



# **Operating Manual**

**SCI-2101UV SCI-2102UV**

**SCI-3101UV SCI-3102UV SPECTROPHOTOMETERS**

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## Contents

1. General Information
  - 1.1 Safety notes
2. Product Overview
  - 2.1 Basic operating principle
  - 2.2 Performance Indicators Definitions
  - 2.3 Applications
  - 2.4 Using conditions
3. Product Features and Installation
  - 3.1 Features
  - 3.2 Technical data
  - 3.3 Main Functions
  - 3.4 Structure Introduction
    - 3.4.1 Top view of structure
    - 3.4.2. Bottom view of structure
    - 3.4.3. Light path diagram
    - 3.4.4. Important part of the instrument
  - 3.5 Instrument installation
4. Instrument Startup
5. Programs
  - 5.1 System Setup
  - 5.2 Photometry
  - 5.3 Wavelength Scan
  - 5.4 Quantitation
    - 5.4.1. Build Standard Curve
    - 5.4.2. Recall Standard Curve
  - 5.5 Multi Wavelength
  - 5.6 Kinetics (Time Scanning)
  - 5.7 Protein/DNA Test
6. Maintenance
  - 6.1 Cleaning Requirements
    - 6.1.1. Spectrophotometer
    - 6.1.2. Display
    - 6.1.3. Cuvettes/cells
  - 6.2 Routine precautions
  - 6.3 Tungsten lamp replacement
  - 6.4 Deuterium lamp replacement
7. Troubleshooting
  - 7.1 Power failure
  - 7.2 Self-test failure
  - 7.3 Other failures

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## 1. General Information

### 1.1. Safety notes

- Read the entire user manual carefully before you unpack, set up or operate the device. Wrong operations could lead to serious injury of the operator or to damage to the device.
- To make sure that the protection provided by this instrument is not impaired, do not use or install this instrument in any manner other than that specified in these operating instructions.
- The source lamps are operated at high temperatures. To avoid the risk of electrocution, make sure the instrument is disconnected from the power source before changing the lamps.

#### CAUTION

Health hazard caused by ozone.  
Hazardous levels of ozone can be generated when the UV lamp is not cooled.

#### WARNING

Health hazard caused by UV light.  
UV-Light can cause eye and skin damage. Protect eyes and skin from direct exposure to UV light.  
Do not look directly at an energized lamp without UV safety glasses.

#### CAUTION

Burn hazard, allow the lamp(s) to cool down for at least 30 minutes before they are serviced/replaced.

#### DANGEROUS

Potential danger with contact with chemical/biological substances.  
Working with chemical samples, standards and reagents can be dangerous.  
Make yourself familiar with the necessary safety procedures and the correct handling of the chemicals before use and read and follow all relevant safety data sheets.

Normal operation of this device may require the use of chemicals or samples that are biologically unsafe.

- Observe all cautionary information printed on the original solution containers and safety data sheets prior to their use.
- Dispose of all consumed solutions in accordance with the local and national regulations and laws.
- Select the type of protective equipment suitable to the concentration and quantity of the dangerous material being used .

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## 2. Product Overview

### 2.1. Basic operating principle

2.1.1 The nature of absorption: 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 was measured and the absorption of each wavelength, the absorption spectrum curve obtained.

Absorption spectrum selective absorption of light from the material, which is the material of macroscopic phenomena, and the nature of the molecular absorption is the result of internal movement and light interaction. When molecules absorb certain wavelengths of spectral energy or by some wavelengths of the spectrum is absorbed to form the absorption spectra. The smaller the energy absorption, the wavelength of light corresponding to the absorption peak at a longer wavelength. When the infrared absorbent is formed in the infrared absorption spectrum, if the energy absorption is larger, the shorter the wavelength corresponding to the absorption peak at a shorter wavelength, when generating the ultraviolet absorption spectra of absorption in the ultraviolet region.

2.1.2 Absorption Law - Lambert Beer law: when a parallel beam through the homogeneous solution, the absorbance of monochromatic light is proportional to the product of the solution concentration and thickness.

Its expression:  $A = \epsilon bc = \log I_0/I = -\log T$  Premise absorption laws established numeric expression:

- ① The incident light is monochromatic.
- ② The absorption process without interaction of each substance, the absorbance of each substance has additively.
- ③ The role of light and matter is limited to the absorption process, no fluorescent and photochemical scattering phenomena.
- ④ Absorbent system is a continuous uniform distribution.

2.1.3. Impact spectrophotometry reasons:

2.1.3.1. Non-absorption errors caused by radiation and matter

2.1.3.2. Fluorescence and photochemical reactions, in general, errors fluorescence spectrophotometry produced 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 direction into the detector, the measurement of absorbance is low, resulting in a negative deviation. Depends on the instrument to measure the impact on the absorption of fluorescence great extent on the optical absorption cell and detector design.

2.1.3.3. Reflection and scattering, absorption law applies only to homogeneous medium absorption

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system, turbid solution so that the measured increase in absorbance due to scattering, resulting in deviation from Beer's law.

2.1.3.4. Non-ideal instrument error caused

2.1.3.5. Beer's law deviation polychromatic contrast, the majority of the photometer can only get close to monochromatic light with a narrow lumen, in fact, there is still a polychromatic nature, can lead to deviations from Beer's law. Deviation depends on the two monochromatic molar absorptivity difference  $\Delta \epsilon$ ,  $|\Delta \epsilon|$  is very small, can be approximated that monochromatic, at low concentrations, curve remains linear, but larger concentrations, with concentration increases, AC curve bend more serious, there is Beer's law applies only to dilute solutions.

2.1.3.6. Stray light, stray light entering the detector means is unnecessary components to 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 error. The instrument is the smallest wavelength of energy, usually at a maximum stray light (such as deuterium lamp 220nm, tungsten lamp 340nm)

2.1.3.7. Slit width, the slit width of the spectrum affects not only the purity, but also affect the absorbance. When quantitative analysis in order to obtain sufficient measuring signal, the slit should be larger, in the qualitative analysis of the use of a smaller slit when the entrance slit and the exit slit width equal to the width of the slit caused minimum error.

2.1.3.8. Wavelength scale ruler of error, the wavelength of the gauge that 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 peak of the more significant)

2.1.3.9. Impact of non-parallel incident, one of the prerequisites ear than the law 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 when the incident beam, obviously lead 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%

2.1.3.10. Photometric scale error, photometric accuracy of the scale that is transmittance, which directly affects the accuracy of the magnitude of the error photometric measurements.

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## 2.2. Performance Indicators Definitions

- 2.2.1. Optical system: usually refers to the formal structure of the optical system, at present, domestic and international institutions often used as a photometer industry type and CT auto collimation two structures;
- 2.2.2. Wavelength range: means for wavelength photometer can difference between maximum and minimum values of the test.
- 2.2.3. Wavelength accuracy means the actual wavelength difference between the real wavelength and the setting wavelength. Each wavelength photometer to be in a lot of points to check wavelength accuracy; spectrophotometer wavelength accuracy is an important technical indicator, it qualitative, quantitative and structural analysis of the impact is enormous. Way to check wavelength accuracy of many spectral lines as a standard filter praseodymium, neodymium, holmium oxide filter, holmium oxide wavelength standard solution, deuterium lamp or low pressure mercury lamp emission and interference filters and so on .
- 2.2.4. Wavelength repeatability: Wavelength Repeatability is the ability of the instrument to return the original wavelength. It reflects the wavelength drive mechanism and the stability of the whole instrument;
- 2.2.5. Spectral bandwidth (sensitivity, resolution): refers to a peak spectral band when the slit on the detector detected through a monochromator energy half-width, expressed in nm wavelength, from another perspective to understand this concept will more user-friendly: first, the monochromator exit slit represents not just the physical size or geometry, it also represents the optical sense, this is the spectral bandwidth, we know that the light from the failure of a single monochromator wavelength, but at a narrow wavelength spectral band are arranged in the order, the number of spectral wavelength band comprises, represented by the spectral bandwidth. Spectral bandwidth is a direct response to the quality level of monochromatic light from the monochromator out. The index with the instrument resolution and sensitivity are similar, but different, they react photometer performance quality from different sides. Resolution refers to the size of the instrument to distinguish two adjacent wavelength's ability Sensitivity is measured at low concentrations do, when the concentration changes by one unit to the detector signal caused by the change amount, it is subject to a calibration curve (standard curve as the horizontal axis, the absorbance on the vertical axis) and a precision instrument itself restrictions. Two measurement precision of the method is the same, the greater the sensitivity calibration curve slope, while the slope equal, the higher the sensitivity, the better precision. It is noted that, in order to obtain accurate test results, the natural bandwidth of the spectral bandwidth of the instrument (Spectral Bandwidth referred SBW) and the analysis of samples (Natural Bandwidth referred NBW) ratio should be less than 0.1, more than 99.5% can be obtained so that the measurement accuracy.

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- 2.2.6. Stray light: wavelength of stray light is irradiated onto the non-selection signal generated by the detector. It is an important source of photometric analysis of errors, stray light limits the accuracy of the General Assembly high concentration solution analysis. Stray light represented by T%
- 2.2.7. photometric range: Refers to meet the photometric test range in various technical indicators, represented by A or T.
- 2.2.8. Photometric accuracy: the true average value refers to the degree of compliance with a plurality of measured; photometric accuracy check is usually through the use of repeated measurements of the neutral density filter carefully film to a standard photometric detection. A neutral density filter for light in a wavelength range having almost the same transmittance (or absorbance) of the filter, and the use of its wavelength insensitive characteristic bandwidth changes, to check the accuracy of the optical instrument and repeatability.
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- 2.2.10. Photometric Repeatability: refers several times under the same conditions as measured in parallel, each parallel line with the degree of determination between the results;
- 2.2.11. Noise: the sum of the instrument detects the unwanted signals, which is the purpose of the relative signal. Generally, the spectrophotometer has two sources of noise, one from the light source, the second is derived from the internal electronic noise inherent in the instrument, such as: power supply, amplifier, AD conversion and the like. To reduce noise, improve signal to noise ratio, there must be a good electrical design. Noise measurement repeatability test under low concentrations, but also affect test accuracy. Noise by averaging several measurements after partial elimination;
- 2.2.12. Drift: refers to the degree of deviation from the instrument over time the starting value. It depends on the stability, light stability of the electrical device and the like. Single-beam instrument, the warm-up time has a great influence on the length of the drift.
- 2.2.13. Baseline flatness: refers to the distribution of the full wavelength range of the instrument.



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## 2.3 Applications

Subjects available for physics, chemistry, medicine, biology, pharmacology, geology and other scientific research, is widely used in chemical, pharmaceutical, biological and chemical, metallurgy, light industry, materials, environmental protection, medicine and other industries and laboratory analysis of the industry's most one important quality control instruments, is essential for routine laboratory instruments.

## 2.4 Using conditions

Equipment should be installed away from the hot or humid environment. The instrument should be used in 16-35 °C , 45-80% humidity conditions. Please try to stay away from issuing magnetic, electric, high-frequency waves of electrical devices, do not install the instrument in the air chlorine, hydrochloric acid gas, hydrogen sulfide gas, such as sulfurous acid gas, corrosive gas Excessive places. Place the instrument table should be smooth, without vibrations; nearby fan of the instrument should be left enough space to exhaust smoothly. Instrument is best to use a single power outlet, power should ensure good grounding. Doing so may result in equipment not working properly. If the local voltage instability, give the instrument is equipped with power supply. The instrument should avoid direct sunlight. Avoid dusty environments.

## 3. Product Features and Installation

### 3.1 Features

With low stray light and a high resolution structure of double-beam optical monochromator the instrument has a good stability, reproducibility and accuracy of readings.

Not only the instrument has automatically set 0% T and 100% T and other control functions as well as the concentration of computing and data processing functions of a variety of methods, but also to prevent user errors with special features, no worries when using Scientific design, the use of new technologies, the optical, mechanical, electrical and computer technology combined with organic, both to improve product performance and convenience for users to use.

Large screen graphic LCD display can display the data and maps. The extensive machine software can complete quantitative analysis, qualitative analysis, kinetics, DNA/Protein and other tests. Coupled with powerful storage and printing capabilities, the computer can complete all testing, analysis and data output with no connection with PC.

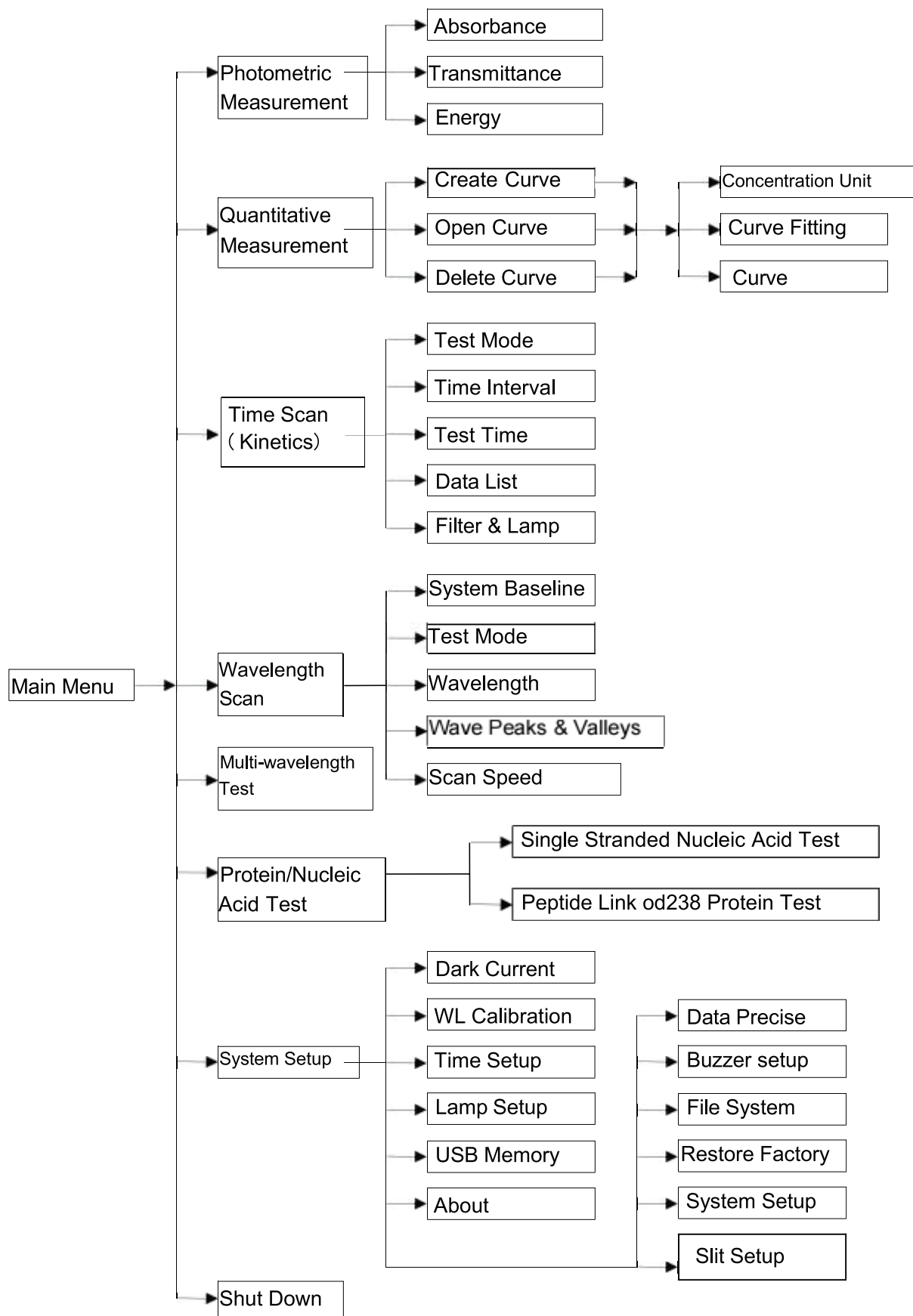
Optional equipment is also available on the Windows platform running UV Professional user application software, the instrument has greater functionality .



### 3.2. Technical data

Mode	SCI-2101UV	SCI-2102UV	SCI-3101UV	SCI-3102UV
Optical System	Single Beam	Single Beam	Double Beam	Double Beam
Wavelength Range	190-1100 nm	190-1100 nm	190-1100 nm	190-1100 nm
Spectral Bandwidth	1 nm	2 nm	1 nm	2 nm
Wavelength Accuracy	+0.1 nm (at Depeak 656.1 nm)±0.3 nm (whole range)	+0.1 nm (at Depeak 656.1 nm)±0.3 nm (whole range)	+0.1 nm (at Depeak 656.1 nm)±0.3 nm (whole range)	+0.1 nm (at Depeak 656.1 nm)±0.3 nm (whole range)
Scan speed	approx.3000 nm/min (max.)	approx.3000 nm/min (max.)	approx.3000 nm/min (max.)	approx.3000 nm/min (max.)
Wavelength reproducibility	±0.1 nm	±0.1 nm	±0.1 nm	±0.1 nm
Photometric Accuracy	±0.0015A(0~0.5A)±0.002A(0.5A~1A)	±0.002A(0~0.5A)±0.003A(0.5A~1A)	±0.0015A(0~0.5A)±0.002A(0.5A~1A)	±0.002A(0~0.5A)±0.003A(0.5A~1A)
Photometric Reproducibility	±0.001A(0~0.5A)±0.0015A(0.5A~1A)	±0.001A(0~0.5A)±0.0015A(0.5A~1A)	±0.001A(0~0.5A)±0.0015A(0.5A~1A)	±0.001A(0~0.5A)±0.0015A(0.5A~1A)
Transmittance Range	0-200%T	0-200%T	0-200%T	0-200%T
Absorbance Range	-3 to 3Abs	-3 to 3Abs	-3 to 3Abs	-3 to 3Abs
Stray Light	≤0.03%T / ( 220 360nm)	≤0.05%T / ( 220 360nm)	≤0.02%T / ( 220 360nm)	≤0.03%T / ( 220 360nm)
Baseline Stability	≤0.0001Abs/h at 500 nm	≤0.0001Abs/h at 500 nm	≤0.0001Abs/h at 500 nm	≤0.0001Abs/h at 500 nm
Baseline Flatness	+0.0006Abs	+0.0006Abs	+0.0006Abs	+0.0006Abs
Noise (at 500 nm)	≤0.0001A (Peak to Peak)≤0.00005A(RMS)	≤0.0001A (Peak to Peak)≤0.00005A(RMS)	≤0.0001A (Peak to Peak)≤0.00005A(RMS)	≤0.0001A (Peak to Peak)≤0.00005A(RMS)
Work mode	%T, Abs, ConG., E	%T, Abs, ConG., E	%T, Abs, ConG., E	%T, Abs, ConG., E
Scanning speed	Fast, Mid. Slow	Fast, Mid. Slow	Fast, Mid. Slow	Fast, Mid. Slow
Wavelength setting	Auto	Auto	Auto	Auto
Display	10.1" TFT Colored Capacitive Touch Screen	10.1" TFT Colored Capacitive Touch Screen	10.1" TFT Colored Capacitive Touch Screen	10.1" TFT Colored Capacitive Touch Screen
Light Source	Deuterium & Tungsten lamp	Deuterium & Tungsten lamp	Deuterium & Tungsten lamp	Deuterium & Tungsten lamp
Detector	Silicon Photodiodes	Silicon Photodiodes	Silicon Photodiodes	Silicon Photodiodes
PC connected and data output	USB port'RS232	USB port'RS232	USB port'RS232	USB port'RS232
Power	AC 110-230V/50-60	AC 110-230V/50-60	AC 110-230V/50-60	AC 110-230V/50-60
Dimension	570 x 440 x 210mm	570 x 440 x 210mm	570 x 440 x 210mm	570 x 440 x 210mm
Shipping Size	770 x 630 x 340 mm	770 x 630 x 340 mm	770 x 630 x 340 mm	770 x 630 x 340 mm
Gross Weight	28kg	28 kg	28kg	28 kg

### 3.3 Main Functions

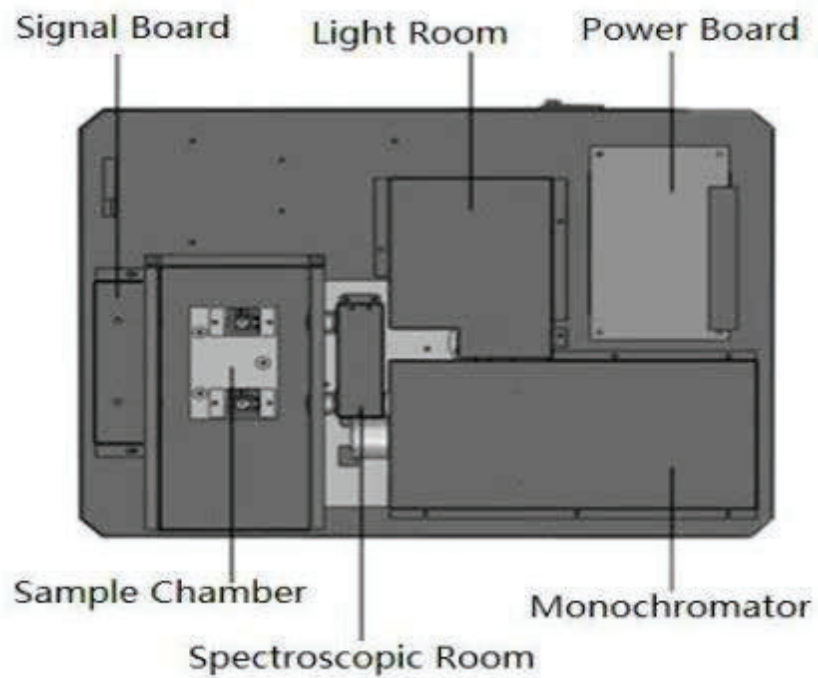


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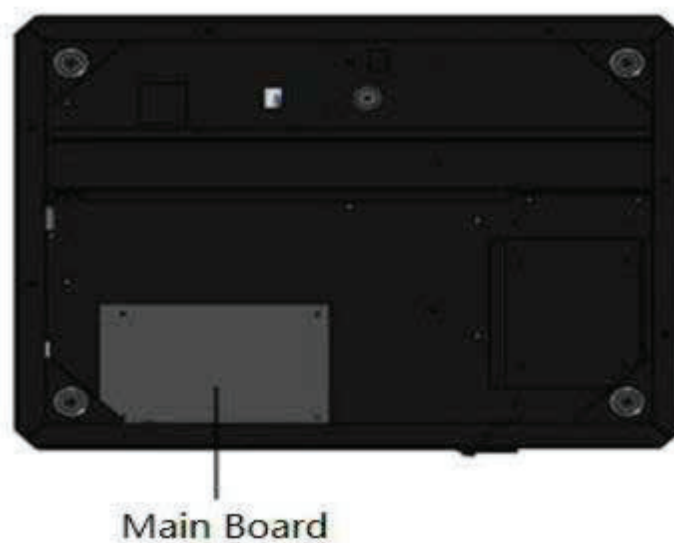
### 3.4 Structure Introduction

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

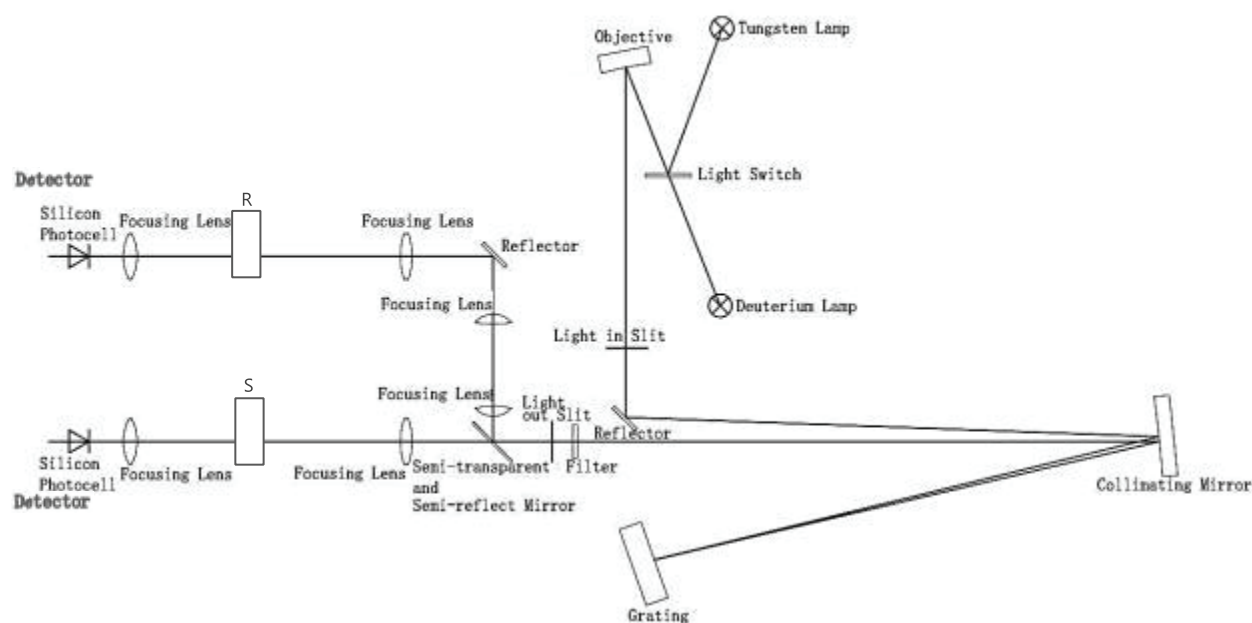
#### 3.4.1 Top view of structure:



#### 3.4.2. Bottom view of structure:



### 3.4.3. Light path diagram for double beam system



### 3.4.4. Important part of the instrument

3.4.4.1 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.

3.4.4.2 Light room: there are tungsten halogen lamp and deuterium lamp source device to automatically switch.

Tungsten halogen: visible spectral region. Applicable wavelength range 340-1100nm. Because it uses the principle of halogen cycle, it has a greater intensity of light emission and longer life. As the halogen cycle requires a higher temperature. Thus, lamps commonly used quartz glass or high temperature glass. Tungsten halogen lamps emit energy in the visible region around the operating voltage is 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.

Deuterium lamp: suitable wavelength range of 190-340nm. When deuterium lamp operation, maximum energy sources in the vicinity of 230nm, 486.0nm and 656.1nm and has two characteristic lines, can be used for instrument calibration wavelength accuracy in the visible region. Stability of the steady flow of less than 0.02% of the models, to ensure stable deuterium lamps, imported from Japan, Hitachi another seat belt deuterium lamp replacement lamps to ensure the convenience and use of the stability and long life.

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3.4.4.3. Monochromator: It contains spectral components - grating, entrance slit, exit slit, mirror, focusing lens, and the wavelength filter drive system, the monochromatic light is emitted from the composite light can be decomposed into monochromatic any wavelength of monochromatic light from the optical separation means

Raster: the dispersion of the original, the model uses 1200 lines / mm holographic grating ensure high resolution and low stray light.

Filter: Due to the grating spectrum spectral overlap exists between the problem class times, so the use of filters to eliminate 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). The slit is too large, color band is deteriorated, is not conducive to the qualitative analysis, quantitative analysis also affects the linear range of the calibration curve, the slit is too small, flux decreased, reducing the signal to noise ratio, affect the measurement accuracy, the 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), the other to represent the bandwidth of spectral bands (in nm).

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

3.4.4.5 Sample Chamber: fixed 2-position cuvette holder, one is for reference solution, and the other is for sample solution. 8-position cell changer is optional.

3.4.4.6 Signal Board: Transfer to the motherboard processed signal detection light amplification.

3.4.4.7. Main board: instrument micro control unit, control instruments light source switch, the motor rotates, the signal processor display, etc.

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### 3.5. Instrument installation

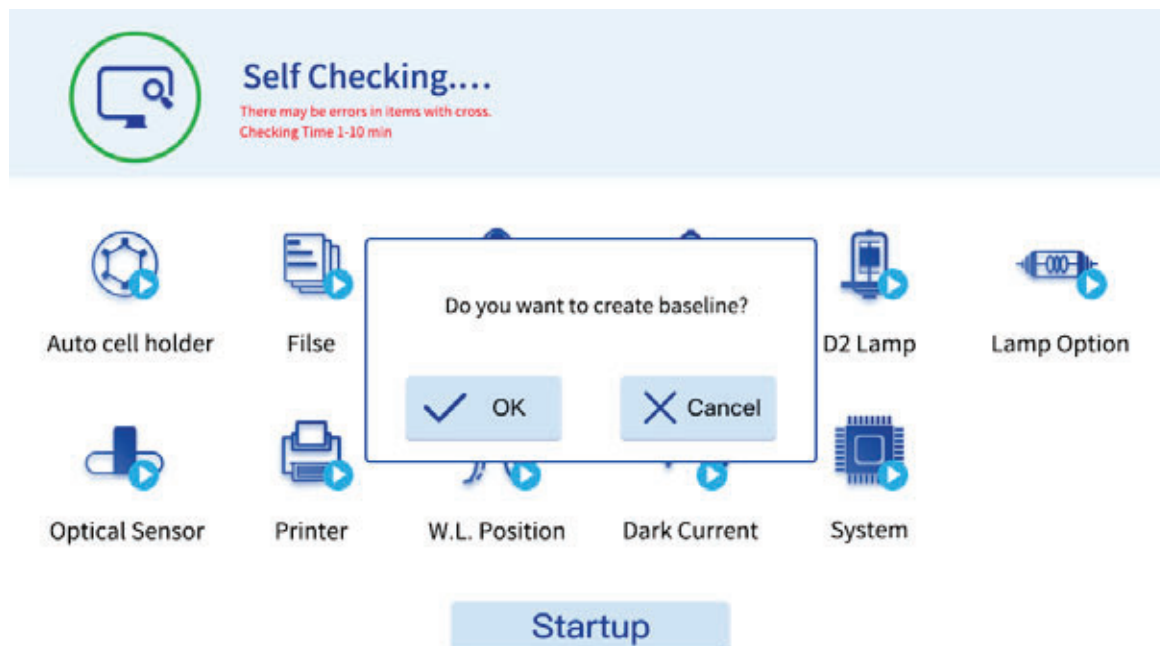
- 3.5.1. After unpacking, carefully check the packing list inside if the object is complete and intact;
- 3.5.2. Determine whether the work environment to meet the foregoing requirements, the ambient temperature 10 – 35 °C, relative humidity less than 85%, operating voltage 220V/50HZ.
- 3.5.3. The instrument is placed on a horizontal platform, the instrument should avoid direct sunlight and be away from electromagnetic launchers and high-power electrical devices, the use of the environment cannot have dust, corrosive gases and vibration.
- 3.5.4. Around the instrument no obstacle to the flow of air around the instrument;
- 3.5.5. The company supplied with a power cord and make sure there are well-grounded power outlet line;
- 3. 5.6. Check the sample chamber, ensure that there is not any solution, and foreign matter and the process of self-test to ensure that the sample compartment lid is closed, you cannot half-open (this is very important otherwise affect the instrument self-test results and normal use!).
- 3.5.7. Turn on the instrument. Then the instrument makes self-test. After that, the instrument can be operated normally. In case there is an error alarm halfway, please refer to the chapter of instrument troubleshooting.

**Note:** Use only a grounded socket for the connection of this device to the power supply. If you are not sure if the sockets are grounded, have this checked by a qualified electrician. The power plug serves in addition to the power supply to isolate the device quickly from the power source where necessary. During the disconnection from the power source, it must be made sure that the correct power plug is pulled (for example by labeling the sockets). This is recommended for long-term storage and can prevent potential dangers in the event of a fault. Therefore, make sure that the socket to which the device is connected is easy to reach by each user at all times.

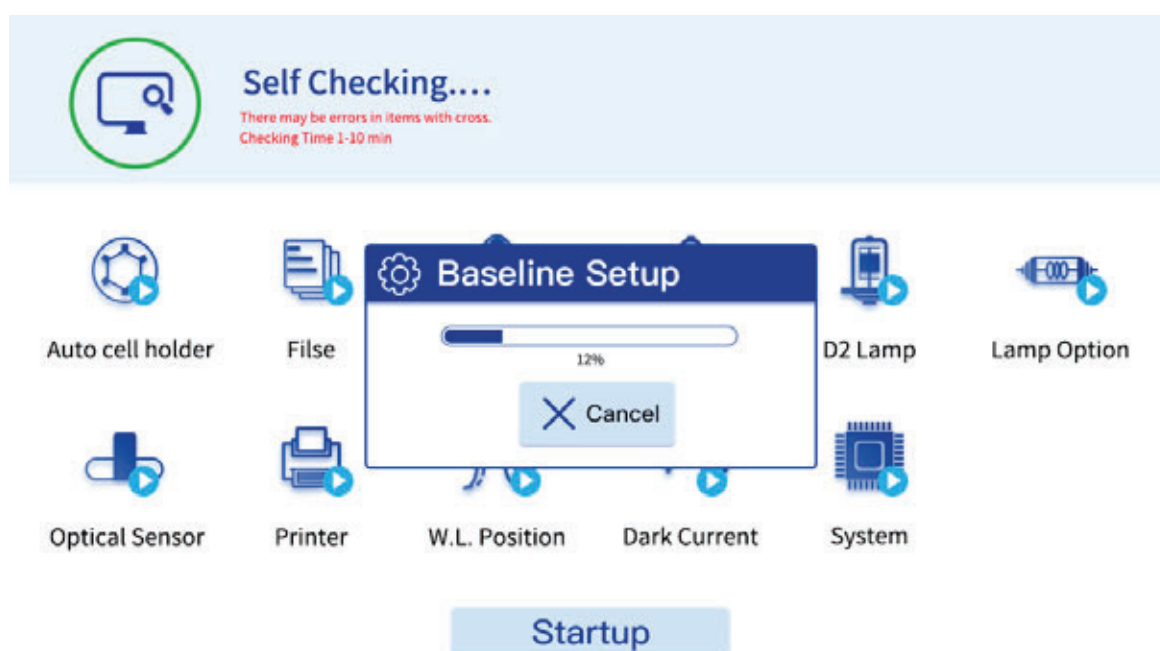
## 4. Instrument Startup

Connect the power cable to a power socket, then switch on the instrument via the power switch on the back, self-checking will start and remind you whether to create the system baseline or not.

**Note:** Wait approximately 20 seconds before switching on again so as not to damage the electronics and mechanics of the instrument.

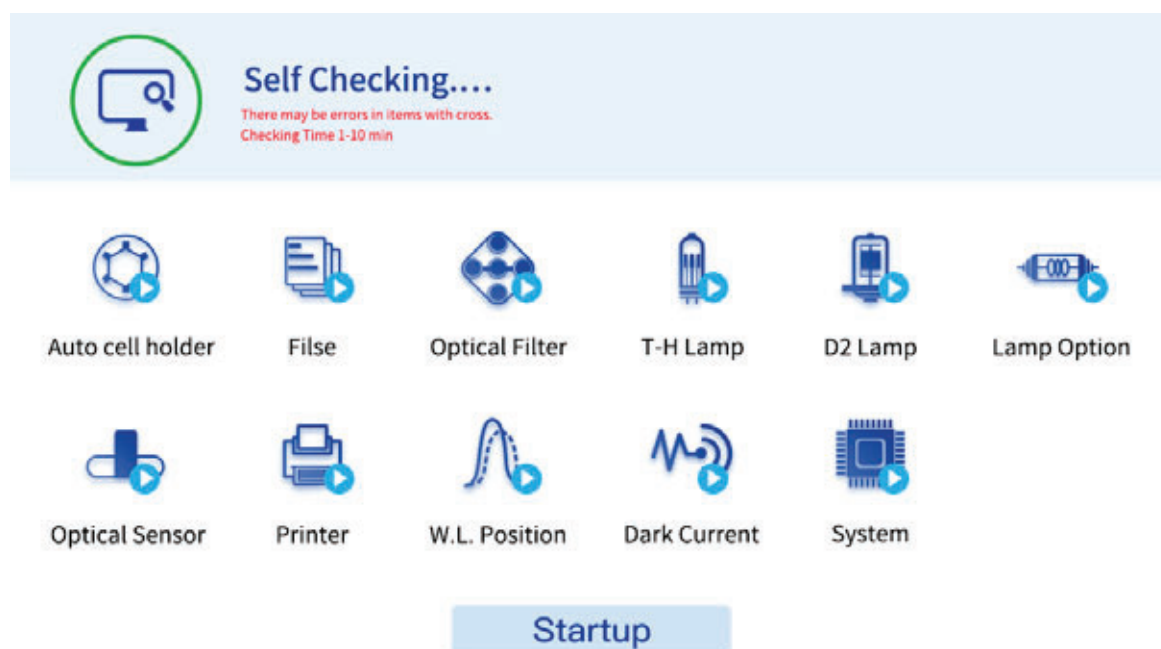


If you need, please press “OK” button, and start the following process. You can stop it by pressing “Cancel” button.





After you create the system baseline or cancel it, the machine will start preheat automatically and last twenty minutes. We suggest you finishing preheat process, otherwise it may influence the instrument's accuracy and stability.



**【Files】** : to check instrument's built-in Flash file system if they are damaged or not. If there is an error, please format file system.

**【Optical Filter】** : to check the instrument's filter motor and its locator is working correctly or not.

**【T-H Lamp】** : Tungsten Halogen Lamp. Open the instrument tungsten light source, check the operating parameters of tungsten lights are working properly. If the parameter is not working properly, then re-set the operating parameters of a tungsten lamp.

**【D2 Lamp】** : Deuterium Lamp. Open deuterium light source instrument operating parameters to check the deuterium lamp is working correctly. If the parameter is not working properly, then re-set the operating parameters of the deuterium lamp.

**【Lamp Option】** : Check the instrument light switch motor and its locator is working correctly or not.

**【Optical Sensor】** : Check if signal detector is working correctly.

**【Printer】** : Check the printer interface device is working properly.

**【WL Position】** : Check if the wavelength calibration function is working normally or not .

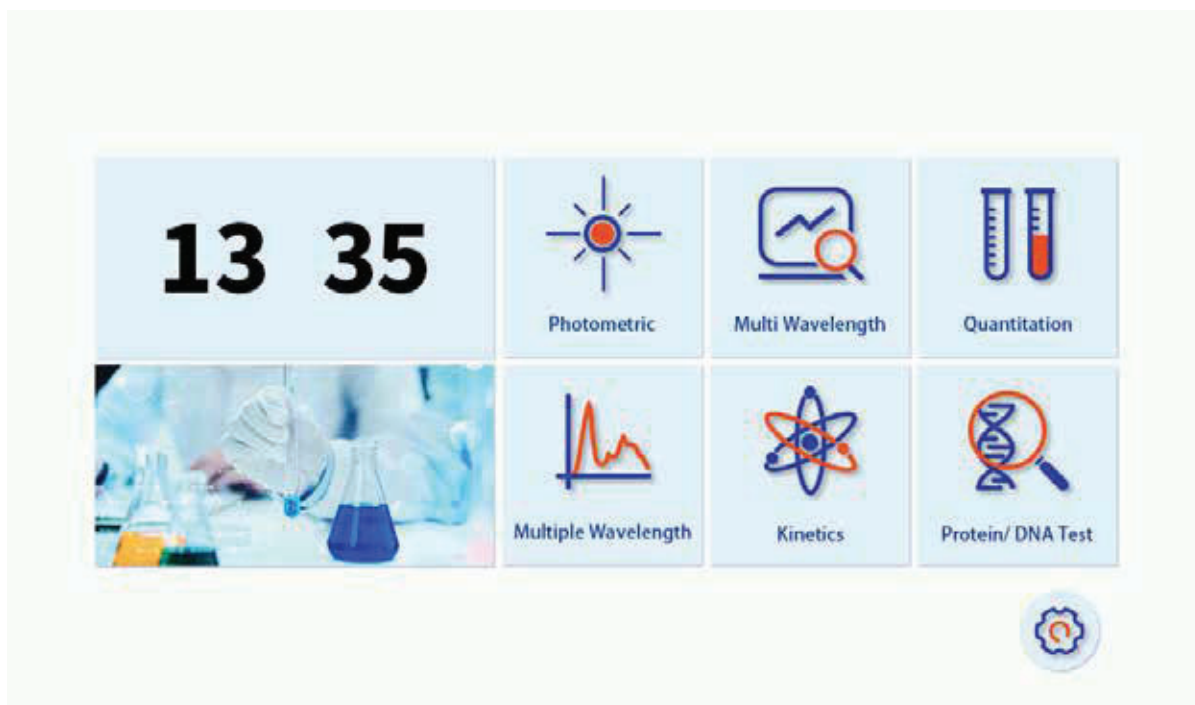
**【Dark Current】** : Read instrument dark current of energy, checking eligibility. If the dark current is in the proper range, which means that the dark current is correct, then displays. the results of  $\sqrt{\quad}$  . If the dark current exceeds the maximum setting, the user is prompted dark current error. The results are displayed as  $\times$  .

**【System】** : Check if instrument system parameters are correct or not.

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**Note:** We always suggest using the printers provided by us, otherwise we cannot guarantee the printer will be connected to our instrument correctly.

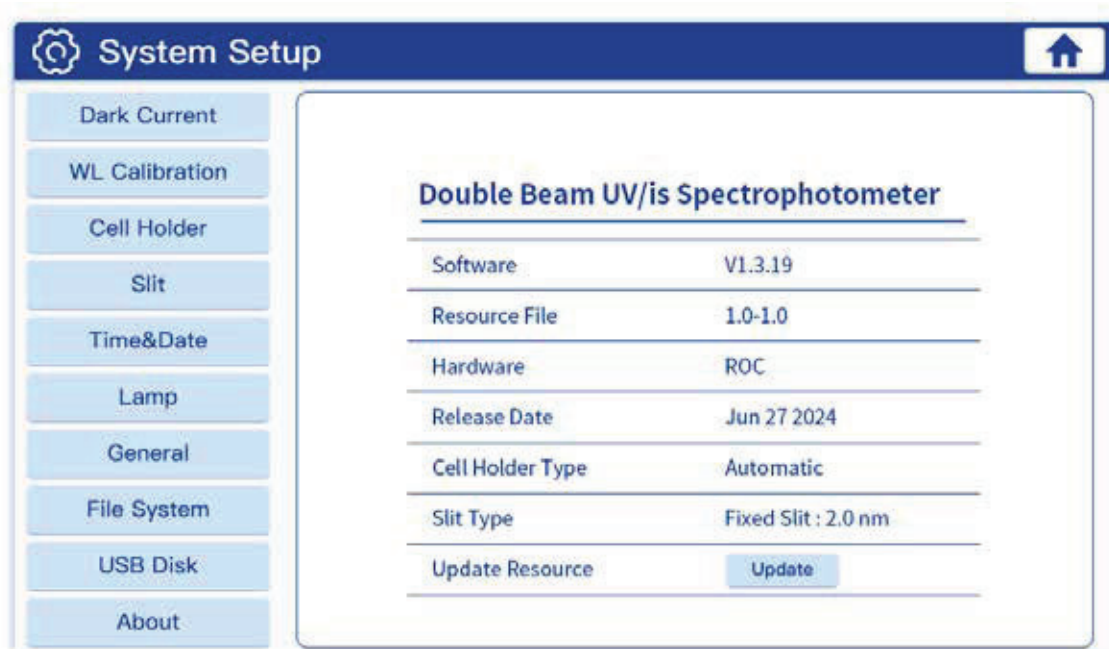
If you want to skip this step, then press 'Startup' to enter the main interface. After the preheat process, it will also enter main menu automatically .



## 5. Programs

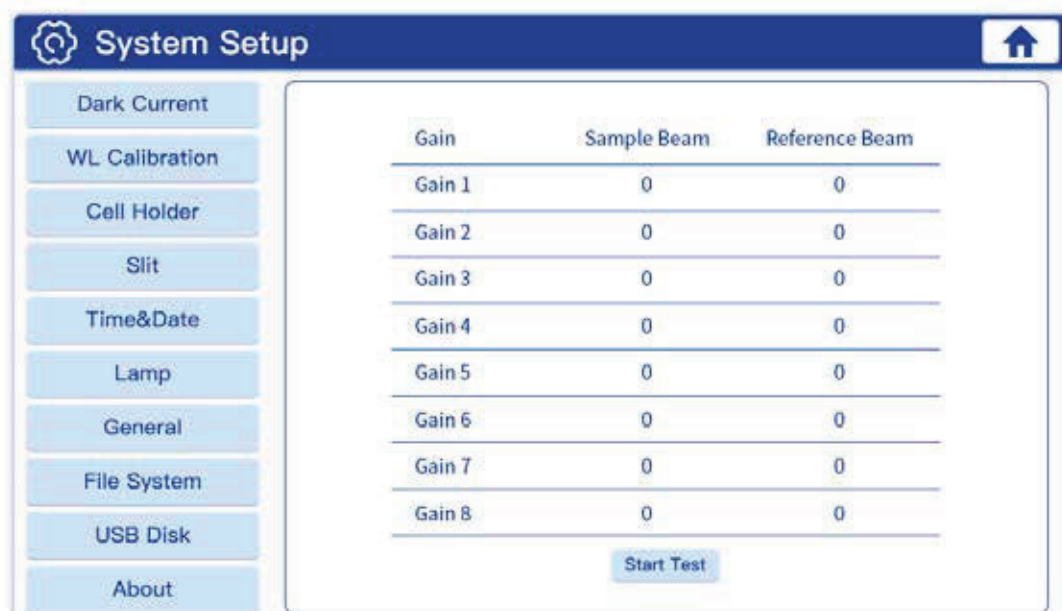
### 5.1. System Setup

Press the above icon to enter system setup to check and set up system parameters. The default interface is as follow.



**1.1 About:** It shows the basic information about this instrument, like software version, resource file version, hardware, program release date and cell holder, etc. Usually, you don't need to update the resource file unless subject to our notice.

**1.2 Dark Current:** Long time operation probably led to drift of dark current, this function is to make correction for full range of dark current. Please make sure to cover the sample chamber lid when test dark current.



### 1.3 WL Calibration: You can choose how to calibrate wavelength.

Automatic: The instrument will check if the current wavelength is correct automatically, if not correct, WL calibration will start automatically. If the current wavelength is valid, it will reminder operators to calibrate the wavelength or not.

The screenshot shows the 'System Setup' window with a sidebar menu on the left containing: Dark Current, WL Calibration (selected), Cell Holder, Slit, Time&Date, Lamp, General, File System, USB Disk, and About. The main content area displays the 'WL Calibration' settings in a table-like format:

Calib. Mode	<input checked="" type="checkbox"/> Automatic <input type="checkbox"/> Always
Validation	<input checked="" type="checkbox"/> Wavelength Accuracy D2 <input checked="" type="checkbox"/> Wavelength Repeatability D2
Wavelength	546.0 nm

Below the table is a 'Calibrate' button.

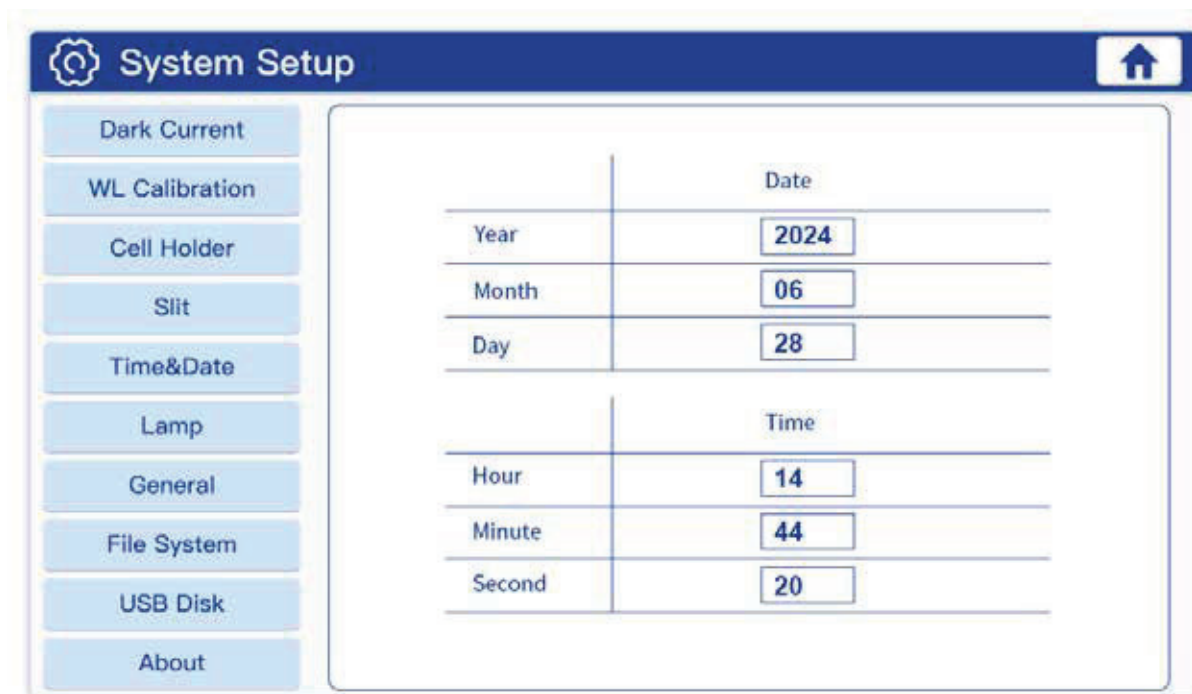
### 1.4 Slit Management: This function is only working for the models with adjustable slits.

The screenshot shows the 'System Setup' window with the same sidebar menu as above. The main content area displays the 'Slit Setup' settings:

Slit Setup

Fixed Slit

**1.5 Time and Date:** You can set up the date and time.



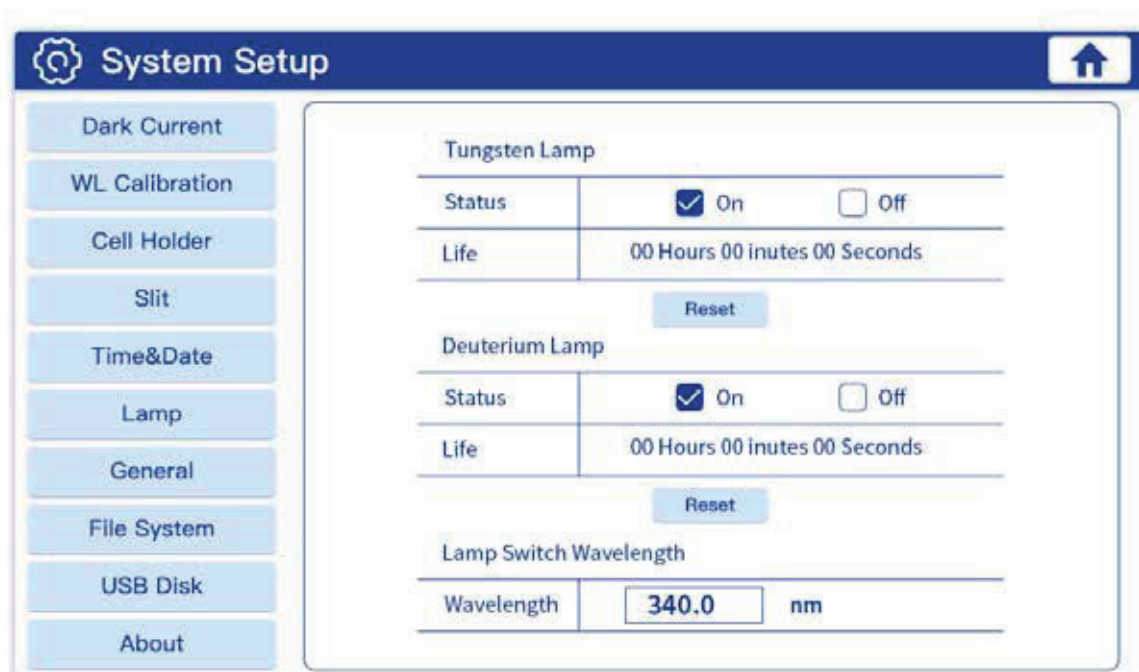
The screenshot shows the 'System Setup' window with a sidebar on the left containing menu items: Dark Current, WL Calibration, Cell Holder, Slit, Time&Date (highlighted), Lamp, General, File System, USB Disk, and About. The main content area is titled 'Time' and 'Date'. The 'Date' section has three input fields: Year (2024), Month (06), and Day (28). The 'Time' section has three input fields: Hour (14), Minute (44), and Second (20).

Date	
Year	2024
Month	06
Day	28

Time	
Hour	14
Minute	44
Second	20

**1.6 Lamp Setup:** You can check and change the status and working time for tungsten and deuterium lamps. You can highlight on or off to choose its status.



The screenshot shows the 'System Setup' window with the same sidebar as the previous image. The main content area is titled 'Lamp' and contains settings for 'Tungsten Lamp' and 'Deuterium Lamp'. Each lamp has a 'Status' field with 'On' (checked) and 'Off' (unchecked) radio buttons, and a 'Life' field showing '00 Hours 00 inutes 00 Seconds'. A 'Reset' button is located below the 'Life' field for each lamp. At the bottom, there is a 'Lamp Switch Wavelength' section with a 'Wavelength' input field set to '340.0' and a unit 'nm'.

Tungsten Lamp	
Status	<input checked="" type="checkbox"/> On <input type="checkbox"/> Off
Life	00 Hours 00 inutes 00 Seconds

Reset

Deuterium Lamp	
Status	<input checked="" type="checkbox"/> On <input type="checkbox"/> Off
Life	00 Hours 00 inutes 00 Seconds

Reset

Lamp Switch Wavelength	
Wavelength	340.0 nm

**1.7 General:** You can choose the precise level, beep status, screen brightness, time and date format. Press restores to restore defaults .

The screenshot shows the 'System Setup' window with a sidebar on the left containing menu items: Dark Current, WL Calibration, Cell Holder, Slit, Time&Date, Lamp, General, File System, USB Disk, and About. The 'General' menu item is selected. The main content area displays a table of settings:

Language	<input checked="" type="checkbox"/> English
Precise	<input checked="" type="checkbox"/> Normal <input type="checkbox"/> High
Signal mode	<input checked="" type="checkbox"/> Transmission mode <input type="checkbox"/> Reflectivity
Beep	<input checked="" type="checkbox"/> On <input type="checkbox"/> Off
Printer	<input checked="" type="checkbox"/> Normal <input type="checkbox"/> Embedded
Brightness	<input type="range" value="100"/> 100%
Time	<input checked="" type="checkbox"/> 24 Hours <input type="checkbox"/> 12 Hours
Date	<input checked="" type="checkbox"/> D/M/Y <input type="checkbox"/> M/D/Y
Restore	<input type="button" value="Reset"/>

**1.8 File System:** You can see the file number in local disk, create time and modify time of resource file and the last file saved in the local disk. Data size, used space and total storage space are shown too. If you press format, all the data in the local disk will be deleted. Press deletes to remove the saved file(s).



The screenshot shows the 'System Setup' window with the 'File System' menu item selected in the sidebar. The main content area displays a table of file system information:

Version	V1.1.0.16
File No.	1
Create Time	05/11/2024 11:46
Modify Time	05/18/2024 14:45
Data Size	17.8KB
Used Space	20.0KB
Free Space	3.86MB

Below the table are two buttons:  and .



**1.9 USB Disk:** You can insert the USB pen drive to store test data and files on your flash memory, it will display your USB status here.

 **System Setup** 

Dark Current

WL Calibration

Cell Holder

Slit

Time&Date

Lamp

General

File System

USB Disk

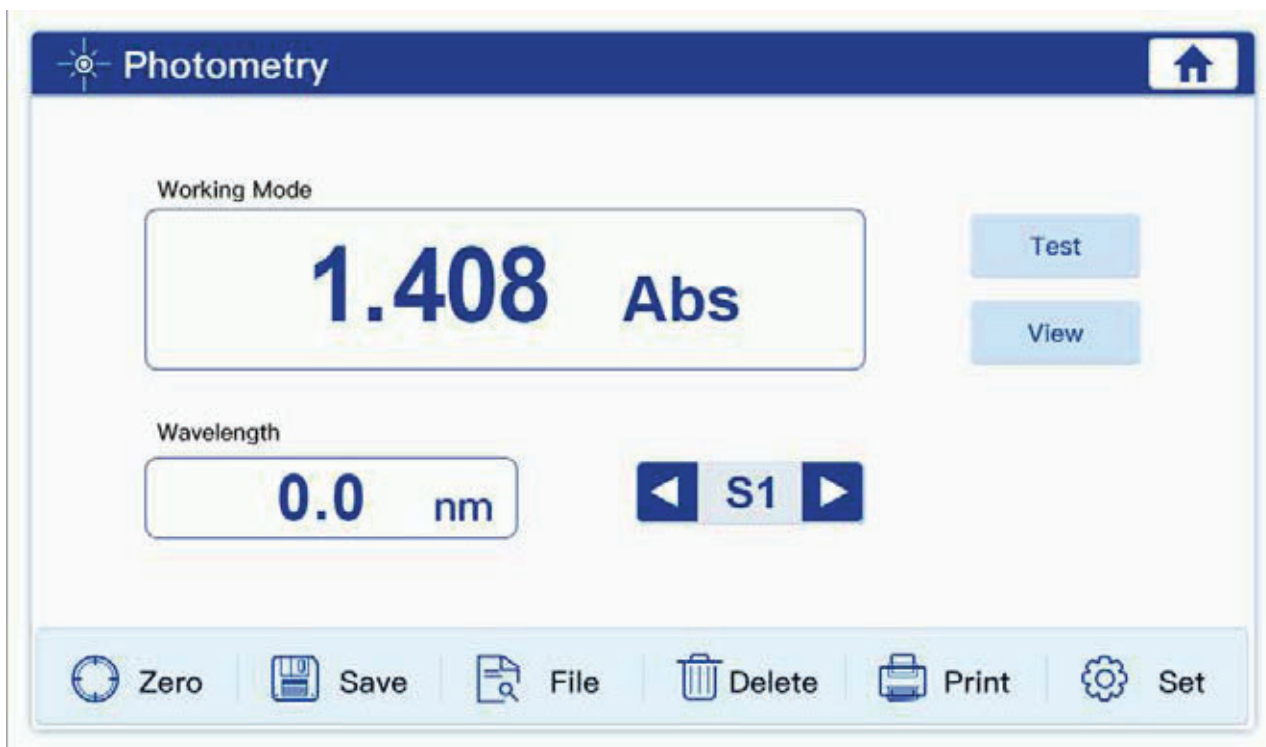
About

USB Status	USB Storage Devices
Disk Label	Allan's disk
Disk SN	2345678
Disk Type	FAT12
Total Space	0B
Free Space	0B



## 5.2. Photometry

Photometric measurements are measuring the absorbance of the sample at a single wavelength, transmittance or energy value.



Zero

**Correction 100%T/0Abs**

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



Save

**Save the test file and data.**



File

**Open saved file.**

After you do some test, first press save button, then open files. Otherwise, the system will remind you Data Modified, Save Record? You can press OK to save test records or cancel it to continue open other files.



Delete

### Delete the latest test records.

This function cannot be used to delete saved files.



Print

### Print the test results,

you can choose the file you want to print, then press this icon to print directly. All the other print function is the same as this one, so we will not introduce other print function correspondingly.



Set

### Set the operating modes (Abs, %T or Energy) and Gain value.

The image shows a screenshot of the 'Photometry' software interface. A settings dialog box is open, titled 'Photometry' with a gear icon. The dialog has the following fields and options:

- Mode:** Radio buttons for Abs (checked), %T, Energy, and %R.
- Coef.:** A text input field containing '1.000'.
- WL.:** A text input field containing '546.0' followed by 'nm'.
- Gain:** A dropdown menu set to 'Auto' and a row of buttons numbered 1 through 8.
- Energy:** Radio buttons for 'Sample' and 'Ref.'.

Buttons for 'Test' and 'View' are visible to the right of the dialog. At the bottom of the dialog are 'OK' and 'Cancel' buttons. The background software interface shows a 'Working Mode' section with a minus sign, a 'Wavelength' input field with '546', and a bottom toolbar with icons for Zero, Save, File, Delete, Print, and Set.

Test

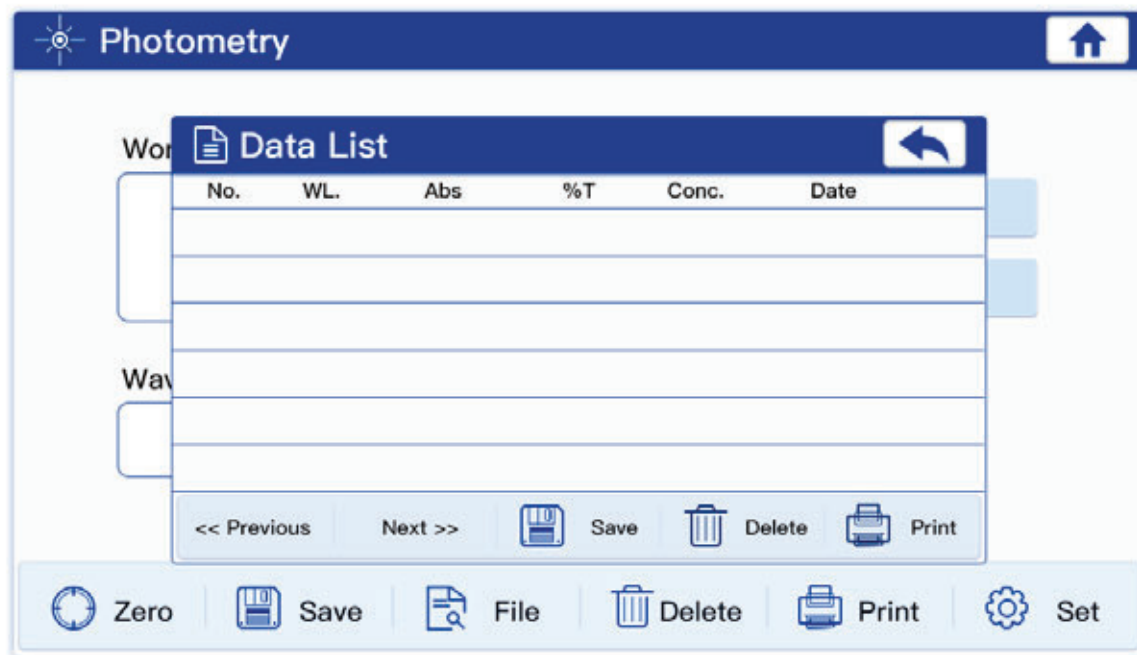
### Test

After you blank and set up other parameters, press this button to do the test.

View

### To view the test records.

After you press this button, you will enter this window. Here you can save the results too, and delete each test record.

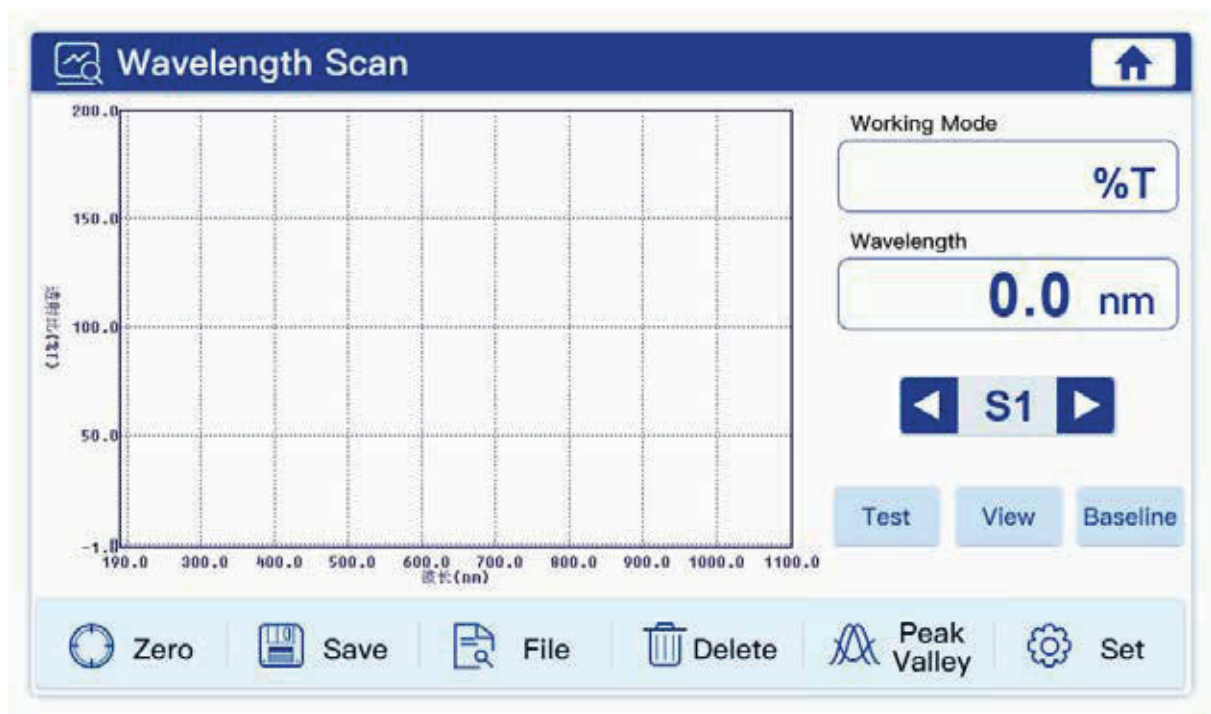


**Return key.** Press this icon to return previous window.



**Home Key.** Press this icon to return to main menu.

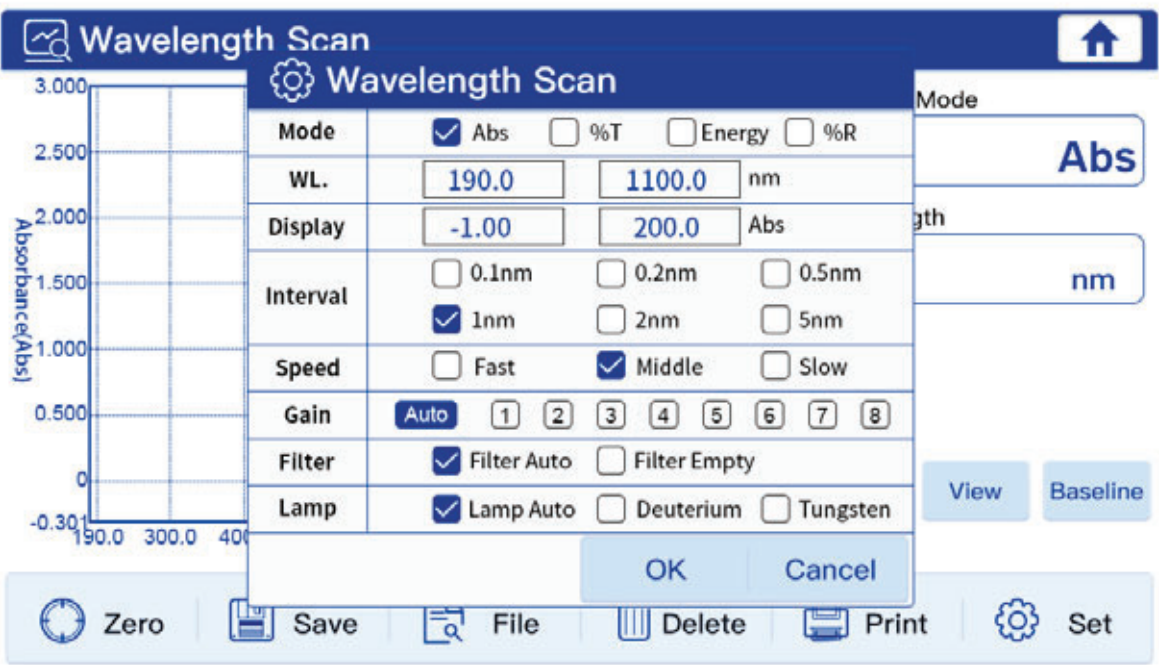
### 5.3. Wavelength Scan



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



Set up the relevant parameters for wavelength scan.



---

➤ **Set measurement mode (Mode)**

The measurement mode is absorbance, transmission or energy. Choose different measurement mode, you need to re-set the display range to show its maximum and minimum limits.

➤ **Set wavelength scan range (WL)**

➤ **Display:** to show limits of values in different measurement modes, and the limit is different under different modes.

➤ **Set wavelength scan interval from 0.1nm to 5.0nm.**

➤ **Set scanning speed.**

The scanning speed determines the quantity of data collecting on single point wavelength. The faster the speed, the less the collecting quantity.

➤ **Filter auto:** The filter will be switched automatically according to different wavelengths. Filter empty means the filter is not working no matter what the wavelength is.

➤ **Lamp:** Automatic Lamp switching can select from 300-400 nm and User can select manually for deuterium or tungsten lamp

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



**Correction 100%T/0Abs**

In two samples simultaneously into the two slots reference solution, and then press the [Zero], the instrument will blank correction in the current wavelength range. Display calibration is completed 100.0% T or 0.000Abs. Press the screen out of the area of “blanking” window to stop zero calibration.



**Save the test file and data.**



**Open saved file.**

After you do some test, first press save button, then open files. Otherwise, the system will remind you Data Modified, Save Record? You can press OK to save test records or cancel it to continue open other files.



**Delete the latest test records.**

This function cannot be used to delete saved files.

Test

### Test

After you blank and set up other parameters, press this button to do the test. If you want to stop test process, press the screen anywhere.

View

### To view the test records.

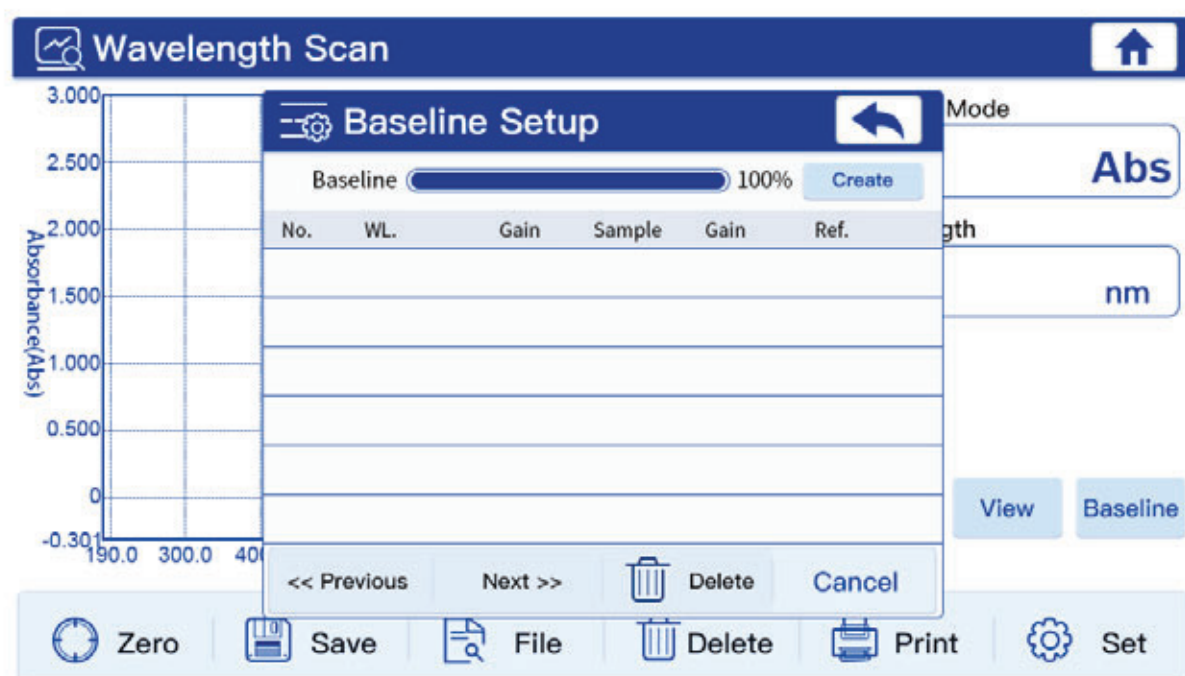
After you press this button, you will enter detailed Data List. Here you can save the results too, and delete test records, if you delete, you will remove all the test records.

Baseline

### Baseline

Before wavelength scan, you must create a system baseline. If you have previously established a system baseline, you can skip this step. A long time without updating the system, re-create the system baseline.

After you press Baseline button, the program will enter the following window:



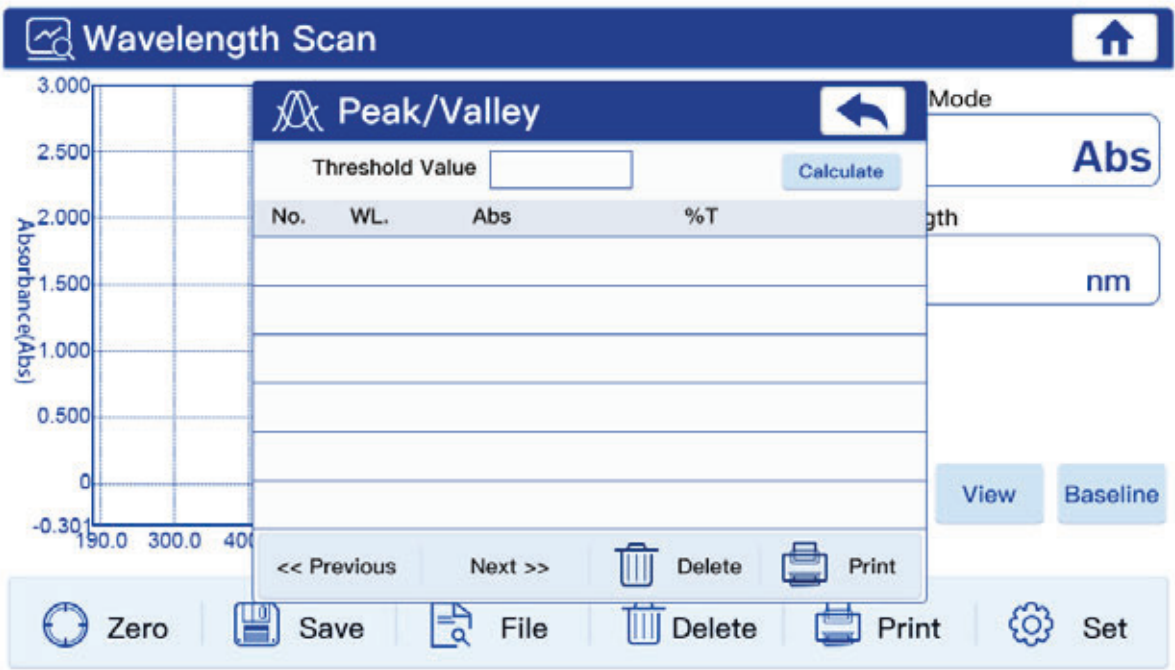
If you want to stop creating baseline, press **Create** again, then press the return key .



### Peak valley


To set up the threshold value and check curve's peak and


valley values. After you input the threshold value, press **Calculate** , all the relevant records will come out.



**<< Previous** Go to previous page of data list.

**Next >>** Go to next page of data list.


 **Return key.** Press this icon to return previous window.

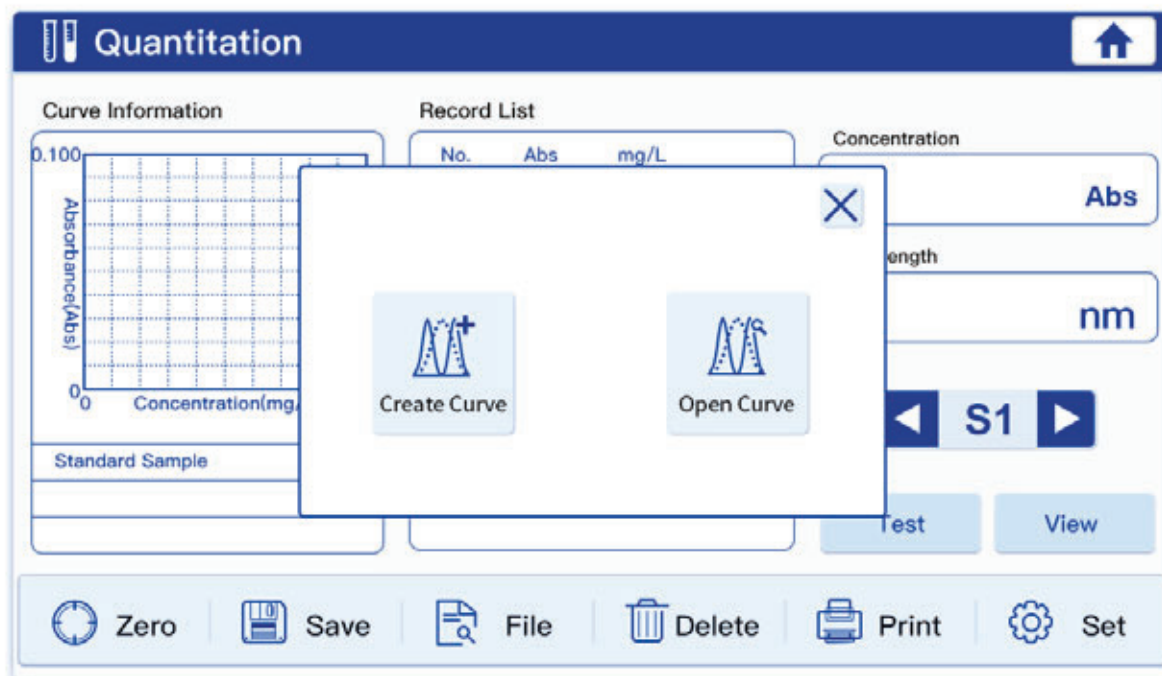
 **Home Key.** Press this icon to return to main menu.




## 5.4. Quantitation



Press icon  to enter quantitative measurement program. There are two options: create standard curve or open saved standard curve.



If you want to return to main menu window, please press cross icon .

### 5.4.1. Create Standard Curve

To use several configured standard samples, input the concentration of sample standard, collect the absorbance of standard sample, and then calculate curve parameters through the relationship between concentration and absorbance which will be used to measure the concentration of test sample.

You can input wavelength, highlight concentration units and fit modes (linear, linear through origin and polynomial 2nd order), test mode (standard samples or coefficients). When you use coefficients mode, it will show the relevant factors in the factor column. If you highlight standard sample mode, you need to input the number of standard samples (at least two).

- **Wavelength value is required**, you need to input it by yourself.
- **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.
- **Curve fitting mode:** there are linear fitting, linear through origin and second order fitting.
- **Curve building method:** there are standard sample method and coefficient method. Stand sample method is to prepare sample first, build curve and then test sample. Coefficient method is to enter the known coefficients and build standard curve, then to test sample.
- **Number of samples:** at least 2 samples. The more samples, the more accurate of testing data.

Continue the next step after set all relevant parameters, let's take the configurations in the above picture as an example, press OK button to enter the following interface

Quantitation

Curve Information

0.100

Absorbance(Abs)

0

Conc

Create Curve

No.	mg/L	Abs	Blank	Abs	WL.
Std 1			Read	Abs	nm
Std 2			Read		
Std 3			Read		

0.100

Concentration(Abs)

0

Absorbance(mg/l)

1.00

Standard Sample

Second Order

r=1.000000

<< Previous

Next >>

Save

S1

View

Zero


Save

File

Delete

Print

Set

Press  Save in the small window to continue, if necessary, please calibrate absorbance by pressing Blank button.

Quantitation

Curve Information

0.100

Absorbance(Abs)

0

Concentration(mg/l)

1.00

Record List

No.	Abs	mg/L
5	-0.000	0.50
4	-0.000	0.50
3	-0.000	0.50
2	-0.000	0.50
1	-0.000	0.50

Concentration

0.50 mg/L

Wavelength

546.0 nm

S1

Test

View

Standard Sample

Second Order

r=1.000000

Zero

Save

File

Delete

Print

Set

After that, you can do the test, view test results, save and open files, delete test records, print and set the concentration units.

You can open the files save on local or USB memory by press



## 5.5. Multi Wavelength

In the Multi Wavelength program, absorbance values can be measured at up to eight wavelengths.



No.	400.0	450.0	500.0	Result



Zero

**Correction 0.000Abs**



Save

**Save the test file and data.**



File

**Open saved file.**



Delete

**Delete all the latest test records.**

This function cannot be used to delete saved files.



Print

**Print**

Print the test results, you can choose the file you want to print, then press this icon to print test records directly.



Set

**Set**

Set up the number of wavelengths, at most eight.

Multi Wavelength

Analysis Result

No. 400.0

No.	Wavelength	Factor
WL.1		
WL.2		
WL.3		
WL.4		
WL.5		
WL.6		
WL.7		
WL.8		

Zero

OK
Cancel

Number

1
2
3
4
5
6
7
8

Mode

☒ Abs
☐ %T

Working Mode

Wavelength

◀
S1
▶

Test

Set

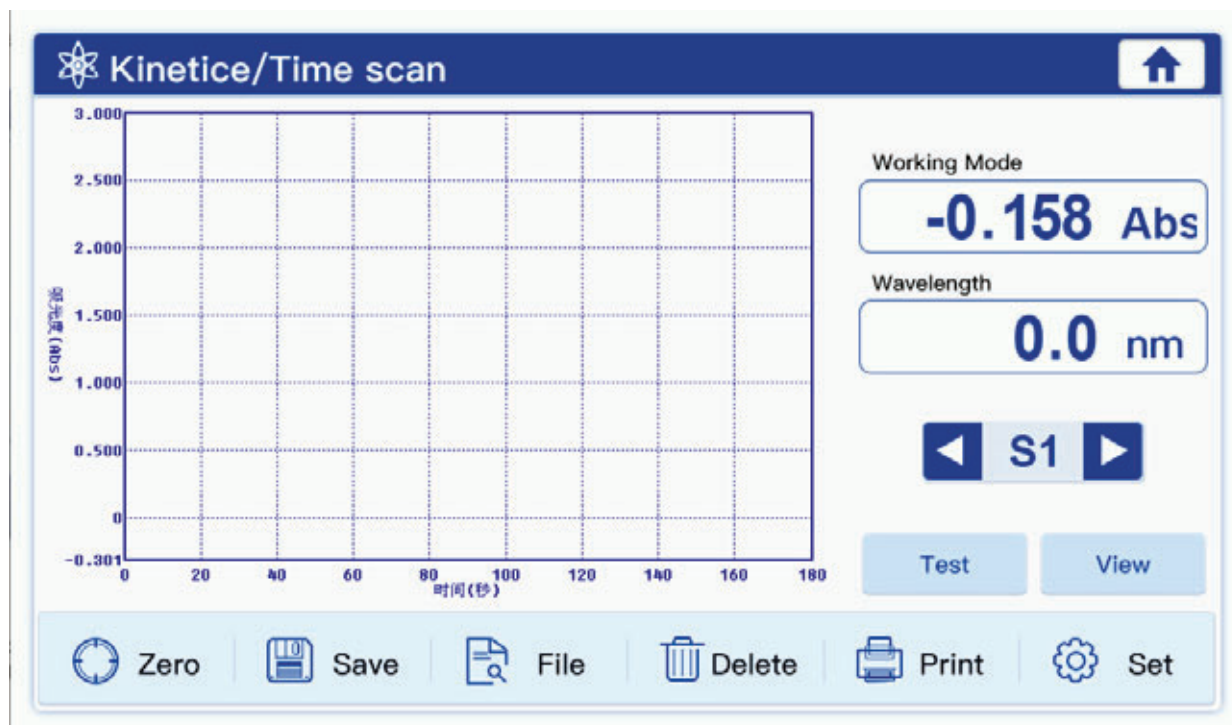


## 5.6. Kinetics (Time Scanning)

Kinetics function is to test absorbance or transmittance of the test sample within a fixed duration and at a certain time interval, and display the trend or values on the curve.



Press icon to enter kinetics program:

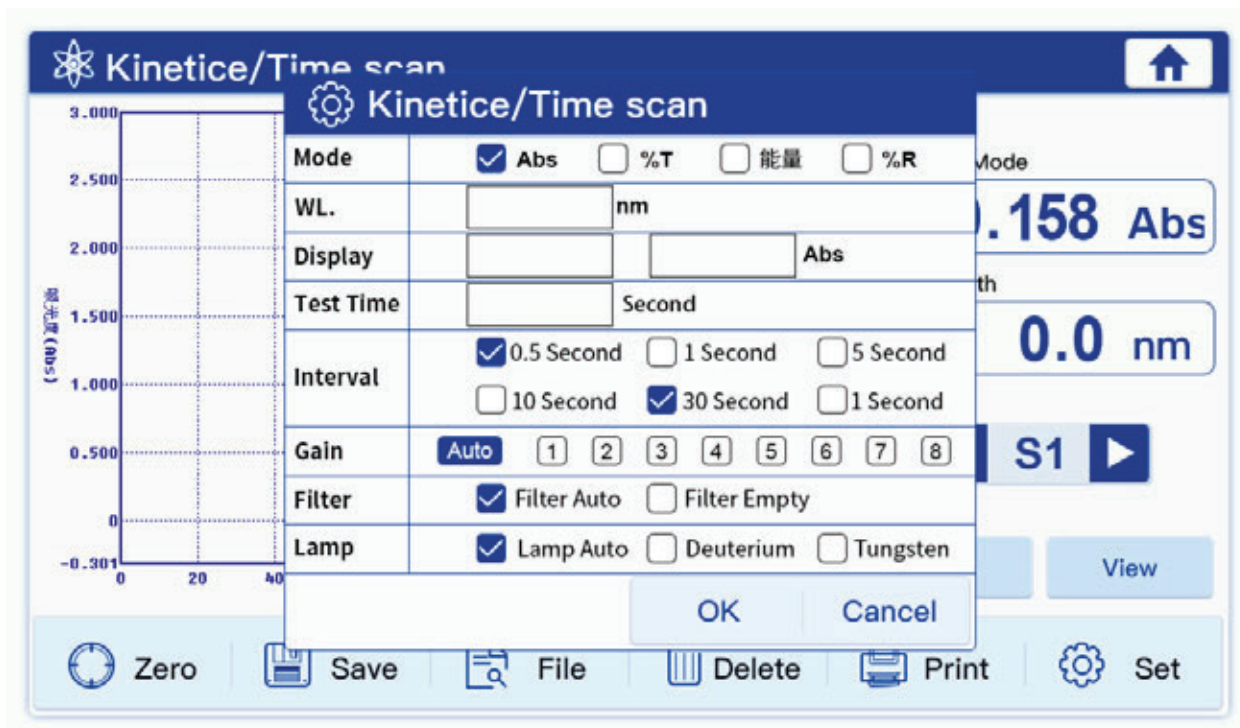


Set

**Set up relevant parameters.**

You need to do the setup before test.





### ➤ Set operating mode (Mode)

The measurement mode is absorbance, transmission or energy. Choose different measurement mode, you need to re-set the display range to show its maximum and minimum limits.

### ➤ Set wavelength (WL)

➤ **Display:** to show limits of values in different measurement modes, and the limit is different under different modes.

➤ **Test time:** input the total test time.

➤ **Set scan time interval** from 0.5 second to 1.0 minute.

➤ **Filter auto:** The filter will be switched automatically according to different wavelengths. Filter empty means the filter is not working no matter what the wavelength is.

➤ **Gain:** You can choose different gain value when under energy mode, or you can highlight gain auto option, and this is strongly recommended.

**You can highlight lamp auto, choose deuterium lamp or tungsten lamp. Lamp auto is recommended in most cases.**



### Correction 100%T/0Abs

Operators need to do zero calibrations before the test. Press this button and the instrument will blank correction at the current wavelength. Display calibration is completed 100.0% T or 0.000Abs.



Save

**Save the test file and data.**



File

**Open saved file.**



Delete

**Delete the latest test records.**

This function cannot be used to delete saved files.

Test

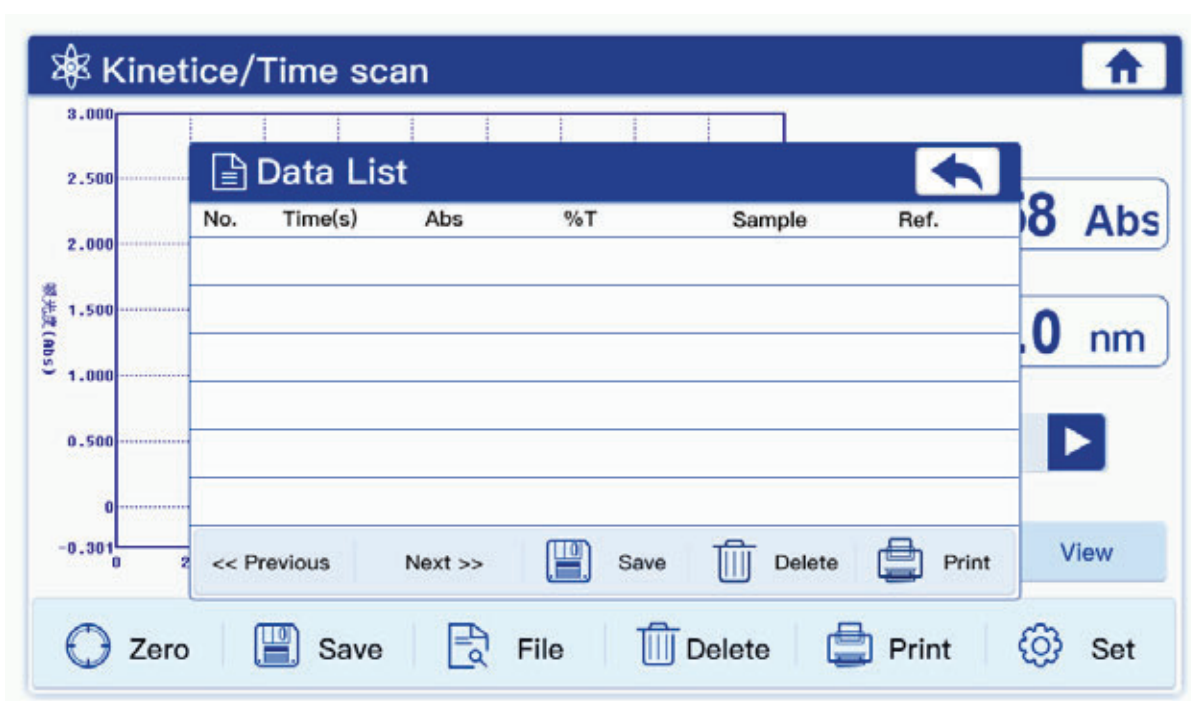
**Test**

After you set up other parameters and do blanking, press this button to do the test. If you want to stop test process, press the screen anywhere, the save file window will come out to remind you whether to save this test data or not.

View

**To view the test records.**

After you press this button, you will see the detailed Data List. Here you can delete test records, if you delete, you will remove all the test records.



## 5.7. Protein/DNA Test

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

The screenshot shows the 'Protein/DNA Test' interface. At the top, there's a title bar with a magnifying glass icon and a home button. Below the title bar, the 'Analysis Result' section contains a table with columns: No., 260.0, 280.0, 320.0, Ratio, DNA, and Protein. The table has several empty rows. To the right of the table, there are controls for 'Working Mode' (set to 'Abs'), 'Wavelength' (set to 'nm'), and a 'Test' button. Below the table and controls, there's a toolbar with icons and labels for 'Zero', 'Save', 'File', 'Delete', 'Print', and 'Set'.



Zero

**Correction 0.000Abs**



Save

**Save the test file and data.**



File

**Open saved file.**



Delete

**Delete all the latest test records .**

This function cannot be used to delete saved files.



## Print



## Set

## Set

There are two modes with different formulas.

**Protein/DNA Test**

Analysis Result

No.	260.0	280.0	320.0	Ratio	DNA	Protein

Working Mode

Abs

Wavelength

nm

◀ S1 ▶

Test

**Protein/DNA Test**

Mode

1 Mode 1 2 Mode 2

Formula

$DNA = (A_{260} - A_{320}) \times 49.1 - (A_{230} - A_{320}) \times 3.48$

$Pro = (A_{260} - A_{320}) \times 183 - (A_{230} - A_{320}) \times 75.8$

OK Cancel

Zero Save File Delete Print Set

---

## 6. Maintenance

### CAUTION

Potential Chemical, Biological Eye and Skin Hazards.  
Only qualified personnel should conduct the tasks described in this section of the manual.

### NOTICE

Remove all cells remaining in the instrument. Dispose of the cells or their contents in an authorized manner.

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:

### 6.1. Cleaning Requirements

### DANGER

Chemical exposure hazard.  
Gas from a chlorine compound and UV light reaction can cause death.  
Do not use chlorine compounds for cleaning.

### CAUTION

Potential Pinch, Eye, Burn and Chemical Hazards.  
Before cleaning, always disconnect the instrument from the power source.

### NOTICE

Never use solvents like turpentine, acetone or similar to clean the instrument, including the display and accessories.

#### 6.1.1 Spectrophotometer

- Only clean the housing, the cell compartments and all accessories with a soft, damp cloth. A mild soap solution can also be used.
- Do not get excess water in the cell compartments.
- Insert no brush and no sharp objects in the cell compartment, to avoid damage to mechanical components.
- Dry the cleaned parts carefully with a soft cotton cloth.

---

### 6.1.2 Display

- Do not scratch the display. Never touch the display with ball pens, pencils or similar pointed objects.
- Clean the display with a soft, lint- and oil-free cotton cloth. Diluted window cleaner liquid can also be used.

### 6.1.3 Cuvettes/cells

**CAUTION:** Potential Chemical/ Biological Exposure Hazards.  
User correct laboratory practices if a risk of chemical exposure exists.

- 1.3.1. After use, clean the glass cells with cleaning agents.
- 1.3.2. Afterwards, rinse the cuvettes/sample cells several times with tap water and then thoroughly with deionized water.

**Note:** Glass cuvettes/sample cells that have been used for organic solvents (such as chloroform, benzene, toluene, etc.) must be rinsed with acetone before being treated with cleaning agents. In addition, another rinse with acetone is necessary as a final treatment step before the cuvettes/sample cells are dried.

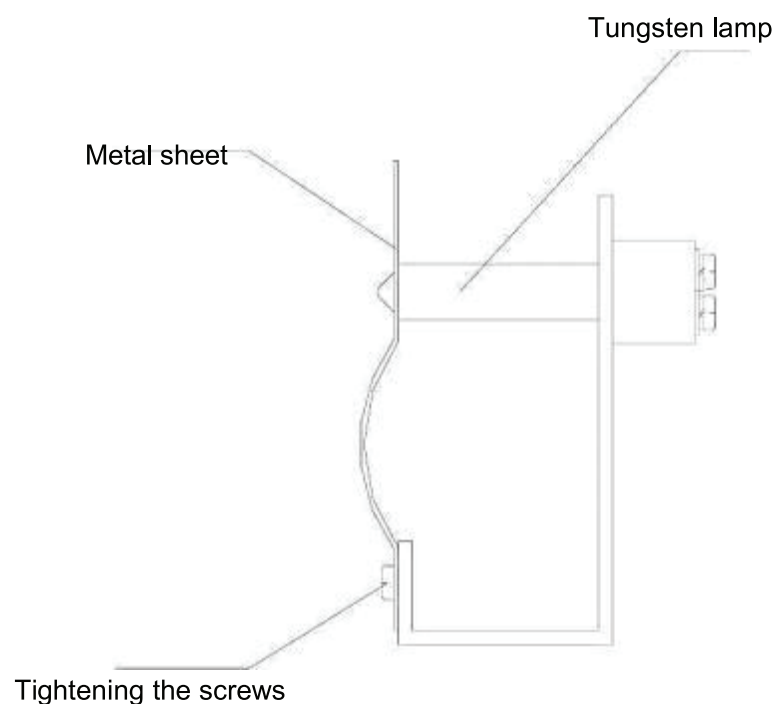
## 6.2. Routine precautions

- 6.2.1 Use the dust cover to prevent dust accumulation when the instrument is not working for long time.
- 6.2.2 Be careful not to spill solution into the sample chamber, to prevent corrosion, for some volatile sample, we recommend using the cuvette lid to prevent the impact of volatile gases to light, thus affecting the accuracy of the test equipment .
- 6.2.3 Check every part of the instrument to make sure they are not loose so as to prevent the optical path deviations and affect the instrument is working properly.
- 6.2.4 Moving instrument should be handled with care, and no heavy items can be placed on the top of instrument, so as to avoid affecting the optical path shift stability and accuracy.
- 6.2.5 Wavelength calibration is recommended once a week in order to improve the accuracy of the measured data, not necessary to do it every time.
- 6.2.6 The instrument can't be left unused for a long time which will shorten its life, and running 1-2 times a week is recommended, half an hour each time.

---

## 6.3. Tungsten lamp replacement

- 6.3.1 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 remove 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 to pull the housing to prevent the pull-beam break)
- 6.3.2 Remove the lamp compartment cover 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 burns)
- 6.3.3 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 tungsten light positive)



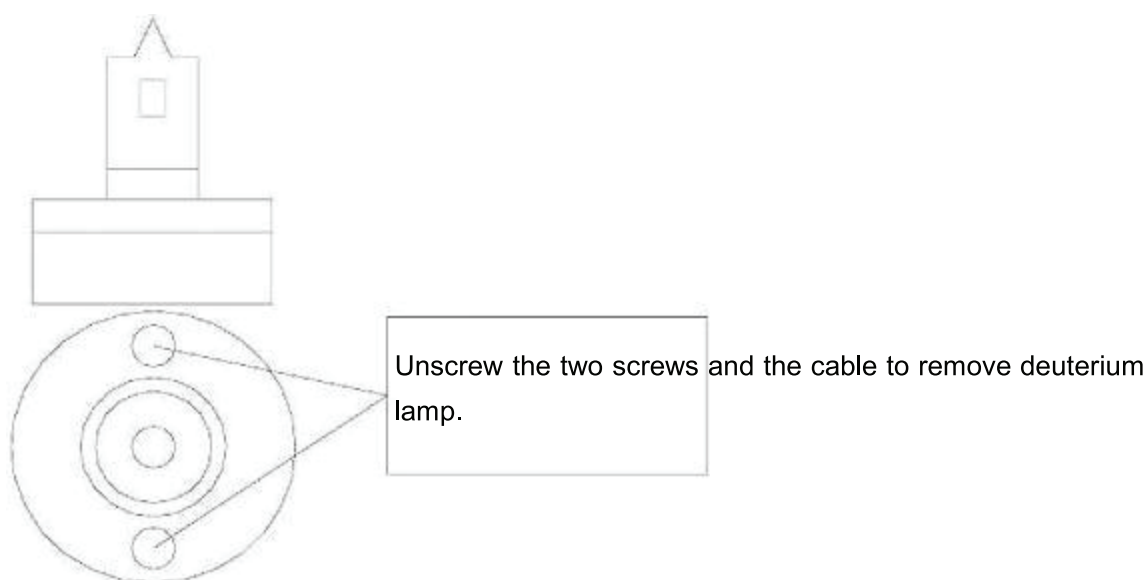
- 6.3.4 Turn on the instrument, make tungsten lamp light, and convert the light source switching mirror to horizontal position manually.
- 6.3.5 Loosen the screws seat switch motors, seat motors to move the focus to switch into the slit in the smallest and tungsten lights centered,



- 
- 6.3.6 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.
- 6.3.7 Re-POST, after the completion of the self-test mode in the wavelength photometric measurements were walked 340nm, 370nm, 1000nm, 1100nm let automatic zero. If it does not display the low energy lamp replacement is completed, if there is low energy, repeat the above steps, if not enough, please contact the company sales staff.

## 6.4. Deuterium lamp replacement

- 6.4.1 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 remove 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 to pull the housing to prevent the pull-beam break)
- 6.4.2 Remove the lamp compartment cover 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 burns!!!)
- 6.4.3 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 accordance with the original position (note deuterium lamp light mouth will toward objective), and plug it in the power supply board .



- 6.4.4 Turn on the instrument, make deuterium lamp light, and convert the light source switching mirror to vertical position manually.

- 
- 6.4.5 Loosen the screws fixed lens holder, fine-tune the focus lens holder into the slot on the smallest and deuterium light centered .
  - 6.4.6 Convert the light source switching mirror to horizontal position manually.
  - 6.4.7 Loosen the screws seat switch motors, seat motors to move the focus to switch into the slit in the smallest and tungsten lights centered .
  - 6.4.8 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.
  - 6.4.9 Re-POST, after the completion of the self-test mode in the wavelength photometric measurements were walked 200nm, 330nm, 340nm, 370nm, 1000nm, 1100nm let automatic zero. If you no longer display low energy lamp replacement is completed, if there is low energy, repeat the above steps, if not enough, please contact the company sales staff.

---

## 7. Troubleshooting

Please refer to following table for common troubles and contact our technicians if you are not sure about the problems.

### 7.1. Power failure

Failures	Causes	Solutions
Boot no reaction	No electrical outlet	Check the external power supply
	Power cord not plugged in	Re-seated host power
	Socket switch inline fuse burned	Replace the spare fuse embedded or purchase the same size fuse
	Instrument socket switch is broken	Please contact the manufacturer or your local dealer
	Internal power supply board or transformer burned	Please contact the manufacturer or your local dealer
Display error	Internal wiring is loose display	Open the housing and re-seat the wire under the guidance service personnel
	Internal +5 V power supply is not normal or loose cable	Open the housing and re-seat the cable under the guidance service personnel
	Internal procedures by the unexpected collapse of the high-frequency voltage shock	Reprogram it under the guidance of service personnel
	The motherboard is not working properly	Please contact the manufacturer or your local dealer

## 7.2. Self-test failure

Failures	Causes	Solutions
Filter positioning error	Loose electrical line filter	Open the housing service personnel under the guidance of re-seated
	Optocoupler line filter loose	Open the housing service personnel under the guidance of re-seated
	+12 V power supply board is not normal or loose cable	Open the housing service personnel under the guidance of re-seated
	Filter optocoupler bad	Please contact the manufacturer or your local dealer
	Motor driver chip on the motherboard bad TD62083	Please contact the manufacturer or your local dealer
Positioning error sources	Switch motor cable loose	Open the housing service personnel under the guidance of re-seated
	Switch micro switch wire loose	Open the housing service personnel under the guidance of re-seated
	Switch bad micro switch	Open the housing service personnel under the guidance of re-seated
	+12 V power supply board is not normal or loose cable	Please contact the manufacturer or your local dealer
	Motor driver chip on the motherboard bad TD62083	Please contact the manufacturer or your local dealer
Error signal detector	Motherboard connector cable loose signal board	Open the housing service personnel under the guidance of re-seated
	Power board + / -15 power cable is loose or not properly	Open the housing service personnel under the guidance of re-seated
	Bad signal board	Please contact the manufacturer or your local dealer
	Bad motherboard	Please contact the manufacturer or your local dealer

### 7.3 Other failures

Failures	Causes	Solutions
Wavelength self-checking is normal. Energy is low or unstable in tungsten lamp wavelength region	Tungsten lights over 2000 hours or bad	Refer to Chapter XV to replace tungsten lamp
	Use too long causes the internal optics moldy	Please contact the manufacturer or your local dealer
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 is too dirty lens	Lens cleaning paper moistened with alcohol to wipe dry
	Deuterium lamp is lit more than 2000 hours or bad	Refer to Chapter XV deuterium lamp replacement
	Use too long causes the internal optics moldy	Please contact the manufacturer or your local dealer