pg instruments

UV/VISIBLE SECTROPHOTOMER

T65/T65+

USER MANUAL

Analytical
Instruments
for
Science

Contents

Chapter 1 Introduction

1.1 Measurement Principle

The measurement principle of the spectrophotometer is based on the Lambert-Beer law. When the beam of collimated monochromatic light passes through a uniform-colored solution, the absorbance of the solution is directly proportional to the concentration of the solution and the optical path. This is the basis for the quantitative analysis. The Lambert-Beer law is described as the following formula:

$$A=k\times b\times C$$

A — Absorbance of the analyte

k — The absorption coefficient

b — The path length in cm

c — The analyte concentration

1.2 Performance and features

The performance and features of the T65 Spectrophotometer are as follows:

- ✧ Low stray light with high resolution optical system enables accurate measurement with good stability and reproducibility.
- ✧ Novel technology organically combines light, machine, electricity and microcomputer, together with scientific design, enabling good instrument stability.
- ✧ 7-inch color capacitive touch screen guarantees the touch point more precisely and enables higher sensitivity and excellent stability.
- ✧ High resolution screen of 800 × 480, for fast running speed and large capacity.
- ✧ Interactive human machine interface enables friendly operation interface, and convenient operation.
- ✧ Powerful system settings, measurement functions such as photometric measurement, quantitative analysis, kinetic analysis, wavelength scan, multi-wavelength measurement, and DNA/protein measurement are available with stand alone operation.

- ✧ Automatic cell position control is available with the 8 cell automatic cell holder accessory.
- ✧ Instrument provides storage for data reading and writing. USB storage is also available.
- ✧ Connecting to a designated model of inkjet printer is available for direct output of reports.

1.3 Application

The spectrophotometer is a common analytical instrument in most chemistry laboratories. It is widely used in pharmaceutical, medicine, health, chemical, energy, machinery, metallurgy, environmental protection, geology, food, biology, materials, agriculture, forestry, fisheries, higher education, metrology, teaching, scientific research, quality control, raw material and product inspection during production process.
The T65 is a single beam spectrophotometer equipped with a touch screen. With its improved stable performance, accurate measurement and powerful functionality, it has strong advantages in many scientific industries.

1.4 Technical Specifications

Model	T65V	T65UV	T65+UV
Wavelength Range	325 - 1100nm	190nm -1100nm	
Bandwidth	1.8nm		1, 2, 4, 5nm
Wavelength Accuracy	±0.5nm		
Wavelength Repeatability	≤0.2nm		
Photometric Range	0 - 200%T, -0.3A - 3A, 0 - 9999C		
Photometric Accuracy	±0.2%T		
Stray Light	≤0.05%T		
Dimensions	490mm × 370mm × 210mm		

1.5 Packing List

No.	Item	Qty	Note
1	T65 Spectrophotometer	1	
2	Power Cord	1	
3	Quartz Cell	2	T65UV only
4	Glass Cell	4	
5	Dust Cover	1	
6	User's Manual	1	
7	Quality Certificate	1	
8	Packing List	1	

1.6 Symbols

HIGH VOLTAGE.

Caution danger of high voltage. Risk of electric shock.

HOT SURFACE

Caution hot surface. Do not touch to avoid the risk of burning.

ULTRAVIOLET RADIATION

Caution emission of UV radiation.

1.7 Product Design

The profile the T65 Spectrophotometer is shown in Fig. 1-1:

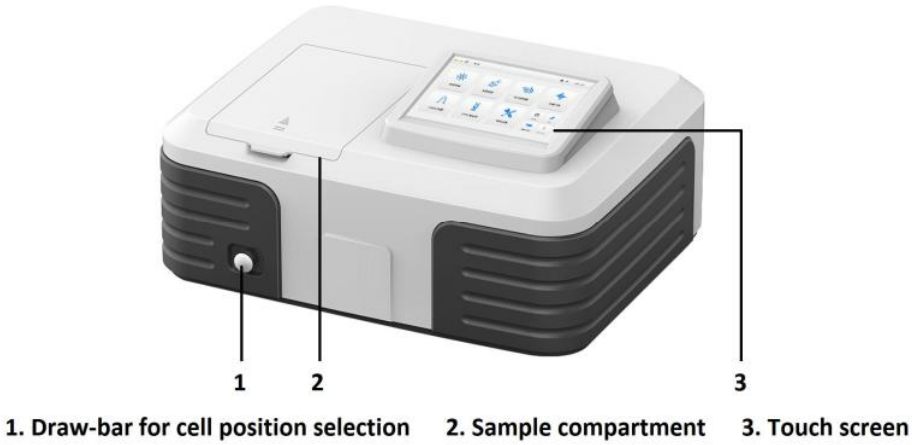

Fig. 1-1

The back of the T65 Spectrophotometer is shown in Fig. 1-2:

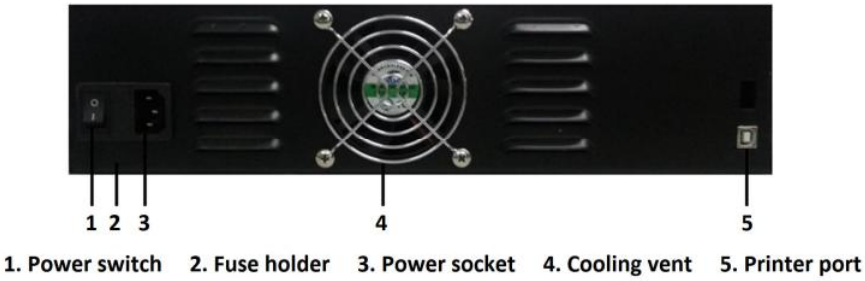

Fig. 1-2

The sample configuration of T65 Spectrophotometer is shown in Fig. 1-3:

Fig. 1-3

Chapter 2 Installation

2.1 Unpacking

Please check the outer packing and make sure it is intact before unpacking. Then check the instrument and accessories according to the packing list to ensure they are complete and not damaged. If there are any questions about packing or damaged parts, please contact your local dealer or contact PG Instruments direct..

2.2 Requirements

The laboratory should be prepared, and the following requirements should be met:

1) The instrument should be placed in a dry room where the room temperature should be in the range of 5 ℃~ 35 ℃. The relative humidity should be less than 85%.
2) Power supply requirement: The rated voltage should be 220V ± 22V AC (110V ± 11V AC is also optional). The frequency should be 50Hz (60Hz is also optional). Good grounding is also required. A voltage stabilizer of 1000W is recommended if the supply is not stable. This will enhance the anti-interference performance of the instrument.
3) Other requirements: The instrument should be kept away from strong or continuous vibration, electromagnetic field, direct sunlight or radiation from heaters. It should be kept free of dust and corrosive vapors. The instrument should be placed on a stable workbench with adequate cooling and ventilation. A clearance of at least 15 mm around the instrument is suggested.

2.3 Installation

Install the instrument as the following steps:

Step 1: Place the instrument onto a stable bench after unpacking.

Step 2: Connect the power cord to the instrument. If a printer is required, connect the power cord of the printer and connect the instrument to the printer with the communication cable.

Chapter 3 Instrument Operation

Before switching on the device, make sure all connections have been checked. The power supply should have a suitable ground and it should meet the relevant requirements. There should be no sample in the cell holder or anything blocking the light path.

3.1 Power On & Self-diagnosis

1. Power On & Self-diagnosis

Switch on the device, it will start self-diagnosis. (Fig. 3-1). System will automatically diagnose the file, automatic sample holder, filter, tungsten lamp, deuterium lamp, lamp conversion, detector, wavelength positioning, dark current and system parameters.

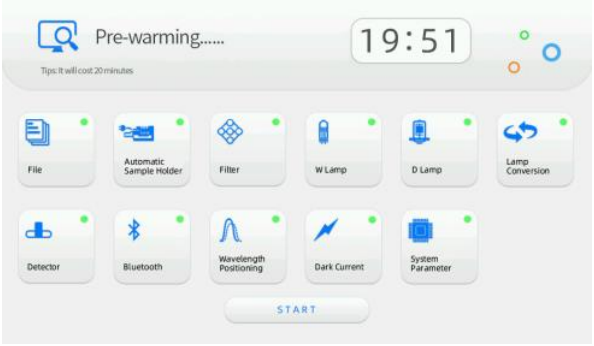

Fig. 3-1

NOTE: There is a status indicator lamp beside each self-diagnosis item which will turn green when the item passes. If any item fails, the system will sound an alarm and the status indicator lamp will turn red. However, the self-diagnosis process will continue.
Please do not open the lid of the sample compartment during the self-diagnosis process.
Please contact your local dealer or PG Instruments direct if any self-diagnosis item fails. You can also refer to chapter 5 in this manual for troubleshooting suggestions.

2. Pre-warming

Pre-warming will start after self-diagnosis has finished. It should take around 20mins. The system will sound an alarm when the pre-warming is complete, and the screen will open the main operation interface. You can simply click “ START ” to skip the pre-warming process.

3. Ready for operation

After pre-warming, the instrument is ready for operation. (Fig. 3-2)

Functions such as photometric measurement, quantitative analysis, kinetic analysis, wavelength scan, multi-wavelength measurement, DNA/protein measurement and system settings are available. Simply click the right icon to enter the operation interface.

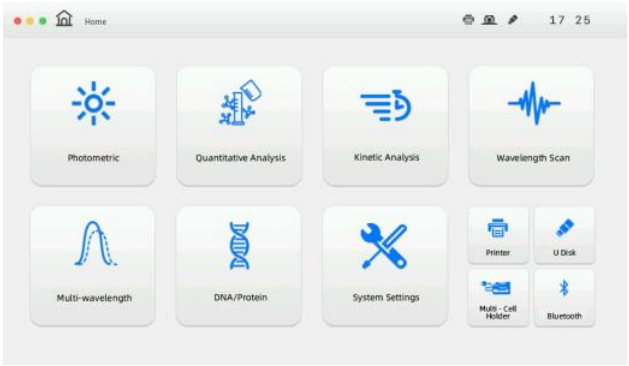

Fig. 3-2

4. Description of touch keys

The common touch keys are shown on the bottom panel after entering each operation interface, following are the descriptions.

BLANK: For blank calibration, adjust to 0.000 Abs or 100.0 %T.

SAVE: Save the data.

OPEN: Open the data.

: Exit the current interface and return to the main interface.

CLEAR: Delete all records displayed in the current measurement interface.

PRINT: Print the data.

SETTING: For measurement parameter setting.

MEASURE: Measure and record the data.

DELETE: Delete the selected measurement data.

: Page up for data browsing or back to previous page.

: Page down for data browsing or go to next page.

3.2 Multi- cell Holder Management

NOTE: This section is only for instruments fitted with automatic 8 cell holder.

With the accessory of automatic 8 cell holder fitted, automatic measurement can be performed with the functions of photometric measurement, quantitative analysis, multi-wavelength measurement and DNA/protein measurement. Click the icon "Multi - Cell Holder" on the bottom right corner of the main interface to enter the multi-cell holder management interface (Fig. 3-3).

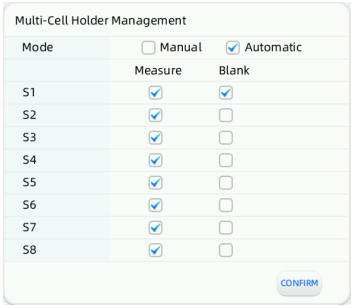

Fig. 3-3

Select the sample with the relevant cell position and click "CONFIRM" to return to the main interface.

3.3 Photometric Measurement

Absorbance, transmittance, and energy measurements are available with photometric measurement. The measurement result also can be printed out.

Click the icon "Photometric" in the main interface to open the photometric measurement interface (Fig. 3-4).

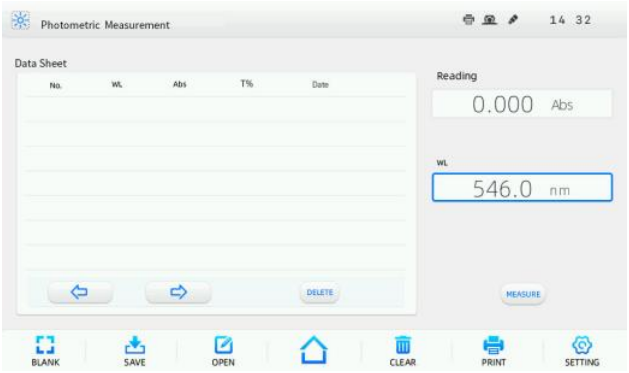

Fig. 3-4

3.3.1 Photometric measurement

Following are the operation steps for photometric measurement.

Step 1 Enter the photometric measurement interface.

Click the icon “  ” in the main interface to enter the photometric measurement interface.

Step 2 Set the measurement wavelength.

In the photometric measurement interface, click on the current wavelength display bar. A digital input window will open (Fig. 3-5). Click “confirm” after inputting the wavelength value. A prompt “Wavelength moving…” will be shown and the wavelength will move to the correct position. You can click “cancel” to exit the digital input window.

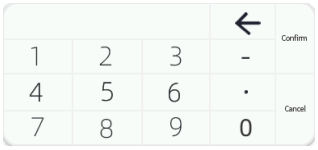

Fig. 3-5

NOTE: The valid wavelength range is between 190 nm and 1100 nm. If the input value is out of range, it is invalid and you can input wavelength again.
You can click “ ← ” to clear the data when an error is put in.
The touch key “ ← ” also works in the process of digital setting in subsequent operations.

Step 3 Sample measurement.

Put the blank solution or reference solution into the cell holder, which is in the light path, and click “  ”. The reading in the instrument will be adjusted to 0.000 Abs/100.0 %T. Then, replace the blank solution or reference solution with the sample solution, click “  ” and record the measurement result.

3.3.2 Data processing

You can carry out data processing such as data saving, opening, printing and deleting after completing photometric measurements.

Data saving: You can save the data to the instrument memory by clicking " SAVE ". When a USB storage device is connected, select to save the data to the USB storage device. Input the file name in the file save window (Fig. 3-6) and click " CONFIRM ". The file will be saved with the suffix of ".bas".

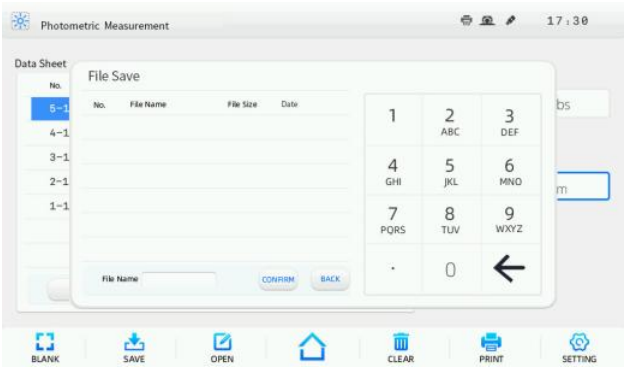

Fig. 3-6

Data opening: Click " OPEN " to open the data opening interface (Fig. 3-7). Select the file to be opened and click " CONFIRM " to open the data.

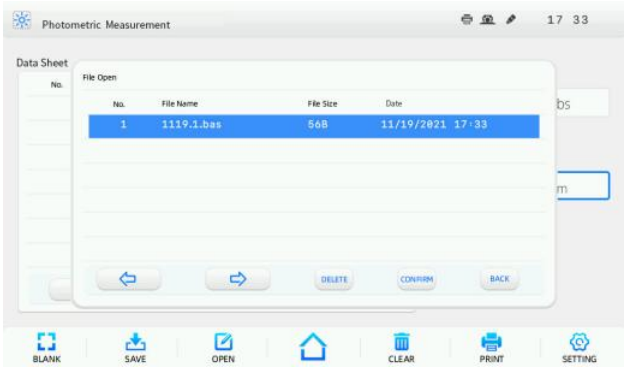

Fig. 3-7

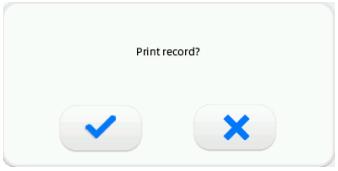

Fig. 3-8

Data printing: Print the data by clicking " PRINT " if a printer is connected. A dialog box will open (Fig. 3-8), click " " to print the data.

Data deleting: If more data needs to be deleted, select the row of the data and click " DELETE " at the bottom of the data sheet. A dialog box will open (Fig. 3-9), click " " to delete. Click " CLEAR " on the lower panel of the operation interface to clear all the data displayed in the data sheet. A dialog box will open (Fig. 3-10), click " " to delete.

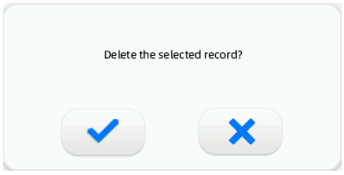

Fig. 3-9

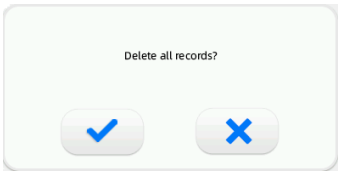

Fig. 3-10

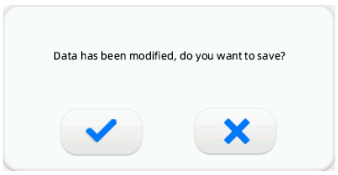

Fig. 3-11

NOTE: The delete operation only works for the current display. The already saved data won't be lost. Before leaving the current interface or returning to the main interface, a dialog box will open (Fig. 3-11). If the data after the delete operation needs to be saved, click "✓" to save the updated data.

3.4 Quantitative Analysis

You can carry out sample measurement based on the method of standard curve in the quantitative analysis interface or utilize coefficient method.

Click the icon "  " in the main interface to open the quantitative analysis interface (Fig. 3-12).

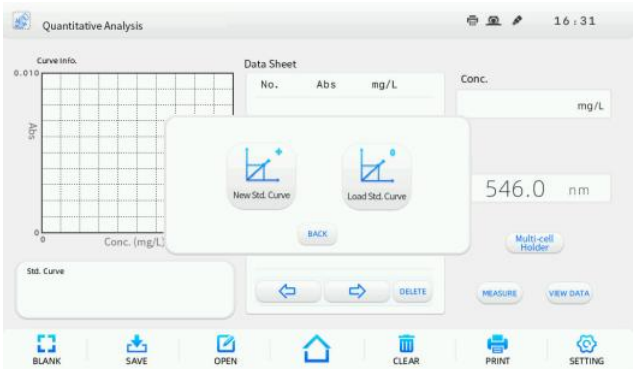

Fig. 3-12

3.4.1 Standard curve measurement

The method of standard curve is to establish a calibration curve first, then measure the sample based on the calibration curve. The standard curve is also known as standard calibration curve. Measure the absorbance of the sample and to obtain the concentration that is calculated according to the standard curve.

Note: The absorbance linearity range will cause measurement error. The best absorbance linearity range is between 0.2 and 0.8.

1. Enter the interface of the standard curve method

In the main quantitative analysis interface, click “ New Std. Curve ” to open the interface of the standard curve method (Fig. 3-13).

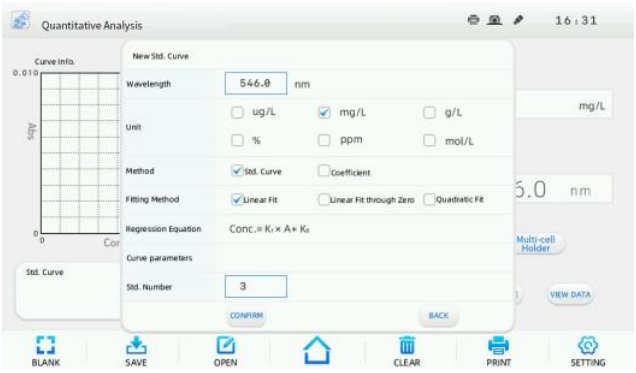

Fig. 3-13

2. Create standard curve

In the interface of the standard curve method, set the wavelength, select the method “Std. Curve”, select fitting method, set the std. number and click “ CONFIRM ” to enter the standard curve measurement interface.

Following are detailed operation steps for standard curve measurement:

Step 1 Measurement wavelength setting.

Click on the wavelength column in the interface of the standard curve method and a digital input window will open (Fig. 3-14). Click “confirm” after inputting the wavelength value. A prompt “Wavelength moving…” will be shown and the instrument will move the wavelength to the selected position.

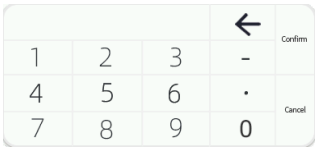

Fig. 3-14

Step 2 Standard samples measurement and standard curve establishing.

In the interface of the standard curve method, click on std. number column, input the number value and click “confirm” to open the standard curve measurement interface (Fig. 3-15).

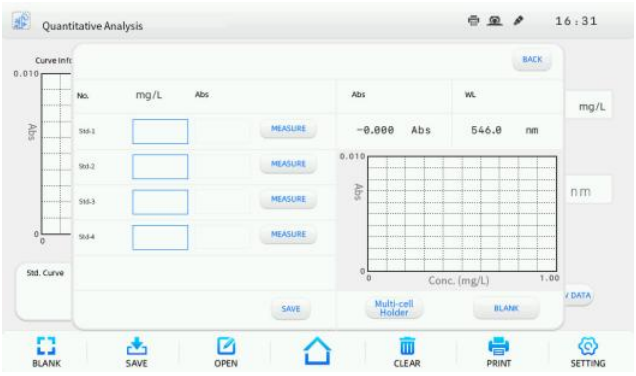

Fig. 3-15

Click on the concentration column of std-1, input the concentration value and confirm it. Input the other standard concentration values one by one. Put the reference solution of the standard samples into the cell holder, which is in the light path, and click "BLANK" to adjust 0.000 Abs. Then, replace the reference solution with the first standard sample solution, click "MEASURE" to record the Abs. value. Measure the other standard sample solutions accordingly. The standard curve is obtained. (Fig. 3-16). Up to ten standard points can be measured.

Fig. 3-16

Step 3 Sample measurement.

Click "SAVE" in the obtained standard curve interface to open the sample measurement interface (Fig. 3-17). The curve information including the standard curve, curve equation and correlation coefficient are shown on the left pane. Insert the blank solution into the cell holder, which is in the light path, and click "BLANK" to adjust 0.000 Abs. Replace the blank solution with the sample solution, click "MEASURE" and the measurement result will be recorded.

Fig. 3-17

NOTE: In the sample measurement interface, click "VIEW DATA" to retrieve the data record of standard samples (Fig. 3-18).

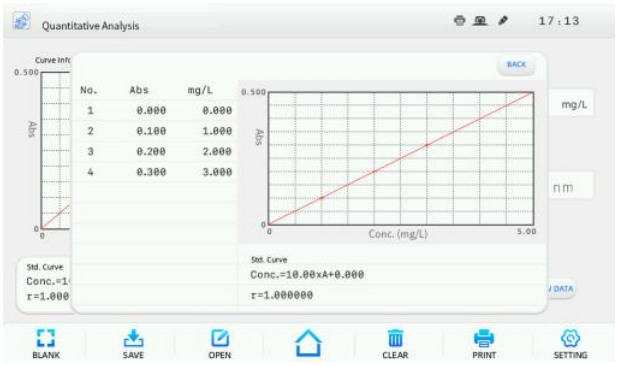

Fig. 3-18

3. Data processing

You can carry out data processing such as data saving, opening, printing and deleting after completing standard curve measurement.

Data saving: Save the data to the instrument memory by clicking "SAVE". When a USB storage device is connected, select to save the data to the USB storage device. Input the file name in the file save window (Fig. 3-19), and click "CONFIRM", the file will be saved with the suffix of ". qua".

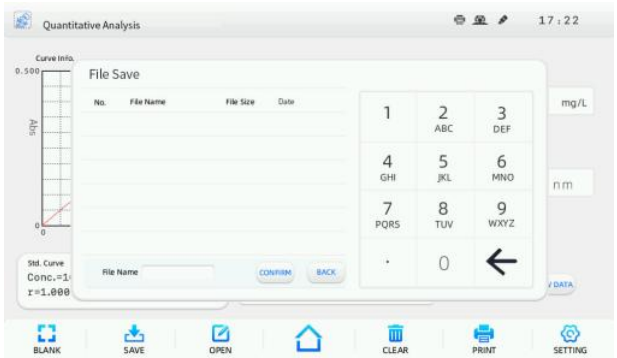

Fig. 3-19

Data opening: Click " OPEN " to enter the data opening interface (Fig. 3-20). Select the file to be opened, and click " CONFIRM " to open the data.

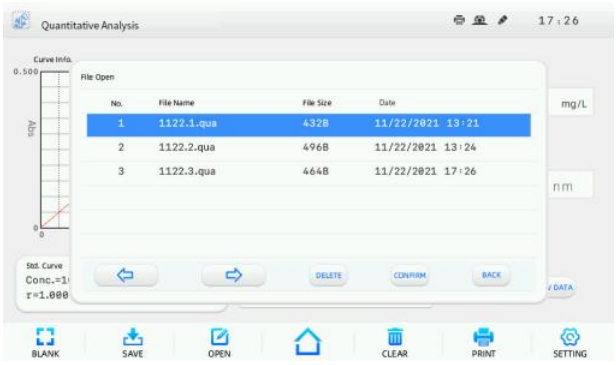

Fig. 3-20

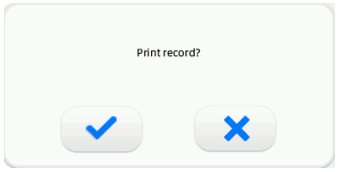

Fig. 3-21

Data printing: Print the data by clicking " PRINT " if a printer is connected. A dialog box will open (Fig. 3-21), click " " to print the data.

Data deleting: If data needs to be deleted, select the row of the data and click " DELETE " at the bottom of the data sheet, a dialog box will open (Fig. 3-22). Click " " to delete. Click on " CLEAR " at the lower pane of the operation interface to clear all the data displayed in the data sheet. A dialog box will open (Fig. 3-23), click " " to delete.

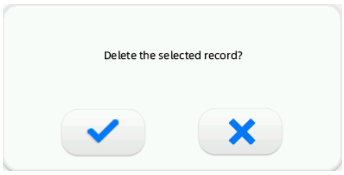

Fig. 3-22

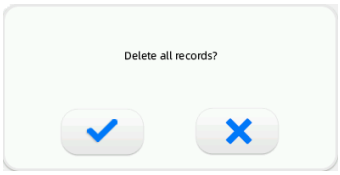

Fig. 3-23

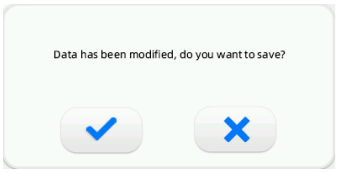

Fig. 3-24

Note: The delete operation only works for the current display. Already saved data won't be lost. Before exiting the current interface or returning to the main interface, a dialog box will open (Fig. 3-24). If the data after the delete operation needs to be saved, click " " to save the updated data.

4. Load standard curve

You can load the saved standard curve. In the main quantitative analysis interface, click on " Load Std. Curve " to open the standard curve loading interface (Fig. 3-25).

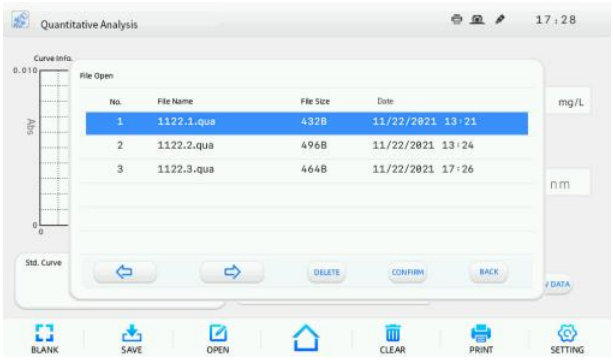

Fig. 3-25

Browse the pages by clicking “ ” and “ ” and select the standard curve file to be loaded. Then, click “confirm” to open the sample measurement interface.

NOTE: The files are saved in ascending order and the latest saved file is saved at the bottom.

3.4.2 Coefficient method application

The coefficient method is an application of the standard curve method. You can input the coefficients of the standard curve and carry out the sample measurement. The calculation formula is based on the fitting method. For linear fit, the calculation formula is $C=K_1\times A+K_0$.

Following are detail operation steps for coefficient method:

Step 1 Open the coefficient method interface.

In the main quantitative analysis interface, click “ ” to open the interface of the standard curve method, select “Coefficient” as the method (Fig. 3-26).

Fig. 3-26

Step 2 Measurement wavelength setting.

Click on the wavelength column and a digital input window will open (Fig. 3-27). Click “confirm” after inputting the wavelength value. A prompt “Wavelength moving…” will be seen and the instrument will move the wavelength to the required position.

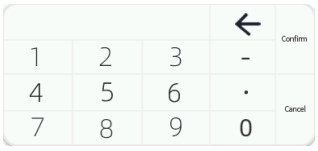

Fig. 3-27

Step 3 Coefficients setting.

For linear fit as an example, select the fitting method “Linear Fit”. Click the blank column of K_1, input the value in the digital input window, input the value of K_0 in the same way. Then click “CONFIRM” to open the sample measurement interface (Fig. 3-28).

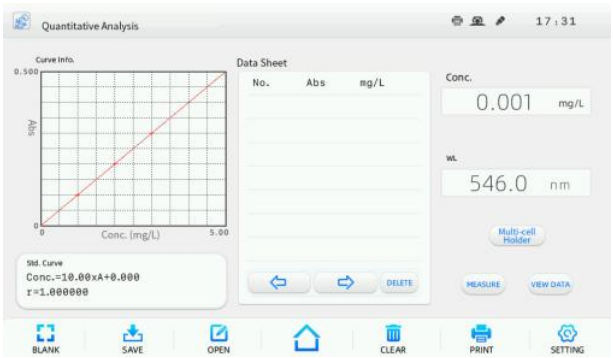

Fig. 3-28

Step 4 Sample measurement.

Insert the blank solution into the cell, in the light path, and click “BLANK” to adjust 0.000 Abs. Then, replace the blank solution with the sample solution and click “MEASURE”, the measurement result will be recorded.

You can select data processing such as data saving, printing and deleting after completing sample measurement. It is omitted here.

3.4.3 Concentration unit setting

Whether utilizing standard curve method or coefficient method, you can set the concentration unit. After clicking “ 

” to open the interface of the standard curve method, select required concentration unit. There are six kinds of commonly used concentration unit to choose from, μg/L, mg/L, g/L, %, ppm and mol/L.

3.5 Kinetic Analysis

A scan of absorbance, transmittance or energy at a specific wavelength in a set time range is available with kinetic analysis. The variation trend of a sample can be analyzed.

Click the icon “ 

” in the main interface to open the kinetic analysis interface (Fig. 3-29).

Fig. 3-29

3.5.1 Kinetic analysis

Following are the operation steps for kinetic analysis:

Step 1 Open the kinetic analysis interface.

Click the icon “Kinetic analysis” in the main interface to open the kinetic analysis interface.

Step 2 Set the kinetic scan parameters.

Click “ 

” to open the kinetic scan setting interface (Fig. 3-30). Select the test mode, set the measurement wavelength, time, time interval and the range. Click on the wavelength column and input the wavelength value in the digital input

window, click “confirm”. Then, separately set the range and time. Click “confirm” to return to the kinetic analysis interface after completing all the settings.

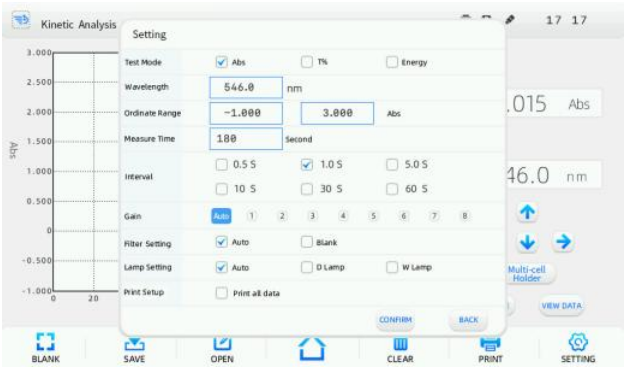

Fig. 3-30

NOTE: The time interval can be selected 0.5 s,1.0 s, 5.0 s, 10 s, 30 s, and 60 s.

Step 3 Kinetics scan.

Insert the blank solution into the cell holder in light path, and click “BLANK”. The instrument will be adjusted to 0.000 Abs/100.0 %T at the correct wavelength. Then, replace the blank solution with the sample solution, click “MEASURE” to begin the kinetics scan. The scan curve will be shown in the graph display area during the kinetics scan process (Fig. 3-31).

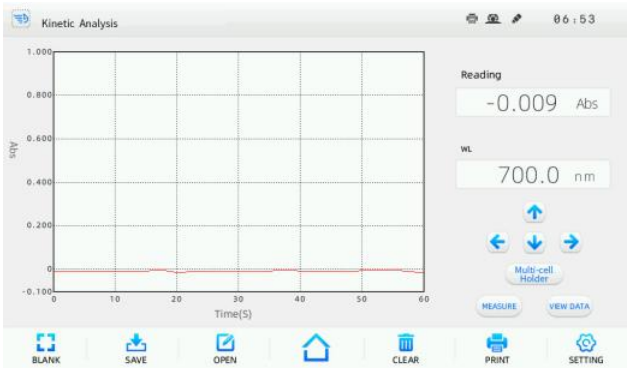

Fig. 3-31

3.5.2 Data processing

Data retrieval with the graph is available after completing the kinetics scan. Click “VIEW DATA” to open the data sheet displaying interface (Fig. 3-32). After completing kinetics scan, select data processing such as data browsing, saving, deleting, and printing.

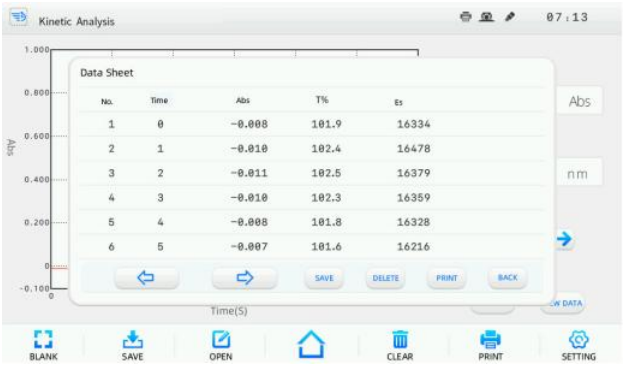

Fig. 3-32

Data retrieval: After completing the kinetics scan, click "" and "" to search the peaks or valleys. Click "" and "" to search the data point by point.

Data browsing: In the data sheet, browse the data pages by clicking "" and "".

Data saving: Save the data to the instrument memory by clicking "SAVE". When a USB storage device is connected, select to save the data to the USB storage device. Input the file name in the file save window (Fig. 3-33), and click "confirm", the file will be saved with the suffix of ".kin".

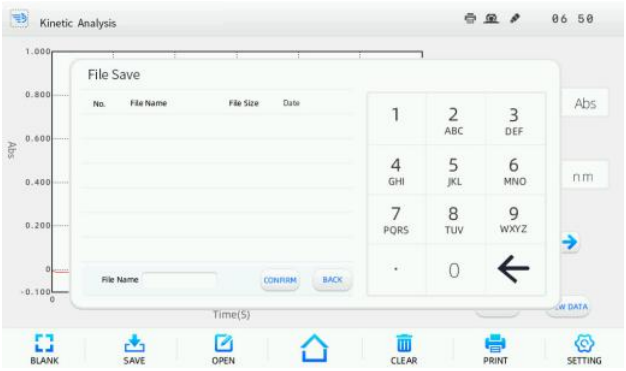

Fig. 3-33

Data opening: Click "OPEN" to open the data opening interface (Fig. 3-34). Select the file to be opened, and click "confirm" to open the data.

Fig. 3-34

Data printing: Print the data by clicking " PRINT " if a printer is connected. A dialog box will open (Fig. 3-35), click " " to print the data.

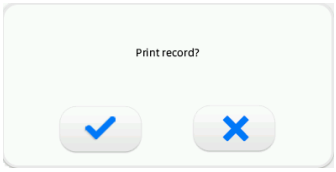

Fig. 3-35

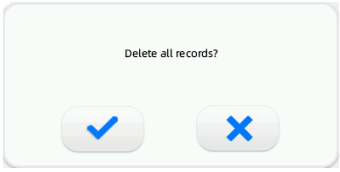

Fig. 3-36

Data deleting: If the data displayed in the data sheet needs to be deleted, click " DELETE " at the bottom of the data sheet, A dialog box will open (Fig. 3-36), click " " to make sure you want to delete. Click " CLEAR " on the lower pane of the operation interface to perform the data deleting.

NOTE: Once performing the data deleting, all the data displayed will be deleted.

3.6 Wavelength Scan

A scan of absorbance, transmittance or energy for a required wavelength range is available with wavelength scan. You can carry out qualitative analysis such as to determine components of a sample by this function.

Click the icon " " in the main interface to open the wavelength scan interface (Fig. 3-37).

Fig. 3-37

3.6.1 Wavelength scan

Following are the operation steps for wavelength scan:

Step 1 Enter the wavelength scan interface.

Click the icon “  ” in the main interface to open the wavelength scan interface.

Step 2 Set the wavelength scan parameters.

Click “SETTING” to open the wavelength scan setting interface (Fig. 3-38). Select the test mode, set the measurement wavelength range, select the range, select the wavelength interval and scanning speed. Click in the wavelength column, input the value of wavelength range in the digital input window, click “confirm” to enter the settings. Set the range. The wavelength interval can be selected 0.1 nm, 0.2 nm, 0.5 nm, 1.0 nm, 2.0 nm, and 5.0 nm. There are three kinds of scanning speed for selection, fast, medium, and slow. Select the right wavelength interval and scanning speed. Then, click “confirm” to return to the wavelength scan interface after completing all the settings.

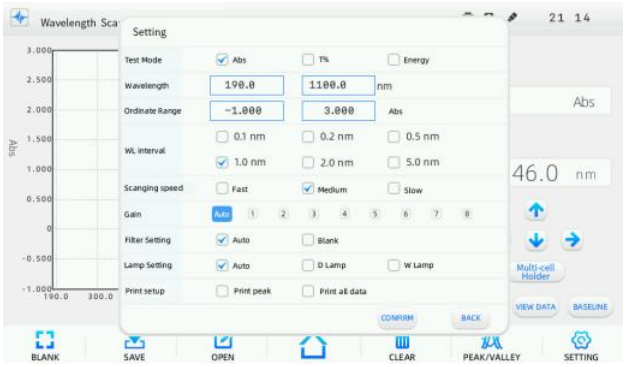

Fig. 3-38

Step 3 System baseline calibration.

System baseline calibration should be carried out before performing the wavelength scan. Click “baseline” to open the system baseline calibration interface (Fig. 3-39). Click “start” to perform the system baseline calibration. Click “back” to return to the wavelength scan interface after completing the calibration.

Fig. 3-39

Step 4 Wavelength scan.

Put the blank solution into the cell holder in the light path and click “BLANK” to perform blank calibration. A prompt “Blanking…” will be shown. The instrument will be adjusted to 0.000 Abs/100.0 %T for each wavelength. Then, replace the blank solution with the sample solution and click “measure” to begin the wavelength scan. The scan curve will be shown in the graph display area during the wavelength scan process (Fig. 3-40).

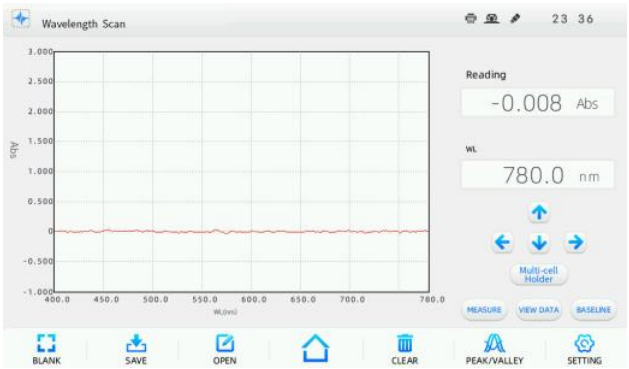

Fig. 3-40

NOTE: The scanning sequence is from the high wavelength to the low wavelength. The system will sound a buzzer after completing the baseline calibration and sample scan. The wavelength will return to the maximum set wavelength after completion of scan.

3.6.2 Data processing

Data retrieval with the graph is available after completing the wavelength scan. Click "VIEW DATA" to open the data sheet displaying interface (Fig. 3-41) after completing the wavelength scan and data processing such as data browsing, saving, deleting, and printing can then be carried out.

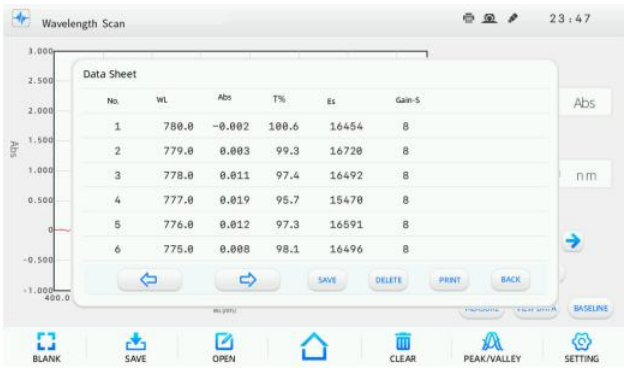

Fig. 3-41

Data retrieval: After completing the wavelength scan, click "↑" and "↓" to search the peaks or valleys. Click "←" and "→" to search the data point by point.

Data browsing: In the data sheet displaying interface, browse the data pages by clicking "⇦" and "⇨".

Data saving: Save the data to the instrument memory by clicking "save". When a USB storage device is connected, select to save the data to the USB storage device. Input the file name in the file save window (Fig. 3-42) and click "confirm", the file will be saved with the suffix of ".wls".

Fig. 3-42

Data opening: Click “ OPEN ” to open the data opening interface (Fig. 3-43). select the file to be opened and click “confirm” to open the data.

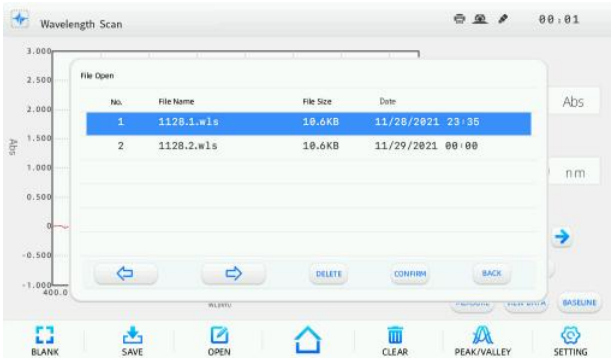

Fig. 3-43

Data printing: Print the data by clicking “ PRINT ” when a printer is connected. A dialog box will open as (Fig. 3-44), click “ ” to print the data.

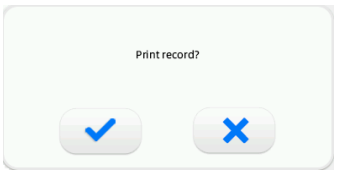

Fig. 3-44

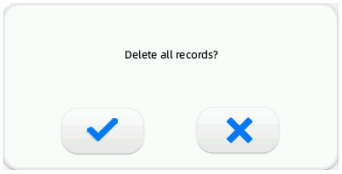

Fig. 3-45

Data deleting: If the data displayed in the data sheet needs to be deleted, click “delete” at the bottom of the data sheet. A dialog box will open (Fig. 3-45), click “ ” to complete deleting. Click “clear” on the lower pane of the operation interface to delete data.

NOTE: all the data displayed will be deleted.

3.7 Multi-wavelength Measurement

You can quickly obtain absorbance values of the sample using several wavelengths with multi-wavelength measurement.

Click the icon “ ” in the main interface to open the multi-wavelength measurement interface (Fig. 3-46).

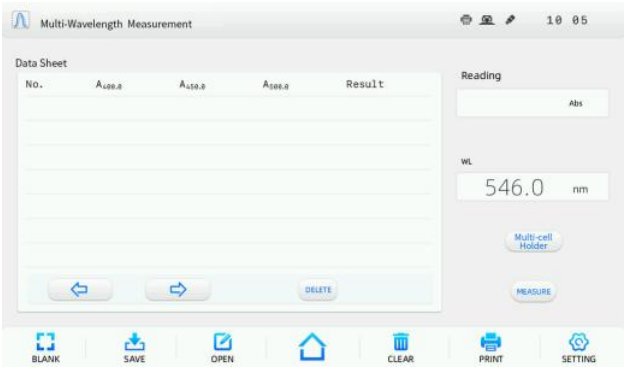

Fig. 3-46

3.7.1 Multi-Wavelength measurement

Following are the operation steps for multi-wavelength measurement:

Step 1 Open the multi-wavelength measurement interface.

Click the icon “  ” in the main interface to open the multi-wavelength measurement interface.

Step 2 Set the measurement parameters.

In the multi-wavelength measurement interface, click “SETTING” to open the parameter setting interface (Fig. 3-47). Up to eight wavelengths can be set. Select the right wavelength number and click on the first wavelength column, a digital input window will open (Fig. 3-48). Click “confirm” after inputting the wavelength value. Click on the calculation parameter column to edit the calculation. Input other wavelengths and calculation parameters, then, click “confirm” to return to the multi-wavelength measurement interface.

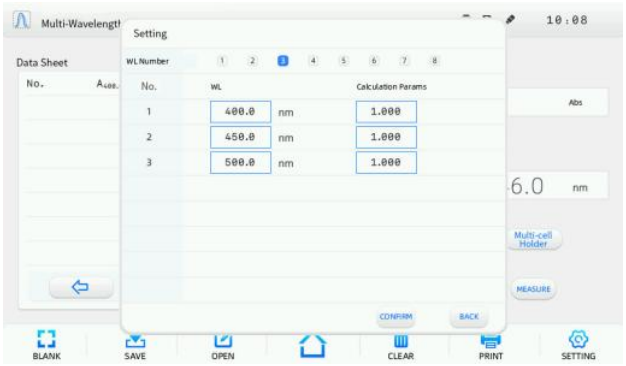

Fig. 3-47

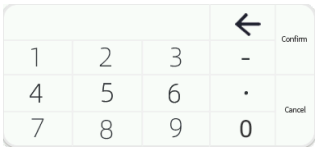

Fig. 3-48

Step 3 Sample measurement.

Insert the blank solution or reference solution into the cell holder in the light path and click “blank”. The instrument will be adjusted to 0.000 Abs/100.0 %T under all wavelengths. Then, replace the blank solution or reference solution with the sample solution, click “measure” and record the measurement result.

3.7.2 Data processing

Carry out the data processing such as data saving, opening, printing and deleting after completing multi-wavelength measurements.

Data saving: Save the data to the instrument memory by clicking “save”. When a USB storage device is connected, select to save the data to the USB storage device. Input the file name in the file save window (Fig. 3-49) and click “confirm”. The file will be saved with the suffix of “.mul”.

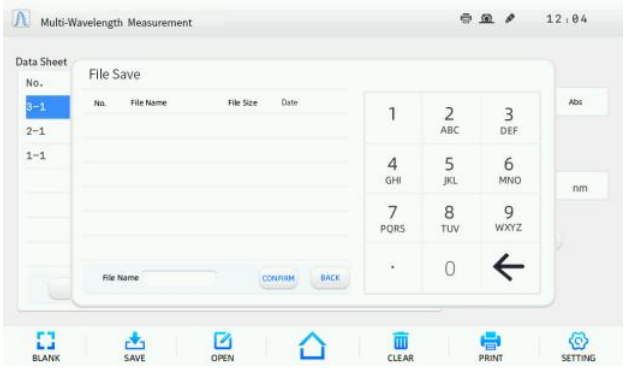

Fig. 3-49

Data opening: Click “open” to open the data interface (Fig. 3-50). Select the file to be opened and click “confirm” to open the data.

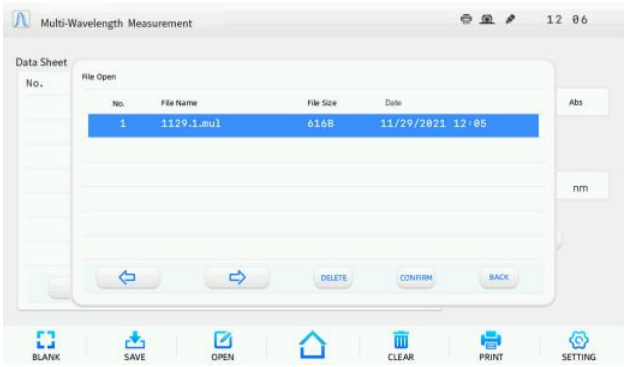

Fig. 3-50

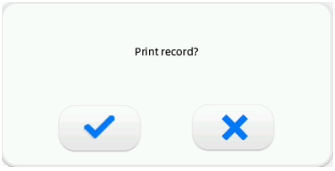

Fig. 3-51

Data printing: Print the data by clicking “ PRINT ” if printer is connected. A dialog box will open (Fig. 3-51), click “ ” to print the data.

Data deleting: If some data needs to be deleted, select the row of data and click “delete” at the bottom of the data sheet. A dialog box will open (Fig. 3-52), click “ ” to complete. Click “clear” on the lower pane of the operation interface to clear all the data displayed in the data sheet. A dialog box will open (Fig. 3-53), click “ ” to complete.

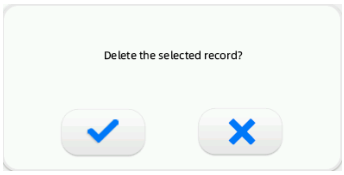

Fig. 3-52

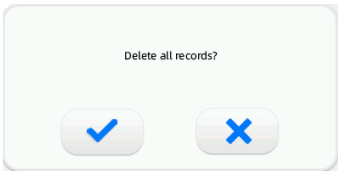

Fig. 3-53

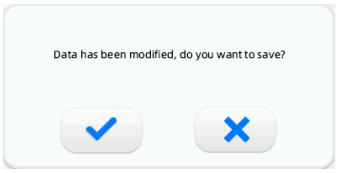

Fig. 3-54

NOTE: The delete operation only works for the current display. The already saved data won’t be lost. Before exiting the current interface or returning to the main interface, a dialog box will open (Fig. 3-54). If the data after the delete operation needs to be saved, user can click “ ” to save the updated data.

3.8 DNA/Protein Measurement

With the DNA/Protein measurement function, quantitative analysis and purity detection of DNA and protein according to the UV absorption characteristics are available.

Click the icon “ ” in the main interface to open the DNA/Protein measurement interface (Fig. 3-55).

Fig. 3-55

3.8.1 DNA/Protein measurement

Following are the operation steps for DNA/Protein measurement:

Step 1 Enter the DNA/Protein measurement interface.

Click the icon “  ” in the main interface to enter the DNA/Protein measurement interface.

Step 2 Select the test mode.

In the DNA/Protein measurement interface, click “setting” to open the measurement setting interface (Fig. 3-56). There are two test modes for selection, method 1 with the calculation formula of:

$C_{DNA} = (A_{260} - A_{320}) \times 62.9 - (A_{280} - A_{320}) \times 36,$

$C_{Protein} = (A_{260} - A_{320}) \times 1552 - (A_{280} - A_{320}) \times 757.3,$

method 2 with the calculation formula of:

$C_{DNA} = (A_{260} - A_{320}) \times 49.1 - (A_{230} - A_{320}) \times 3.483,$

$C_{Protein} = (A_{260} - A_{320}) \times 183 - (A_{230} - A_{320}) \times 75.83.$

Select the test mode and click “confirm” to return to the DNA/Protein measurement interface.

Fig. 3-56

Step 3 Sample measurement.

Insert the blank solution or reference solution into the cell holder in the light path and click “blank”. The instrument will be adjusted to 0.000 Abs/100.0 %T for all wavelengths. Then, replace the blank solution or reference solution with the sample solution, click “MEASURE” and record the measurement result.

3.8.2 Data processing

Cary out data processing such as data saving, opening, printing and deleting after completing DNA/Protein measurements.

Data saving: Save the data to the instrument memory by clicking “save”. When a USB storage device is connected, select to save the data to the USB storage device. Input the file name in the file save window (Fig. 3-57), and click “confirm”. The file will be saved with the suffix of “.dna”.

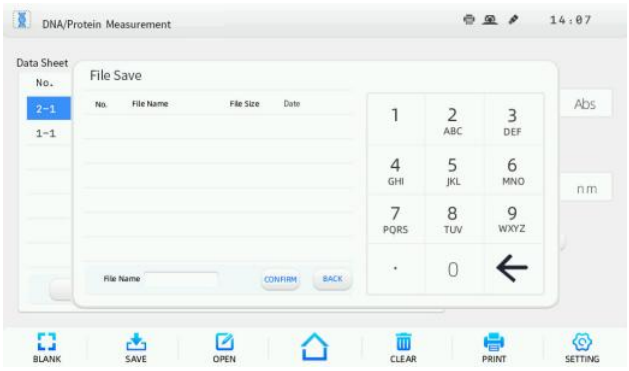

Fig. 3-57

Data opening: Click “open” to open the data interface (Fig. 3-58). Select the file to be opened and click “confirm” to open the data.

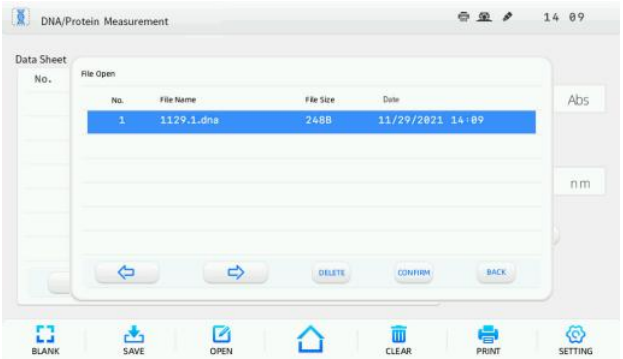

Fig. 3-58

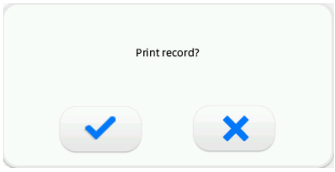

Fig. 3-59

Data printing: Print the data by clicking “print” if a printer is connected. A dialog box will open (Fig. 3-59), click “ ” to print the data.

Data deleting: If some data needs to be deleted, select the row of the data and click

“delete” at the bottom of the data sheet. A dialog box will open (Fig. 3-60), click “ ” to complete deleting. Click “clear” on the lower pane of the operation interface to clear all the data displayed in the data sheet. A dialog box will open (Fig. 3-61), click “ ” to complete deleting.

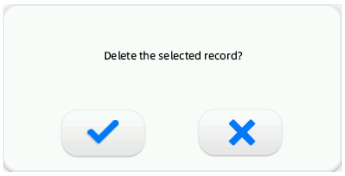

Fig. 3-60

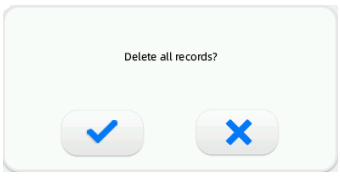

Fig. 3-61

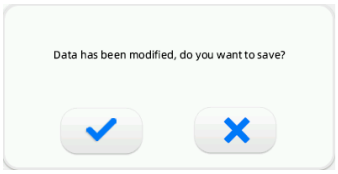

Fig. 3-62

NOTE: The delete operation only works for the current display. The already saved data won’t be lost. Before exiting the current interface or returning to the main interface, a dialog box will open (Fig. 3-62). If the data after the delete operation needs to be saved, click “ ” to save the updated data.

3.9 System Settings

Operations such as dark current calibration, wavelength calibration, bandwidth setting, time settings, lamps management, general settings, operation with file system and system information are available in the system settings interface.

Click the icon “ ” in the main interface to open the system settings interface (Fig. 3-63).

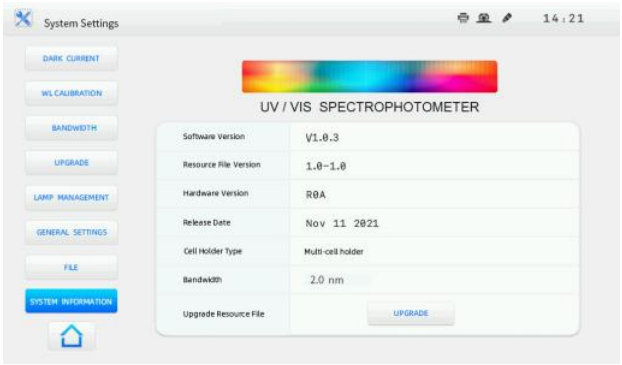

Fig. 3-63

3.9.1 Dark current calibration

The dark current may change when the instrument runs for a long time or due to any other influences. For measurement accuracy, the dark current calibration is necessary when the measurements are outside of the tolerances expected.

Click “dark current” in the system settings interface to open the dark current calibration interface (Fig. 3-64). Click “start”, the system will start the calibration and a prompt “Correcting dark current…” will be shown. The dark current data displayed will be refreshed after completing the calibration. Click “ ” to return to the main interface.

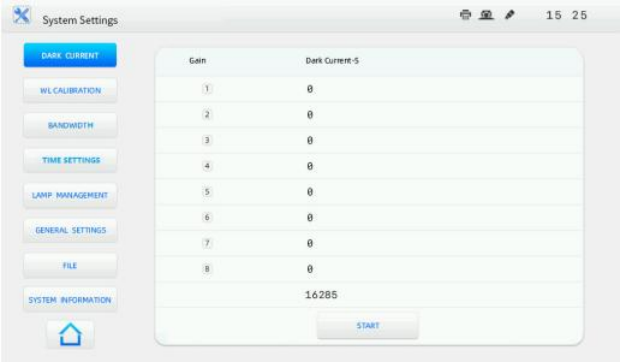

Fig. 3-64

3.9.2 Wavelength calibration

The wavelength calibration is necessary when there is a deviation of the wavelength. Click “ WL CALIBRATION ” in the system settings interface to open the wavelength calibration interface (Fig. 3-65). Click “ START ” and the system will start the calibration using the wavelength 656.1nm with the deuterium lamp in the instrument. A prompt “Correcting wavelength…” will be shown while the calibration process is operating which may take more than one minute. Click “ ” to return to the main interface after completing the calibration.

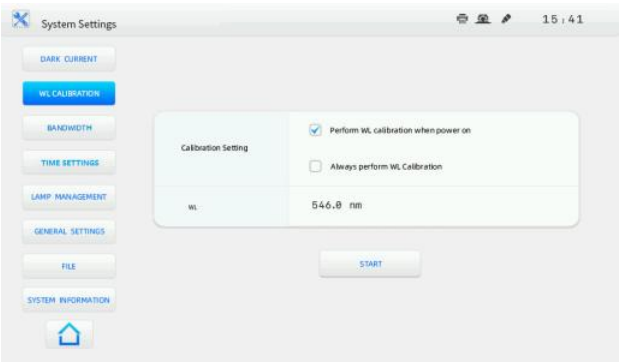

Fig. 3-65

3.9.3 Bandwidth setting

User can set the bandwidth. Click “ BANDWIDTH ” in the system settings interface to open the bandwidth setting interface (Fig. 3-66). The bandwidth of the T65V / T65UV Spectrophotometer is fixed at 1.8nm. For bandwidth adjustable instruments, T65+UV there are bandwidths of 1.0 nm, 2.0 nm, 4.0 nm, 5.0nm

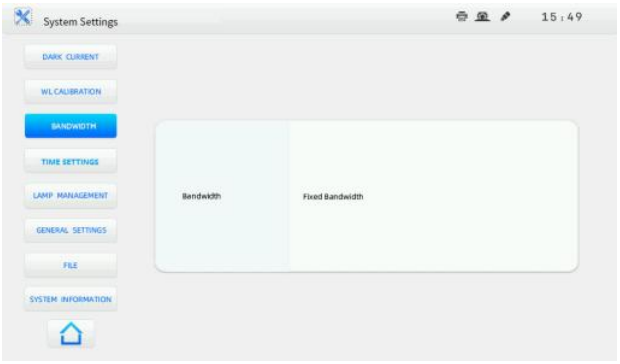

Fig. 3-66

3.9.4 Time settings

Set the system displaying time by Clicking “ TIME SETTINGS ” in the system setting interface to open the time setting interface (Fig. 3-67).

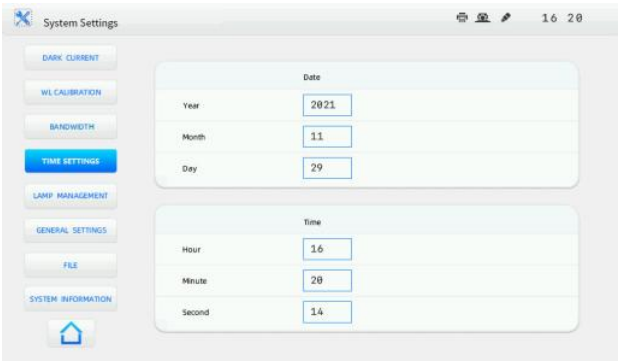

Fig. 3-67

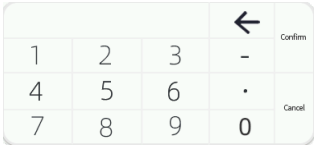

Fig. 3-68

Click on the year column, a digital input window will open (Fig. 3-68). Click “confirm” after inputting the year value. Set other time parameters in the same way, then, click “ ⌂ ” to return to the main interface after completing all the settings.

3.9.5 Lamps management

Click “ LAMP MANAGEMENT ” in the system settings interface to open the lamp management interface (Fig. 3-69).

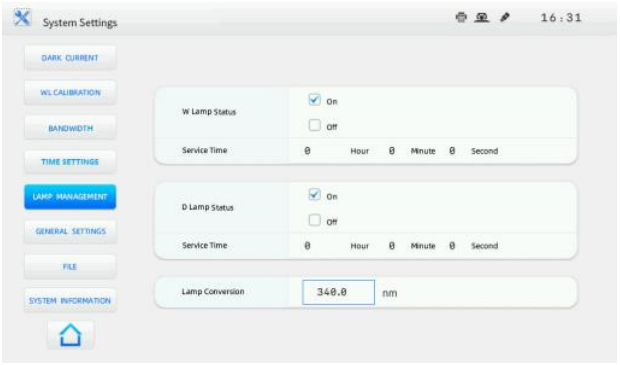

Fig. 3-69

Switch on or off the lamp as necessary. The service time of the lamp is recorded. Set the lamp conversion wavelength by clicking in the lamp conversion column. Input the conversion wavelength value in the digital input window and click “confirm” to accept the setting.

NOTE: If only using the UV range or visible range to analyse, switch off the idle lamp, after the instrument has completed the self-check, to prolong the service life of the lamp.
The default lamp conversion wavelength is 340nm and the valid setting range is between 300nm and 400nm. For measurement accuracy, don’t measure close to the conversion wavelength. Set the conversion wavelength before measurement.

3.9.6 General settings

Click “ GENERAL SETTINGS ” in the system settings interface to open the general setting interface (Fig. 3-70). Select language, data precision, buzzer on or off, printer type, time format, date format and screen brightness. Click “confirm” to restore the factory defaults. A dialog box will open (Fig. 3-71), click “ ✓ ” to complete restoring and a prompt “Restoring factory settings… ” will be shown.

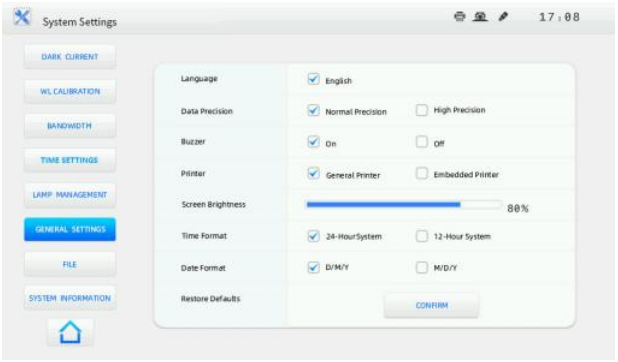

Fig. 3-70

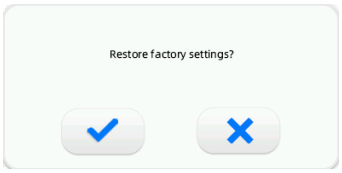

Fig. 3-71

NOTE: All the saved data including the test records, parameters settings and standard curves will be cleared by factory default restoring. Please make sure this is correct before performing this operation.

3.9.7 File system

Click "FILE" in the system settings interface to open the file system operation interface (Fig. 3-72). Click "FORMAT" to perform file format as necessary, and a dialog box will open (Fig. 3-73), click "✓" to make sure the format, and a prompt "Formatting file system… " will be shown. Otherwise, click "✕" to exit the file formatting.

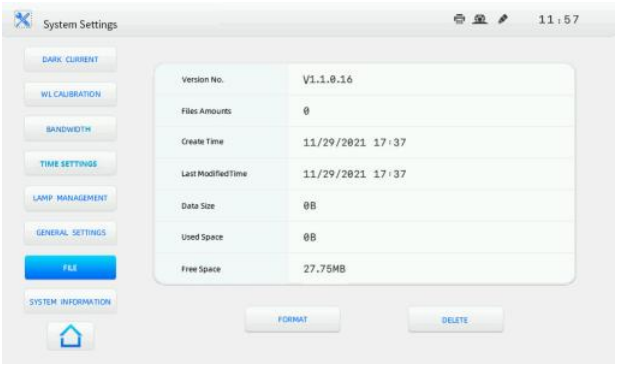

Fig. 3-72

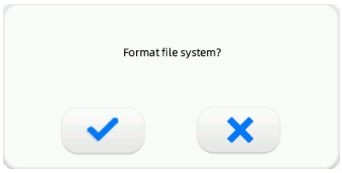

Fig. 3-73

Note: Once the file formatting is performed, all the data saved will be cleared.

You can also delete the file. Click "DELETE" to open the file opening interface (Fig. 3-74), select the file and click "DELETE" at the bottom of the file list. A dialog box will open (Fig. 3-75), click "✓" to make sure the file deleting. Otherwise, click "✕" and "BACK" to exit the deleting.

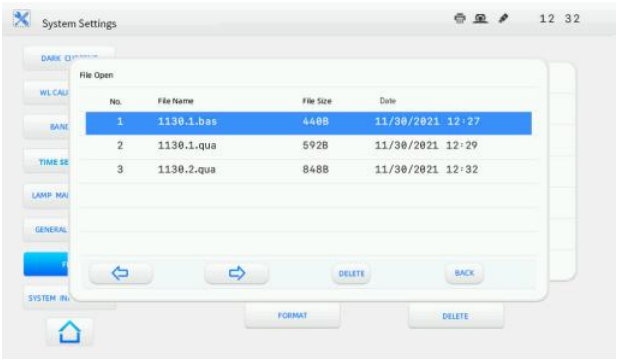

Fig. 3-74

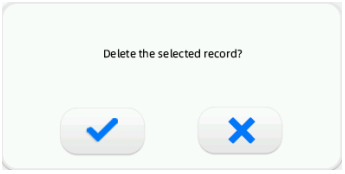

Fig. 3-75

3.9.8 System information

Click “ SYSTEM INFORMATION ” in the system settings interface to open the system information interface (Fig. 3-76). The system information such as software version, resource file version, hardware version, release date, cell-holder type, and bandwidth can be viewed in this interface. Click “ UPGRADE ” to upgrade the resource file as necessary.

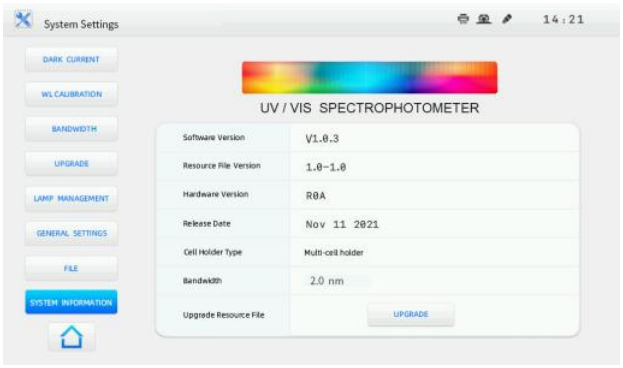

Fig. 3-76

Chapter 4 Maintenance

T65 UV/Vis Spectrophotometer is a precise optical instrument. It was assembled and debugged carefully before delivery. However, appropriate maintenance will not only guarantee its reliability and stability, but also prolong its service life. Correct use is the best maintenance. In addition to previously mentioned installation requirements, following tips also should be noticed in daily use.

(1) Before switching on the power, make sure that there is no sample cell in the cell holder with nothing blocking the light path, and the cell holder position is correct, to avoid error during the self-diagnosis.

(2) Please carefully load the solution into the cuvette to a height, ideally, no more than 2/3 of the cuvette. Try to avoid bubble generation, as a bubble on the inner surface of the cuvette or in the solution will affect the measurement result. Please wipe off any solution residue on the outer surface of the cuvette. To measure volatile samples, using with a cuvette cover is suggested. Try to avoid contamination to the cell holder by cleaning off any residue solution on the cell holder.

(3) Don’t touch the two optical surfaces of the cuvette with fingers, as the finger residue will absorb the light and affect the measurement accuracy. Please handle the cuvettes gently as they are fragile. Clean the cuvette properly. Improper cleaning or without cleaning will affect the measurement accuracy or unstable results.

(4) After placing or removing the sample, please close the lid of the sample compartment during the measurement. Please remove the sample from the sample compartment after completing the measurement, check that there is no residue in the sample compartment and keep it dry. Any solution or residue left in the sample compartment may cause damage to parts of the instrument, some components could be become corroded. Please open and close the lid gently.

(5) To prolong the service life of the lamp, switching off the idle lamp during the measurement is suggested. Please switch off the instrument and disconnect the plug to prevent possible damage during thunderstorms.

(6) Be careful during transport. Don’t place any heavy object onto the instrument to prevent any light path shift which will affect the instrument stability and measurement accuracy.

(7) Don’t disassemble the cover and the inner parts of the instrument without authorization, especially for the optical parts. All optical surfaces including the light sources can’t be touched by hand or any other objects as it could affect the normal operation even cause permanent damage.

(8) Keep the instrument surface and the working environment clean. For the surface of the cover, please don’t clean the cover with organic solutions such as alcohol, gasoline etc. If the instrument is not in use, cover the instrument with a clean cloth or dust cover to avoid dust accumulation.

(9) long time not in use should be avoided and regular startup is suggested to guarantee normal operation. In a high temperature and humidity area, please pay more attention to keep away from moisture.

Note: The instrument self-diagnosis is performed for normal diagnosis each time when switching on the power. However, the system error may occur after transporting, moving, or a period when not in use. When the measurement data differs greatly from the experienced value, or any above situation occurs, the dark current calibration and wavelength calibration are suggested to be carried out.

Chapter 5 Troubleshooting

Each T65 UV/Vis Spectrophotometer is strictly debugged and inspected before delivery. Commonly, there won't appear any problems in normal storage, transport and use. However, wrong operation or extreme states, and problems caused by long-term use still can't be avoided, such as the damage of electrical and optical units caused by bad storage and working environment, the damage of vulnerable units or the loosening of the fixing parts caused by improper transport, the lamp exceeds its lifetime and other problems caused by wrong operation.

Please carefully refer to the related instructions before operating the instrument. Problems and troubleshooting are shown in following table (Table 5-1).

Table 5-1

No.	Problem		Cause	Troubleshooting
1	No response when switching on the power.		1) Power disconnected.	- Check the power supply and power cord, make sure that the power supply is ok and the power cord is connected correctly.
			2) The fuse is burned.	- Change the fuse.
			3) The switching power supply is damaged.	- Contact the distributor or PG Instruments engineer for maintenance.
2	No display or unclear display, however the fan of the power supply unit is running when switching on the power.		1) The control chip or component is damaged.	- Contact the distributor or PG Instruments engineer for maintenance.
			2) Bad connection of the display, or the display is damaged.	- Contact the distributor or PG Instruments engineer for maintenance or change the display.
3	Self-diagnosis Failure	Lamp conversion fault.	1) Control motor fault.	- Contact the distributor or PG Instruments engineer for maintenance.
		Filter fault.	1) Control motor does not work.	- Contact the distributor or PG Instruments engineer for maintenance.
			2) The optocoupler positioning is abnormal.	- Contact the distributor or PG Instruments engineer for maintenance.

No.	Problem		Cause	Troubleshooting
3	Self-diagnosis Failure	Detector fault.	1) Amplifier circuit fault.	- Contact the distributor or PG Instruments engineer for maintenance.
			2) Filter position error.	- Contact the distributor or PG Instruments engineer for maintenance.
			3) Bad connection of signal wire between the amplifier and the microcomputer board.	- Contact the distributor or PG Instruments engineer for maintenance.
		Wavelength calibration fault.	1) Some sample in the sample compartment, or the lid of the sample compartment is opened.	- Check the sample compartment, make sure that no sample is in the light path. Don't open the lid of the sample compartment during self-diagnosis.
			2) Wrong position of the cell holder causes block to the light path.	- Make sure that the cell holder is in right position.
			3) Deuterium lamp is not lit.	- Contact the distributor or PG Instruments engineer for maintenance.
			4) The optical parts damaged and cause low energy.	- Contact the distributor or PG Instruments engineer for maintenance.
			5) Wavelength motor fault.	- Contact the distributor or PG Instruments engineer for maintenance.
			6) Filter motor fault.	- Contact the distributor or PG Instruments engineer for maintenance.
		Dark current error	1) The lid of the sample compartment is opened during self- diagnosis.	- Don't open the lid of the sample compartment during self- diagnosis.
			2) Amplifier board fault.	- Contact the distributor or PG Instruments engineer for maintenance.
4	The reading is not stable when adjusting 100% T or 0.000 Abs.		1) Wrong position of the cell holder causes block to the light path.	- Make sure that the cell holder is in right position.
			2) The pre-warming time is not enough.	- Pre-warming time, no less than 30 min.
			3) The tungsten lamp is exhausted or with bad connection.	- Replace the tungsten lamp with a new one.

No.	Trouble	Cause	Troubleshooting
4	The reading is not stable when adjusting 100% T or 0.000 Abs.	4) Deuterium lamp is exhausted.	- Replace the deuterium lamp with a new one.
		5) Wavelength error.	- carry out dark current calibration and wavelength calibration, then, try again.
		6) Light path, or the amplifier and its power supply fault.	- Contact the distributor or PG Instruments engineer for maintenance.
5	The sample reading is not stable.	1) Abnormal self-diagnosis.	- Make sure that the instrument can pass through the self- diagnosis successfully.
		2) The pre-warming time is not enough.	- Pre-warming time, no less than 30 min.
		3) Unstable voltage.	- Contact the distributor or PG Instruments engineer for maintenance.
		4) Ambient interference, such as unstable power supply, corrosive gas interference.	- Configure with a steady power supply, keep the instrument from corrosive gas.
		5) Unstable sample.	- If the sample is unstable, measure it as soon as possible. If there is some bubble in the solution, eliminate the bubble or reload the solution. Measure with a cuvette cover for volatile sample.
		6) The cuvette is contaminated and it’s too dirty.	- Make sure that the cuvette is clean before measurement.
		7) The blank value is much higher, or the sample concentration is too high, and the absorbance reading is out of the stable range.	- The absorbance value of the blank solution or reference solution is better below 0.1. Dilute the sample solution correctly, and the absorbance value is better between 0.2 and 0.8.
		8) The tungsten lamp or deuterium lamp is exhausted, and the energy is too weak.	- Change the light source.

No.	Trouble	Cause	Troubleshooting
6	The sample reading is not accurate.	1) Dark current drift.	- Calibrate the dark current and measure the sample again after blank recalibrating.
		2) Cuvette matching error	- Make sure that the cuvettes are matching.
7	Touch screen no response.	System halted.	- Restart the instrument.
8	The printer doesn’t work, or printing error.	1) Loose connection between the instrument and the printer.	- Make sure the connection between the instrument and the printer is good.
		2) The printer model doesn’t match.	- Choose the factory specified printer type.

pg instruments

ALMA PARK, WIBTOFT
LEICESTERSHIRE, LE17 5BH
UNITED KINGDOM

T: +44 (0)1455 220131
F: +44 (0)1455 220025
www.pginstruments.com