

OPERATION MANUAL



LLG-uniSPEC 1 UV/VIS Spektrophotometer

Thank you very much for purchasing
this LLG-uniSPEC 1 UV/VIS.

Please read the following instructions carefully
and always keep this manual within easy reach.

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1. Preface

1.1 Safety

Read the following manual before installing and using the instrument and its accessories. This instrument should be operated by appropriate laboratory technicians.

1.2 General

The apparatus described in this manual is designed to be used by properly trained personnel in a suitable equipped laboratory. For the correct and safe use of this apparatus it is essential that laboratory personnel follow generally accepted safe procedures in addition to the safety precautions called for in this manual.

The covers on this instrument may be removed for servicing. However, the inside of the power supply unit is a hazardous area and its cover should not be removed under any circumstances. There are no serviceable components inside this power supply unit. For this instrument, avoid touching the high voltage power supply at all times.

Some of the chemicals used in spectrophotometry are corrosive and/or inflammable and samples may be radioactive, toxic, or potentially infective. Care should be taken to follow the normal laboratory procedures for handling chemicals and samples.

1.3 Electrical

Before switching on the apparatus, make sure it is set to the voltage of the local power supply (see **Installation**).

The power cord shall be inserted in a socket provided with a protective earth contact. The protective action must not be negated by the use of an extension cord without a protective conductor.

1.4 Warning

Any interruption of the protective conductor inside or outside the apparatus or disconnection of the protective earth terminal is likely to make the apparatus dangerous. Intentional interruption is prohibited.

Whenever it is likely that the protection has been impaired, the apparatus shall be made inoperative and be secured against any unintended operation.

Note: NEVER touch or handle the power supply on this instrument due to the high voltage!

The protection is likely to be impaired if, for example, the apparatus

- Shows visible damage
- Fails to perform the intended measurements
- Has been subjected to prolonged storage under unfavorable conditions
- Has been subjected to severe transport stresses

1.5 Performance

To ensure that the instrument is working within its specification, especially when making measurements of an important nature carry out performance checks with particular reference to wavelength and absorbance accuracy. Performance checks are detailed in this manual.

1.6 Radio Interference

For compliance with the EMC standards referred to in the EC Declaration of Conformity, it is necessary that only shielded cables supplied by us are used when connecting the instrument to computers and accessories.

2. INTRODUCTION OF THE INSTRUMENT

2.1 Brief Introduction of the instrument

The LLG-uniSPEC 1 is a single beam, general purpose instrument designed to meet the needs of the Conventional Laboratory. This instrument is ideal for various applications, such as: Chemistry, Biochemistry, Petro-chemistry, Environmental Protection, Food and Beverage Labs, Water and Waste Water Labs and other fields of quality control and research.

This instrument incorporates a 128 × 64 dots matrix LCD display for photometric results, easy operation and wavelength range of 190 nm to 1000 nm. This instrument is ideal for measurements in the visible and ultraviolet wavelength region of the electromagnetic spectrum.



Fig 2-1 Front View

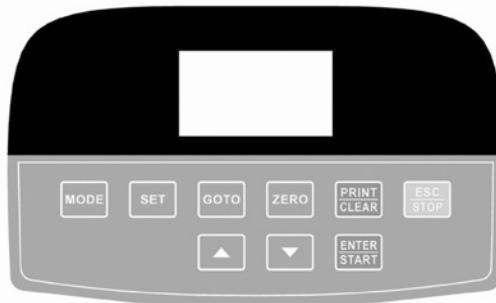


Fig 2-2 Control Panel

2.2 Working Principle

Different matter has different but special absorbance wavelength point. Also, when at the fixed wavelength point, the absorbance has some relation to the substance's (Always transparent Solution) concentration and its thickness. The relation can be concluded as the following Formula, which is called Lambert-Beer Law.

$$T = I/I_0$$

$$A = KCL = -\log I/I_0$$

A Absorbance

C Concentration of the Solution

K Absorbance Coefficient of the Solution

L The length of the Solution in the light path

I The intensity of the light focused on the A/D after it permeate the solution to be measured.

I_0 The intensity of the light focused on the A/D after it permeate the Solution.

Note: When the test is running, the solvent is usually taken as the Reference Solution and its Transmittance is considered as 100%T. While the Transmittance of the sample to be tested is a relative value which is going to be compared to that of the Reference.

2.3 Structure

The spectrophotometer consists of five parts:

- 1) Halogen or deuterium lamps to supply the light;
- 2) A monochromator to isolate the wavelength of interest and eliminate the unwanted second order radiation;
- 3) A sample compartment to accommodate the sample solution;
- 4) Detector to receive the transmitted light and convert it to an electrical signal; and
- 5) A digital display to indicate absorbance or transmittance. The block diagram (Fig 2.4) below illustrates the relationship between these parts.

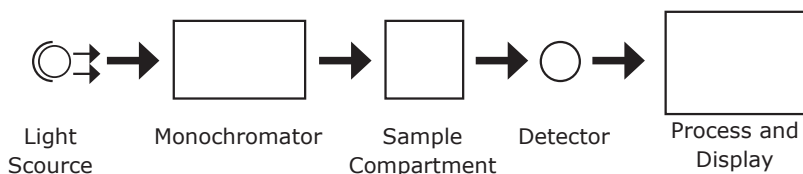


Fig 2.4 Block diagram for the Spectrophotometer

In your spectrophotometer, light from the lamp is focused on the entrance slit of the monochromator where the collimating mirror directs the beam onto the grating. The grating disperses the light beam to produce the spectrum, a portion of which is focused on the exit slit of the monochromator by a collimating mirror. From here the beam is passed to a sample compartment through one of the filters, which helps to eliminate unwanted second order radiation from the diffraction grating. Upon leaving the sample compartment, the beam is passed to the silicon photodiode detector and causes the detector to produce an electrical signal that is displayed on the digital display.

2.4 Unpacking Instructions

Carefully unpack the contents and check the materials against the following packing list to ensure that you have received everything in good condition.

Packing List	
Description	Quantity
Spectrophotometer	1
Power Cord	1
1 cm Glass Cuvettes	1 Set of 4
1 cm Quartz Cuvettes	1 Set of 2
User's Manual	1

Note: The Printer mentioned in this manual is an optional accessory. It does not come standard with the instrument.

2.5 Specifications

Wavelength Range	190-1000 nm
Band Width	2 nm
Wavelength Accuracy	±2 nm
Wavelength Repeatability	0.5 nm
Wavelength Setting	Auto
Photometric Accuracy	±0.5 %T
Photometric Repeatability	≤0.2 %T
Photometric Display Range	0-200 %T, -0.3-3.0A, 0-9999C
Stability	0.002 A/h @ 500 nm
Stray Light	≤0.1 %T
Data Output Port	USB
Printer Port	Parallel Port
Display	128*64 Dots LCD
Lamps	Deuterium Lamp & Tungsten Halogen Lamp
Detector	Silicon Photodiode
Power Requirement	AC85~250 V
Dimension (L*W*H)	420*280*180 mm
Weight	11 kg

3. Install Instrument

3.1 Environment Required

To ensure the best performance, the following conditions are required:

- The best working temperature range is 16-30 °C and the humidity is 45-80 % r.H.
- Keep it as far as possible away from the strong magnetic or electrical fields or any electrical device that may generate high-frequency fields.
- Set the unit up in an area that is free of dust, corrosive gases and strong vibrations.
- Remove any obstructions or materials that could hinder the flow of air under and around the instrument.
- The power requirement is AC85V~265V.
- Use the appropriate power cord and plug into a grounded outlet.
- If the local voltage is not stable enough, a Power Stabilizer is required.
- Keep away from direct sunlight

3.2 Installation

Step 1: Check the packing list

Unpack the contents, check the materials with the Packing List. Any damage or item missing please contact us or the local dealer.

Step 2: Position

Place the instrument on a stable table carefully.

Step 3: Link the power cord

Make sure the instrument's power switch is in the Off condition, link the power cord to the instrument and insert another end in the socket provided with a protective earth contact.

Step 4: Switch on the power

Check again, make sure that connections are correct. Switch on the power. The instrument can be used for measurements after self-test and pre-warm.

4 Operation Introduction

4.1 Software Structure

4.1.1 Main Interface

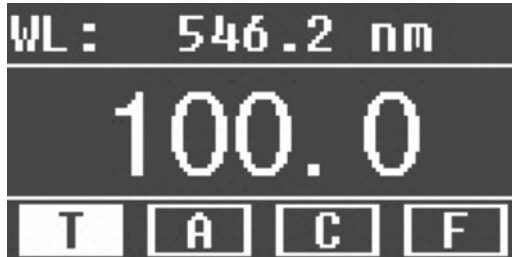


Fig 4-1 Main Interface

After 20 minutes' warm-up, the system goes into main interface. (Fig.4-1) Press the key of **MODE** to change the functions.

4.1.2 Firmware Functions

The firmware consists of 5 functions: T, A, C, F and system functions

1) T

To measure the Transmittance of a sample in a fixed wavelength point. The test result can be stored in the Photometer, total 200 groups of data can be stored.

2) A

To measure the Absorbance of a sample in a fixed wavelength point. The test result can be stored in the Photometer, total 200 groups of data can be stored.

3) C-Standard Curve Method

Set up standard curve by standard samples; use the new curve to measure the unknown sample's concentration. The curves and the test results can be stored in the Photometer. Total 200 curves can be stored.

4) Coefficient Method

Input the values of the curve equation's coefficient, and then measure the unknown sample's concentration.

5) Setup-System Functions

Press the key of **SET** on the keypad to go into system functions (Only available in **T MODE** and **A MODE**). Light source management; Get Dark Current; Calibrate Wavelength and Load default, etc.

4.2 Basic Operation

4.2.1 Set Wavelength

In the measurement Interface, press to go into wavelength setting Interface. Use Arrow Key to increase or decrease the value of wavelength, then press to confirm. When arriving at the setting wavelength point, it sets 100%T/0Abs automatically.

4.2.2 Delete the test result and stored data

In the measurement Interface, press to delete the test result and stored data.

4.2.3 Calibrate 100%T/0Abs

Put the Reference in the light path, press to calibrate 100%T/0Abs.

4.2.4 Measure Samples

Put the samples in the light path and press to measure

4.2.5 Print the test result

In the Measurement Interface, press to print the result.

4.3 Preparation before test

4.3.1 Switch on the instrument and begin the system self-test

Make sure to remove all the cuvettes in the light path; Close the compartment lid and switch on the power; Then the system will begin self-test.

Note: During the course of Diagnostic Program runs, please DO NOT open the lid of the compartment!

4.3.2 Pre-warm

When the diagnostic program finished, it goes into pre-warm condition. 20 minutes is required before measure.

4.3.3 Check the cuvettes

The cuvette should be clear and no solution should remain on the transparent surface. If the wavelength is below 340nm, you will have to use a **Quartz Cuvette**.

4.4 Measurement

4.4.1 T-Mode

Step 1, Go into T Mode Interface

In the Main Interface, press **MODE** Key to move the cursor on "T", you will see the current sample's T% value. Press **ENTER**, to go into Continuous Measurement Interface. Fig. 4-2;

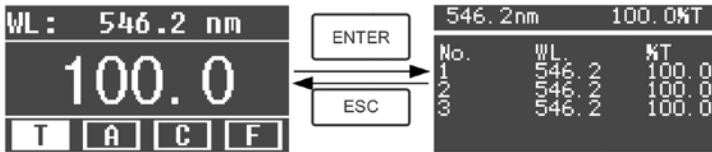


Fig. 4-2

Step 2, Set Wavelength

Press **GOTOλ** to set Wavelength, input the wavelength value by the Arrow Key, then press **ENTER** to confirm. Fig. 4-3;



Fig. 4-3

Step 3, Calibrate 100%T/0Abs

Put the Reference Solution in the light path, press **ZERO** to calibrate 100%T/0Abs;

Step 4, Measure Sample

Put the unknown concentration sample in the light path, press **START** to measure, and the result displays in the data sheet. At the same time, the test result will be stored in the Photometer automatically.

Repeat this step to finish all the samples measurement.

Step 5, Print or Delete the data

Press **PRINT/CLEAR** to go into the following interface.(Fig.4-4)

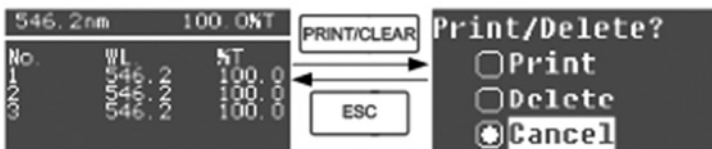


Fig. 4-4

- 1) When the optional Printer is linked to the instrument, if you want to print out the test result, use Arrow Key to choose "Print", then press to confirm. After printing, the data will be deleted from the Photometer.
- 2) If you want to delete the saved data, move the cursor on the item of "Delete", then press to confirm.

4.4.2 A-MODE

Step 1, Go into A Mode Interface

In the Main Interface, press Key to move the cursor on "A", you will see the current sample's Absorbance value. Press to go into Continuous Measurement Interface. Fig. 4-5;



Fig. 4-5

Step 2-5 is the same as T-mode, please refer to the corresponding operation in 4.4.1

4.4.3 C-MODE (Standard Curve)

1) Go into C-MODE Interface

In the Main Interface, press Arrow Key to move the cursor on "C", then you will see the following Interface. (Fig.4-6) Here you can create a new curve, or you can load a saved curve. If you want to delete a saved curve, just choose "Delete Curve".

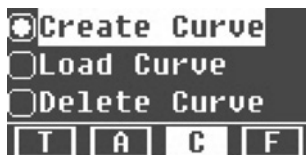


Fig. 4-6

2) Create Curve

If you want to create a new standard curve by several standard samples, Use Arrow Key to move the cursor to "Create Curve", then press **ENTER** to confirm. The system will ask you to input the quantity of your standard samples. (Fig.4-7).

Note: The default quantity is "3". Please don't change the value at this time, you should first set the Wavelength.

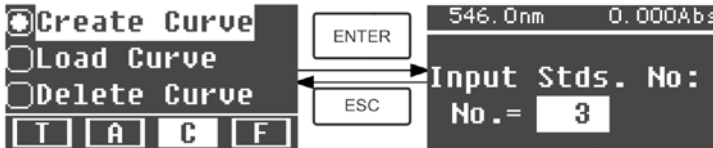


Fig. 4-7

Step 1, Set Wavelength

Press **GOTOλ** to go into the wavelength setting interface, input the WL. Value by the Arrow key and press **ENTER** to confirm. Fig. 4-8;



Fig. 4-8

Step 2, Input the quantity of the standard samples

Use Arrow Key to input the quantity of the standard samples, then press **ENTER** to confirm. The system will go into the following interface. (Fig. 4-9)



Fig. 4-9

Step 3, Calibrate 100%T/0Abs

Put the Reference Solution in the light path, then press **ZERO** to calibrate 100%T/0Abs

Step 4, Input Standard Samples' Concentration

Pull the 1# Standard Sample in the light path and input the value of its concentration by the Arrow key, then press to confirm. The system will go into the next interface. (Fig.4-10)



Fig. 4-10

Pull the 2# Standard Sample in the light path and input its concentration, then press to confirm. Repeat the above step till the last sample's concentration is finished.

Step 5, Display the Curve

When the last standard sample is finished, double press to confirm. then the Standard Curve and its equation will display on the screen automatically. (Fig. 4-11) At the same time, the Curve Equation will be saved in the Photometer automatically.

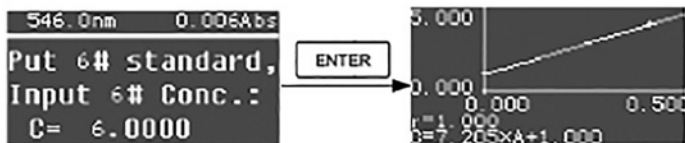


Fig. 4-11

Note: If a mistake happens during the operation, the system will beep 3 times and return the initial interface automatically. Of course, the curve can not be displayed on the screen.

Step 6, Measure Samples

Put the Reference solution in the light path and press to go into the continuous measurement interface. (Fig. 4-12)



Fig. 4-12

Put the unknown sample in the light path, then press to measure. The result will be displayed on the screen one by one. At the same time, the data will be saved in the Photometer automatically. Total 200 groups of data can be saved.

3) Load Curve

All the curve equations will be saved in the Photometer automatically. If you want to reload the saved curve, just follow the following steps:

Move the cursor on "Load Curve" and press to confirm. Then the system will go into the curve equation record interface.(Fig. 4-13)

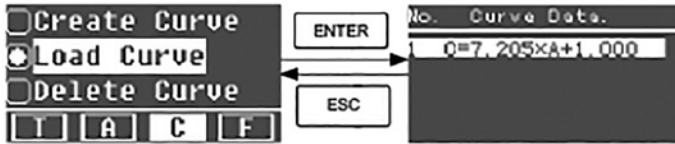


Fig. 4-13

Move the cursor on the equation that you need and press to confirm. Then the corresponding curve will display on the screen. (Fig. 4-14)



Fig. 4-14

Press to go into sample continuous measure interface and measure samples. (Fig. 4-12)

Note: When you reload the curves, the wavelength will be set at the point where you create the Standard Curve automatically.

4) Delete Curve

Move the cursor on "Delete Curve" and press to confirm. Then the system goes into the curve equation selection interface. (Fig. 4-15)



Fig. 4-15

Move the cursor on the curve equation that you want to delete and press , then system will ask you to confirm again. (Fig. 4-16)



Fig. 4-16

Move the cursor on "Yes" and press to confirm, then the curve equation will be deleted. If you don't want to delete it, just choose "No" or press to return.

4.4.4 F-MODE (Coefficient Method)

1) Go into F-MODE Interface

Press Arrow Key to choose "F" in the Main Interface, and you'll see the following Interface. (Fig. 4-17)

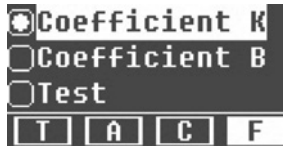


Fig. 4-17

2) Parameter Setting

Use Arrow Key to move the cursor on "Coefficient K" and press to go into K setting interface. Fig. 4-18; Enter every digit of the K value using the Arrow Key and press to confirm. When the last digit is entered, the system will return to the previous Interface automatically.

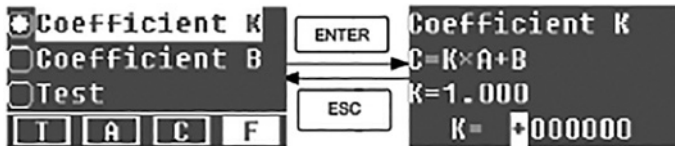


Fig. 4-18

Input the value of **B** in the same way(Fig. 4-19)

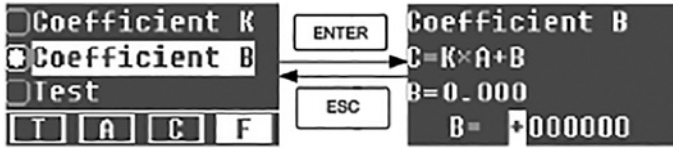


Fig. 4-19

3) Test Samples

Step 1, Go into pre-test Interface

Move the cursor on "Test", then press to go into pre-test Interface. (Fig.4-20)

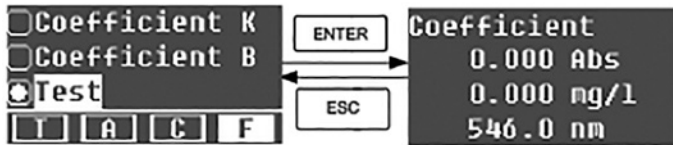


Fig.4-20

Step 2, Set Wavelength

Press to go into wavelength setting interface, input the wavelength value by Arrow key and press to confirm. (Fig. 4-21)



Fig. 4-21

Step 3, Calibrate 100%T/0Abs

Press **ENTER** to go into continuous measurement interface (Fig. 4-22). Put the Reference Solution in the light path, then press **ZERO** to calibrate 100%T/0Abs;

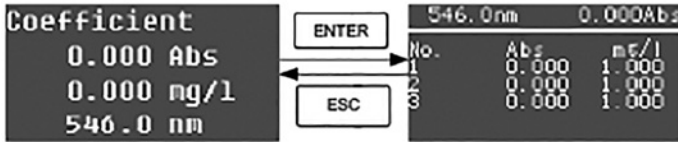


Fig. 4-22

Step 4, Measurement

Put the samples to be measured in the light path, press **ENTER** to measure, then the result will be displayed on the screen. Repeat this step to measure other samples. All the test results will be listed on the screen and stored in the Photometer automatically. They can be reload even after a sudden power cut.

Step 5, Print or Delete the Test Result

In the continuous measurement interface, press **ENTER/CLEAR** to print or delete the test result. Please refer to **Chapter 4.1** for details.

5. System Functions

In the **T** mode or **A** mode of Main Interface, press SET Key to go into system functions Fig. 4-23).



Fig. 4-23

5.1 Energy

To see the energy of present wavelength. Move the cursor on "Energy", then press **ENTER** to confirm. (Fig.4-24)

Note: Users seldom use this function. It is useful for service to judge the fault.



Fig. 4-24

5.2 Get Dark Current



When the working condition changes, a dark current calibration is required before any measurement.

Use Arrow key to choose "Dark Current" and press **ENTER** to confirm (Fig. 4-25)

Note: Remove the cuvettes from the light path first. Do not open the lid of the compartment during the course of calibration.

Press **ESC** to return when it finishes.



Fig. 4-25

When it finishes, it will display the following words on the screen. (Fig. 4-26). If it displays "Dark Current Err", you should check if there's something else in the compartment and repeat this step.

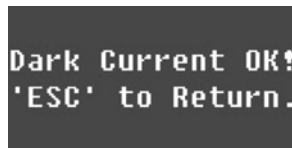


Fig. 4-26

5.3 Wavelength Calibration



After some time, the energy of lights drops off which can have a slight influence on the test result. In this case, users can reset the wavelength to compensate. We suggest the users to calibrate the wavelength every one or two months.

Remove all the cuvettes from the light path and close the lid of the compartment, press Arrow Key to choose “Calibrate WL.” and press to begin the calibration (Fig. 4-27). The lid of the compartment should not be opened during the calibration.

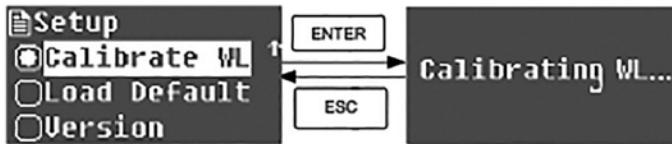


Fig. 4-27

When it finishes, it will display the following words on the screen. (Fig. 4-28). If it displays “Wavelength Err”, you should check if there’s something else in the compartment and repeat this step.



Fig. 4-28

5.4 Load Default

Press Arrow Key to choose “Load Default” and press to confirm. (Fig. 4-29) press Arrow Key to choose “Yes” and press to confirm. Then the system will recall the default settings. Choose “No” to cancel the operation.

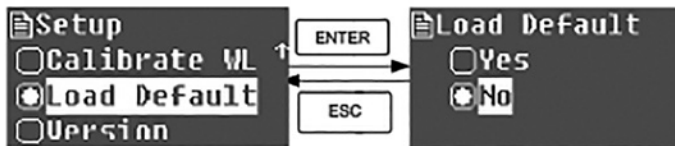


Fig. 4-29

Note: All the saved data and curves would be deleted from the Photometer once “Yes” is chosen!

5.5 Version

Press Arrow Key to choose "Version" and press to confirm. You will see the version of the software and hardware. (Fig.4-30). Press to return.



Fig. 4-30

Due to different software versions and updates, what you see on the instrument screen maybe different from the one showed in the above fig. 4-31.

6 Instrument Maintenance

To keep the instrument work properly, constant maintenance is needed.

6.1 Daily Maintenance

1) Check the compartment

After measurement, the cuvettes with sample solutions should be taken out of the compartment in time or the volatilization of the solution will make the mirror go moldy. Users must pay more attention to the corrosive sample and liquid easy to volatilize. Any solution remains in the compartment should be wiped off immediately.

2) Surface Clean

The cover of the instrument is with paint. Please use wet towel to wipe off the drip on the surface immediately. Do not use Organic solutions to clean the cover. Please wipe off the dirt on the cover quickly.

3) Clean the cuvettes

After every test or after a solution change, the cuvettes should be cleaned carefully or the remains on the surface would cause measuring errors.

6.2 Troubleshooting

1) Dark Current Error when self-test

Possible Cause

- Open lid of the compartment during the self-test.

Solution

Close the lid of the compartment and switch on the power again.

2) No response after power on

Possible Cause

- Bad contact in power supply
- Fuse melt

Solution

Improve the contact
Replace by new fuse

3) Printer not work, printer error

Possible Cause

- No power supply
- Bad contact in power supply
- Bad contact of the data cable

Solution

Switch on the power supply
Improve the contact
Improve the contact

4) No Stable Reading

Possible Cause

- Not enough pre-warm time
- Glass cuvettes used in UV Range
- No stable Sample
- Too high sample concentration
- Low voltage or unstable power supply
- Light defect
- Light used up

Solution

Increase the pre-warm time
Use Quartz Cuvettes.
Improve the sample
Dilute the sample
Improve the power condition
Replace the lamp
Replace the lamp

5) Worse Repeatability

Possible Reason

- Unstable sample
- Cuvettes polluted

Solution

Improve the sample
Clean the cuvettes

6) Incorrect reading

Possible Reason

- Dark Current Error
- Wrong cuvettes matching

Solution

Re-get the dark current
Improve the matching of the cuvettes

6.3 Fuse replacement



Danger! Be sure to switch off the power and unplug the socket before replacement!

Step 1: Tools preparation

Prepare a 3 × 75 Flat Blade screwdriver

Step 2: Switch Off the power supply

Switch off the power supply, and unplug the socket.

Step 3: Take out the Fuse Seat

Take out the fuse seat with a screwdriver. (Fig. 5-1)



Fig. 5-1

Step 4: Replace a new fuse

Pick out the spare fuse and replace it to the working position. (Fig. 5-2)

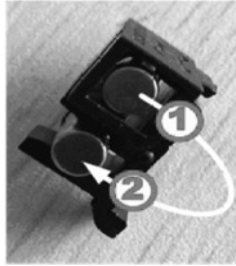


Fig. 5-2

Step 5: Reset the fuse seat

Replace the fuse seat in the power socket

Step 6: Switch on the power

Plug the socket and switch on the power

7. Spare part and accessories

Part code	Description
6.263 636	LLG-uniSPEC 1 UV/VIS-Spectrophotometer with EU and UK plug
6.263 633	Deuterium lamp (D2) for LLG-uniSPEC 1
6.263 615	Tungsten lamp for LLG-uniSPEC 1, 2 and 4
6.266 530	Cell holder for 4 cuvettes 50 mm and 100 mm, for LLG-uniSPEC 1, 2 and 4

10. Warranty

This product is warranted to be free from defects in material and workmanship for a period of three (3) years from date of purchase.

This warranty is valid only if the product is used for its intended purpose and within the guidelines specified in this instruction manual. This warranty does not cover damage caused by accident, neglect, misuse, improper service, natural forces or other causes not arising from defects in original material or workmanship. This warranty does not cover any incidental or consequential damages, commercial loss or any other damages from the use of this product.

The warranty does not cover damage to paint or finish and defects or damages caused by physical and chemical abuse or normal wear and tear. The warranty is invalidated by any nonfactory modification, which will immediately terminate all liabilities on us for the products or damages caused by its use. The buyer and its customer shall be responsible for the product or use of products as well as any supervision required for safety. If requested the products must be returned to the distributor in well packed and insured manner and all shipping charges must be paid.

Information on the disposal of electrical and electronic devices in the European Community:

The disposal of electrical devices is regulated within the European Community by national regulations based on the European Directive 2012/19/EU on waste electrical and electronic equipment (WEEE). According to these regulations, any devices supplied after 13.06.2005 in the business to business sphere, to which this product is assigned, may no longer be disposed of in municipal or domestic waste. They are marked with the following symbol to indicate this. As disposal regulations within the EU may vary from country to country, please contact your supplier if necessary.

PRODUCT DISPOSAL



In case the product is to be disposed of, the relevant legal regulations are to be followed.

Notes

A large grid of graph paper, consisting of 25 columns and 30 rows of small squares, intended for taking notes.



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