LABOTRONICS



DOUBLE BEAM UV-VISIBLE SPECTROPHOTOMETER

LB-14DBS

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1. Introduction

Double Beam UV-Visible Spectrophotometer LB-14DBS is a light intensity measuring unit with deuterium lamp for prevention of ozone inhalation. The SiO2 coated optical mirror enables uninterrupted propagation of light and reduces contamination through external sources. It is characterized with double and triple wavelength test feature for measurement of transmittance and absorbance.

2. Features

1. Photometric detection by fixed wavelength
2. Three modal standard curve
3. Wide scanning range for derivative and arithmetic operation, graphically
4. Multi-Wavelength configuration for measurement of transmittance and absorbance
5. Socket-type deuterium and tungsten lamps
6. Testing and storage capacity of 240 data in each curve
7. Automatic wavelength calibration, lamp source deviation and dark current calibration
8. Efficient time course scanning and reaction rate calculations

3. Specifications

Model No.	LB-14DBS
Optical system	Double beam
Wavelength range	190 nm ~ 1100 nm
Spectral bandwidth	0.5 nm, 1 nm, 2 nm, 5 nm
Stray light	≤ 0.04 T at 360 nm; 220 nm
Wavelength accuracy	± 0.3 nm
Wavelength repeatability	≤ 0.2 nm
Photometric accuracy	± 0.002 A (0 Abs ~ 0.5 Abs)
	± 0.004 A (0.5 Abs ~ 1.0 Abs)
	± 0.3% T (0% T ~ 100% T)
Photometric repeatability	0.001 Abs (0 Abs ~ 0.5 Abs)
	0.002 Abs (0.5 Abs ~ 1.0 Abs)
	≤ 0.2% T (0% T ~ 100% T)
Stability	± 0.0003 A/h at 500 nm
Baseline flatness	± 0.0005 A
Noise	± 0.0002 Abs
Display	7 inch TFT LCD
Light source	Deuterium lamp, Tungsten lamp
Input	Membrane keypad
Output	USB print and data output
Power	AC 110V ± 10 %; 50 Hz
	AC 220 V ±10% ; 60 Hz
Dimensions	740 × 570 × 440 mm
Gross weight	25 kgs

4. Applications

Used for concentration measurement, photometric analysis, impurities detection in the fields of biology, biochemical, pharmaceutical, environmental science, food, chemical, genetic, quality control, etc.

5. Instrument Introduction

Overall structure consists of three parts: an optical system, a power system, and a micro-computer system.

1) Top view

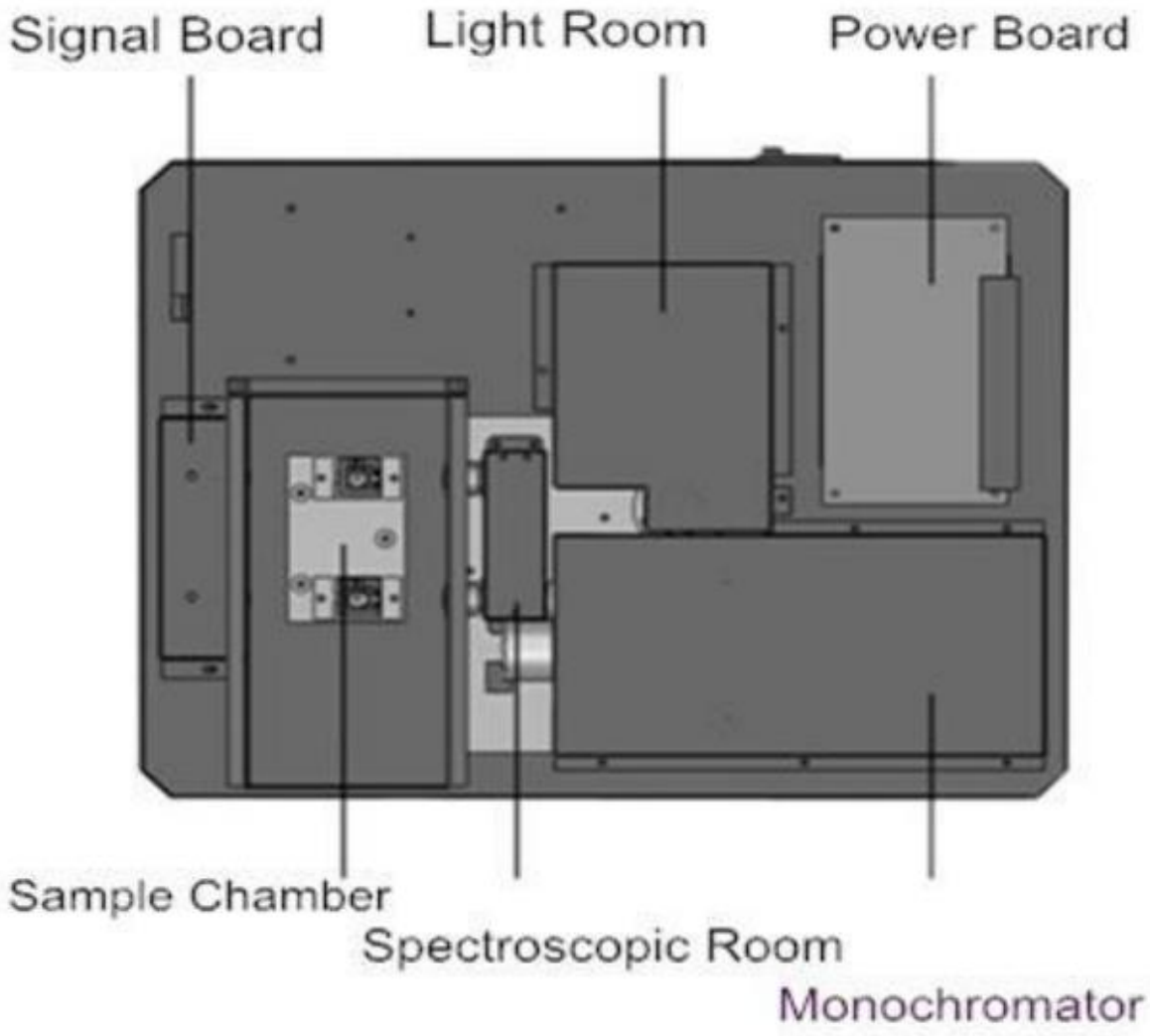


Figure-1

2) Bottom View

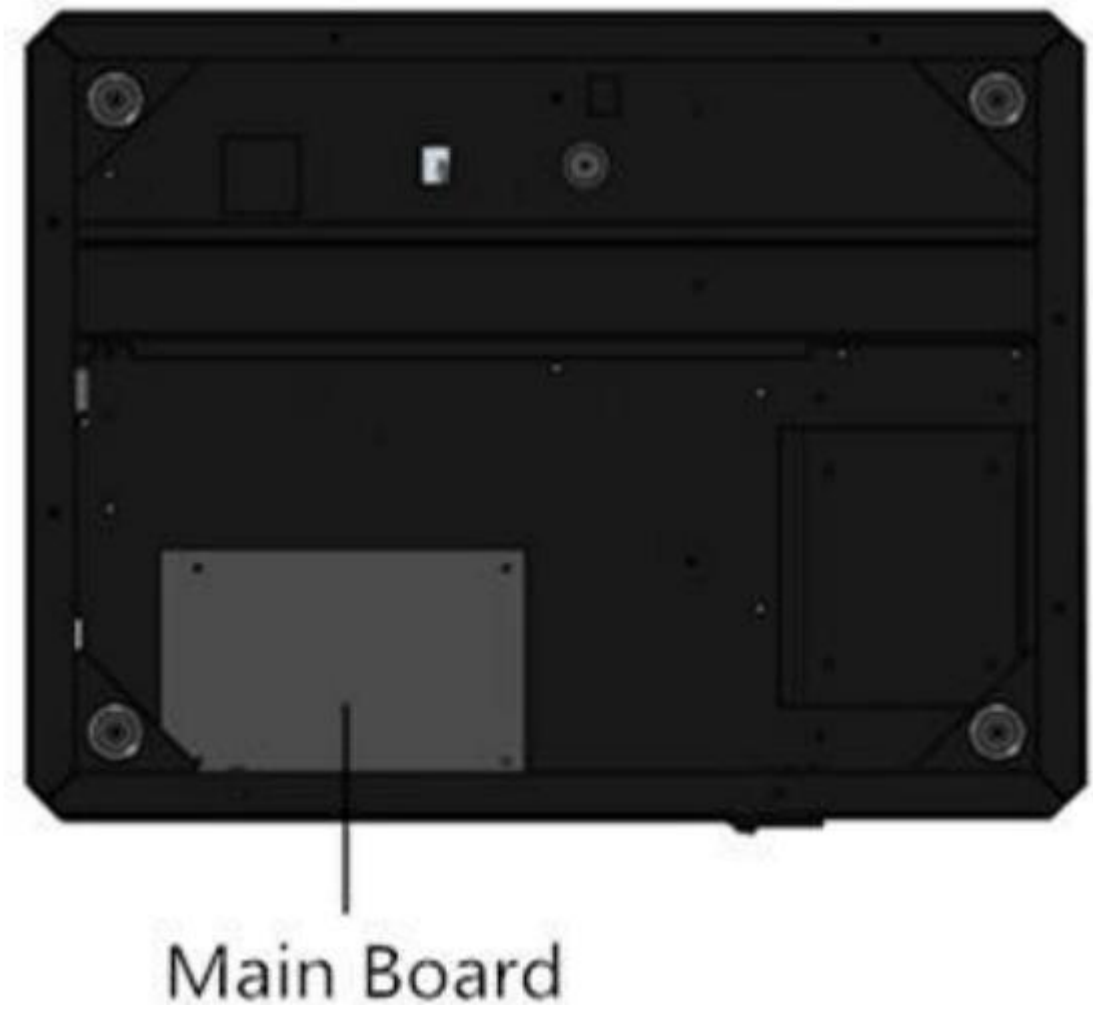


Figure-2

3) Light Path Diagram

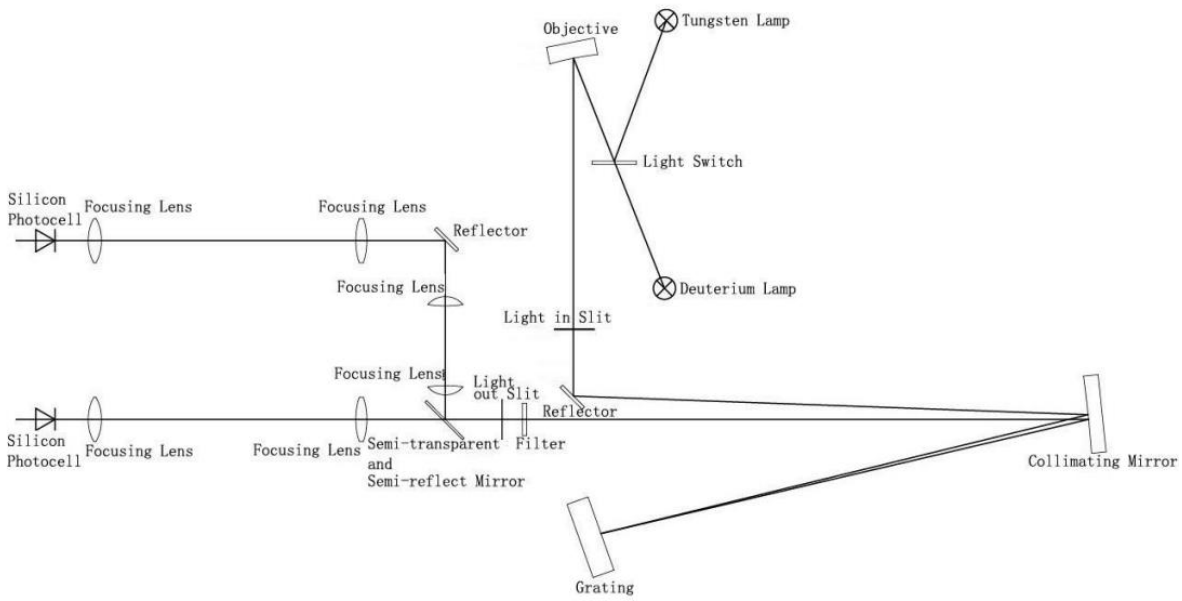


Figure-3

4) Important parts of the instrument

(1) **Power Board:** The 220V50Hz/110V60Hz power conversion and regulation outside access to the necessary equipment:-11.5V (tungsten lamp power), +12 V (fan power, electrical power), +5 V (computer system power), + /-15V (signal board power supply), deuterium lamp filament preheating and lit power deuterium lamp is lit up and the power breakdown

(2) **Light room:** These are tungsten halogen and deuterium lamp source devices, which automatically switch the halogen tungsten as tungsten halogen light source visible and near-infrared spectral region.

(3) The applicable wavelength range is 250-2000nm as it uses the principle of the halogen cycle, it has a greater intensity of light emission and longer life. The halogen cycle requires a higher temperature. Thus, lamps commonly use quartz glass or high-temperature glass.

(4) Tungsten halogen lamps emit energy in the visible region around the operating voltage proportional to the fourth power, therefore, to make light stable, the model has a stability of less than 0.2% of the power supply. The other imported Philips halogen socket tungsten halogen lamp replacement to ensure stable and easy to use and long life.

(5) **Deuterium lamp:** On suitable wavelength range of 185-400nm. When the deuterium lamp is in operation, maximum energy sources are in the vicinity of 230nm, 486.0nm, and 656.1nm. They have two characteristic lines, which can be used for instrument calibration wavelength accuracy in the visible region.

(6) **Monochromator:** Contains spectral components - grating, into the slit, the slit, mirror, the focusing lens, and the wavelength filter drive system.

(7) **Raster:** The dispersion of the original, the model uses 1200 / mm holographic grating to ensure high resolution and low stray light.

(8) **Filter:** Due to the grating spectrum spectral overlap that exists between the problem class times, filters are used to eliminate the spectral overlap problem. Action slits, the slits in the monochromator are large, and the resolution of the instrument is not only related to the dispersion of the grating and the size of the image (i.e., the slit width).

(9) If the slit is too large, the color band is deteriorated and is not conducive to the qualitative analysis, or quantitative analysis and affects the linear range of the calibration curve. If the slit is too small, flux decreases, reducing the signal-to-noise ratio, and affecting the measurement accuracy slits there are two general representations of the width, the actual width of the slit of a knife-edge between the two expressed (in mm), and the other represents the bandwidth of spectral bands (in nm).

(10) **Spectroscopic Room:** It contains a half-mirror, focusing lens, and reflector to achieve a beam monochromator out into two beams of light in different directions

(11) **Sample Chamber:** It has a fixed 2-cell holder, one is for reference solution, and the other is for sample solution. An 8-cell changer is optional.

(12) **Signal Board:** Transfer to the motherboard processed signal detection light amplification.

(13) **Mainboard:** Instrument micro control unit, control instruments light source switch, the motor rotates, the signal processor display, etc.

6. Installation

6.1 Post-unpacking

- After unpacking, carefully check the packing list inside, to see if the object is complete and intact.
- Determine whether the work environment meets the foregoing requirements, the ambient temperature 10 to 35 □, relative humidity less than 85%, operating voltage (220 3 22) V / (50 3 1) H3.
- The instrument is placed on a horizontal platform, the instrument should be avoided from direct sunlight and away from electromagnetic launchers and high-power electrical devices, the surrounding environment cannot have dust, corrosive gases, and vibration.
- Avoid any obstacle to the flow of air around the instrument.
- The power cord makes sure there are well-grounded power outlet lines.
- Check the sample chamber, ensure that there is no solution or foreign matter, and the process of self-test to ensure that the sample compartment lid is closed, do not open in use (this is very important; otherwise, it may affect the instrument's self-test results and normal use).
- Turn on the instrument, then the instrument makes a self-test after that, the instrument can be operated normally in case there is an error alarm halfway, further refer to the instrument troubleshooting.

6.2 Environmental Conditions

- Equipment should be installed away from the hot and humid environment, the instrument should be used in 16- 35 ℃45-80% humidity conditions.
- Make sure to stay away from issuing magnetic, electric, or high-frequency wavesof electrical devices, and do not install instruments in the air chlorine, hydrochloric acid gas, hydrogen sulfide gas, suchas sulfurous acid gas, or corrosive gas-filled places.
- The instrument table should be smooth, without vibrations; near a fan, leaving enough space to exhaust smoothly.
- Best to use the instrument in a single power outlet, which should ensure good grounding. Not doing so may result in equipment not working properly.
- If the local voltage is unstable, the instrument is equipped with a power supply. The instrument should avoid direct sunlight. Avoid dusty environments.

7. Working Principle

Basic Principle of Spectrophotometer

1) The nature of absorption

- The spectrophotometric analysis method is the use of substances to choose a different wavelength of light absorption characteristics established.
- Typically using a prism or grating to obtain monochromatic light that passes through the continuous monochromatic solution, the solution is measured and the absorption of each wavelength, the absorption spectrum curve is obtained.
- The absorption spectrum uses selective absorption of light from the material, which is the material of macroscopicphenomena, and the nature of molecular absorption is the result of internal movement and light interaction.
- When molecules absorb certain wavelengths of spectral energy, or some wavelengths of the spectrum are absorbed to form the absorption spectra.
- The smaller the energy absorption, the wavelength of light corresponding to the absorption peak is at a longer wavelength.
- When the infrared absorbent is formed in the infrared absorption spectrum, if the energy absorption is large, the shorter wavelength corresponds to the absorption peak at a shorter wavelength, when generating the ultraviolet absorption spectra of absorption in the ultraviolet region.

2) Absorption Law-Lambert-Beer law

- When a parallel beam passes through the homogeneous solution, the absorbance of monochromatic light is proportional to the product of the solution concentration and thickness.

Digital expression: A=KCL=LogI0/I=-Log T

- **Premise absorption laws establish numeric expression**

① The incident light is monochromatic.

②The absorption process without interaction of each substance, the absorbance of each substance has additivity.

③ The role of lightand matter is limited to the absorption process, with no fluorescent and photochemical scattering phenomena.

④ Absorbent system is a continuous uniform distribution.

3) Impact spectrophotometry reasons

- Non-absorption errors caused by radiation and matter.
- Fluorescence and photochemical reactions, in general, errors fluorescence spectrophotometry produces negligible fluorescence efficiency is very small in most cases the color system and the fluorescence emission is isotropic, only a small portion along the transmitted light directed into the detector, the measurement of absorbanceis low, resulting in a negative deviation.

- Depends on the instrument to measure the impact of the absorption of fluorescence great extent on the optical absorption cell and detector design.
- Reflection and scattering, absorption law applies only to homogeneous medium absorption system, turbid solution so that the measured increase in absorbance due to scattering, results in deviation from Beer's law.
- Non-ideal instrument error caused.
- Beer's law deviation polychromatic contrast, most of the photometers can only get close to monochromatic light with a narrow lumen there is still a polychromatic nature, which can lead to deviations from Beer's law.
- Deviation depends on two monochromatic molar absorptivity difference □ ε, | □ ε | which is very small and can be approximated that monochromatic, at low concentrations, the curve remains linear, but larger concentrations, with the increase in concentration, AC curve bends more, hence the Beer's law applies only to dilute solutions.
- Stray light, stray light entering the detector, means that unnecessary components would be tested at other wavelengths outside the range of the wavelength spectral bandwidth.
- The main dispersive element from a prism or grating spectrometer, a mirror, a lens surface scattering, dust and other inner walls of monochromator components, and diffuse reflection and other scars, the stray light can cause serious measurement errors.
- The instrument is the smallest wavelength of energy, usually at a maximum stray light (such as a deuterium lamp 220nm, tungsten lamp 340nm).
- Slit width, the slit width of the spectrum affects not only the purity but also affects the absorbance.
- When quantitative analysis is used, to obtain sufficient measuring signal, the slit should be larger.
- In qualitative analysis, the use of a smaller slit when the entrance slit and the exit slit width equal the width of the slit, resulting in minimum error.
- Wavelength scale ruler of error, the wavelength of the gauge affects the wavelength accuracy of the instrument, such as a large error or correction.
- The spectral measurements produce errors that affect the accuracy of absorbance measurements (in the absorption spectrum of the more significant peak).
- Impact of non-parallel incident, one of the prerequisites is the use of a parallel incident beam to ensure that all beams through the same thickness of the absorbing medium, when a large deviation from parallelism on the incident beam, leads to deviations from Beer's law.
- If the instrument is in moderate-intensity beam deviation from parallelism, absorbance measurement error is generally caused by less than 0.5%.
- Photometric scale error, photometric accuracy of the scale that is transmittance, directly affecting the accuracy of the magnitude of the error photometric measurements.

8. Operations

8.1 Key definitions and basic operation

1) Button panel schematic diagram

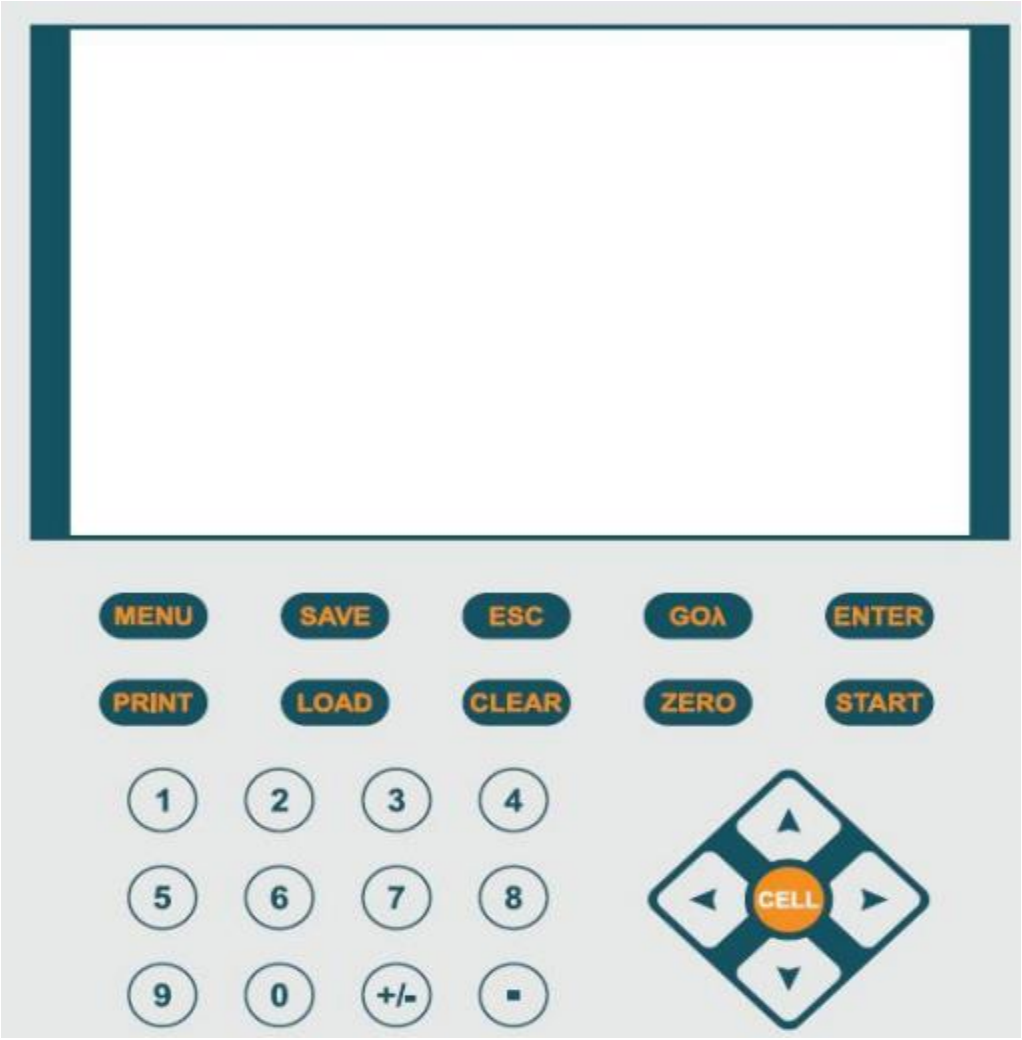


Figure-4

2) Button functional description

Button name	Button functional description
【MENU】	Menu key under each function
【PRINT】	Print output button
【SAVE】	File storage button
【LOAD】	File open button
【ESC】	Back, cancel button, test stop button
【CLEAR】	Clear key to delete the input data, delete files
【GO λ】	Set the wavelength
【ZERO】	Adjust 100%T and 0Abs, build user baseline key
【ENTER】	Enter the confirmation button, function, menu selection button
【START】	Test the beginning button
【0】-【9】	Number button
【.】	The decimal point
【+/-】	Plus, or minus sign
【↑】,【↓】	Up and down key
【←】,【→】	Left and Right key
【CELL】	Automatic sample holder button

3) Basic Operation

1. **How to adjust the blank**
   In any test interface, put the cuvette containing the reference solution into the cuvette slot, and pull it into the light path., press【Zero】key to adjust the blank.

2. **How to set the wavelength**
   In any measurement interface press【Go λ】key to set the current working wavelength.

3. **Store files in text or cvs format (use Excel format for simple spreadsheet files).**

8.2 Instrument Self-test



Figure-5

1) **Communication port inspection**
   Check if the communication port of the instrument is working properly. The result is displayed correctly √ and an error is ×, the buzzer alarm.

2) **File system check**
   Check if the instrument's built-in Flash file system is correct. If the result is displayed correctly √, an error will reformat the file system.

3) **Filter positioning**
   Check if the instrument's filter motor and its locator are working correctly. The result is displayed correctly as √, an error as ×, the buzzer alarm.

4) **Light positioning**
   Check if the instrument light switch motor and its locator are working correctly. The result is displayed correctly √, an error is displayed result is ×, the buzzer alarm.

5) **Printer check**
   Check if the printer interface device is working properly. The result is displayed correctly √, an error is displayed result is ×, the buzzer alarm.

6) Tungsten lamp examination

Open the instrument tungsten light source, and check if the operating parameters of the tungsten lights are working properly. If the parameters are not working properly, then re-set the operating parameters of a tungsten lamp. Change detections are always displayed correctly, the result is always √.

7) Deuterium lamp examination

Open the deuterium light source instrument operating parameters to check if the deuterium lamp is working correctly. If the parameters are not working properly, then re-set the operating parameters of the deuterium lamp. Change detections are always displayed correctly, the result is always √.

8) Signal detector check

Check if the signal detector instrument is working correctly. The result is displayed correctly √, an error is displayed result is ×, the buzzer alarm.

9) Wavelength Calibration

The wavelength parameter checking instrument is working properly. Correct, then the pop-up boxes, please confirm whether the user input wavelength calibration if no user input within five seconds, then skip this. If the argument is the wrong wavelength, then start looking for a deuterium lamp to automatically correct the characteristic peak wavelength. Wavelength calibration result is displayed √, the correction is not passed, then the result is ×, the buzzer alarm.

10) Dark current correction

Read the instrument's dark current of energy, checking eligibility. If the dark current is in the proper range, which means that the dark current is correct, then displays the results √. If the dark current exceeds the maximum setting, the user is prompted dark current error. The results are displayed as ×, the buzzer alarm.

11) System parameters check

The instrument system baseline reading is correct. If correct, then the pop-up box that asks the user whether to re-enter the correction system baseline, baseline correction system by default does not automatically skip the 3 seconds. If an error does not exist or the baseline, the baseline correction system directly. Showing results √, the correction is not passed, then the result is ×, the buzzer alarm. Self-test end, after re-calibration of dark current, into the main instrument display.



Figure-6

Note: After power is turned on, the instrument will automatically self-test and initialization begins, after initialization is complete, the instrument will warm up for 20 minutes. 20 minutes warm-up time or press [ESC] to skip preheating. In case, the instrument is being prompted for the preparatory work environment, which is the instrument re-calibration dark current, set the working parameters, etc., and then enter the main menu.

8.3 Photometric Measurement

1) **Function description**
   Photometric measurements measure the absorbance of the sample at a single wavelength, transmittance, or energy value.

2) **Set measuring mode**
   Press the set button, enter the measurement mode settings menu, select the desired test mode, and press [ENTER] to confirm. If users choose the energy model, the energy window appears and prompts users to select the amplifier gain.

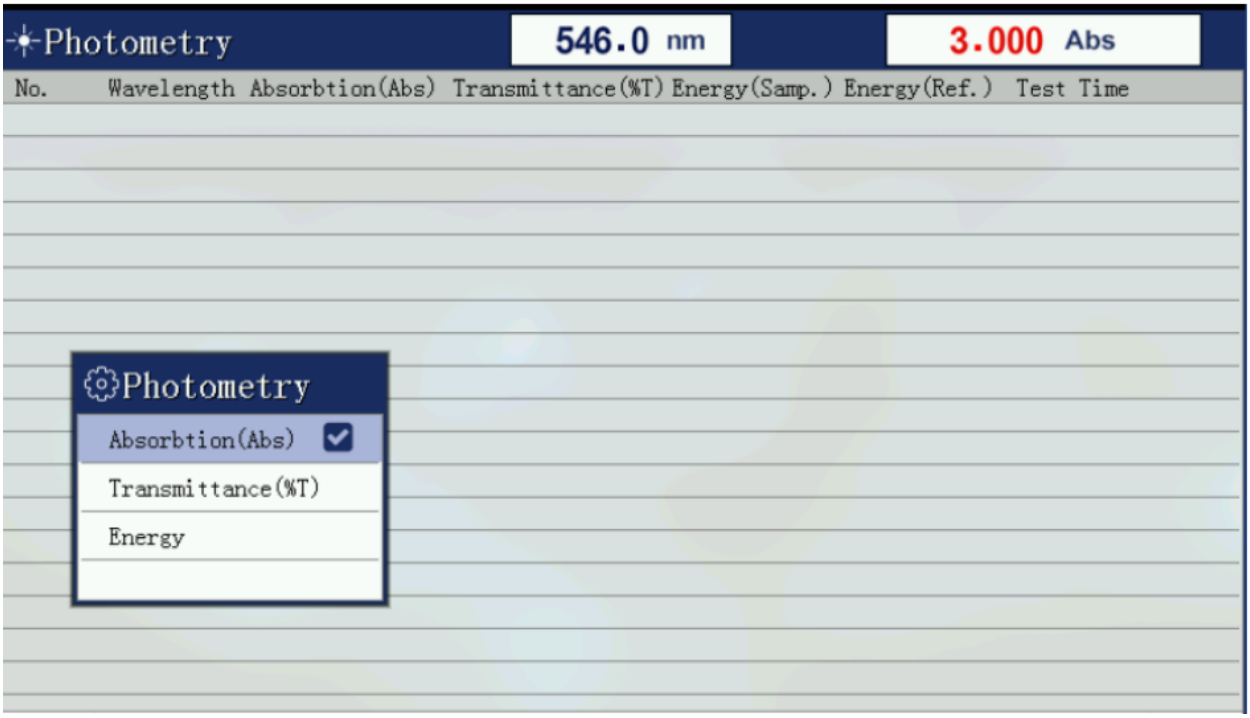


Figure-7

3) Set wavelength

Set the current working wavelength range 190nm-1100nm, press the up and down button to open the wavelength setting window, press [0] - [9] to enter the desired wavelength, press [CLEAR] to clear the input, press [ENTER] to confirm. Input errors or exceeds the set range buzzer alarm.

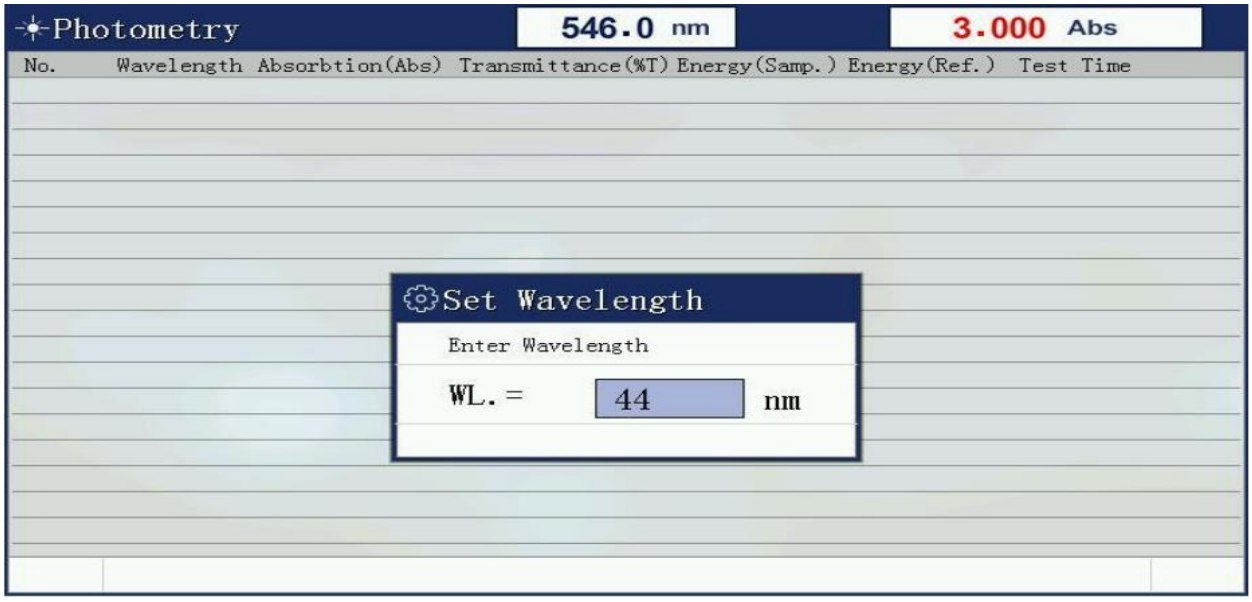


Figure-8

4) Correction 100%T/0Abs

In two samples simultaneously into the two slots reference solution, and then press the [3ERO] key, the instrument will be a blank correction in the current wavelength. Display calibration is completed 100.0% T or 0.000Abs.

5) Measurement data

Calibrated with reference solution 100% T/0Abs, remove the rear slot, place reference sample solution, and then press the [START] button, then perform a test, the sample data are immediately added to the list.



Figure-9

6) Delete data

Delete files Press the [CLEAR] button, delete files prompt box will pop up, this operation will delete all the test data currently under test. Select [Yes], the file will delete all data, and select [No] to return to the test window.

7) Save the file

Press the Save button to save the current list of test data to a file. If this is the first time users save a file, the dialog box will pop up asking to save the file name input.

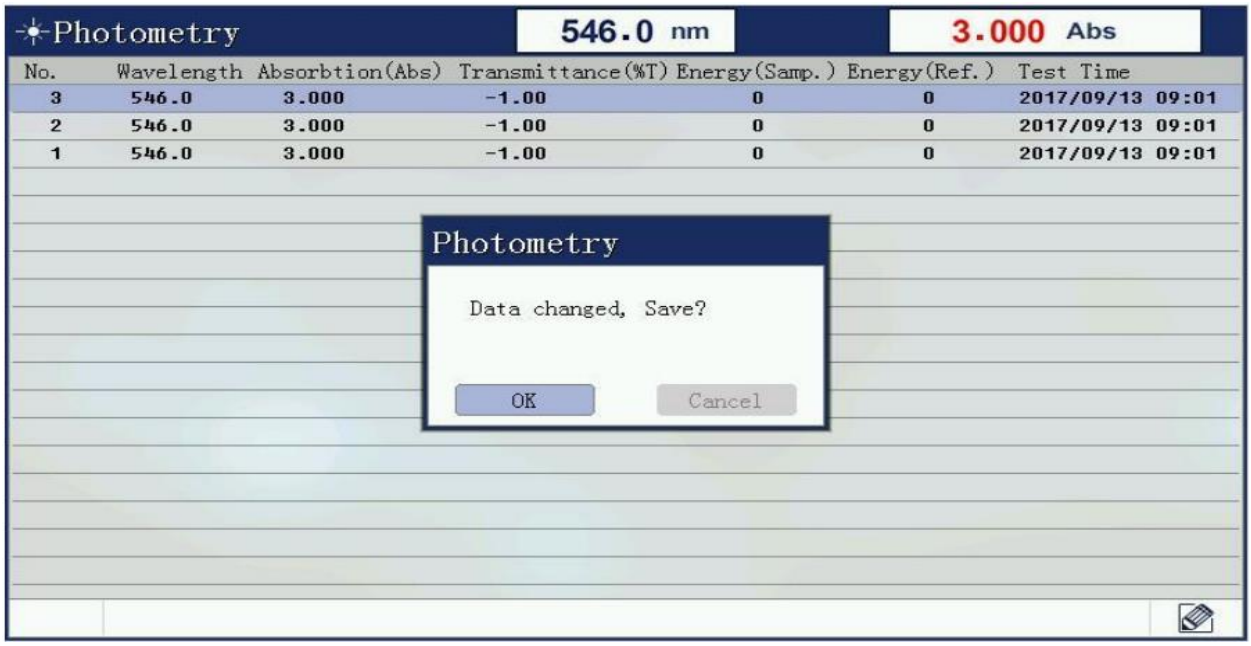


Figure-10

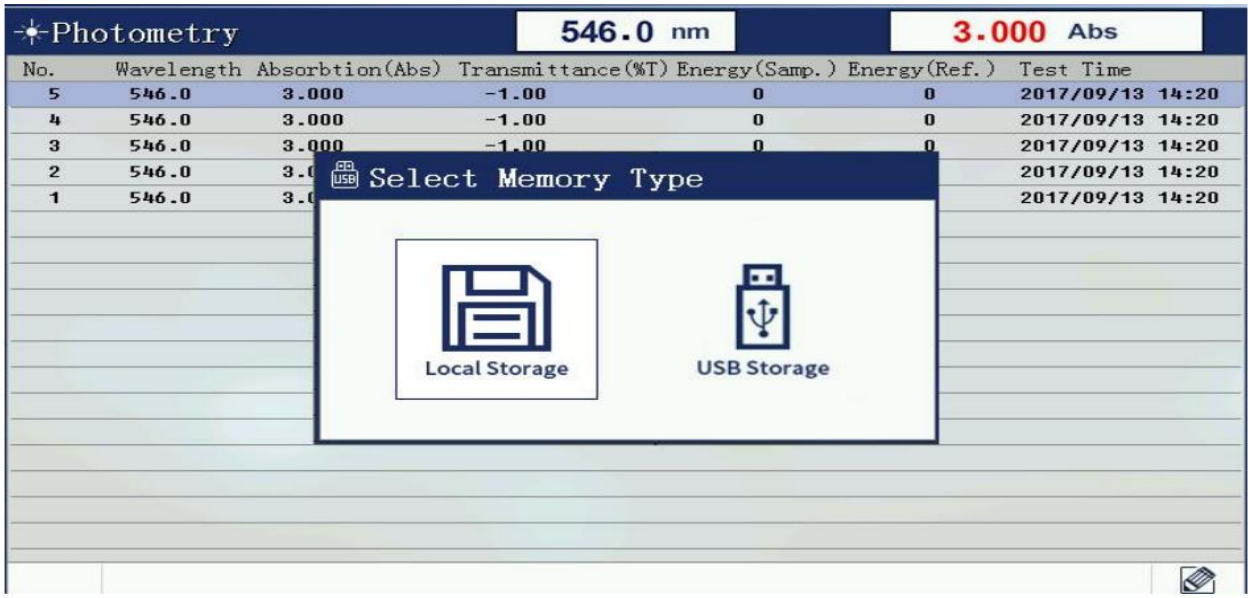


Figure-11

8) Open the file

In photometric measurement, the interface will be displayed by the load button to open the window, open the window for all the photometric data file lists. Select the appropriate data file and press [ENTER], the file will be read into all the test data, and then automatically enter into the measurement mode.

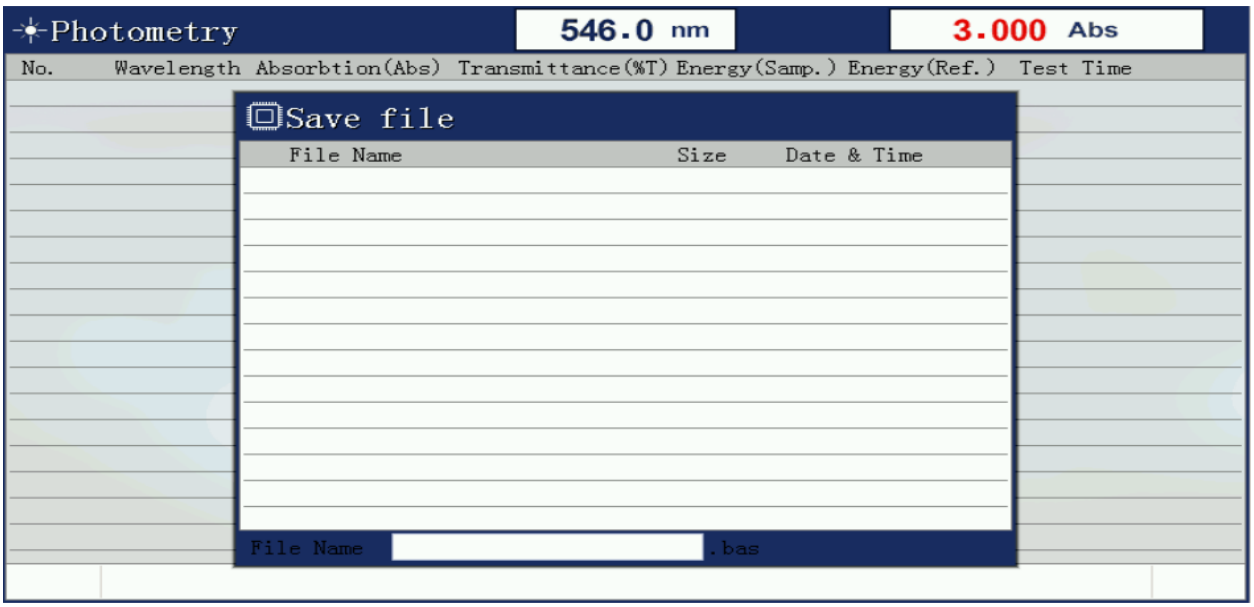


Figure-12

8.4 Quantitative Measurement

Select [quantitative measurement] with up and down, left and right keys, then press the enter key. There are two options: build a standard curve and open a standard curve.

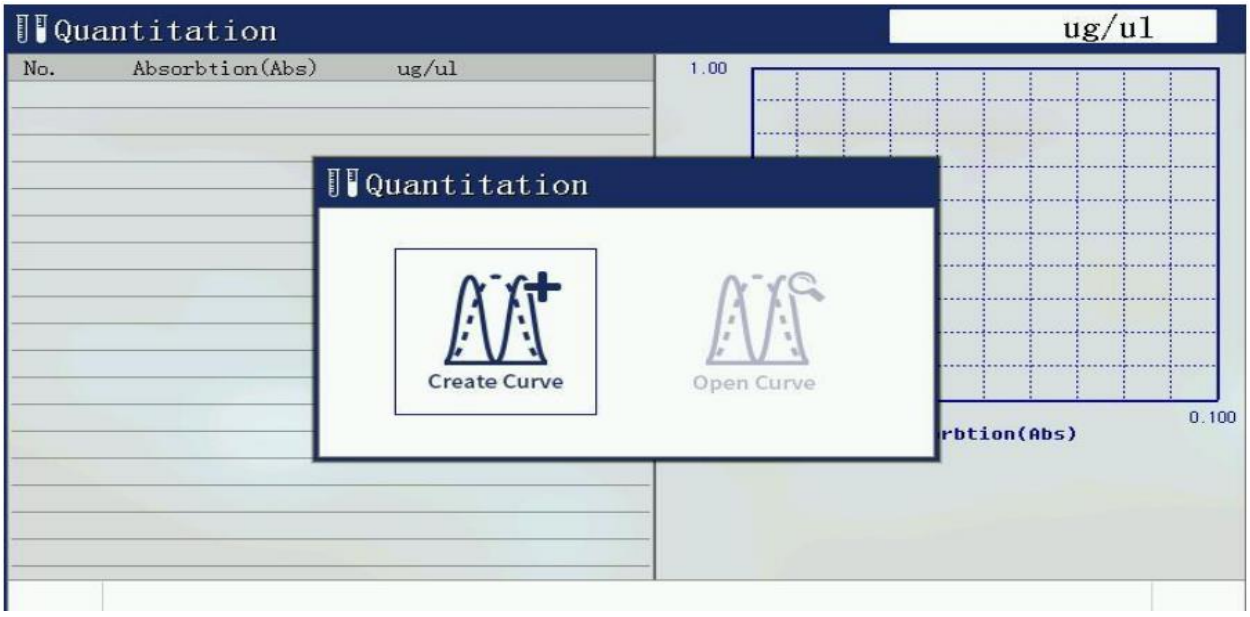


Figure-13

1) Build a standard curve

To use several configured standard samples, input the concentration of the sample standard, and collect the absorbance of the standard sample, using the relationship between concentration and absorbance. The curve parameters are calculated, and this parameter is used to measure the concentration of the sample.

1. **Curve fitting mode:** There are first-order fitting, first-order fitting through zero, and second-order fitting.

2. **Curve building method:** There are standard sample methods and coefficient methods. The standard sample method is the sample is placed first, the build curve, and then the test sample. The coefficient method is to enter the known coefficient and build a standard curve, then test the sample.

3. **The number of samples:** At least 2 samples. More sample numbers, more accurate testing data.

4. **Concentration units:** Enter the concentration value of each standard sample, because the parameters of the curve have established limits, please select the appropriate concentration units.

5. **Wavelength value is required.**

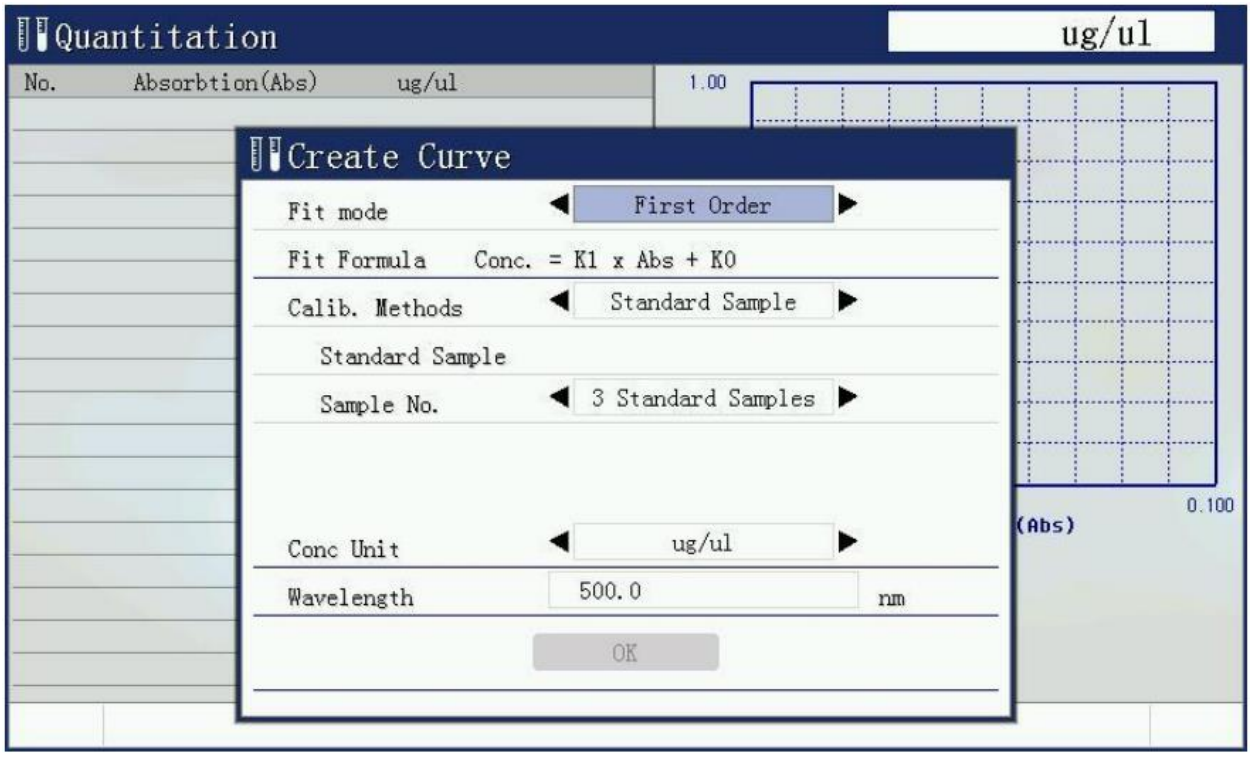


Figure-14

6. **Standard sample measuring**

Put various standard samples into a cuvette holder orderly, and enter the concentration value of each sample, then press the **[enter]** key, and read the absorbance of the sample. The input is completed, and the data of the standard sample is calculated automatically according to the parameters of the curve, displayed on the screen. If the parameter is wrong, the alarm rings and exits to establish the curve function.

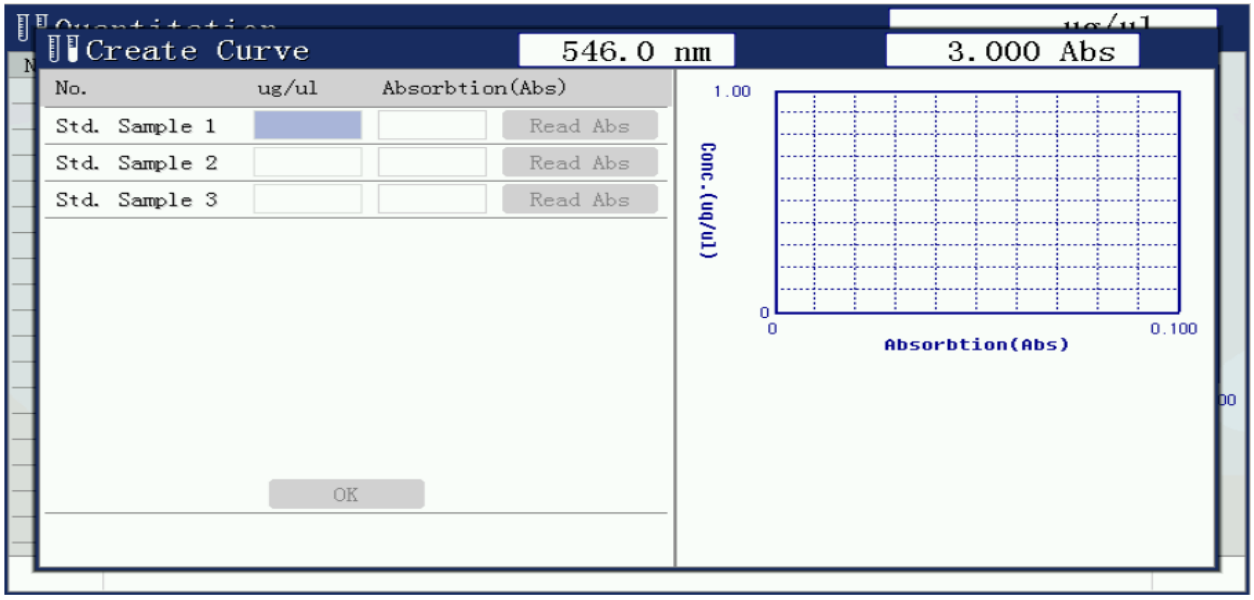


Figure-15

7. **Sample Test**

Put the sample into the cuvette holder and press the [start] key, to get the concentration value of the current sample.

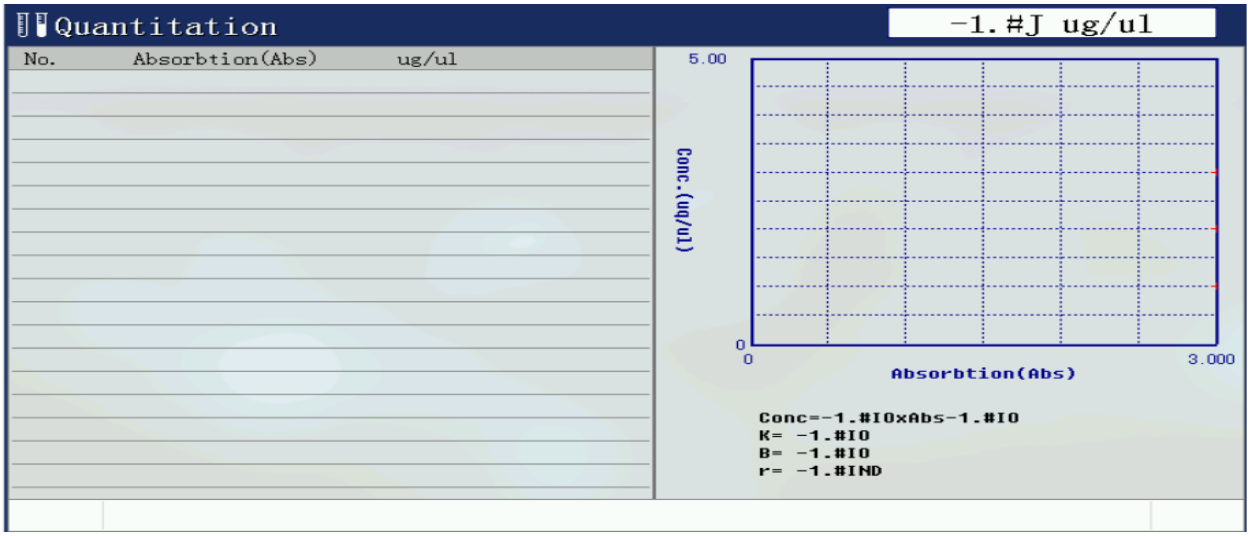


Figure-16

8. Open standard curve

By opening the previously established curves for measurements. Select the appropriate quantitative test file, and press the [Enter] key to open a standard curve file.

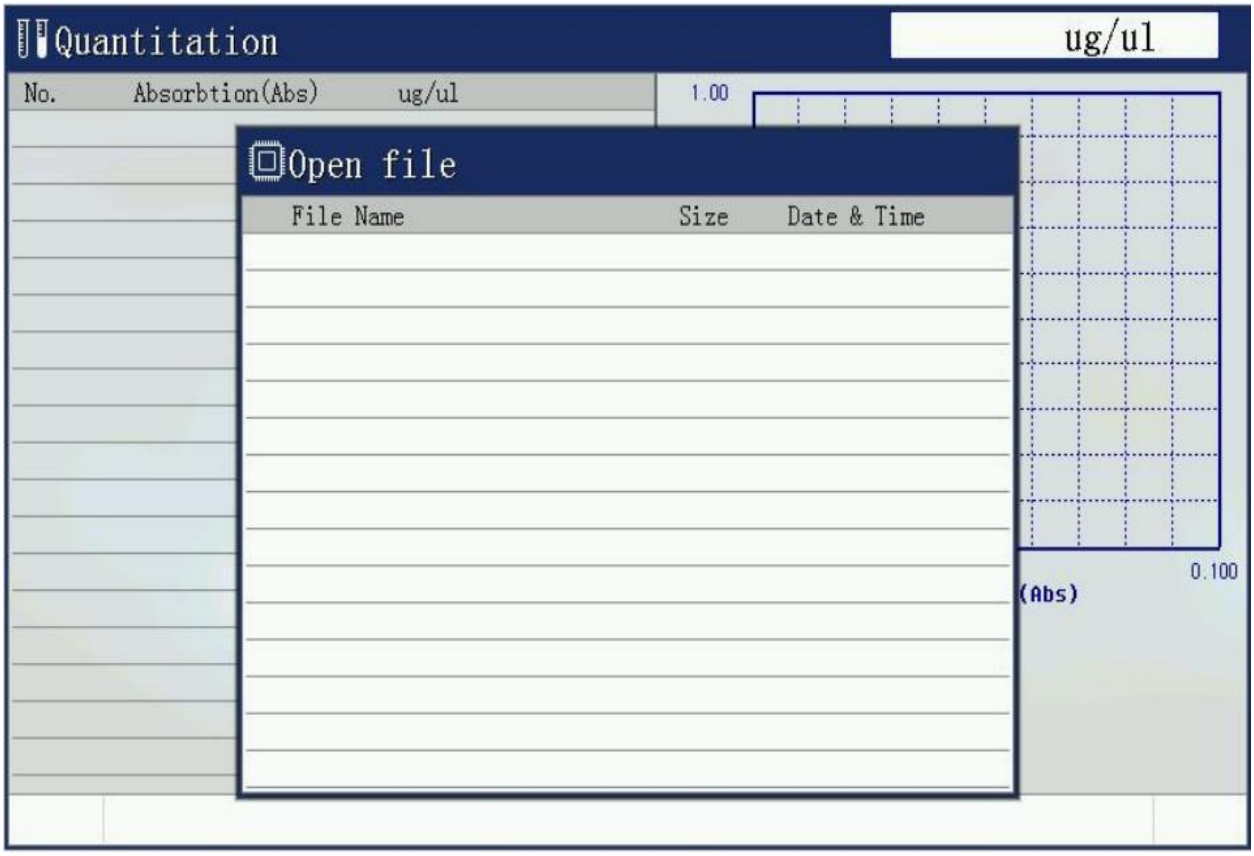


Figure-17

8.5 Time Scan (Kinetic)

1) Function description

The scan time (kinetic) function is a fixed time interval to the trend in absorbance or transmittance of the test current and is displayed on the map. Select the time scanning (kinetic) menu option and press [ENTER].

2) Time scanning parameters set

Set the time to scan the scanning parameters: Time interval, test time, and measurement mode, the display displays the upper and lower limits.

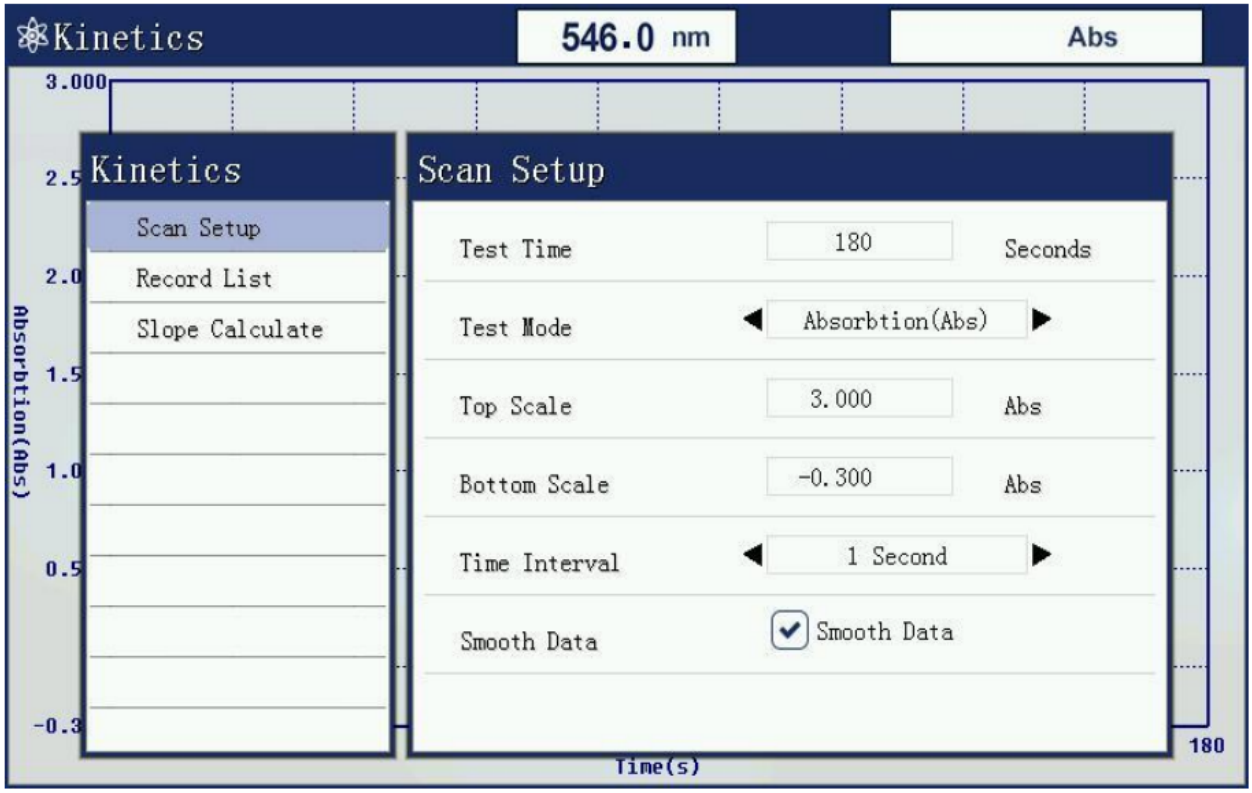


Figure-18

1. **Set test time**
   Test time is the total time of the entire test.

2. **Set the measurement mode**
   The measurement mode is absorbance, transmission, or energy. Choose a different measurement mode, you need to reset the display to display the upper and lower limits.

3. **Set the upper and lower limit**
   The different measurement modes and upper and lower displays are not the same.

4. **Set the time interval**
   Scan scanning interval setting time, 0.5 seconds minimum, maximum 1 minute.

5. **Select to make data smoothing**
   The function of data smoothing is to reduce the irregular fluctuation caused by the external environment during testing.

3) Data Test

Press [START] to start measuring. the current real-time map will be on the screen.

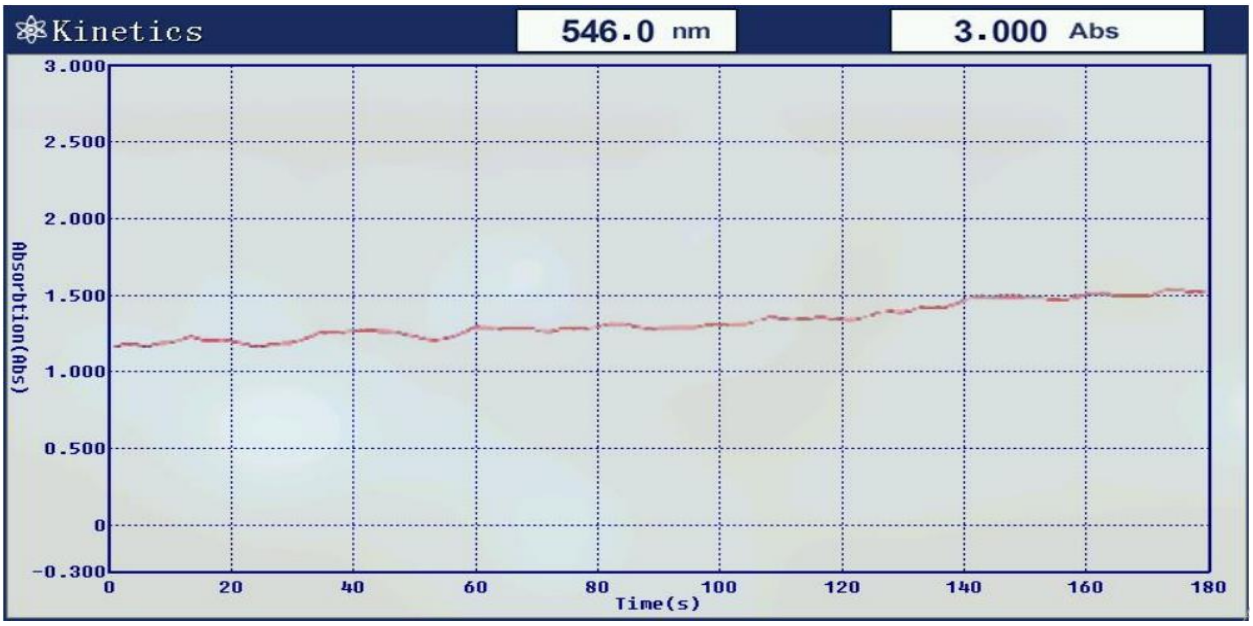


Figure-19

4) Data List

Press the [Menu] key to check the scanning data after the scanning finish.

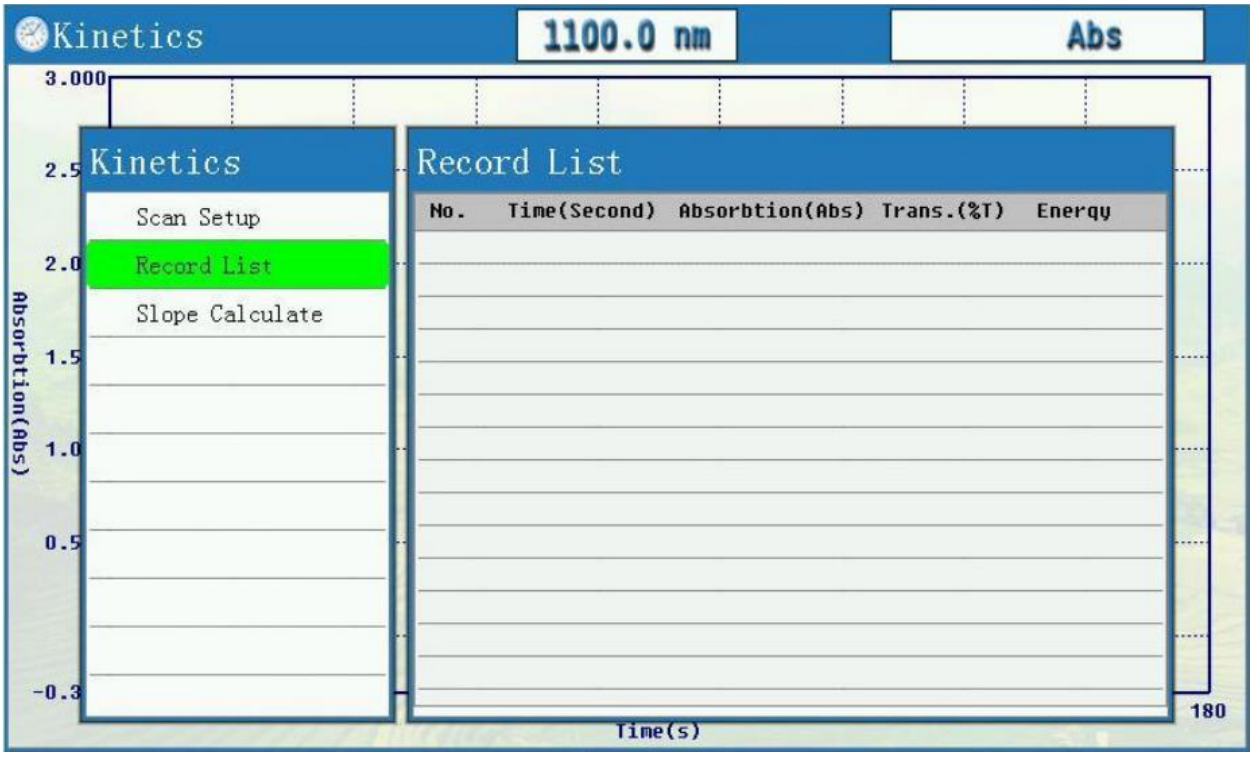


Figure-20

5) Slope Calculation

After scanning, press the [Menu] key to set the starting time and end time for slope calculation.



Figure-21

8.6 Wavelength Scanning

1) Function description

In the set wavelength range, in a certain wavelength interval to record the absorbance of the sample and the energy transmittance value, the results are plotted in the map, which can be seen in the sample absorbance, transmittance, and the energy value trends at different wavelengths.

2) Set scanning parameters

1. **Set start wavelength and end wavelength**

   The start wavelength and end wavelength mean the wavelength range used for scanning.

2. **Set the measurement mode**

   The measurement mode is absorbance, transmission, or energy. Choose a different measurement mode, you need to reset the display to display the upper and lower limits.

3. **Set the upper and lower limit**
   The different measurement modes and upper and lower displays are not the same.

4. **Set the time interval**
   Scan scanning interval setting time, 0.5 seconds minimum, maximum 1 minute.

5. **Set scanning speed**
   The scanning speed depends on the quantity of data collected on a single-point wavelength; the faster the speed, the less the collecting quantity.

6. **Select to make data smoothing**
   The function of data smoothing is to reduce the irregular fluctuation caused by the external environment during testing.

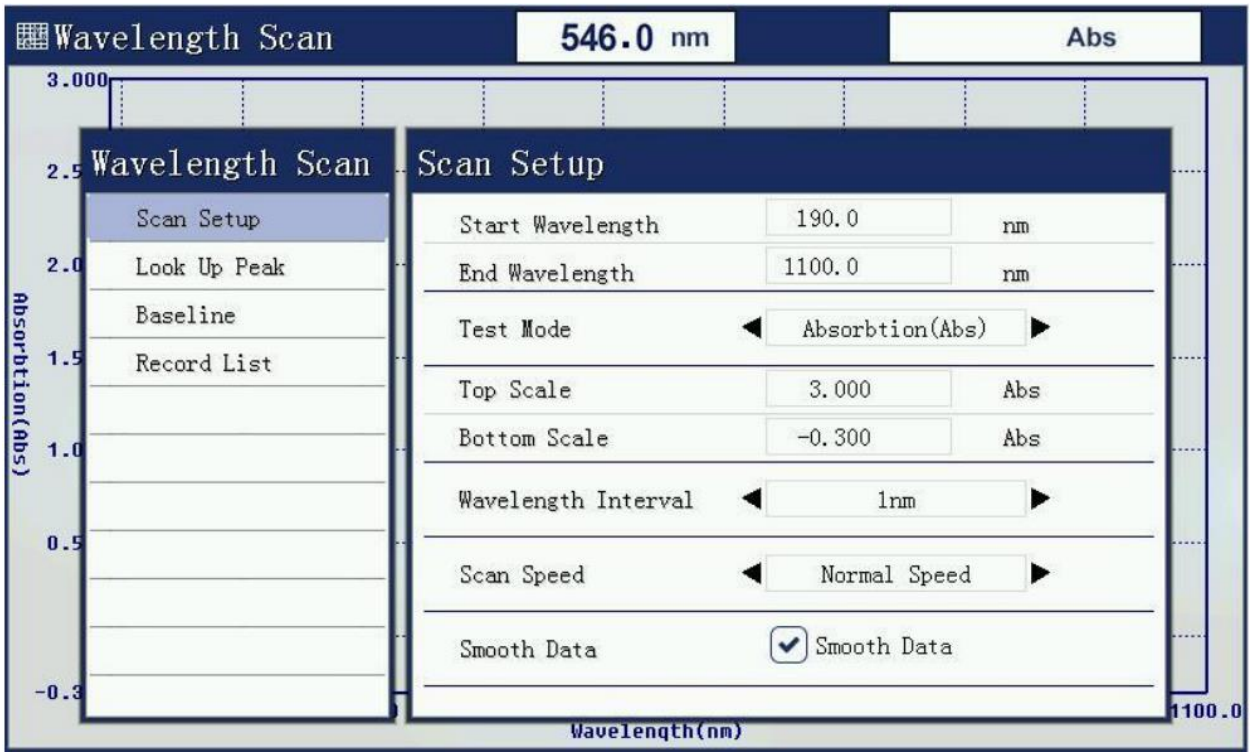


Figure-22

Note: Users must set the scan settings before calibration parameters are blank, because the scan settings to modify the parameters, the baseline will lead to an invalid user, and the user needs to re-establish a baseline.

3) System baseline

Before the beginning of the measurement wavelength scan, users must create a system baseline. If users have previously established a system baseline, users can skip. A long time without updating the system, re-create the system baseline.

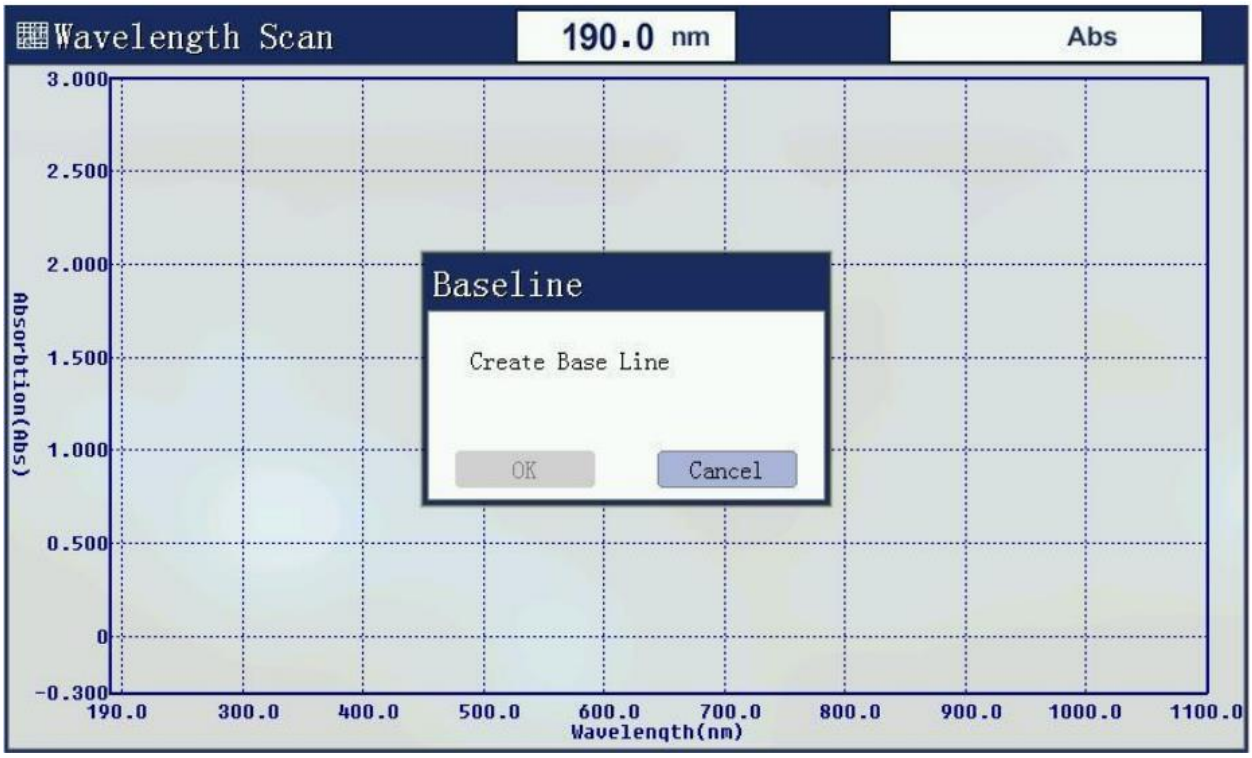


Figure-23

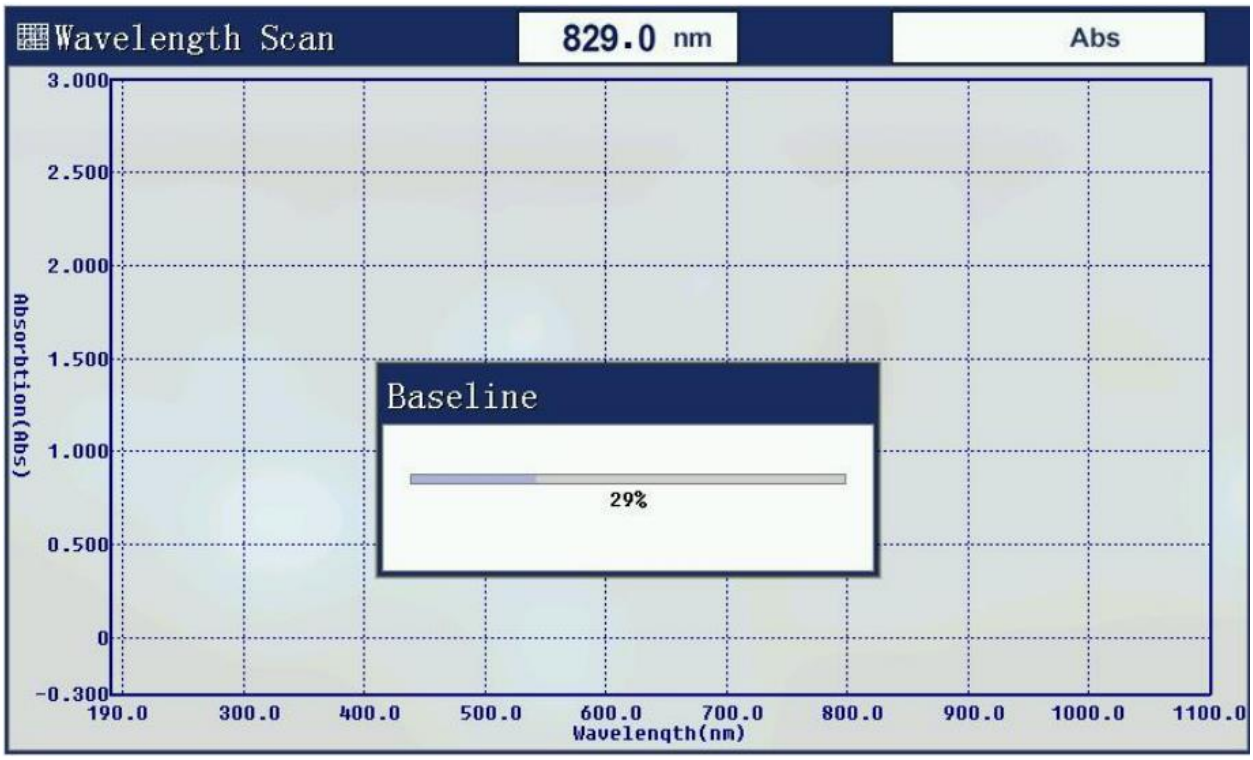


Figure-24

Press the [Menu] key to view the baseline data after building the system baseline.

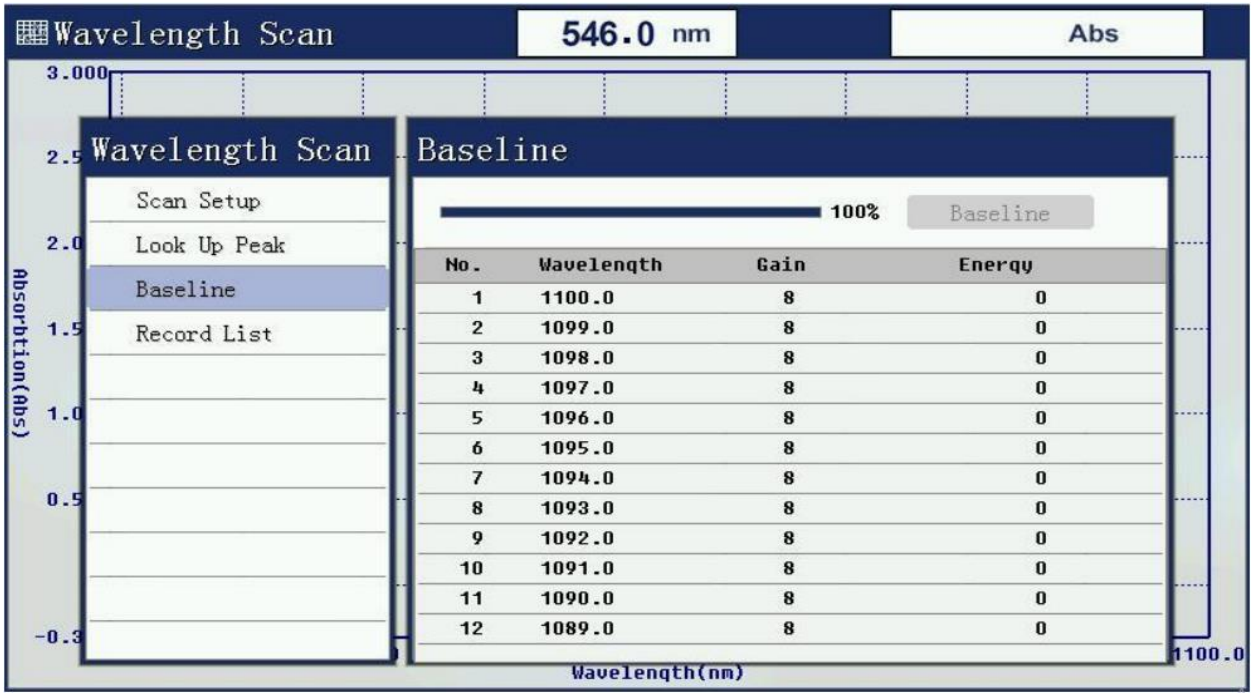


Figure-25

4) Create a user baseline (corrected blank)

Before starting the measurement, the user must establish a baseline, that is, correction of the reference sample 100% T and 0Abs.

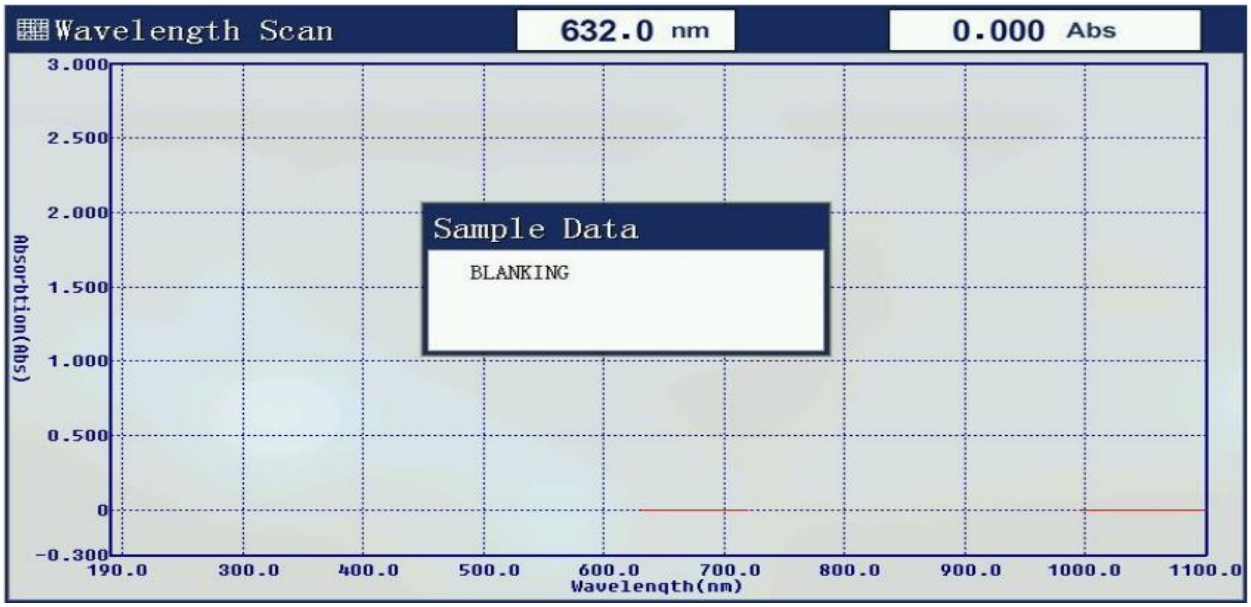


Figure-26

5) Begin testing

The tested samples were placed in the light path, press [START] to start the test.

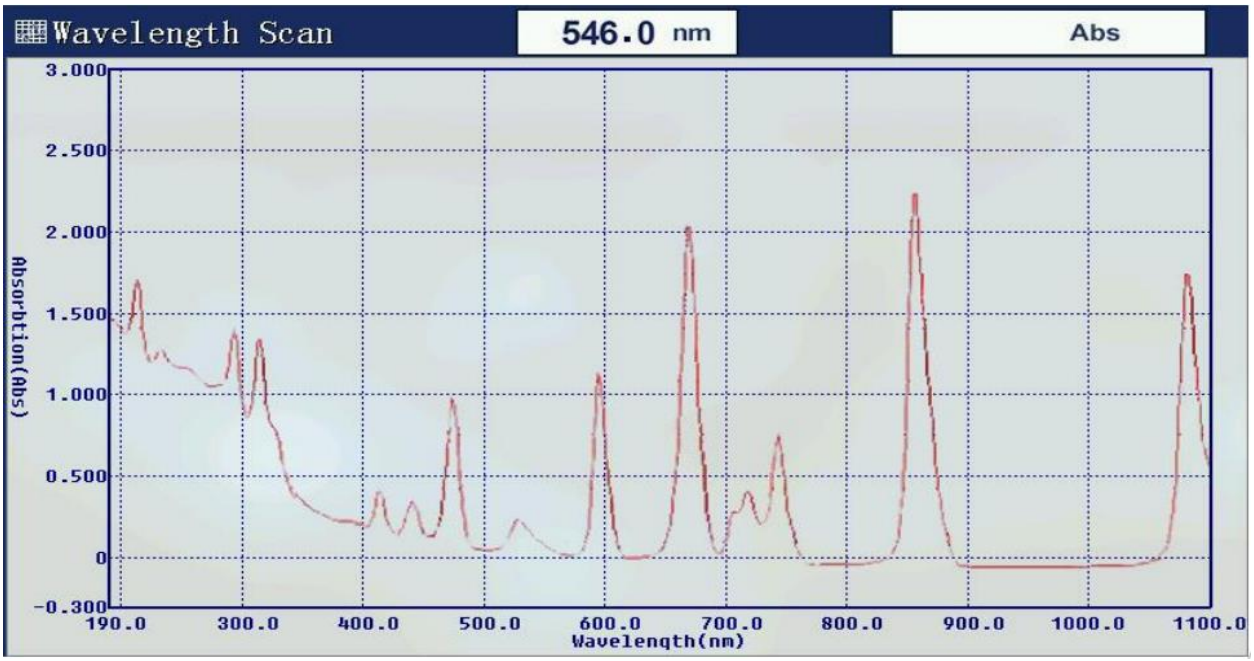


Figure-27

6) Peaks and troughs

After the test is complete, users can choose to find peaks and valley peaks and valleys values of the test results.

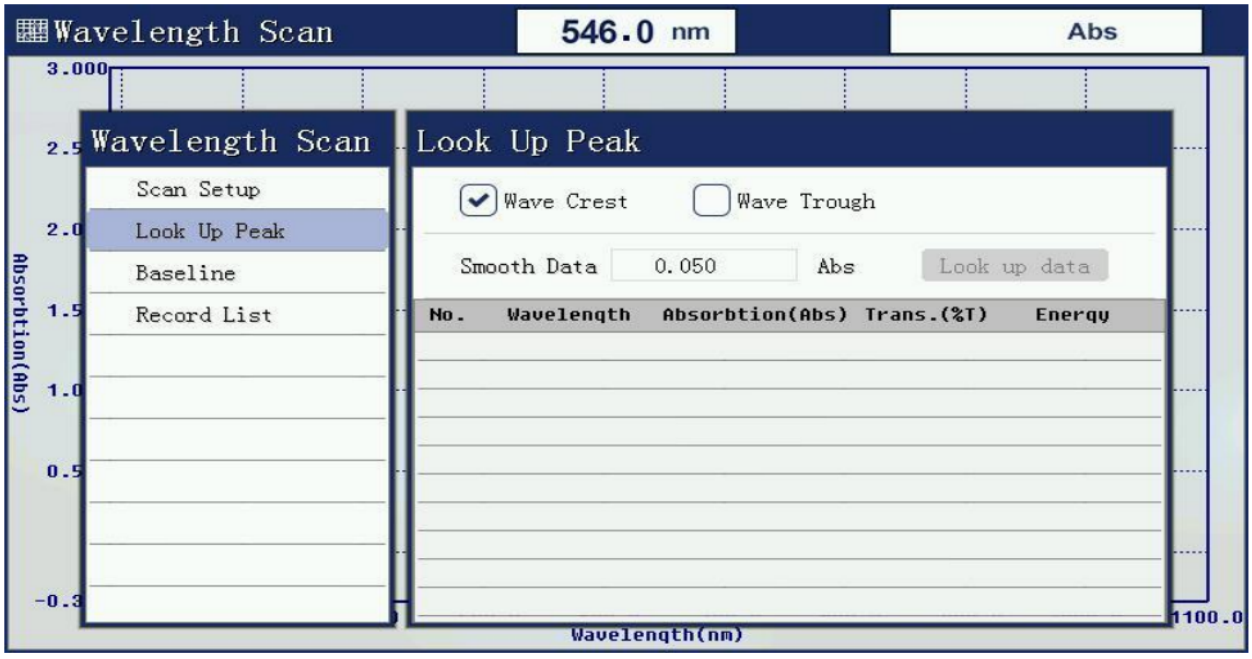


Figure-28

7) Data list

Press the [Menu] key to see the list of test data.



Figure-29

8.7 Multi-wavelength Test

1) Function Description

Multi-wavelength for the user is needed to test a sample while measuring the transmittance or absorbance at a wavelength setting of several functions, the user interface can be placed in this first sample obtained values for several wavelengths simultaneously, thus simplifying user operation processes.

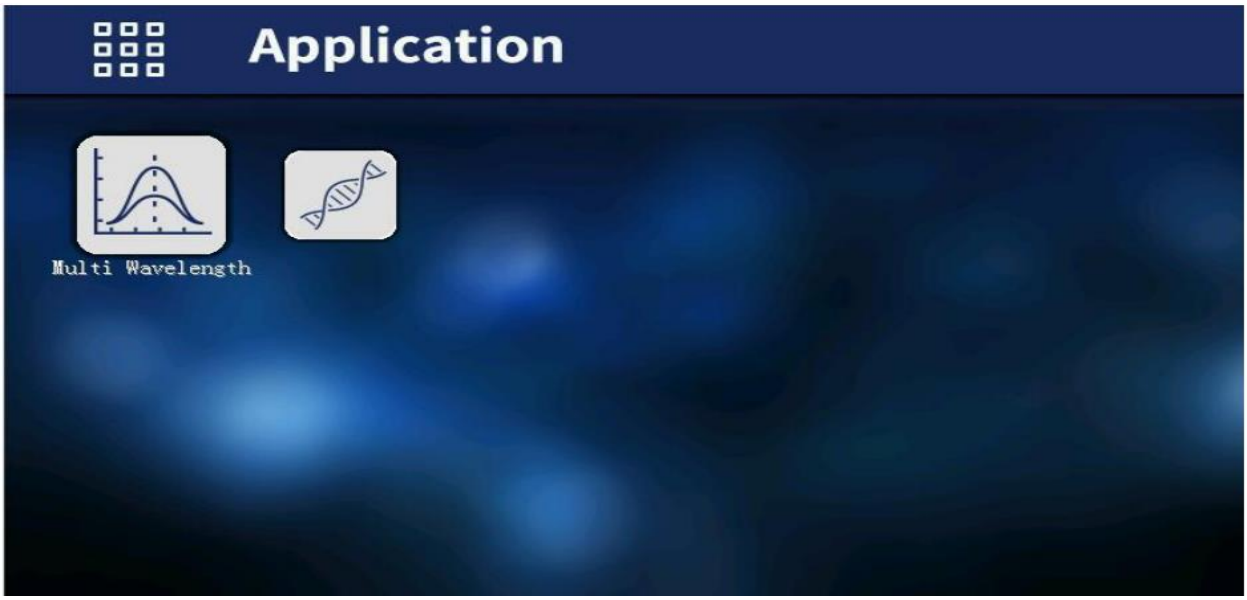


Figure-30

2) Set Parameter

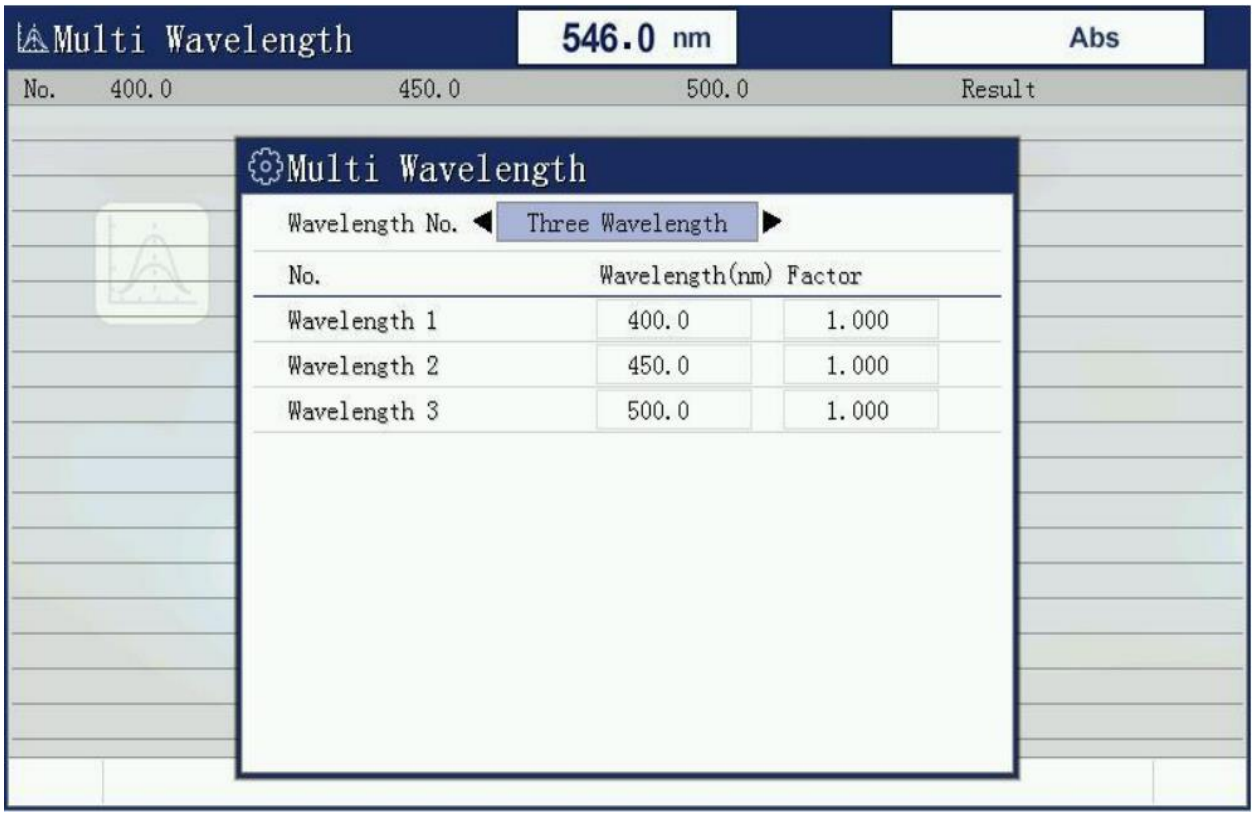


Figure-31

1. **Set the number of wavelength measurement**
   When users select a multi-wavelength test capability will be prompted to enter the number of the instrument wavelength.

2. **Set test wavelength**
   After setting the number of wavelengths, measuring wavelength will enter the setup interface, this interface inputs wavelength values of all measured using the number keys, lost a good point [ENTER] after confirming then lose the next one, until all shall be measured wavelengths losers.

3) Correction 100%T/0Abs

After these parameters are set, place two reference solutions for both colorimetric anti-tank, and then press the [3ERO] key, the instrument will go to the pre-school set a good few wavelengths were blank, went after the end of the prior setting the minimum wavelength, and displays 100.0% T or 0.000Abs.

4) Data Test

Remove the rear slot of the reference sample solution (the front does not move), place the sample solution measured, and then press the [START] button will measure a set of data, if a second sample is to be measured, replace the solution after press [START], once on.

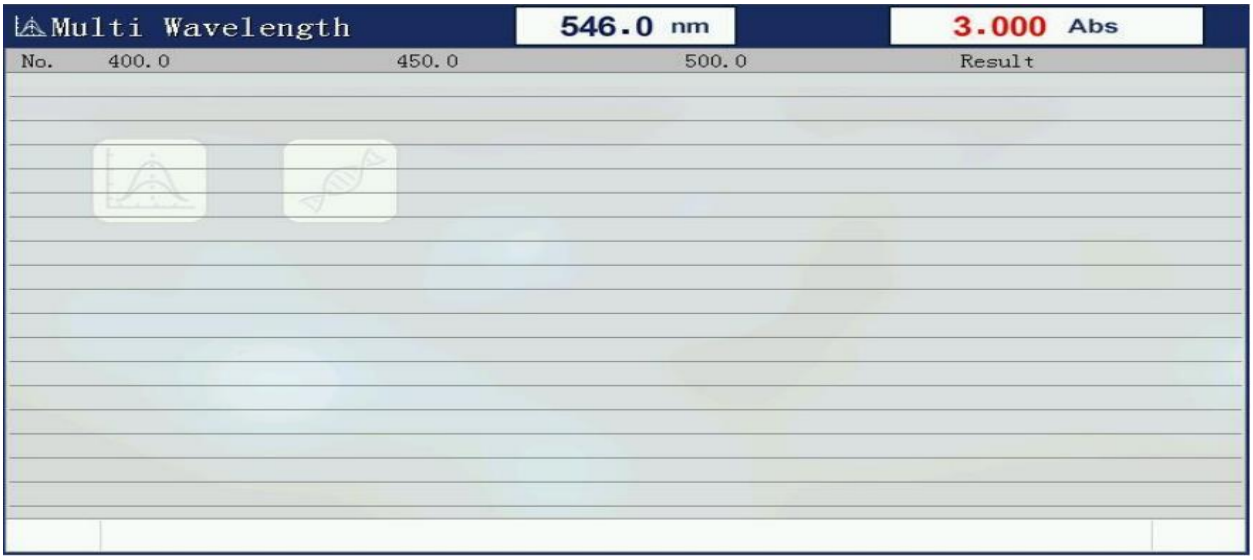


Figure-32

8.8 Protein / Nucleic Acid Measurement

1) Function Description

Protein / nucleic acid comprises two tests: Measurement of protein and single-stranded nucleic acid testing. The curve and parameter are installed inside the instrument for the two tests and users can make tests without building the standard curve again.

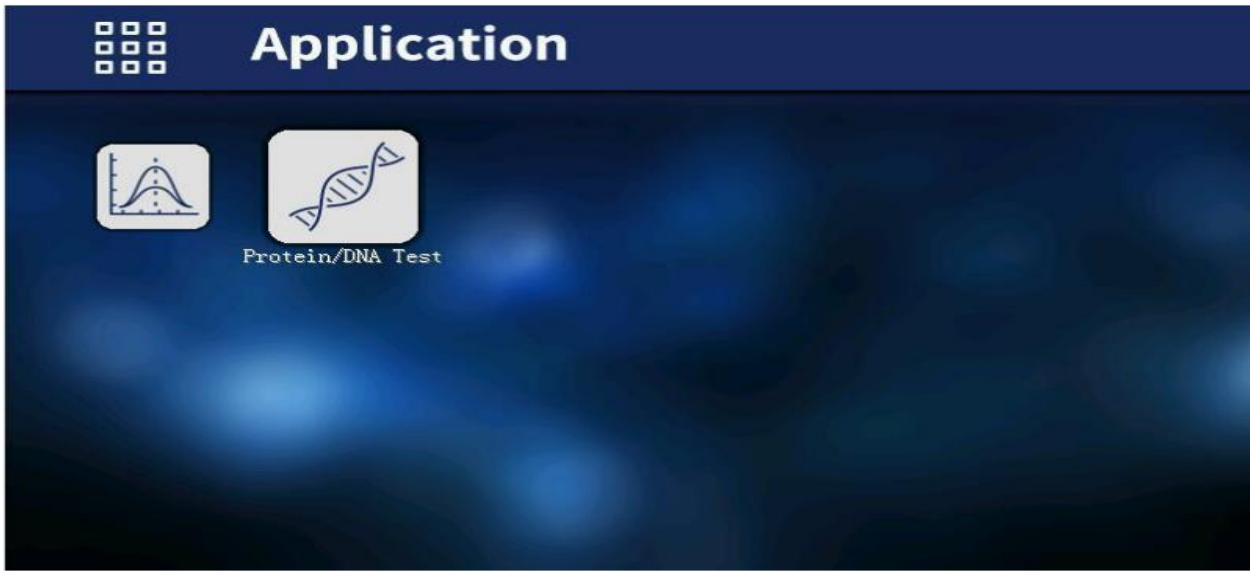


Figure-33

2) Parameter selection

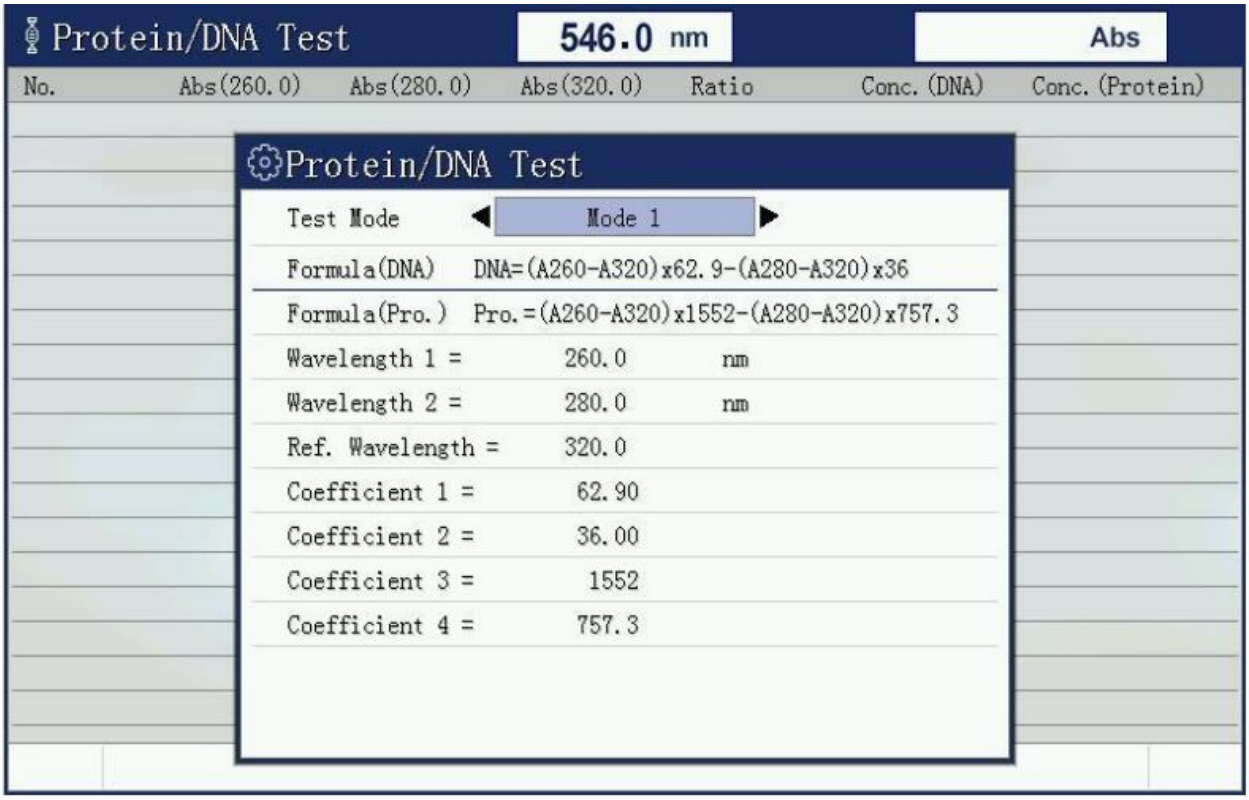


Figure-34

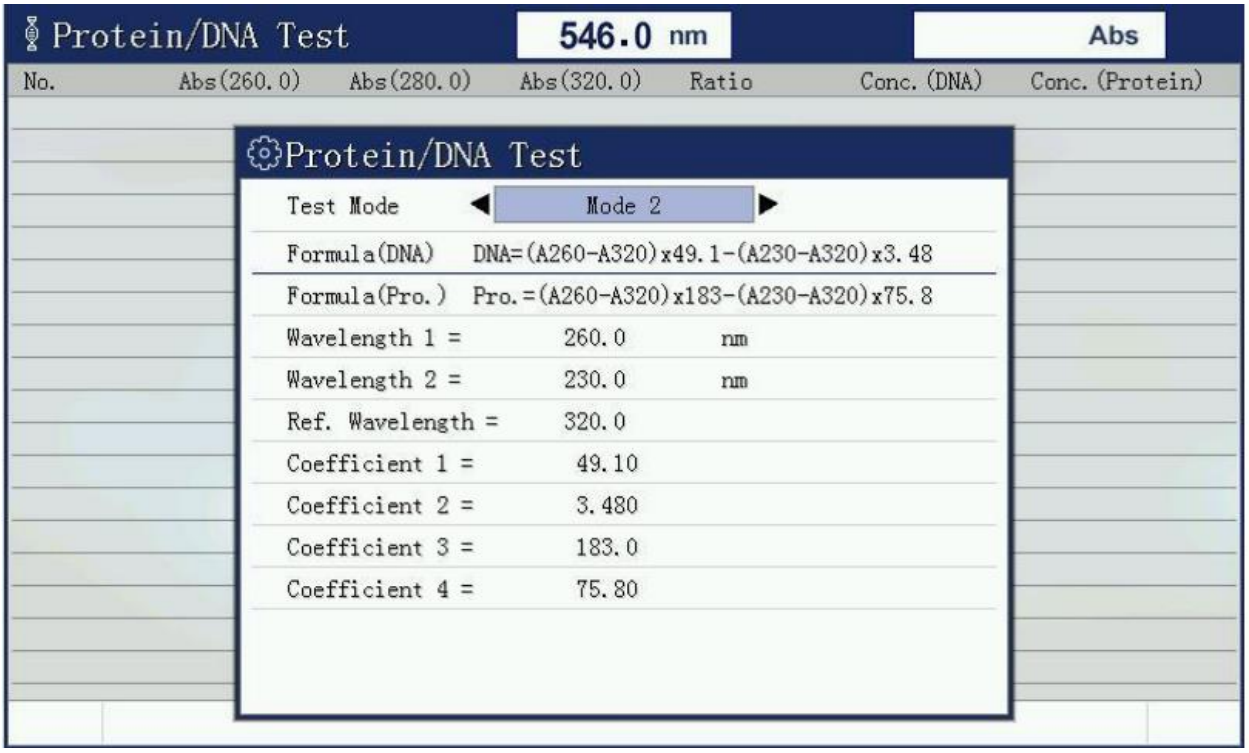


Figure-35

3) Set Zero

Put reference solution into light path after selecting mode, and press the [Zero] key to set zero.

4) Test

Put the sample solution into the light path, and press the [Start] key to measure.



Figure-36

8.9 System Setting

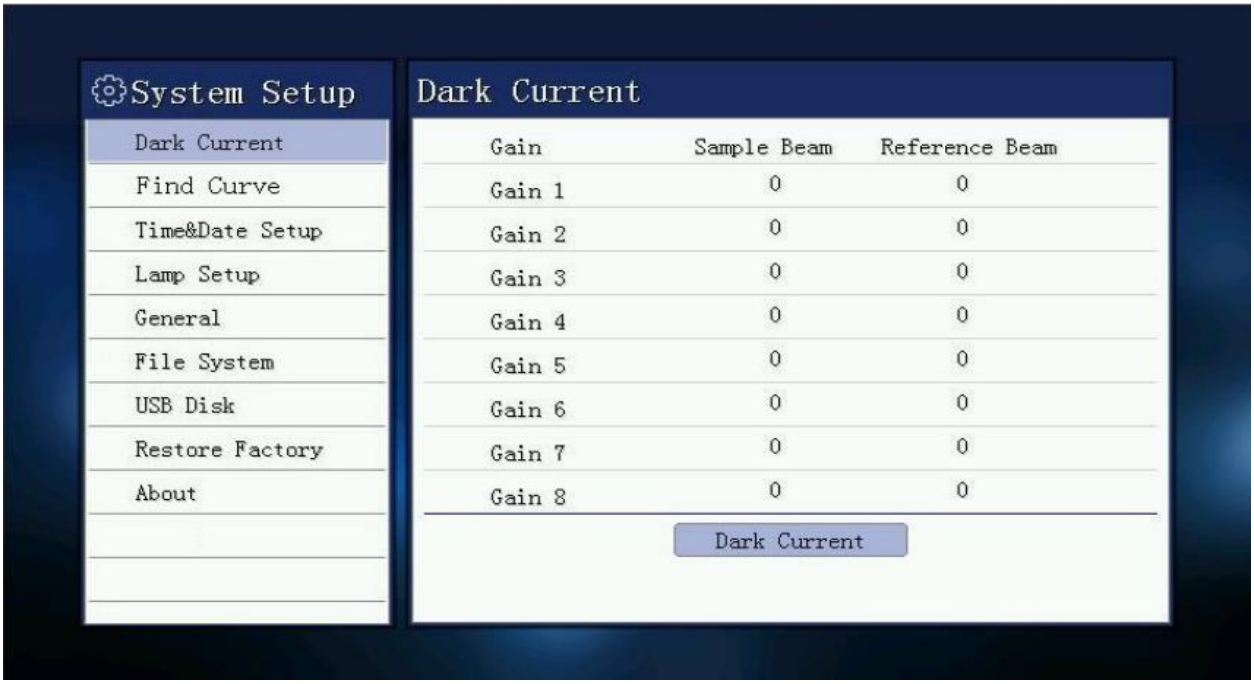


Figure-37

1) Dark current measurements

Long time operation of the instrument probably leads to drift of dark current. this function can correct the full range of dark current, make sure to cover the sample chamber lid when testing dark current.

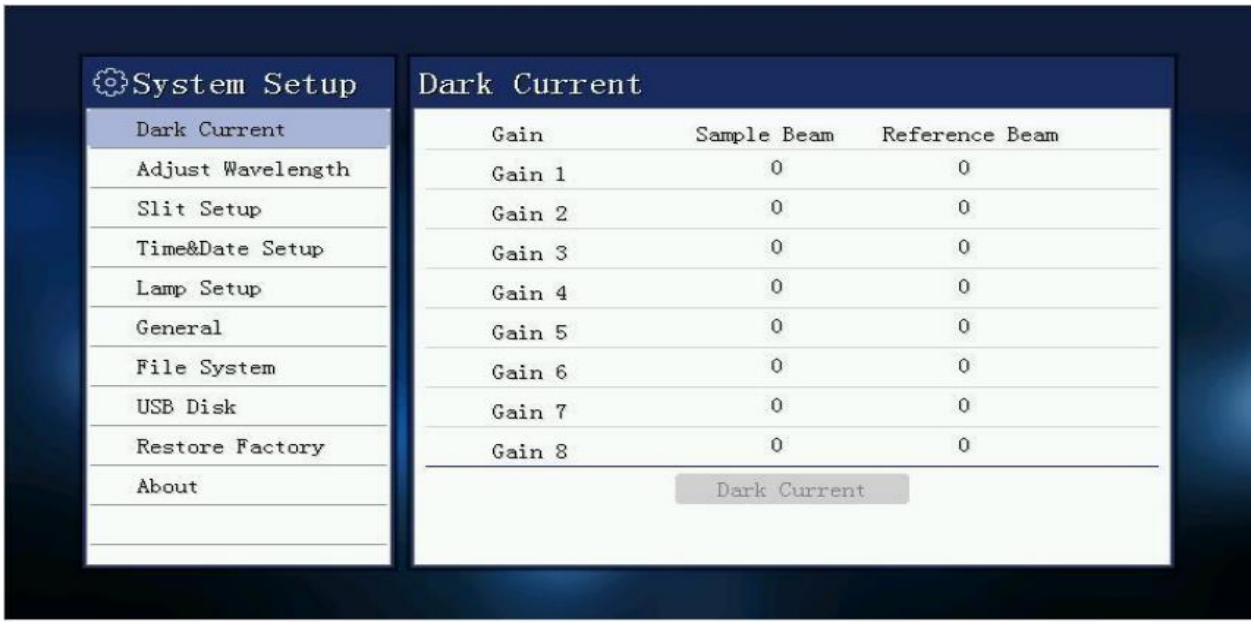


Figure-38

2) Looking for a deuterium lamp curve

This function is to locate the 656.1nm wavelength characteristic curve by looking deuterium lamp, and wavelength calibration. If the seek fails the deuterium lamp characteristic curve, the wavelength is invalid, and the instrument will not work.

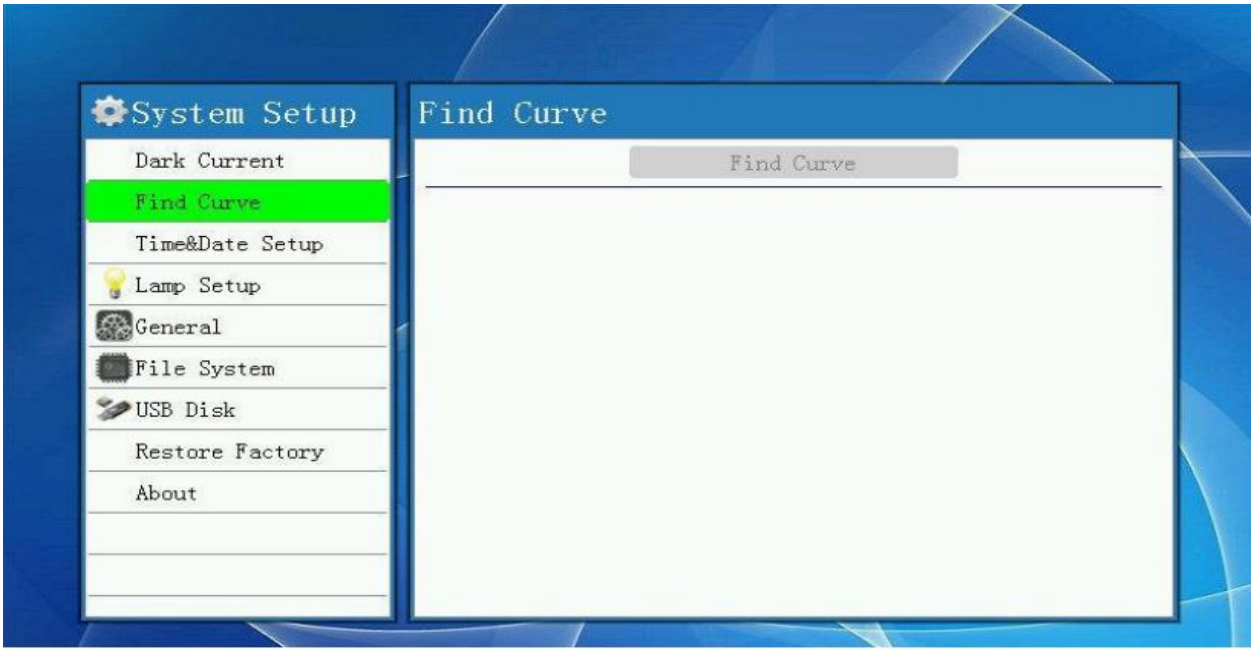


Figure-39

3) Time and date settings

Set the time and date of the instrument, set the year, month, day, hour, minute, and second. By the arrow keys select the year, month, day, hour, minute, and second, through the numeric keys currently selected content. Press enter to confirm your entry, and press Esc to abandon input.

Note: The time and date after the instrument is switched off, will not be lost.



Figure-40

4) Light source management

On the Deuterium lamps and tungsten light source light switches control the display of each light source life. Up and down keys to select the source, press Enter to confirm the selection, the arrow keys to select the state of the light source, and press Enter to confirm the selection,

Note: The open deuterium lamp needs preheating after 15 seconds before it can open



Figure-41

5) General

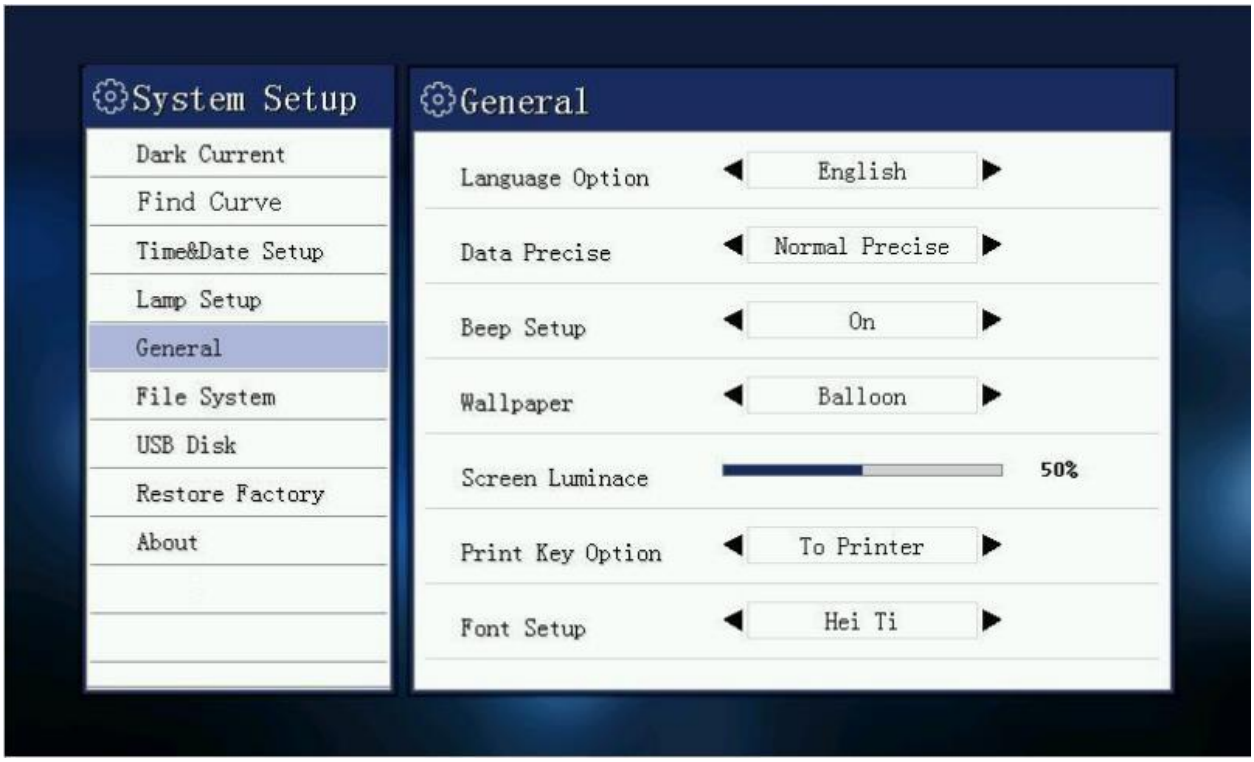


Figure-42

6) Slit setting (Only applicable for N6000SPLUS)

Select slit settings (the instrument defaults to stop at 2 nm bandwidth after finishing self-inspection), select the required slit bandwidth, and confirm it by pressing 【ENTER】

7) File System

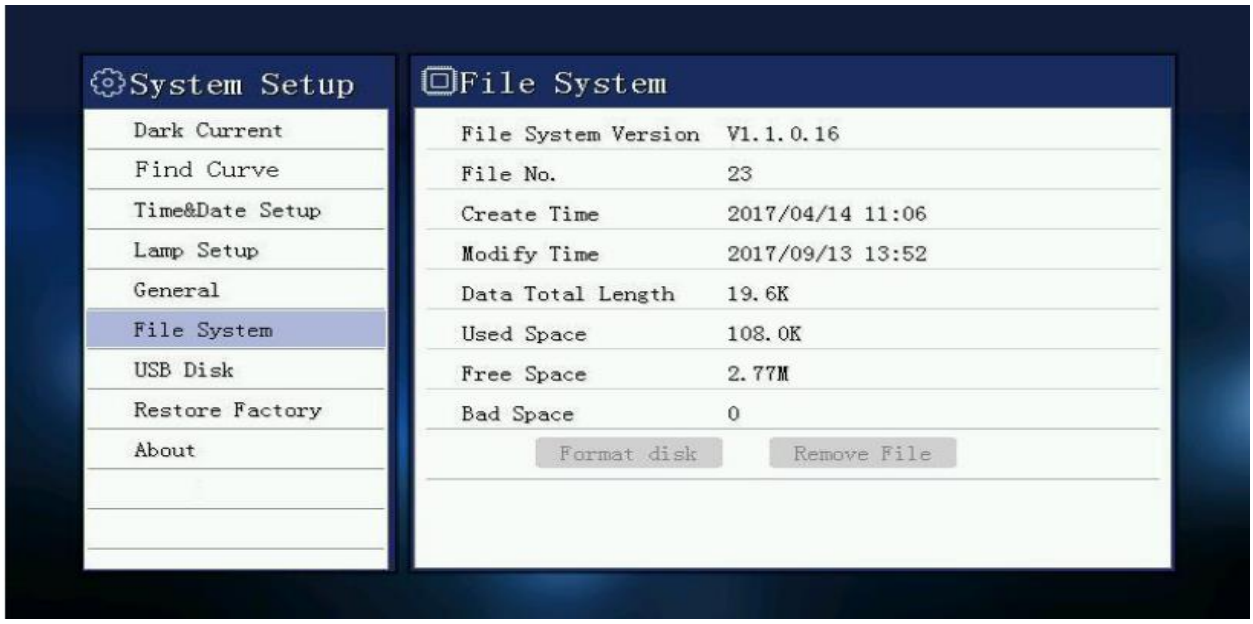


Figure-43

8) USB storage device

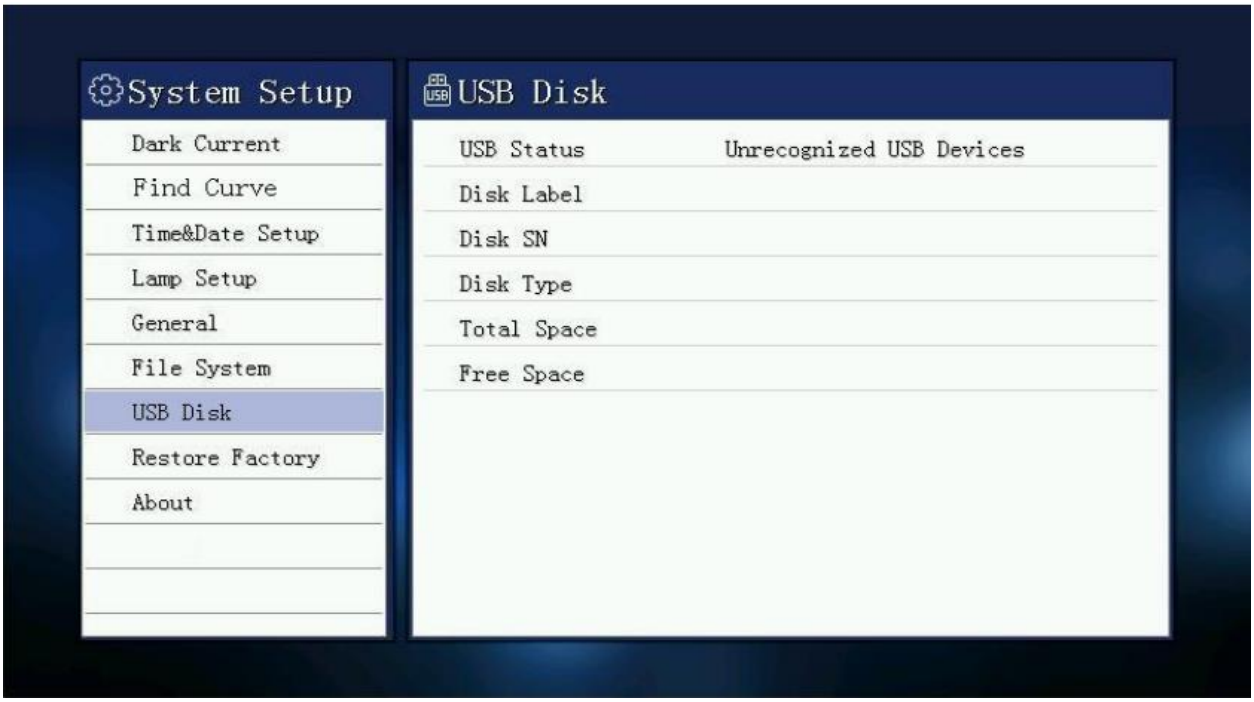


Figure-44

9) Restore factory settings

This operation will restore all system configuration information, this operation does not affect the system baseline and data files.



Figure-45

10) System information

Users can view software version and hardware version information.

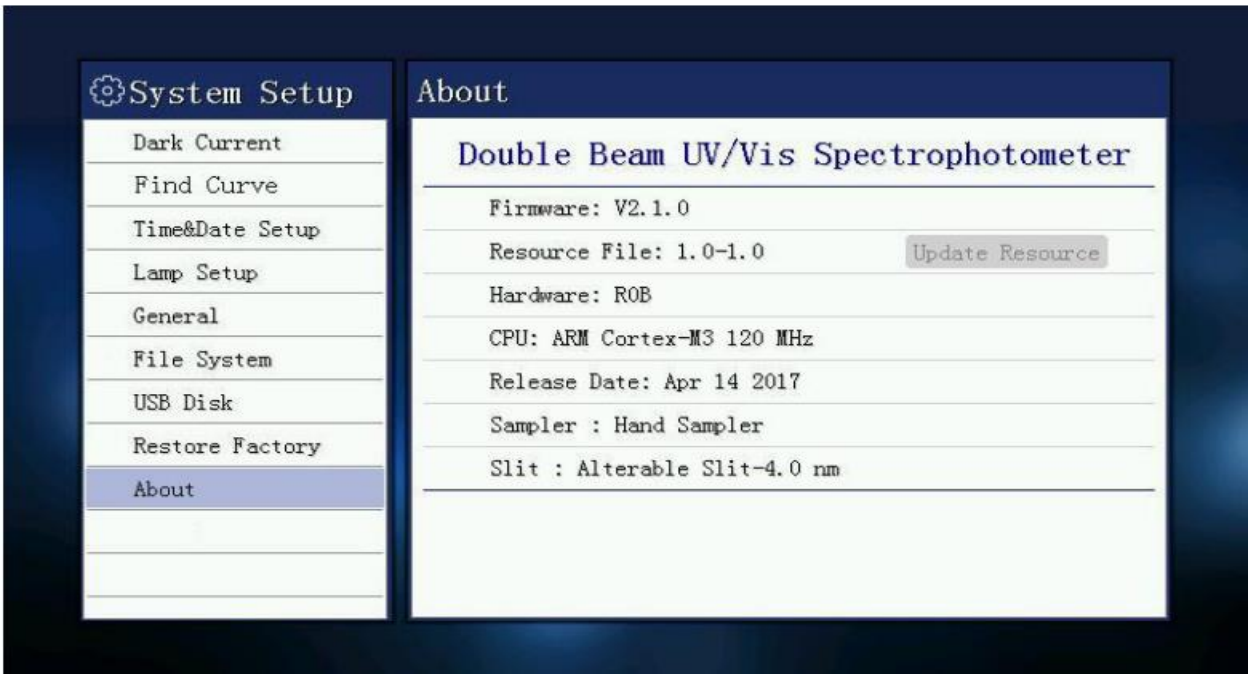
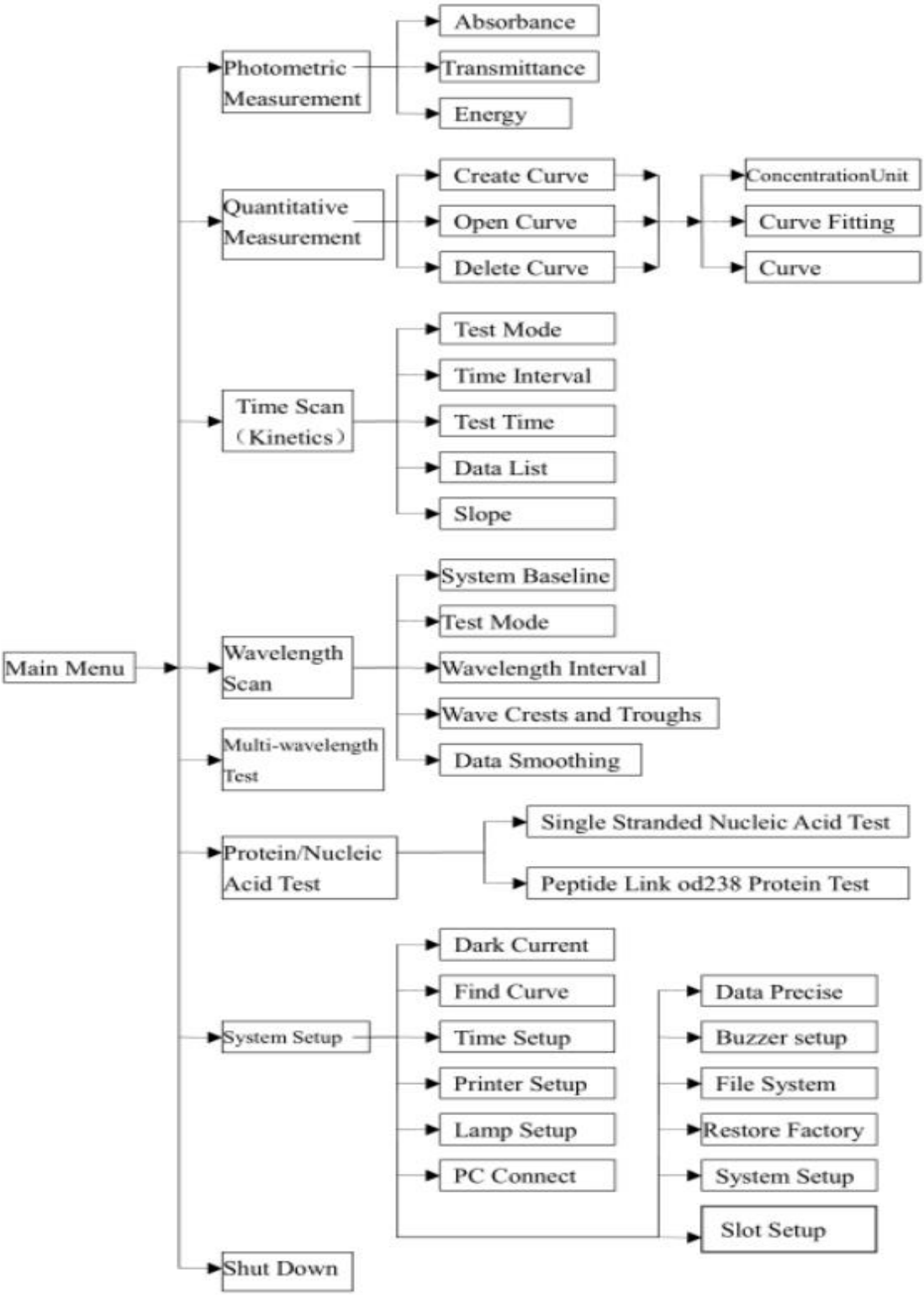


Figure-46


Main Menu
Photometric Measurement
Absorbance
Transmittance
Energy
Quantitative Measurement
Create Curve
Open Curve
Delete Curve
ConcentrationUnit
Curve Fitting
Curve
Time Scan (Kinetics)
Test Mode
Time Interval
Test Time
Data List
Slope
Wavelength Scan
System Baseline
Test Mode
Wavelength Interval
Wave Crests and Troughs
Data Smoothing
Multi-wavelength Test
Protein/Nucleic Acid Test
Single Stranded Nucleic Acid Test
Peptide Link od238 Protein Test
System Setup
Dark Current
Find Curve
Time Setup
Printer Setup
Lamp Setup
PC Connect
Data Precise
Buzzer setup
File System
Restore Factory
System Setup
Slot Setup
Shut Down

9. Maintenance

9.1 Routine Precautions

Any instrument is concerned, the correct use is the best safeguard for equipment maintenance, with emphasis on the use of the environment and mobile devices, in addition to the requirements previously proposed for use, we must also pay attention to the following issues:

1) Use the environment clean, the host instrument when not in use can be used to cover up the cloth cover to prevent dust accumulation, the thermostat should be placed in long-term storage and dry indoors better.
2) The sample is placed over the pool should pay attention to the color being careful not to let the solution spill into the sample chamber, to prevent corrosion, for some volatile samples, we recommend using the cuvette lid to prevent the impact of volatile gases to light, thus affecting the accuracy of the test equipment.
3) Any optical instrument road section screws and nuts are not going to lose, to prevent the optical path deviations affect the instrument's working properly.
4) The instrument must not mirror all the hard and soft hands or objects to touch, once leaving traces, will produce stray light reduce the effective energy punishment, and even cause damage to man-made instruments.
5) Instrument handling should be handled with care, and cannot be placed on the instrument shell weight, to avoid affecting the optical path shift stability and accuracy,
6) The instrument cannot work in bright light to ensure the accuracy of measurements,
7) Wavelength calibration is recommended once a week to improve the accuracy of the measured data.
8) The instrument cannot be left unused for a long time, so instead of reducing life, if not for some time, it is recommended to boot 1-2 times a week, each about half an hour.

9.2 Instrument Care and Maintenance

1) **Check the sample chamber lens:** Regular checks on both sides of the sample chamber are about bias in the quartz lens position, look at whether fingerprints and other stains, if stains serious impact on the accuracy of the measured value will be found after the stain, after a clean cloth moistened with alcohol to wipe in one direction can decontamination is recommended to check once a month.

2) **Wavelength accuracy check:** Buy a calibrated holmium oxide solution in the instrument wavelength scanning interface scanning range corresponding absorption spectra, measured by the detection of reconciliation between the peak value of the calibration standard, the error is between wavelength accuracy of the instrument error, it is recommended to check once a year.

3) **Wavelength Accuracy cursory examination:** After the completion of the self-test instrument interface into any of the tests, set the wavelength to 546nm, and then open the sample chamber, take a small piece of white paper on the left side of the lens at any of the sample chambers, watching the display in the white color of the light sheet of paper, if the wavelength of light green indicates substantially correct, and when the result of the test is larger away from their past experiences can be checked at any time.

10. Troubleshooting

When the instrument is faulty, it can be determined the initial failure is part of the nature of the general failure of the instrument's internal and external points, and occasional failures of the points, make sure that it requires effective and timely maintenance by trained personnel.

1) Power Failure

Failures	Causes	Solutions
Boot no reaction	No electrical outlet.	Check the external power supply.
	The power cord is not plugged in.	Re-seated host power.
	The socket switch inline fuse burned.	Replace the spare fuse embedded or purchase the same size fuse 3A.
	The instrument socket switch is broken.	
	Internal power supply board or transformer burned.	
Instrumentation display is not normal	Internal wiring is a loose display.	Opening the housing service personnel under the guidance of re-seated.
	The internal +5 V power supply is not normal or loose cable.	Opening the housing service personnel under the guidance of re-seated.
	Internal procedures by the unexpected collapse of the high-frequency voltage shock.	Service personnel under the guidance of the re-programming process.
	The motherboard is not working properly.	

2) Self-test Failure

Failures	Causes	Solutions
Filter positioning error	Loose electrical line filter.	Opening the housing service personnel under the guidance of re-seated.
	Optocoupler line filter loss.	Opening the housing service personnel under the guidance of re-seated.
	+12 V power supply board is not normal.	Opening the housing service personnel under the guidance of re-seated.
	The filter optocoupler is bad.	
	The motor driver chip on the motherboard is bad TD62083.	

Positioning error sources	Switching motor cable loose.	Opening the housing service personnel under the guidance of re-seated.
	Switch micro switch wire loose.	Opening the housing service personnel under the guidance of re-seated.
	Switching bad micro switch.	Opening the housing service personnel under the guidance of re-seated.
	+12 V power supply board is not normal or loose cable.	
	The motor driver chip on the motherboard is bad TD62083.	
Error signal detector	The motherboard connector cable loose signal board.	Opening the housing service personnel under the guidance of re-seated.
	The power board + / -15 power cable is loose or not properly.	Opening the housing service personnel under the guidance of re-seated.
	Bad signal board.	
	Bad motherboard.	

3) Other Failures

Failures	Causes	Solutions
Normal self-tungsten lamp wavelength region of low energy or unstable	Tungsten lights over 2000 hours or bad.	Refer to the tungsten lamp replacement.
	Using too long causes the internal optics to be moldy.	
Wavelength calibration test normal low-energy deuterium lamp or unstable areas	Experimental cuvette with a glass.	Use quartz cuvette.
	Both sides of the sample chamber are a too-dirty lens.	Lens cleaning paper moistened with alcohol to wipe dry.
	Deuterium lamp is lit for more than 2000 hours or bad.	Refer to the deuterium lamp replacement.
	Using too long causes the internal optics to be moldy.	

11. Accessories

Standard Accessories

Sr. No.	Name of the accessory	Quantity
1.	10 mm glass cuvette	4 units
2.	10 mm quartz cuvette	2 units
3.	Software	-

Optional Accessories

Sr. No.	Name of the accessory
1.	Single cell holder
2.	General cell holder
3.	Test tube holder
4.	Solid sample holder
5.	Deuterium lamp
6.	Halogen lamp
7.	4 place cell holder
8.	Printer
9.	Water- jacketed cell holder (4 cells capacity)
10.	Constant temperature system

12. Replacement

Light source replacement
Note: To make the instrument work, choose to replace the original parts.

1) Tungsten lamp replacement

- Turn off the instrument and unplug the power cord and disconnect the equipment on both sides of the four screws fastening the shell and gently remove the left vertical against the instrument.
  (**Note:** The connecting wire between the housing and the base plate, so after fastening the housing screws are not removed too much force is to pull the housing to prevent breakage)
- Remove the lamp compartment cover with three fixing screws and gently remove the lamp compartment cover.
  (**Note:** If the instrument has been open for some time the lamp compartment cover will be very hot, please be careful not to burn)
- Find the objects shown in the following figure, loose fastening sheet metal screws, pull out a tungsten lamp, and the new tungsten lamp according to the original position seated, and put on a solid metal piece tighten the screws (to ensure the tungsten light is positive)

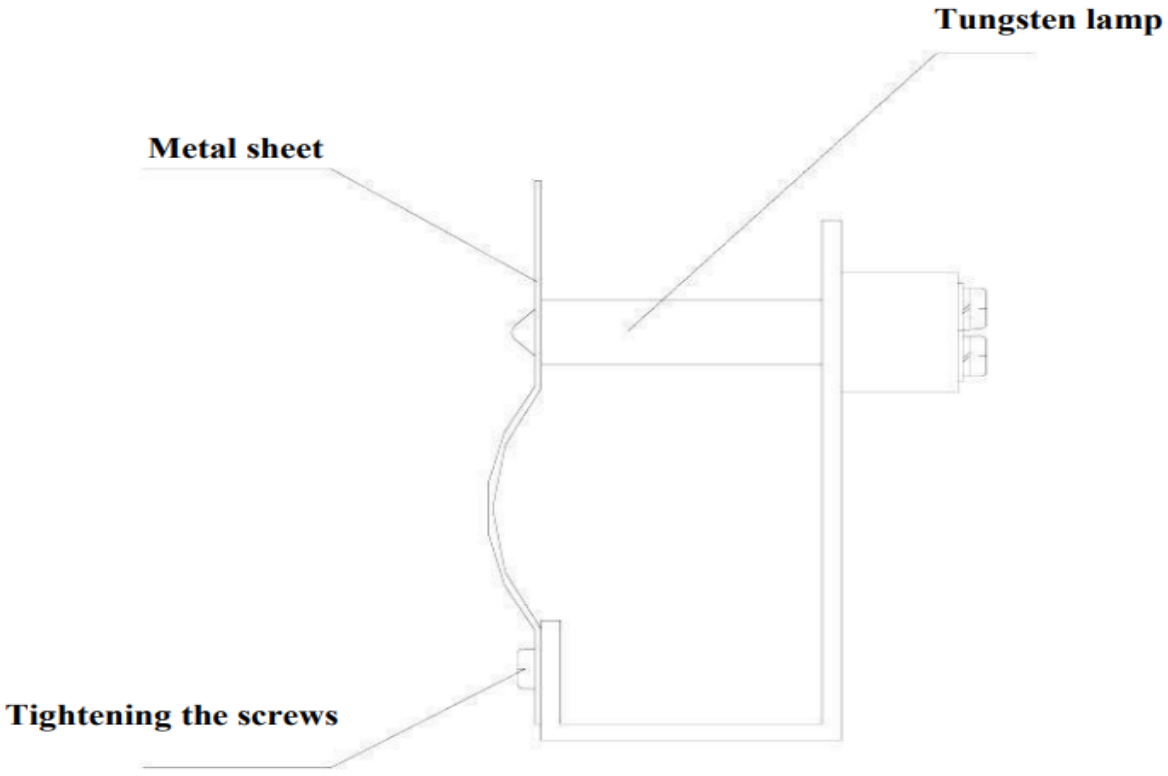


Figure-47

- Turn on the instrument, make a tungsten lamp light, and convert the light source switching mirror to a horizontal position manually.
- Loosen the screws seat switch motors, and seat motors to move the focus to switch into the slit in the smallest and tungsten lights centered.
- Replace the lamp compartment cover (be careful not to press the right side of the line) and the instrument housing (do not press the display line) and tighten the corresponding screws.
- Re-POST, after completion of the self-test mode in the wavelength photometric measurements, 340nm, 370nm, 1000nm, 1100nm let automatic zero.
- If it does not display, the low-energy lamp replacement is complete, if there is low energy, repeat the above steps.

2) Deuterium lamp replacement

- Turn off the instrument and unplug the power cord and disconnect the equipment on both sides of the four screws fastening the shell and the shell gently removing the left vertical against the instrument.
  (**Note:** The connecting wire between the housing and the base plate, so after the fastening of the housing screws are not removed too much force is to pull the housing to prevent the pull-beam break)
- Remove the lamp compartment cover with three fixing screws and gently remove the lamp compartment cover.
  (**Note**: If the instrument has been open for some time the lamp compartment cover will be very hot, please be careful not to burn)
- Find the objects shown in the figure, as shown in Figure unscrew the screws and disconnect the plug on the power supply board to remove the deuterium lamp socket, then put the new deuterium lamp installed in the original position.
  (**Note**: Deuterium lamp light mouth will toward the objective) and plug it into the power supply board.
- Turn on the instrument, make a deuterium lamp light, and convert the light source switching mirror to a vertical position manually.
- Loosen the screws fixed lens holder, fine-tune the focus lens holder into the slot on the smallest and deuterium light centered, and convert the light source switching mirror to a horizontal position manually.
- Loosen the screws seat switch motors, and seat motors to move the focus to switch into the slit in the smallest and tungsten lights centered.
- Replace the lamp compartment cover (be careful not to press the right side of the line) and the instrument housing (do not press the display line) and tighten the corresponding screws.
- Re-POST, after the completion of the self-test mode in the wavelength photometric measurements were walked at 200nm, 330nm, 340nm, 370nm, 1000nm, and 1100nm let automatic zero. If users no longer display low energy lamp replacement is completed, if there is low energy, repeat the above steps.

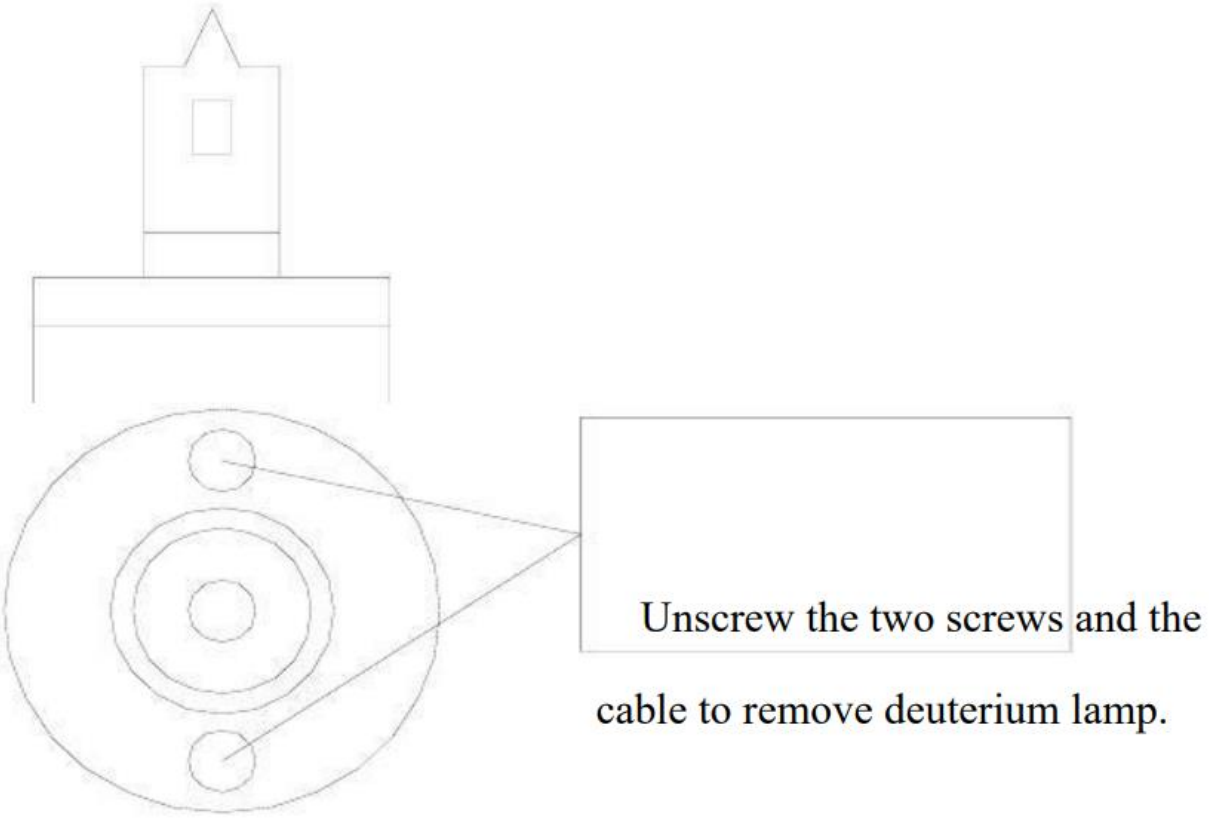

Unscrew the two screws and the
cable to remove deuterium lamp.

Figure-48