the *enter* key to confirm selection of this ID.
4. The scan display screen is returned with a briefly displayed information box confirming that the scan was saved and the chosen Result ID.
5. To recall a saved scan see below for *Recalling a scan*.

NOTE: Care must be exercised when saving a scan as inputting a previously used Result ID will overwrite the old data set.

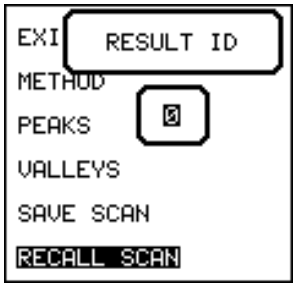
Recalling a scan

1. From the scan display screen use the *right* or *left* arrow keys to select **OPTIONS** and then press the *enter* key.
2. Use the *up* or *down* arrow keys to select **RECALL SCAN** and then press the *enter* key.
3. Use the *up* or *down* arrow keys to adjust the number in the pop-up box to show the Result ID, from 1 to 3, for previously saved scans. Press the *enter* key to confirm the setting. For the ‘0’ option see the note below.
4. The saved scan is displayed on the screen with a briefly displayed information box confirming the Result ID for this scan. The Result ID is displayed below the wavelength axis.

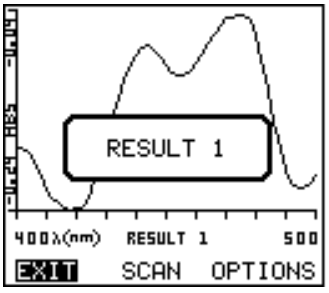
NOTE: The result IDs 1 to 3 are non-volatile. Result ID ‘0’ is used for storing the current or last scan, this data is overwritten with each scan completed and will not be stored when power is switched off.



Saving a scan



Re-calling a scan



A re-called scan

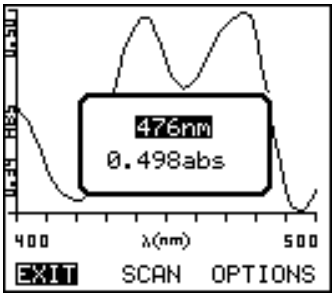
5.5 Browsing and Peak/Valley Selection

Browsing

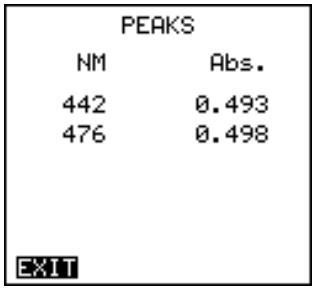
1. With either a completed scan or a recalled scan displayed, press the *up* or *down* arrow keys.
2. An information box will be displayed containing the initial wavelength and the absorbance value recorded at this wavelength. The wavelength displayed can be adjusted using the *up* or *down* arrow keys. The points displayed are based on the Scan Interval selected when the method used was set up (1, 2 or 5nm steps).
3. Either the *right*, *left* or *enter* keys can be pressed to close the Browse data box.

Peak and Valley Selection

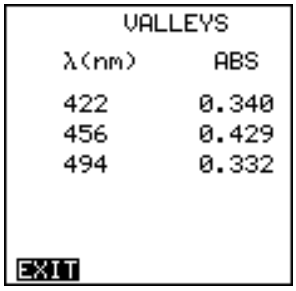
1. From the scan display screen use the right or left arrow keys to select **OPTIONS** and then press the *enter* key.
2. Use the *up* or *down* arrow keys to select the **PEAKS** or **VALLEYS** options and then press the *enter* key.
3. The screen updates to display a table of the wavelength of each peak or valley detected and its corresponding Absorbance value (the peak or valley table may take a short time to appear).
4. To return to the scan display screen press the *enter* key to exit the peaks or valleys table.



Browse by data points



Peak Picking



Valley Picking

Section 6

Kinetics Mode

6.1 Creating and saving a Method

1. Select **KINETICS** from the main menu and press the *enter* key.
2. Use the *right* arrow key to select **OPTIONS** at the bottom of the kinetics display screen, then press the *enter* key.
3. Use the *down* arrow key to select **METHOD** in the kinetics options display screen then press the *enter* key.
4. Use the *down* arrow key to select **METHOD ID** then press the *enter* key.
5. Use the *right* and *left* arrow keys to highlight each digit in turn (adjust with the *up* or *down* keys) to set a method number under which the new method will be stored. When set press the *enter* key to confirm your choice.

NOTE: Take care not to select the number for a method that has already been set, as any changes will overwrite the earlier method. Using the 6315 software up to eight alphanumeric characters can be used to name a stored method.

6. Use the *down* arrow key to select **WAVELENGTH** then press the *enter* key.
7. Use the *right* and *left* arrow keys to highlight each digit in turn (adjust with the *up* or *down* keys) to set the wavelength at which the kinetic measurement will be performed. When all the digits have been set press the *enter* key to confirm your settings.

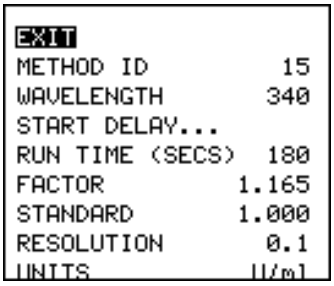
NOTE: Where an incubation period or a non-linear initial phase will occur a Start Delay can be programmed so that this period is ignored. If the Start Delay function is not required forward to step 14.

8. Use the *down* arrow key to select **START DELAY…** then press the *enter* key to display the Start Delay sub menu.
9. Use the *down* arrow key to select **LAG TIME** then press the *enter* key. Use the *right* and *left* arrow keys to highlight each digit in turn (adjust with the *up* or *down* keys) to set the lag time in seconds, if required. The lag time is the period for a non-linear or incubation portion of the reaction that will be ignored by the instrument. A lag time should be used if the reaction is initiated in the instrument.
10. If the incubation or non-linear portion of the reaction is defined by the attainment of a specific Absorbance value then the **START ON LEVEL** option should be selected and set to On. The Start On Level will override the lag time function. If the ‘Start on Level’ function is required then steps 11 and 12 must be completed, if not forward to step 13.
11. Use the *down* arrow key to select **LEVEL**, then press the *enter* key. Use the *right* and *left* arrow keys to highlight each digit in turn (adjust with the *up* or *down* keys) to set the absorbance level that will trigger the start of the measurement.
12. Use the *down* arrow key to select **START WHEN** then press the *enter* key. Select Above for reactions with an increasing absorbance value and Below for those with a decreasing trend. Press the *enter* key to confirm the selection.
13. To return to the kinetics method menu use the *up* or *down* keys to select **EXIT** and press the *enter* key.

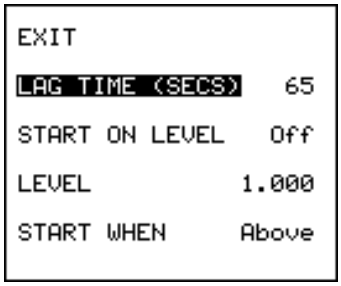
14. Use the *down* arrow key to select **RUN TIME**, press the *enter* key. Use the *right* and *left* arrow keys to highlight each digit in turn (adjust with the *up* or *down* keys) to set the run time in seconds of the kinetic measurement. When all digits have been set press the *enter* key to confirm the run time.
15. Use the *down* arrow key to select **FACTOR** then press the *enter* key. Use the *right* and *left* arrow keys to highlight each digit in turn (adjust with the *up* or *down* keys) to set the value of a known factor. Press the *enter* key to confirm the Factor when all digits have been set. The measured rate of change will be multiplied by the inputted Factor to give a concentration value. For applications without a specified factor set this value to 1.000.
16 If a concentration standard is specified for calibration then use the *down* arrow key to select **STANDARD** and enter the value as described above. Press the *enter* key to confirm the inputted standard value. Where a Factor is specified and no standard is defined set this value to 1.000
17 Use the *down* arrow key to select **RESOLUTION** and then press the *enter* key. Use the *up* or *down* arrow keys to select from the options of 0.001 to 1 for the resolution of the concentration value. Press the *enter* key to confirm the selected option.
18 Use the *down* arrow key to select **UNITS** and press the *enter* key. Use the *up* or *down* arrow keys to select from the various options for the units of measurement, press the *enter* key to confirm the selected option. This unit will be appended to the concentration value.
19 Use the *up* or *down* arrow keys to select **EXIT**, press the *enter* key, the new settings are saved under the designated method ID. Press the *enter* key again to exit from the kinetics options screen and return to the kinetics display screen.

Parameter	Maximum Value	Minimum Value	Adjustment	Default Value
Method ID	50	0	1	0
Wavelength	1000nm	198nm	1nm	400nm
Lag Time	999 sec.	0 sec.	1 sec	0 sec.
Start on Level	On	Off	On/Off	Off
Level	2.000	0.000	0.001A	1.000
Start When	Above	Below	Above/Below	Above
Run Time	9999 sec.	1 sec.	1 sec	10 sec.
Factor	10,000	0.000	0.001	1.000
Standard	1000	0.000	0.001	1.000
Resolution	0.001	1	0.001	0.001
Units (select from…)	U/ml, mEq, ppm, %, (no units), g/l, mg/l, ug/l, ng/l, g/dl, mg/dl, ug/dl, mg/ml, ug/ml, M/l, mM/l, uM/l, U/l, mU/l, EBC, SRM			

Select METHOD



METHOD Menu



START DELAY Sub-Menu

6.2 Recalling a Method

1. Select **KINETICS** from the main menu and press the *enter* key.
2. Use the *right* arrow key to select **OPTIONS** at the bottom of the kinetics display screen, then press the *enter* key.
3. Use the *down* arrow key to select **METHOD** in the kinetics options display screen then press the *enter* key.
4. Use the *down* arrow key to select **METHOD ID** then press the *enter* key. Use the *right* and *left* arrow keys to highlight each digit in turn (adjust with the *up* or *down* keys) to select the method number that contains the desired settings. Press the *enter* key to confirm selection of the displayed method number.
5. Check the settings shown are correct and press the *enter* key to exit the method set-up screen. Press the *enter* key again to exit from the kinetics options screen and return to the kinetics display screen.

6.3 Kinetic Measurements

Having returned to the kinetics display screen (from either the method creation or method recall procedures described above) a calibration must be run using the updated settings before a measurement can be performed.

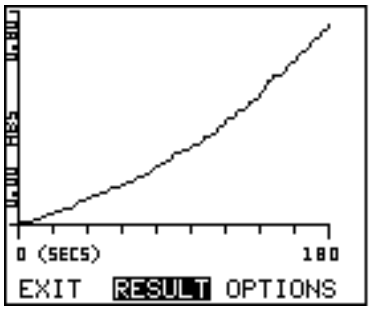
1. Insert a cuvette containing the blank solution in the sample holder and close the sample chamber lid. (Test tubes or other sample containers may be used depending on the sample holder accessory fitted).
2. Use the *right* arrow key to select **CAL** and press the *enter* key. During calibration the '**Calibrating…**' information box will be displayed, when complete the information box will close and the **CAL** option automatically updates to **START**.

NOTE: For applications that compare the rate-of-change of the sample to the rate-of-change of a standard a further calibration step will be required. This step will measure and store the rate-of-change of the specified standard. To incorporate the further calibration continue with the following procedure for sample measurement but substitute a properly prepared standard solution for the first sample. Remember to store the result as a standard where indicated.

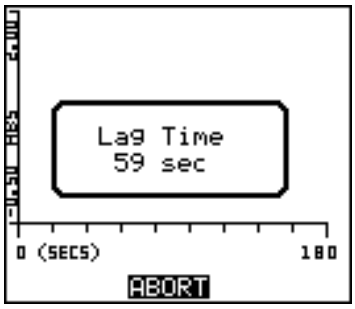
3. Remove the blank and insert the properly prepared and/or incubated sample in the holder, closing the sample chamber lid. Press the *enter* key to start the kinetic run for this sample.
4. On completion of the measurement (any lag time entered + the run time) the **START** option automatically changes to **RESULT**. Press the *enter* key to display the calculated results for this sample. This data can now be printed or recorded as the result for the first sample.
5. If a standard has been run (see NOTE above) the results should be saved to complete the calibration. Press the *right* arrow key to select **OPTIONS**, then press the *enter* key. Use the *up* or *down* arrow keys to select **SAVE AS STANDARD** and press the *enter* key, an information box will be displayed briefly to confirm that the data was saved. Select **EXIT** to return to the **RESULTS** screen.
6. To perform further measurements place the required sample in the sample holder and close the chamber lid. Select the **NEW** option on the Results screen and press the *enter* key. Use the *right* arrow key to select **START** and press the *enter* key to start a new run for the next sample.

NOTE: During the kinetic run time a graphical display of the change in absorbance with time is shown. Initially the Absorbance axis is based on the maximum range of the instrument therefore the result may appear flatter than expected. On completion the Absorbance axis is automatically re-scaled to show the change in absorbance at the optimum resolution.

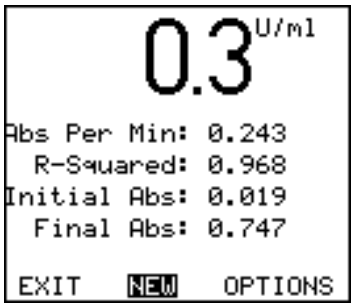
NOTE: The results screen displays the sample concentration with the selected units of measurement appended. Also displayed is the rate of change of absorbance per minute, the correlation co-efficient (R-squared), which defines the linearity of the kinetics run and the initial and final absorbance values.



Kinetic run



Lag time countdown



Results Screen

NOTE: For test kits that require the average rate of change to be recorded at equal time intervals during the run, use the **BROWSE** function as described below:

With a completed run displayed on the screen press the *up* or *down* arrow keys to display an information box for each data point. This includes the time in seconds, the actual absorbance and the average rate of absorbance change since the previous analysis point (as no average can be calculated for the first point this box will only give the actual absorbance and time).

6.4 Saving and Recalling a Kinetic Run

Saving a run

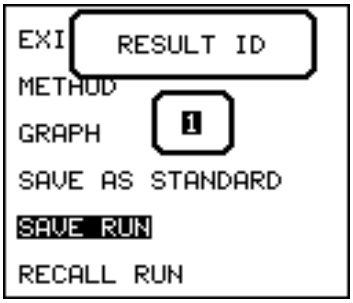
1. On completion of the run use the *right* arrow key to select **OPTIONS** and press the *enter* key.
2. Use the *up* or *down* arrow keys to select **SAVE RUN** and then press the *enter* key.
3. Use the *up* or *down* arrow keys to adjust the number in the pop-up box, from 1 to 3, this will be the Result ID for this run. Press the *enter* key to confirm selection of this ID.
4. The screen will return to the graphical display with a briefly displayed information box confirming the scan was saved and the chosen Result ID.
5. To recall a saved scan see Recalling a scan.

NOTE: Care must be exercised when saving a scan as inputting a previously used Result ID will overwrite the old data set.

Recalling a run

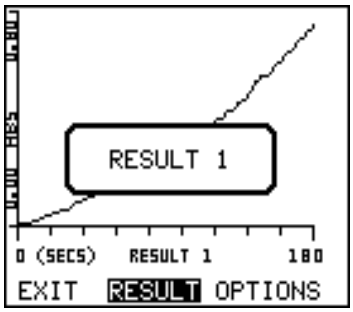
1. From the graph display screen use the *right* or *left* arrow keys to select **OPTIONS** and press the *enter* key.
2. Use the *up* or *down* arrow keys to select **RECALL RUN** and then press the *enter* key.
3. Use the *up* or *down* arrow keys to adjust the number in the pop-up box to show the Result ID, from 1 to 3, for previously saved runs (for the '0' option see the note below). Press the *enter* key to confirm the setting.
4. The saved run is displayed on the screen alongside a briefly displayed information box confirming the Result ID for this run. The recalled Result ID is displayed below the wavelength axis.

NOTE: Result IDs 1 to 3 are non-volatile and therefore the saved runs will be stored when the instrument is switched off. Result ID '0' is used for storing the current or last run, this data is overwritten with each run completed and is not stored when the power is switched off.



Saving a run

Recalling a run



A recalled run

Section 7

Concentration Mode

7.1 Creating and Saving a Method

1. Select **CONCENTRATION** from the main menu and press the *enter* key.
2. Use the *right* arrow key to select **METHOD** in the Concentration display screen then press the *enter* key.
3. Use the *down* arrow key to select **METHOD ID** then press the *enter* key.
4. Use the *right* and *left* arrow keys to highlight each digit in turn (adjust with the *up* or *down* keys) to set a method number under which the new method will be stored. Press the enter key to confirm your settings.

NOTE: Take care not to select the number for a method that has already been set, as any changes will overwrite the earlier method. Using the 6315 PC software up to eight alphanumeric characters can be used to name a stored method.

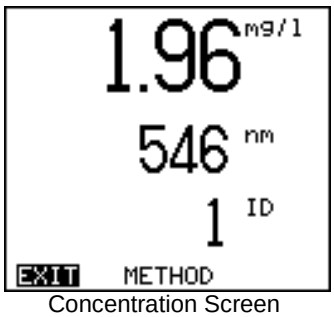
5. Use the *down* arrow key to select **WAVELENGTH** then press the *enter* key.
6. Use the *right* and *left* arrow keys to highlight each digit in turn (adjust with the *up* or *down* arrow keys) to set the wavelength at which the concentration measurement will be made. When all the digits have been set, press the enter key to confirm your settings.
7. If a concentration standard is specified for calibration then use the *down* arrow key to select **STANDARD** and enter the value as described above. Press the *enter* key to confirm the standard value. Where a Factor is specified and no standard is defined set this value to 1.000

8 If a factor is specified for calibration then use the *down* arrow key to select **FACTOR** and enter the value as described above. Press the *enter* key to confirm the factor value.

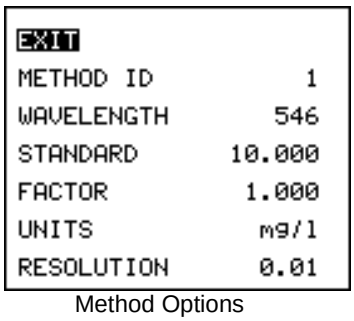
9. Use the down arrow key to select **UNITS** and press the *enter* key. Use the *up* or *down* arrow keys to select from the various options for the units of measurement, press the *enter* key to confirm the selected option. The selected unit will be appended to the concentration value.
10. Use the down *arrow* key to select **RESOLUTION** and press the *enter* key. Use the *up* or *down* arrow keys to select from the options of 0.001 to 1 for the resolution of the concentration value. Press the *enter* key to confirm the selected option.
11. Use the *up* or *down arrow* keys to select **EXIT**, then press the *enter* key. New settings will be saved under the designated method ID.

Parameter	Maximum Value	Minimum Value	Adjustment	Default Value
Method ID	50	0	1	0
Wavelength	1000nm	198nm	1nm	400nm
Standard	1000	0	0.001	1.000
Factor	100	0	0.001	1.000
Resolution	0.001	1	0.001	0.001
Units (select from…)	U/ml, mEq, ppm, %, (no units), g/l, mg/l, ug/l, ng/l, g/dl, mg/dl, ug/dl, mg/ml, ug/ml, M/l, mM/l, uM/l, U/l, mU/l, EBC, SRM			

Select Concentration



Concentration Screen



Method Options

7.2 Recalling a Method

1. Select **CONCENTRATION** from the main menu and press the *enter* key.
2. Use the *right arrow* key to select **METHOD** on the concentration display screen and press the *enter* key.
3. Use the *down arrow* key to select **METHOD ID** then press the *enter* key. Use the *right* and *left* arrow keys to highlight each digit in turn (adjust with the *up* or *down* keys) to select the method number that contains the desired settings. Press the *enter* key to confirm selection of the displayed method number.
4. Check the settings shown are correct, then press the *enter* key to exit the method set-up screen.

7.3 Concentration Measurement

Before a concentration measurement can be performed the instrument must be calibrated. There are two methods for concentration calibration:

1. With a blank and standard
2. With a blank and factor

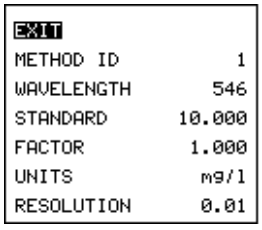
Both calibration methods are described below. Performing a sample measurement is the same in both cases, details of this procedure follows the calibration methods.

7.31 Calibration with a blank and standard

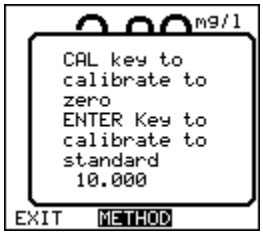
1. Having created or re-called a method as above, insert the cuvette containing the blank solution in the sample holder and close the sample chamber lid. (Test tubes or other sample containers may be used depending on the sample holder accessory fitted).
2. Press the **CAL** key to display an information box that details the options for calibrating to zero or a standard. Follow the on-screen instructions and press the **CAL** key again to confirm that calibration to zero concentration is required.
3. The '**Calibrating…**' information box is briefly displayed while the calibration is completed. After this closes the display is updated to zero concentration.
4. Insert the cuvette containing the standard solution in the sample holder and close the sample chamber lid. (Test tubes or other sample containers may be used depending on the sample holder accessory fitted).
5. Press the **CAL** key to display an information box detailing the options for calibrating to zero or a standard. Follow the on-screen instructions and press the *enter* key to confirm that calibration to the standard value is required.

6. The '**Calibrating…**' information box is displayed briefly while the calibration is completed. When this closes the display updates to the specified concentration value for the standard used.
7. Sample measurements are carried out by inserting each sample in turn in the sample holder, closing the sample chamber door and recording or printing the displayed result once it has settled.

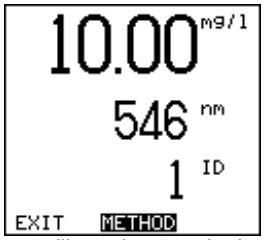
NOTE: On completion of this calibration the factor is calculated. This is based on the measured absorbance of the standard and the concentration value entered in the method. The calculated factor is automatically entered in the method set-up to replace the default value (1.000). **Section 7.32** describes how the above Calibration methodology can be used without the need for a standard solution.



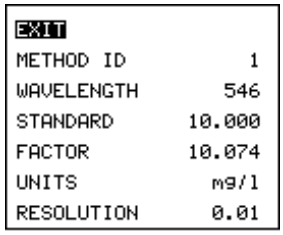
Initial method



Calibration information



Calibrated to Standard

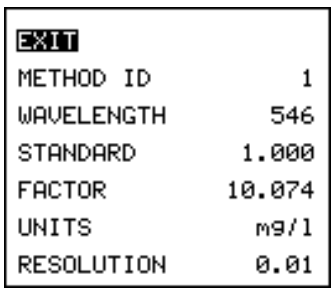


Method updated with factor

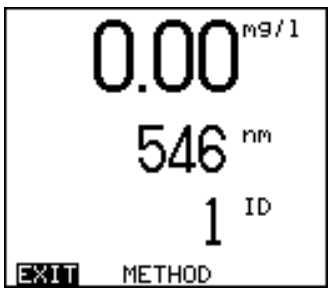
7.32 Calibration with a blank and factor

1. Having created or re-called a method as above, insert the cuvette containing the blank solution in the sample holder and close the sample chamber lid. (Test tubes or other sample containers may be used depending on the sample holder accessory fitted).
2. Press the **CAL** key to display an information box that details the options for calibrating to zero or a standard. Follow the on screen instructions and press the **CAL** key again to confirm that calibration to zero concentration is required.
3. The '**Calibrating…**' information box is displayed briefly during the calibration. Upon completion the display is updated to zero concentration.
4. Sample measurements are carried out by inserting each sample in turn in the sample holder, closing the sample chamber door and recording or printing the displayed result once it has settled.

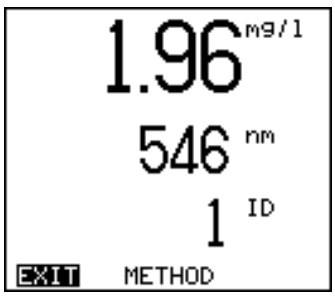
NOTE: Measurements that made using this method rely on the accuracy of the factor entered in the method set-up. Where this is in any doubt or results show a bias against QC material an accurate standard must be made up. **Section 7.31** describes the calibration procedure using a standard solution.



Method with Factor



Calibrated to zero



Reading a sample

Section 8

Quantitation Mode

The Quantitation mode builds on the functions of the Concentration mode offering up to six calibration points, calibration curve display and absorbance and calibrant tables. The integrity of all calibrations can be reviewed using the curve fit options and statistical analysis.

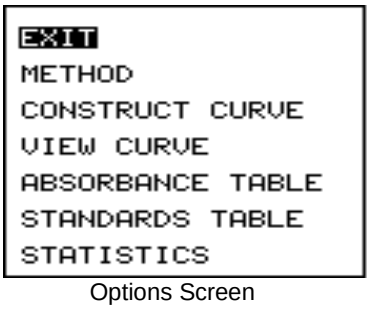
8.1 Creating and saving a method

1 Select **QUANTITATION** from the main menu and press the *enter* key.
2. Use the *right* arrow key to select **OPTIONS** in the Quantitation display screen then press the *enter* key.
3. Use the *down* arrow key to select **METHOD** then press the *enter* key, use the *down* arrow again to select **Method ID**
4. Use the *right* and *left* arrow keys to highlight each digit in turn (adjust with the *up* or *down* arrow keys) to set a method number under which the new method will be stored. Press the enter key to confirm your setting.

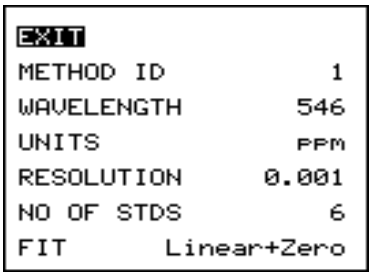
NOTE: Take care not to select the number for a method that has already been set, as any changes will overwrite the earlier method. Using the 6315 PC software up to eight alphanumeric characters can be used to name a stored method.

5. Use the *down* arrow key to select **WAVELENGTH** then press the *enter* key. Use the *right* and *left* arrow keys to highlight each digit in turn (adjust with the *up* or *down* arrow keys) to set the wavelength at which the concentration measurement will be made. When all the digits have been set, press the enter key to confirm your settings.
6. Use the *down* arrow key to select **UNITS** and press the *enter* key. Use the *up* or *down* arrow keys to select from the various options for the units of measurement, press the *enter* key to confirm the selected option. The selected unit will be appended to the concentration value.
7. Use the *down* arrow key to select **RESOLUTION** and then press the *enter* key. Use the *up* or *down* arrow keys to select from the options of 0.001 to 1 for the resolution of the concentration value. Press the *enter* key to confirm the selected option.
8. Use the *down* arrow key to select **NO OF STDS**, then press the *enter* key. Use the *up* or *down* arrow keys to select from the options of 2 to 6 standards. Press the *enter* key to confirm the selected option.
9. Use the *down* arrow key to select **FIT** and then press the *enter* key. Use the *up* or *down* arrow keys to select the required curve fit option from linear regression, interpolation or linear regression through zero. Press the *enter* key to confirm the selected option.
10. Use the *up* or *down arrow* keys to select **EXIT**, then press the *enter* key. The new settings are saved under the designated method ID.

Select Quantitation



Options Screen



Method Menu

8.2 Recalling a method

1. Select **QUANTITATION** from the main menu then press the *enter* key.
2. Use the *right* arrow key to select **OPTIONS** in the Quantitation display screen then press the *enter* key.
3. Use the *down* arrow key to select **METHOD** in the Quantitation options display screen then press the *enter* key.
4. Use the *down* arrow again to select **METHOD ID** and use the *right* and *left* arrow keys to highlight each digit in turn (adjust with the *up* or *down* keys) to select the method number that contains the desired settings. Press the *enter* key to confirm selection of the displayed method number.
5. Check the settings shown are correct, then press the *enter* key to exit the method set-up screen.

8.3 Measurements using prepared standards

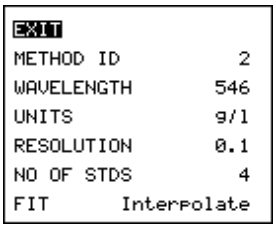
1. Select **QUANTITATION** from the main menu then press the *enter* key.
2. Use the *right* arrow key to select **OPTIONS** in the Quantitation display screen then press the *enter* key.
3. Use the *down* arrow key to select **STANDARDS TABLE** then press the *enter* key.
4. Use the *down* arrow key to select each standard in turn, pressing the *enter* key to select the corresponding concentration value. Use the *right* and *left* arrow keys to highlight each digit and adjust with the *up* or *down* arrow keys, press the *enter* key to confirm the setting. When complete select **EXIT** to return to the options screen.
5. Use the *down* arrow key to select **CONSTRUCT CURVE** then press the *enter* key.
6. An information box requesting a zero absorbance calibration is displayed briefly and **ZERO ABS** highlighted in the bottom menu bar. Insert the blank solution in the sample holder, close the chamber door and press the *enter* key to complete the zero calibration.
7. An information box requesting the first standard to be inserted is displayed briefly. The required standard with its expected concentration is shown on the the display. Insert the standard in the sample holder, close the sample chamber lid and press the *enter* key.
8. Continue as above until all standards have been recorded. An information box confirming **CAL COMPLETE** will be displayed briefly before the Model 6315 returns to the options screen.

Note: A calibration measurement can be aborted at any time by pressing the *left* arrow key, highlighting **ABORT** and pressing the *enter* key.

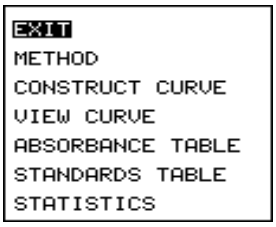
9. Use the *down* arrow key to select **VIEW CURVE** and press the *enter* key to review the calibration curve. Press the *enter* key to exit the calibration curve screen and return to the options screen.
10. Use the *up* or *down* arrow keys to select **ABSORBANCE TABLE** and press the *enter* key. The absorbance values for each of the standard solutions is displayed in a tabular format.
11. Use the *up* or *down* arrow keys to select **STATISTICS** and press the *enter* key. The statistics screen details the slope and off-set values for the calibration curve. For linear regression the correlation co-efficient (R-squared value) is displayed. For interpolation the slope value between consecutive pairs of data points is tabulated. To exit the statistics screen and return to the options screen press the *enter* key.
12. Use the *up* or *down* arrow keys to select **EXIT** and press the *enter* key to return to the measurement display screen.
13. Concentration measurements are performed by inserting each sample in turn, closing the sample chamber door and recording or printing the displayed result once it has settled.

8.4 Measurements using known absorbances

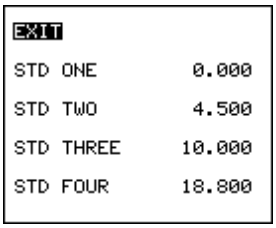
1. Select **QUANTITATION** from the main menu then press the *enter* key.
2. Use the *right* arrow key to select **OPTIONS** in the Quantitation display screen then press the *enter* key.
3. Use the *down* arrow key to select **STANDARDS TABLE** then press the *enter* key.
4. Use the *down* arrow key to select each standard in turn, pressing the *enter* key to select the corresponding concentration value. Use the *right* and *left* arrow keys to highlight each digit and adjust with the *up* or *down* arrow keys, press the *enter* key to confirm the setting. When complete select **EXIT** to return to the options screen.
5. Use the *down* arrow key to select **ABSORBANCE TABLE** then press the enter key.
6. Use the *down* arrow key to select each absorbance in turn, pressing the *enter* key to select the corresponding absorbance value. Use the *right* and *left* arrow keys to highlight each digit and adjust with the *up* or *down* arrow keys, press the *enter* key to confirm the setting. When complete select **EXIT** to return to the options screen.
7. Use the *up* or *down* arrow key to select **VIEW CURVE** and press the *enter* key to review the standard curve. Press the *enter* key to return to the options screen.
8. Use the *up* or *down* arrow keys to select **EXIT** and press the *enter* key to return to the measurement display screen.
9. Concentration measurements are performed by inserting each sample in turn, closing the sample chamber door and recording or printing the displayed result once it has settled.



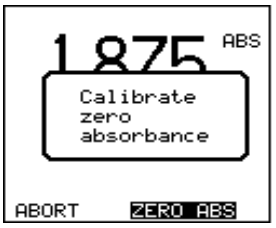
Quantitation Method Menu



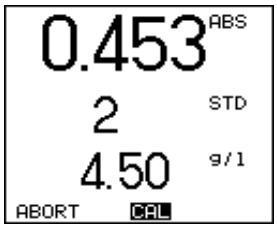
Quantitation Options Menu



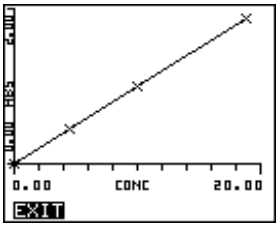
Standards Table (up to 6 standards can be entered)



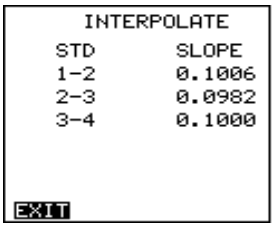
Curve Construction requesting an initial Calibration to Zero Absorbance

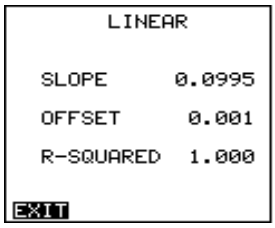


Curve construction continues with calibration to each standard, its number and expected concentration shown with the measured absorbance level.

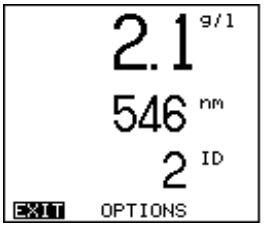


View Curve option, showing four cal points as in the above settings





Statistics verify curve fit options



Insert samples to measure concentration

Section 9

Maintenance & Troubleshooting

9.1 General

The sample area should always be kept clean and any spillages cleaned up immediately. Ensure the external surfaces of the Model 6315 are kept clean and free from dust. To give added protection when not in use, the unit should be disconnected from the mains supply and covered with the optional dust cover (630 028). For long-term storage or re-shipment it is recommended that the unit be returned to the original packing case. These good housekeeping practices ensure that the Model 6315 gives the optimum performance with minimum maintenance.

NOTE: The 6315 monochromator is a non-serviceable unit and no attempt should be made to repair this item. Failure to observe this recommendation will result in the loss of any Warranty Claim on this product. In the unlikely event of the monochromator requiring service or calibration, it is essential that you contact the Manufacturer or local Distributor immediately for advice.

9.2 Light Source Replacement

The only routine maintenance that may be required is the replacement of the light source. An indication of lamp failure is given if the lamp failure indicator appears on the display. Looking in the sample chamber will confirm if the lamp needs replacing. The xenon lamp is available from the Manufacturer or your local Distributor (refer to Section 10.2 Spares).

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

CAUTION: The following safety precautions should be observed prior to attempting the lamp module replacement procedure.

1. Disconnect the unit from the mains supply prior to removing the top cover.
2. Protective gloves should be worn when handling the replacement lamp to prevent damage from finger marks.
3. A voltage supply of 400V is present, so all normal safety precautions should be observed.
4. Ensure the lamp is cool prior to handling.

Access to the lamp can be made by removing the top case assembly. The sampling accessory can be accessed through the sample chamber. Figure 9.2.1 shows the removal of the outer case and lamp module.

The top and bottom case assemblies can be separated as follows:

1. Unscrew the four recessed screws in each corner of the base. This should be done without inverting the unit.

2. The top half of the case can then be lifted off the bottom half, taking care not to strain any cables between the top and bottom sections.

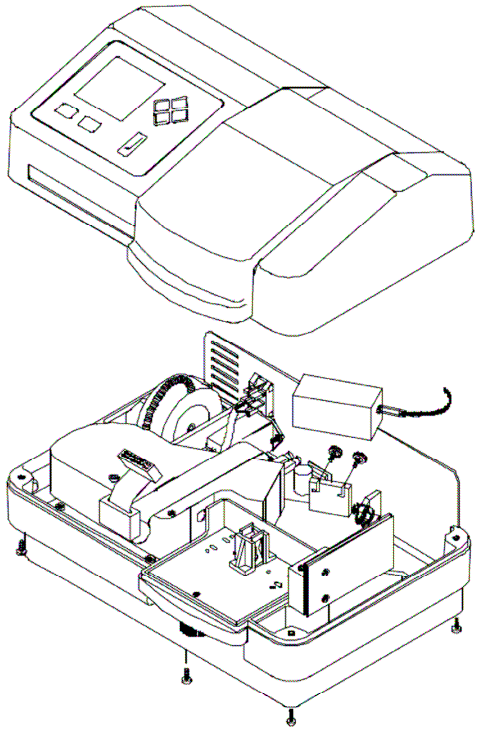


Figure 9.2.1. Separating the top and bottom case assemblies

To replace the lamp module:

1. Remove the 4 case screws (see Figure 9.2.1).
2. Lift the top cover clear, taking care not to strain the ribbon cable.
3. Remove the thumb screw retaining the xenon lamp (see Figure 9.2.1).
4. Remove the connector from the rear of the xenon lamp.
5. When replacing the lamp ensure it is pushed fully up into the optics housing before tightening the thumb screws.
6. Reconnect the lamp.
7. Refit the top cover, taking care not to trap the ribbon cable. Refit the 4 outer case screws.

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

9.3 Error Codes & Troubleshooting

A number of error codes are generated that relate to fault conditions. These error codes are detailed below with a brief description of their most common causes.

SYSTEM ERROR - DARK LEVEL CALIBRATION FAILURE

This error indicates that the dark level is too high during calibration. In normal operation the lamp is switched off during an operator initiated calibration sequence to ensure that the detector output is below a threshold level. The calibration will be aborted and the error message displayed, if the detector output is above this threshold level. Press any key to clear the message and reattempt the calibration.

The most likely causes of this error are:

1. The sample chamber door has been left open during the calibration sequence.
2. The sample chamber door was opened during the calibration sequence.
3. There is a fault on the detector PCB.

SYSTEM ERROR – WAVELENGTH CALIBRATION FAILURE

The instrument failed to detect the self-calibration wavelength peaks. This error is given during the wavelength calibration routine, indicating that the initial threshold level was not achieved. This message will be displayed permanently on the screen and can only be removed by switching off and restarting the unit.

The most likely causes of this error are:

1. There is a cuvette, sample or other obstruction in the light path.
2. Lamp failure.
3. The grating position sensor was not detected for one of the following reasons:
    a. Faulty opto-coupler.
    b. Stepper motor failure, so that the wavelength drive from the power supply PCB fails.
    c. Loose wire connection between the opto-coupler and the PCB.
    d. Faulty power-supply PCB.
    e. Alignment error.

WARNING – OPERATING PARAMETERS RESET TO DEFAULT

The setup and operating parameters have been reset to the default values. This error is commonly caused by memory corruption when checking the non-volatile RAM.

The most likely causes of this error are:

1. Battery failure on the display PCB.
2. Enter key held down during power on and self-test.

Section 10

Optional Accessories

10.1 Accessories

The following list of items is available as optional accessories:

631 600	6315 PC software on CD ROM (compatible with Windows 98™ and above)
633 001	Heated cuvette system (cuvette holder and external control unit), supplied with interconnection cables, instruction manual, mains cables for EU, UK and USA. Universal voltage and frequency.
632 001	External sipper pump supplied with inlet and outlet tubing, mains cable and instruction manual 230V/50Hz
632 031	External sipper pump supplied with inlet and outlet tubing, mains cable and instruction manual 110V/60Hz
630 005	Adjustable path length cuvette holder (10 – 100mm)
630 020	Test tube holder (12.5 – 13.5mm diameter)
630 022	Test tube holder (15.5 – 16.5mm diameter)
630 021	Test tube holder (24 – 25.5mm diameter)
634 001	4 position rotary cuvette holder
648 001	Water heated cuvette holder
037 201	Thermostatted water circulator 230V
037 202	Thermostatted water circulator 110V
033 290	Storage Case
630 028	Dust Cover

10.2 Spares

630 204	10mm cuvette holder (supplied as standard with product)
012 094	Xenon lamp
060 084	10x10mm plastic cuvettes (pack 100)
060 229	10x10mm plastic cuvettes (pack 500)

Section 11

Specification & Data

11.1 Technical Specification

Wavelength	
Range	198 to 1000nm
Resolution	1nm
Spectral Bandwidth	8nm
Absorbance	
Range	-0.300 to 1.999
Transmittance	
Range	0 to 199.9%
Concentration	
Range	-300 to 1999
Selectable Resolution	1, 0.1, 0.01 or 0.001
Calibration	Blank with a single standard or factor
Memory	50 methods
Quantitation	-300 to 1999
Selectable Resolution	1, 0.1, 0.01 or 0.001
Calibration	Blank with up to 6 standards
Curve Correction	Linear regression, interpolation or linear regression through zero
Memory	50 methods including calibration curve
Kinetics	Graphical and calculated concentration value
Calibration	Against standard and factor
Correlation Factor	r squared value displayed with result
Memory	50 methods and 3 graphed results
Spectrum	Any range between 198 and 1000nm
Scan Data Internal	1, 2 or 5nm selectable
Analysis	Absorbance and wavelength of peaks and valleys
Memory	50 methods and 3 scans
GLP	- Real time clock and calendar - Operator ID - Supervisor security (locks all set up parameters) - Method display lock
Outputs	Analogue and RS232 serial
Light Source	Xenon up to 2W, 400-600V
Input Voltage	115/230V ac –20% +10%
Input Power	<50W
Size	365(w) x 272(d) x 160(h) mm
Weight	6Kgs

11.2 Analogue Output

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

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

11.3 RS232 Serial Interface

The Model 6315 has a bi-directional RS232 interface set to:

1200 baud
7 data bits
odd parity
1 stop bit

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

The following commands can also be sent to the 6315 via the serial interface.

ASCII **TRANS** Outputs transmission and wavelength separated by an ASCII TAB character, regardless of the 6315 operating mode.
For example: 100.0 540

ASCII **ABS** Outputs absorbance and wavelength separated by an ASCII TAB character, regardless of the 6315 operating mode.
For example: 0.001 540

ASCII **CONC** Outputs concentration and wavelength separated by an ASCII TAB character, regardless of the 6315 operating mode.
For example: 123.4 540

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

ASCII **GOTO** Commands the 6315 to go to the wavelength nm.
For example: GOTO 540<CR> will set the wavelength to 540nm. ‘OK’ is returned by the GOTO command. Each character should be sent within 260mS of the previous character, otherwise the instrument responds with TXERR and preceding characters are discarded.

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

The connections are as follows:

TXD 2	- INPUT TO 6315
RXD 3	- OUTPUT FROM 6315
RTS 4	- LINKED TO CTS
CTS 5	- LINKED TO RTS
DSR 6	- OUTPUT FROM 6315
DCD 8	- OUTPUT FROM 6315
DTR 20	- INPUT TO 6315 (must be active)
GND 7	

Suggested interconnections are detailed below:

6315	**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

6315	**IBM PC XT (9 way "D")**	
TXD 2	3	TXD (From PC)
RXD 3	2	RXD (To PC)
RTS 4	7	RTS (From PC)
CTS 5	8	CTS (To PC)
DSR 6	6	DSR (To PC)
DCD 8	1	DCD (To PC)
DTR 20	4	DTR (From PC)
GND 7	5	GND

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

EC Declaration of Conformity

Jenway Model 6315 Spectrophotometer complies with the following European Standards:

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

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

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

Following the provision of:

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

Thank you for reading this data sheet.

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

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