





Biochrom Ltd  
Certificate No. 890333

## Declaration of Conformity

This is to certify that the **Libra S35 PC UV/Visible Spectrophotometer**  
Part number 80-5000-36  
Serial number 81000 onwards

manufactured by Biochrom Ltd. conforms to the requirements of the following  
Directives-: **73/23/EEC & 89/336/EEC**

Standards to which conformity is declared

EN 61 010-1: 2001

Safety requirements for electrical equipment for measurement, control and laboratory use.

EN 61326: 1998

Electrical equipment for measurement, control and laboratory use – EMC requirements

Signed:

Dated: 9<sup>th</sup> September 2004

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## Unpacking, Positioning and Installation

- Inspect the instrument for any signs of damage caused in transit. If any damage is discovered, inform your supplier immediately.
- Ensure your proposed installation site conforms to the environmental conditions for safe operation:
  - Indoor use only
  - Temperature 10°C to 40°C
  - Maximum relative humidity of 80 % up to 31°C decreasing linearly to 50 % at 40°C
- The instrument must be placed on a hard flat surface, for example a laboratory bench or table, which can take its weight (13 kg) such that air is allowed to circulate freely around the instrument.
- Ensure that the cooling fan inlets and outlets are not obstructed; position at least 2 inches from the wall.
- This equipment must be connected to the power supply with the power cord supplied and must be earthed (grounded). It can be used on 90 - 240V supplies.
- Switch on the instrument and check the status of the power/progress indicators; flashing amber is calibrating and green is normal operating mode; refer to Messages for more information.
- The instrument is delivered with a stored baseline. This is required to correct for the wavelength/energy profile of the light source.

This is a “press to read” instrument, whereas other deuterium / tungsten lamp instruments measure continuously. The lamps will switch off from stand by mode automatically if the instrument is not used for 15 minutes; the message “Turning lamp on...” will appear for a few seconds when the instrument is re-used.

If this equipment is used in a manner not specified or in environmental conditions not appropriate for safe operation, the protection provided by the equipment may be impaired and instrument warranty withdrawn.

## Essential Safety Notes

There are a number of warning labels and symbols on your instrument. These are there to inform you where potential danger exists or particular caution is required. Before commencing installation, please take time to familiarise yourself with these symbols and their meaning.



Caution (refer to accompanying documents).  
Background colour is yellow, symbol and outline are black.



**WARNING**



**WARNING**

**UV RADIATION  
HOT**

**UV RADIATION IS HARMFUL TO YOUR EYES**  
If power is restored with this cover removed,  
eye protection must be worn

### Accessories

- Care should be taken when handling all heated accessories.
- Ensure that the cell compartment lid is closed when operating cell changers and the sipper.
- It is essential that the baseplate plug supplied with single cell accessories is fitted to optimise air flow and to prevent light ingress.

# OPERATION

## Introduction

Your UV/Visible spectrophotometer is a general purpose, modular instrument that is controlled by a PC via a serial interface.

It works on the basis of light from either of the light sources being directed by a motorised mirror through the monochromator inlet slit. This passes through one of several (dependent on wavelength selected) filters mounted on a filter quadrant; the filtered light is then directed onto the holographic grating, which produces light of the selected wavelength. The light then leaves the monochromator via the exit slit, and mirrors focus and direct the light into the sample compartment. This passes through your cell containing the sample of interest and a de-focussing lens to a solid state detector unit. The resulting signal is then amplified and displayed.

The instrument meets the requirements of the British Pharmacopeia (BP) test (A88 Appendix IIB). This states that a spectrophotometer recording the spectrum of a 0.02% volume/volume solution of toluene in hexane is able to show that ratio of the absorbance at the maximum wavelength (269 nm) to that at the minimum (266 nm) is at least 1.5. Typically, this requires a bandwidth of 1.8 nm.

A range of accessories further enhances the capability of the instrument.

## Acquire Applications Software

Acquire comprises application modules for wavelength scanning, reaction kinetics, quantification, multi wavelength, time drive, and can be used to enhance the software already included on the spectrophotometer.

80-2115-31	<b>Acquire Applications Software</b> Wavelength Scanning, Reaction Kinetics, Quantification, Time Drive, Multi Wavelength
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### Recommended PC for proper operation

For optimum performance, an IBM compatible 486 or greater personal computer running Microsoft Windows 95, 98 or NT is required. The PC should have a minimum of 8MB RAM, 200Mb hard disk, a 1.44 MB 3.5 inch floppy disk drive, CD-ROM, a serial mouse installed, and free COMMS serial port and VGA graphics. Any printer supported by Microsoft Windows 95 can be used. Contact your supplier for further information.

## 21 CFR part 11 compliant Acquire Applications Software

21 CFR part 11 Acquire Applications Software provides full FDA compliance in terms of electronic records and signatures with the flexibility and functionality of the established Acquire software, and will be very welcome in any analytical or QC laboratory that operates within such an environment. The software comprises both client and server applications for networked installations, but both of these can be installed on one PC if required.

### 80-5000-31 21 CFR part 11 compliant Acquire software

Instrument Control, Wavelength Scanning, Reaction Kinetics, Quantification, Multi Wavelength, Time Drive, CFR Administrator

### Recommended PC for proper operation

21 CFR part 11 compliant Acquire software requires a PC or network with one of the following Microsoft Windows operating systems to be installed:

NT 4.0 with Service Pack 6.

2000 with Service Pack 2 or 3.

XP with Service Pack 1.

Additionally, at least one NTFS (New Technology Filing System) formatted directory must be available in order to use the software (note that FAT & HPFS are NOT adequate alternatives). Contact your supplier for further information.

## Messages

The spectrophotometer goes through a multi step calibration sequence which is indicated by a flashing amber light until normal operating mode (green) is reached; it is solid green when communicating with the PC, flashing green when awaiting connection to the PC or when waiting to communicate with the PC. (Note: If the instrument has been GLP enabled, it will flash amber/green during the waiting period). A flashing red light indicates a recoverable fault (see below). A continuous red light relates to a serious fault condition that will require a service engineer from your local supplier.

<b>Fault</b>	<b>Possible Cause</b>	<b>Remedy</b>
Continuous red	System failure	Service engineer
Flashing red	Light in cell compartment	Close lid and restart
	Beam blocked	Remove obstruction and restart
	Tungsten lamp failure	Check Acquire Instrument Control. If red indicator off, replace tungsten lamp
	UV lamp failure	Check Acquire Instrument Control. If blue indicator off, replace deuterium lamp
Flashing red / green	Baseline lost	Re-run baseline
	New EPROM installed	Re-run baseline
Flashing green	Not communicating	Check serial connections
Bright green	Under computer control	OK

## ACCESSORIES

All cell holders accommodate 10 mm pathlength cell as standard, unless stated otherwise. Refer to Essential Safety Notes.

### Multiple Cell Holder Accessories

- Install by removing accessory in place, replacing with the new one, turning the central mounting screw until it is finger tight followed by clicking on Accessory in Instrument Control.

Description	Part number	Comments
4 position cell changer	80-2106-01	Accommodates cells 10-50mm in pathlength
8 position water heated cell changer	80-2109-70	Requires a water-circulating bath. Locate round extension of tube restrainer into top of cell changer thumb screw. Attach the tube guide to the instrument base using the screws provided. Replace the front blanking plug on the cell compartment lid with the new one that is provided.
6 position Peltier heated cell changer	80-2106-04	Requires Temperature Control Unit (80-2112-49). Insert into socket 1.
8 position cell changer	80-2108-01	Spare, if required

## Single Cell Holder Accessories

- Install by removing accessory in place, replacing, if necessary, the baseplate plug supplied and positioning the single cell holder so that the arrow is on the front face and it locates in place. Then push the finger locks backwards so that they lock into position. Click on Accessory in Instrument Control.

Description	Part number	Comments
Cell holder, 10mm pathlength	80-2106-05	
Cell holder, for sample stirring	80-2108-10	Requires magnetic flea and controller
Cell holder, 50mm pathlength	80-2106-07	
Cell holder, 100 mm pathlength	80-2107-14	
Cylindrical cell holder	80-2106-10	Up to 100 mm pathlength cylindrical cells
Water heated cell holder	80-2106-08	10-40 mm pathlength. Requires a water-circulating bath. Replace the front blanking plug on the cell compartment lid with the new one that is provided..
HPLC cell holder	80-2106-11	Flowcell volume is 8 $\mu$ l, pathlength is 2.5mm. Thread wires through front blanking plug and attach to instrument base using the screws supplied
Peltier cell holder	80-2106-13	Set required temp in range 20-49 °C. Insert into socket 2.
Electrical cell holder	80-2106-12	Set required temperature: off, 25, 30, 37 °C. Insert into socket 2.

## Other Accessories

Description	Part number	Comments
Sipper	80-2112-25	Use if a large number of samples for single readings is required. Requires single cell holder (80-2106-05 or 80-2106-13). 10mm flowcell and tubing supplied, together with separate user instructions.
Temperature Control Unit	80-2112-49	Required to supply the extra power required by the 6 position Peltier heated cell changer (80-2106-04).
Printer stand	80-2112-18	For thermal printer
Dust cover	80-2106-19	Spare

## Consumables and other items

Pump head tubes (6) for Sipper	80-2080-74
PTFE flowcell tubing with connectors	80-2055-13
Replacement flowcell (including tubing)	80-2080-60
Autosampler Interface kit	80-2104-96
Serial interface cable for connection to PC (D9 male instrument to D9 PC)	80-2105-97
Spreadsheet Interface Software	80-2112-23
Centronics parallel printer interface cable	80-2071-87

Separate information giving details on serial and parallel interface connections, if required, is available from a Service Engineer with your local supplier, whom you should contact for further details.

# MAINTENANCE

## After Sales Support

We supply support agreements that help you to fulfil the demands of regulatory guidelines concerning GLP/GMP.

- Calibration, certification using filters traceable to international standards
- Certificated engineers and calibrated test equipment
- Approved to ISO 9001 standard

Choice of agreement apart from break down coverage can include

- Preventative maintenance
- Certification

When using calibration standard filters, insert such that the flat surface is facing away from the spring end of the cell holder.

Observe all necessary precautions if dealing with hazardous samples or solvents

User maintenance is restricted to changing the instrument lamps and mains fuse. For any other maintenance operation or rectification contact your local supplier.

## Lamp Replacement

Replacement lamps are available from your supplier using the following part numbers:

Deuterium lamp 80-2106-17 (includes tungsten lamp as well)

Tungsten lamp 80-2106-16

The deuterium lamp is supplied fitted into a mounting and pre-adjustment plate; a new tungsten lamp is also included.

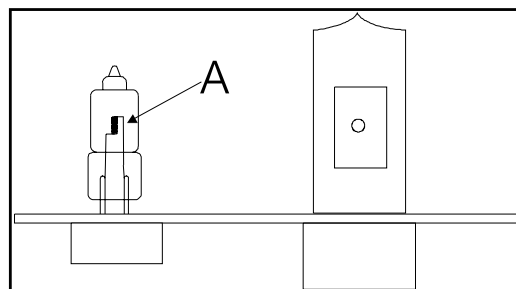
### NOTE:

- Although deuterium lamps are covered by their own warranty, an engineer's call out fee is not, and users are advised to change their own lamps. Lamp replacement is very easy, and the process has been designed so that the user can do it without the need to call out a local service engineer. No lamp alignment is required as the lamp select mirror is automatically aligned for maximum lamp energy throughput during the instrument calibration procedure.
- The lamps become very hot in use. Ensure they are cool before changing.
- Do not touch the optical surfaces of either lamp with your fingers (use tissue); if touched, the area should be cleaned with iso-propanol.

To change a lamp, proceed as follows:

1. Switch off the instrument, remove sample from cell holder and disconnect the power supply cord. Allow time for lamps to cool.
  2. Locate the lamp access cover on the left-hand side of the instrument, and push the cover back.
  3. Undo the black knurled screw on the lamp cover plate with your fingers and remove the plate.
  4. Slide the lamp plate out and unplug the cable connector.
- If the tungsten lamp has failed, the replacement should be inserted onto the plate, pushing it all the way down into its holder \*.
  - If the deuterium lamp has failed, insert the tungsten lamp onto the plate as above and then replace the whole assembly with the new one.
5. Reconnect the cable connector and slide the lamp plate in until it locates.
  6. Replace the lamp cover plate by attach by re-tightening the black knurled screw.
  7. Replace the lamp access cover.
  8. Reconnect the power supply cord and switch the instrument on.
  9. After the lamp has warmed up sufficiently (30 minutes), run a new baseline (Instrument Control/configure/baseline).
  10. Reset lamp life to zero and take an original energy reading as appropriate by clicking on Instrument Control/configure/reset.

\* For reliable tungsten lamp alignment fit the tungsten lamp as shown in the diagram below, with the straight length of wire A closest to the deuterium lamp.



## **Deuterium Lamp Warranty**

Criteria for lamp replacement are that it must:

- be less than 15 months old

## **Fuse Replacement**

- 1) Switch off the instrument and disconnect the power supply cord. The fuse holder can only be opened if the power supply plug has been removed, and is located between the power input socket and the on/off switch on the back panel of the instrument.
- 2) Slide the fuse holder open by pulling at the notch.
- 3) Place fuses (1.6A, 5mm x 20mm, FST) into the fuse holder and slide back into position.
- 4) Reconnect the power supply cord and switch on the instrument.

Fuses are not normally consumed in an instrument's lifetime. If they blow repeatedly contact your supplier.

## **Cleaning and General Care**

### **External cleaning**

- Switch off the instrument and disconnect the power cord.
- Use a soft damp cloth.
- Clean all external surfaces
- A mild liquid detergent may be used to remove stubborn marks.
  
- **Sample compartment spillages**
  
- Switch off the instrument and disconnect the power cord.
- The cell holders, baseplate and sample compartment are coated in a chemical resistant finish. Strong concentration of sample, however, may affect the surface, and spillages should be dealt with immediately.
- Observe all necessary precautions if dealing with samples or solvents that are hazardous.
- There is a small drain hole in the sample compartment to allow excess liquid to drain away. Liquids will drain onto the bench or table under the spectrophotometer or if preferred, this drain hole can be connected to waste using suitable tubing.
- Remove the cell holder and clean separately.
- Use a soft dry cloth to mop out the sample compartment. Replace the cell holder.
- Reconnect the power cord and switch on the instrument.

# APPENDIX

## Pharmacopoeia

In general, there has been an increase in laboratory requirements to conform with Good Laboratory Practice techniques; this is particularly the case in Pharmaceutical companies and in Biotechnology facilities, where the interest in finding solutions to gene therapy opportunities is great. Typically, scientists working in pharmaceutical and bio-pharmaceutical research, be it University or Industry, require a high specification instrument with the ability to develop methods.

The Pharmacopoeia test for resolution states that:

- To verify the resolution of the instrument, the spectrum of a 0.02% (v/v) solution of toluene in hexane should be recorded; the ratio of the absorbance at the maximum (~269nm) and minimum (~266nm) determines the resolution.
- At  $20^{\circ}\text{C} \pm 1^{\circ}\text{C}$  the value should be in the range 2.0 to 2.1 for a  $1\text{nm} \pm 0.1\text{nm}$  bandwidth instrument

The European Pharmacopoeia (1984, v.6.19, 2<sup>nd</sup> Edition) states that for stray light:

- To verify the stray light of the instrument, the absorbance of a 1.2 % w/v solution of potassium chloride with a pathlength of 1cm should be more than 2.000 when compared with water as reference liquid.

This instrument fulfils the requirements of the Pharmacopoeia, and is delivered with the appropriate factory final test certificate to show this. An “Instrument Qualification and Performance Verification Logbook” is also included on the CD supplied with the instrument; this details the various tests that have to be done to prove Pharmacopoeia compliance and enables the results to be plotted as a function of time.

## Good Laboratory Practice

Good laboratory Practice (GLP) concerns being able to trace experimental results to an instrument, an operator and the time the result was obtained so that a laboratory can prove that the instrument was functioning correctly or not. Laboratory, operator and internal instrument reference names can be entered via the software.

### GLP Diagnostic Tests

On calibration or re-calibration, the instrument self-checks its integrity for GLP purposes. This is quantified from:

- the calibration status of the instrument
- the age of the lamps
- the wavelength accuracy by comparing to the 656nm deuterium line
- the absorbance values of built in absorbance filters compared to when the instrument was manufactured (or last serviced by an accredited engineer).
- the stray light

The expected values are given in parentheses on the GLP print out after calibration, and the range of acceptance is defined in the technical specification of the instrument.

In the unlikely event that the instrument fails calibration or goes out of specification, a sequence of error messages will appear on the PC, the final message being "GLP CALIBRATION FAIL".

The following should be checked:-

- is the cell compartment lid closed properly
- is a sample in the light beam - if so, remove it
- is the baseplate plug in place (single cell accessory)
- is the blanking plug at the front of the cell compartment in place

Pressing **OK** after the message "GLP Calibration Fail" appears confirms that you have accepted the instrument status. If you are working in a regulated environment such as a drug discovery laboratory that generates data for GLP/GMP activities or reports, you should not use the instrument and contact your local service engineer.

## Specification

Wavelength range	190 - 1100nm, in 0.1 nm steps
Monochromator	1200 lines/mm Aberration corrected concave grating
Spectral bandwidth	1.8 nm
Spectral bandwidth	1.0 nm
Scan speeds	2100 nm/minute survey scan at 1.0 nm steps down to 135 nm/minute fine detail scan at 0.1 nm steps
Wavelength accuracy	± 0.5 nm
Light sources	tungsten halogen and deuterium lamps
Detector	silicon photodiode
Photometric range	- 3.000 to 3.000A, 0.01 to 99999 concentration units, 0.1 to 200%T
Photometric accuracy (linearity)	± 0.5% or ± 0.003A to 2.000A at 546 nm, whichever is the greater
Photometric reproducibility	within 0.5% of absorbance value to 3.000A at 546nm
Noise	± 0.001A near 0A at 546nm, ± 0.002A near 2A at 546nm
Baseline flatness	± 0.003A
Stability	± 0.001A per hour at 340nm near OA after warm-up (tungsten lamp)
Stray light	< 0.025 %T at 220nm using NaI and < 0.025 %T at 340nm using NaNO <sub>2</sub>
Digital output	9 pin Serial
Sample compartment size	210 x 140 x 80mm
Dimensions	500 x 360 x 190mm
Weight	13kg
Power requirements	90-265 V AC, 50/60Hz, 150VA
Safety Standard	EN61010-1
EMC emissions	EN 50 081-1 Generic emissions part 1
EMC immunity	EN 50 082-1 Generic immunity part 1
Mains harmonics	EN 61000-3-2
Quality System	Designed and manufactured in accordance with an ISO9001 approved quality system

Specifications are measured after the instrument has warmed up at constant ambient temperature and are typical of a production unit. As part of our policy of continuous development we reserve the right to alter specifications without notice.

## Warranty

Your supplier guarantees that the product supplied has been thoroughly tested to ensure that it meets its published specification. The warranty included in the conditions of supply is valid for 12 months only if the product has been used according to the instructions supplied. They can accept no liability for loss or damage, however caused, arising from the faulty or incorrect use of this product.

This product has been manufactured by Biochrom Ltd, 22 Cambridge Science Park, Milton Road, Cambridge CB4 0FJ, UK.