BIOBASE

Micro-Volume UV/VIS Spectrophotometer
BK-CW2000
User Manual

BIOBASE GROUP

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Preface

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About this Manual

This manual contains following sections:

- Introduction
- Warning and Safety
- Hardware Installation
- Software Installation
- Software Operation
- Basic Operation
- Maintenance

Content

Chapter 1. Introduction

1.1 Instrument Description

BK-CW2000 is a full spectrum (190nm - 850nm) spectrophotometer for both micro-volume measurement and traditional cuvette measurement. And the micro-volume measurement is based on a sample retention technology that employs surface tension to hold the sample in place between two optical fibers. There are two path lengths for chosen, 1mm and 0.2mm. This enables the measurement of high concentration samples without the need for dilutions. BK-CW2000 spectrophotometer has a capability to measure sample concentration up to 40 times more concentrated than samples measured using the standard cuvette. However, cuvette measurement is a well complementary for diluted samples with concentration as low as 0.01Abs. And kinetic analysis is also available with cuvette measurement.

Note: For high viscosity samples, dealing with oscillation and centrifugation before measurement is suggested, and a volume of 1.5μL will be better for measurement.

1.2 Application

BK-CW2000 Micro-Volume Spectrophotometer is available for absorbance measurement with nucleic acid and protein samples such as ssDNA, dsDNA, RNA, and BSA.

When BK-CW2000 Micro-Volume Spectrophotometer is blanked, a spectrum is taken of the reference solution (blank) and stored in memory as an array of light intensities by wavelength. When a measurement of a sample is taken, the intensity of light that was transmitted through the sample is recorded. The sample intensities along with the blank intensities are used to calculate the sample absorbance according to the following equation:

$$A = \lg \frac{I_0}{I_t}$$

The Beer-Lambert equation is used to correlate the calculated absorbance with concentration:

$$A = \varepsilon * b * c$$

A = the absorbance represented in absorbance units (A)

I_0 = the blankintensity

I_t = thesample intensity

ε = the wavelength-dependent molar absorptivity coefficient (or extinction coefficient) with units of liter/mol•cm

b = the pathlength in cm

c =the analyte concentration in moles/liter or molarity (M)

Note: The reference, or blank solution, generally is the buffer that the molecule of interest is suspended or dissolved in. This solution should be the same pH and of a similar ionic strength as the sample solution.

1.3 Instrument Specifications

Items	Specifications
Minimum Sample Size:	0.5μL
Path Length:	1mm/0.2mm/0.05 mm selectable
Path Length(Cuvette Mode):	10mm/5mm/2mm/1mm
Wavelength Rage:	190 nm ~850nm
Wavelength Accuracy:	±1 nm
Wavelength Resolution:	≤0.3nm（FWHM@ Hg 253.7nm）
Absorbance Accuracy:	±2%（0.76 A @ 257nm）
Absorbance Precision:	0.002Abs（1mm Path）
Absorbance Range:	0.005~300 (10mm equivalent)
Detector:	3648 pixels linear CCD array
Light Source:	Xenon flash lamp
Measurement Time：	<5 s
Dimensions:	200mm×130mm×136mm（L×W×H）
Weight:	≤ 2.5 kg
Sample pedestal Material of Construction:	304 stainless steel and quartz fiber
Power Supply:	100~240VAC, 50~60Hz
Operating Power:	24W

Chapter 2. Warnings and Safety Information

2.1 Important Safety Information

 **Warning!**

Warning messages alert you to a specific procedure or practice which, if not followed correctly, could cause personal injury.

 **Caution!**

Emission of UV Radiation!

 **Caution!**

Dangerous electric voltage!

2.2 About Maintenance Service

Only authorized engineers can carry out the maintenance service work. Please contact us or our authorized distributors for maintenance.

Chapter 3. Hardware Installation

Please read the requirements and operation procedures described in this manual carefully before installing the hardware. User should strictly follow the installation procedures to avoid instrument damage.

3.1 Installation Requirements

1) Environment Requirements

The instrument has been designed for indoor use. To obtain the best performance from your instrument, following requirements should be met:

Ambient Temperature: 5℃~40℃

Ambient Relative Humidity: ≤70%

Atmosphere Pressure: 86kPa~106kPa

The place should be free of draft, dust, corrosive vapors as well as vibrations.

Do not set up the instrument near electromagnetic fields.

Do not expose the instrument to direct sunlight or the radiation of heaters.

2) Space Requirements

Considering the dimensions of BK-CW2000 Micro-Volume Spectrophotometer (200 mm ×130 mm × 136 mm) and a clearance of approximately 100 mm to the sides and the front, a bench space is needed and it should bear at least 10 kg weight.

3) Power Supply

The operating power of the instrument is 24W. For the normal power supply is 100~240VAC, 50~60Hz, a power adapter with its output voltage of 12VDC should be configured.

4) Computer Requirements

To run the software efficiently, the computer workstation should meet following requirements:

Processor: Intel Core2, duo 2.0 GHz or faster

RAM: 1G or more

Virtual Memory Space: 512M or more

Hard Disk Space: 40G or more

CD-ROM Drive: 40X or faster

USB Interface: USB2.0

Display Resolution: 1280 × 800 pixels

Operating System: Windows XP (32bit, 64bit), or Windows7 (32bit, 64bit)

3.2 Unpacking

1) Check the outlook, if there is anything damaged, please indicate it on the acceptance sheet.
2) Unpack the contents carefully and check the materials according to the packing list. Please contact BIOBASE and the distributor immediately if any inner parts damage is found.
3) Keep the package carton carefully so that it can be reused for well protection during shipping when the instrument needing return to service.

Warning!
Don't connect the instrument to the power supply if any damage is found in the system.

Notice!
Take care when unpacking and placing the instrument onto the bench, any vibration or collision may cause damage to the instrument.
4) Accessories
A power adapter, and a USB cable are important accessories to the instrument.

Adapter

USB cable

Notice!
Don't use a USB cable more than 3 m. Better to use a USB cable with a magnetic ring protection.

3.3 Installation

Step 1: Gently place BK-CW2000 Micro-Volume Spectrophotometer onto a stable bench.
Step 2: Connect the instrument and computer with a USB cable. However, to obtain maximum current drive capability and better resistance to interference, a USB interface on the rear panel of the computer is suggested to chosen.
Step 3: Connect the output port of the power adapter to the instrument, and connect the input port to the power supply.

3.4 Calibration

BK-CW2000 Micro-Volume Spectrophotometer is a precision instrument. Some trouble may be encountered during the first installation after long-distance shipping. Please contact us if the problem still couldn't be solved.
A calibration is necessary before the first use. Make sure that the system is all right, then, carry out

the calibration.

3.5 System Shutdown

Following are the steps of system shutdown.
Step 1: Clean the instrument, save the measurement pictures, export the data and save them in certain format.
Step 2: Exit the control system.
Step 3: Power off. And the LED indicator lamp will go out.
Step 4: Disconnect the power adapter and USB cable from the instrument.
Note: Don’t disconnect the USB cable from the instrument before closing the software. Otherwise, the USB firmware may be lost and that cause damage to the instrument.
To avoid shortening the instrument service life, be sure to power off the instrument after closing the software.

Chapter 4. Software Installation

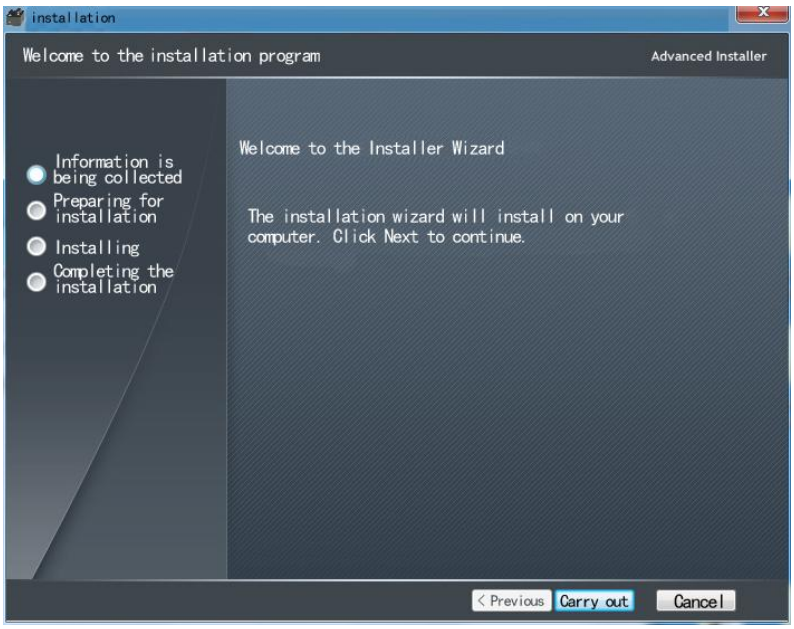
Make sure that the system configurations of the computer meet the installation requirements before software installation. The software will be installed to the default directory “SYSTEMDISK\Program Files\BK-CW2000”, it also can be installed to user specified directory.

4.1 Installation Preparation

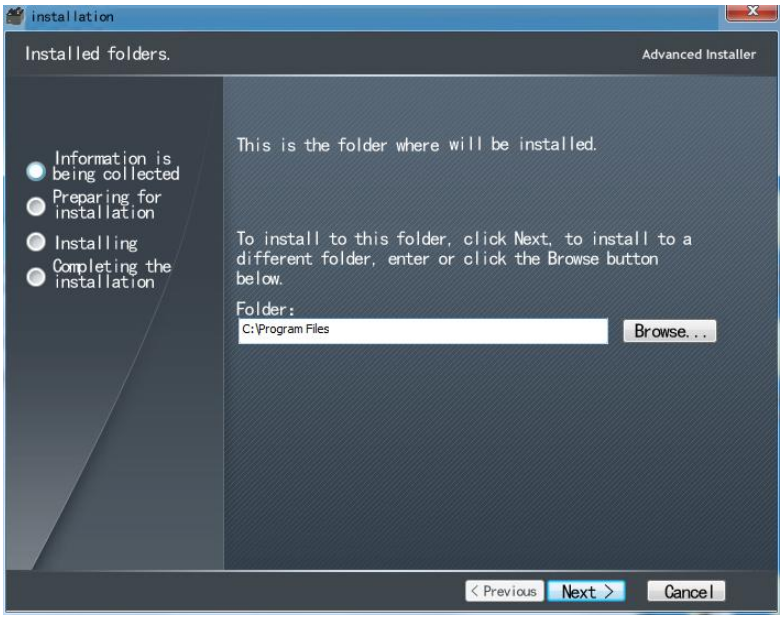
Following steps should be carried out before installation.
Step 1: Start the computer, login on the system as Administrator.
Step 2: Put the system CD of BK-CW2000 into CD-ROM drive.
Step 3: In the CD-ROM root directory, find out the installation file with certain system version, double-click “BK-CW2000 Setup.exe” to start the installation progress.

4.2 Installation Wizard

The installation wizard is as following.
Step 1: There is a welcome interface of the program installation, click “Next” to continue the installation.

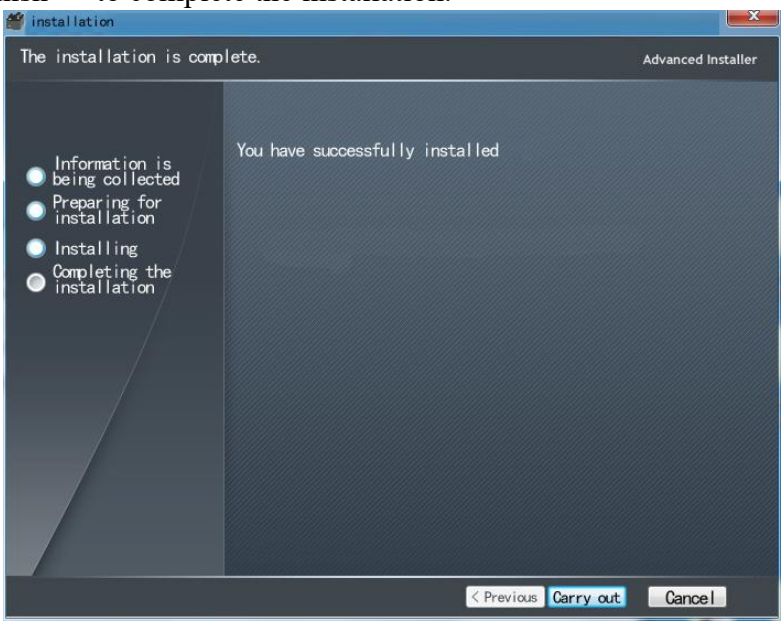


Step 2: Select the installation directory, and click “Next” to continue the installation.



Step 3: Click “ ” to start the installation progress.

Step 4: Click “Finish” to complete the installation.

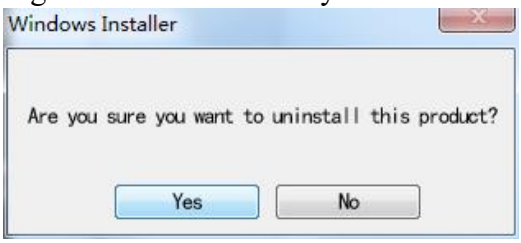


4.3 Software Uninstall

There are two ways to safely uninstall BK-CW2000 software.

One way, through [Control Panel], enter the [Add or Remove Programs] dialog, select [BK-CW2000], and click the [uninstall] button.

The other way, in the [Start] menu, select [BK-CW2000] and [UninstallBK-CW2000] in [All Programs], and the uninstall progress will automatically uninstall the BK-CW2000 software.



Chapter 5. Software Operation

5.1 Overview

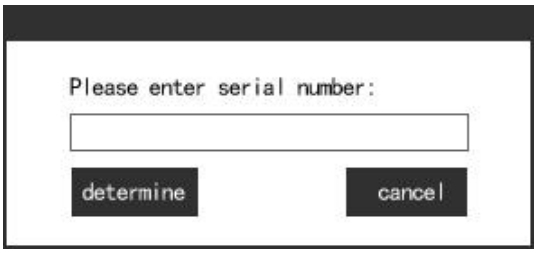
Basic instrument operation and software operation of BK-CW2000 are described in this chapter so that user can quickly handle the operation. Generally, if a new system is installed, or there is any change from the hardware or software, recalibrating the instrument under the guidance of authorized maintenance engineer is suggested.

5.2 System Start

Following are the steps of system start.
Step 1: Start the computer.
Step 2: Connect the instrument and computer with the USB cable. And connecting to the USB interface on the rear panel of the computer is suggested. Then, power on the instrument.
Step 3: Start BK-CW2000 software program. User can open “Start” menu or double click the shortcut icon on the desktop. The menu path to start BK-CW2000 software program is usually as following: “All Programs”>“BK-CW2000”>“BK-CW2000.exe”. Then, the instrument will start initialization as shown in following picture.

Note: If the connection to the instrument and computer is incorrect, or the drive program is improperly installed, a failure prompt will be shown.

Note: User should input the serial number at the first use. The serial number is a group of character string with sixteen characters that labeled on the disc. Input null or input with incorrect serial number may cause inaccurate measurement result.



Step 4: Enter the main interface of the software after successfully starting the program.

5.3 Measurement Mode Selection

After completing the instrument initialization and inputting the serial number, it will enter the measurement mode selection interface. There are two modes for chosen, pedestal mode (for micro-volume measurement) and cuvette mode (for traditional cuvette measurement).

Pedestal Mode: Click "Platform Mode" to enter micro-volume measurement interface.

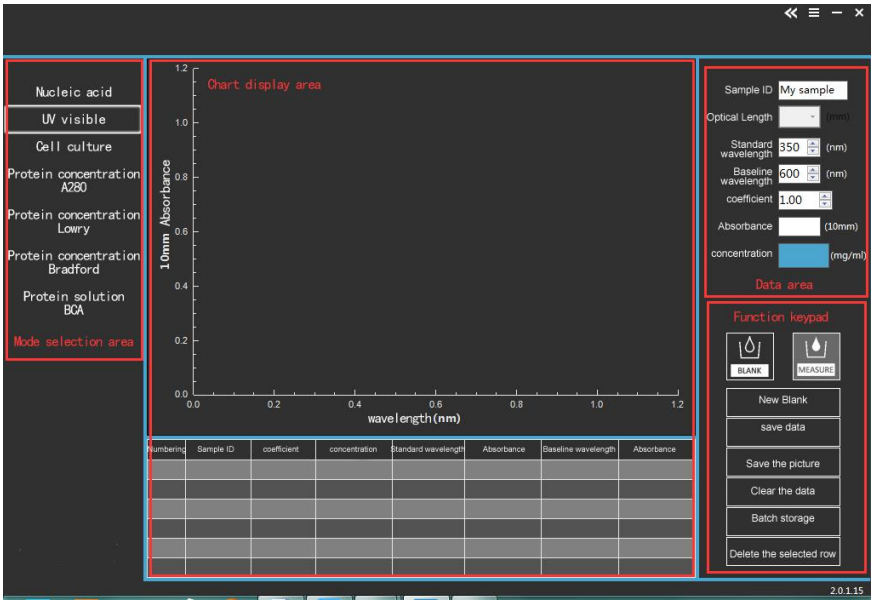
Cuvette Mode: Click "Cuvette Mode" to enter cuvette measurement interface.

Setting: Click "Setting" to enter parameters setting interface.

5.4 Software Operation

5.4.1 Software Interface

The software interface is shown in the following picture. It includes several parts: measurement function selection buttons in the left pane, graph display and datasheet in the middle pane, measurement settings and current records in the upper right pane, action buttons in the lower right pane, and system toolbar at the top right corner.



The system toolbar includes three buttons: Information button, Minimize button and Close button.

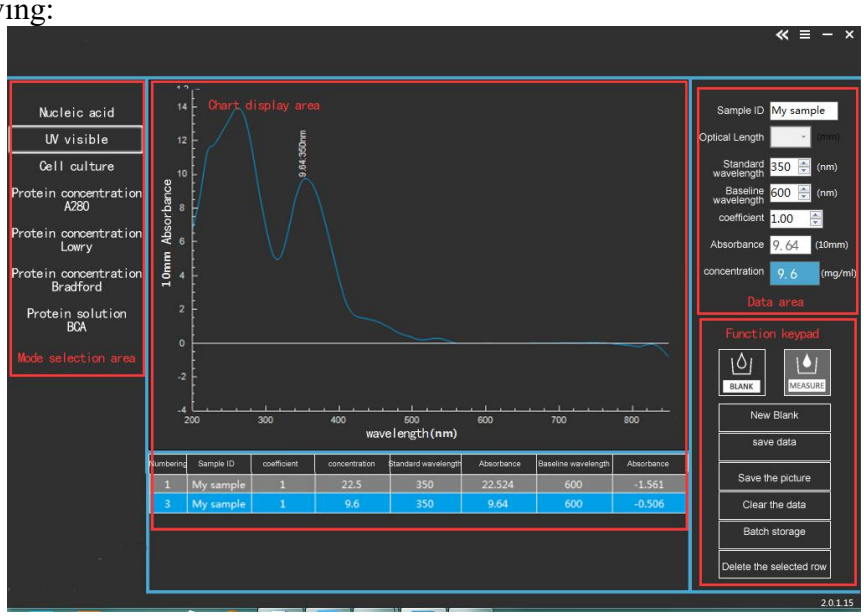
Click the Information button “  ”, and click “Help”, user can view the user’s manual.

A message window will pop up . User can login the website and contact us.

For micro-volume measurement, there are seven measurement functions for chosen: Nucleic Acid, UV-VIS (for full spectrum measurement), Cell Culture, Protein Concentration A280, Protein Concentration Lowry, Protein Concentration Bradford, and Protein Concentration BCA.
For cuvette measurement, besides above functions, Kinetics function also can be chosen.

5.4.2 UV-VIS

Select “UV-VIS” in the left pane to enter UV-VIS (for full spectrum measurement) interface which is shown as following:



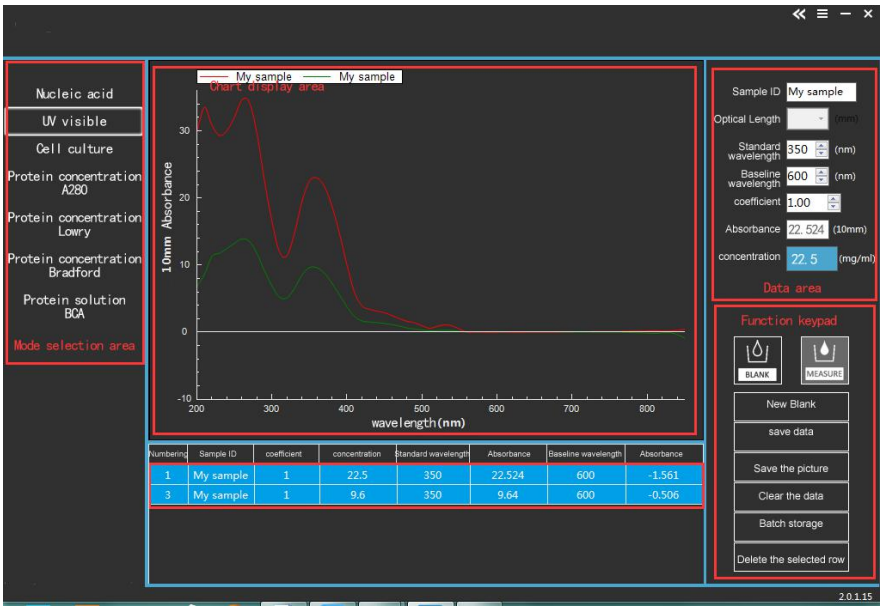
1. Graph display and datasheet

Following operations can be done in the graph display and datasheet area:

1) Graphic Overlay: Multiple curves will be shown in the same graph when several groups of data are selected. And the selected data are marked in blue.

2) Graphic Display: The measurement data will be shown as a curve in the graph display area, and it can be in Absorbance mode and Intensity mode. User can browse the absorbance or intensity data at any wavelength by cursor positioning.

3) Datasheet: The measurement data are recorded in tabular form. And they can be recorded in ascending or descending order.



2. Measurement settings and current records

Following operations can be done in the measurement settings and current records area:

1) Sample ID: User can input the Sample ID with numbers or English characters.

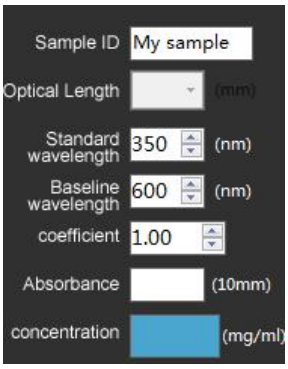
2) Path Length: User can select the path length. It's available only for cuvette measurement mode.

3) Standard Wavelength: The absorbance under this wavelength is used to calculate the sample concentration.

4) Baseline Wavelength: It allows for specification of a wavelength for the dichromatic normalization of absorbance data for the entire spectrum. The baseline is automatically set to the absorbance value of the sample at the reference wavelength. All wavelength data will be referenced off of this value. If the baseline correction is not utilized, the spectra will be offset from the baseline.

5) Coefficient: It's a slope of the standard curve, which is used together with the absorbance to calculate the sample concentration.

6) Concentration: It displays the concentration result of sample measurement, and uses mg/ml as the concentration unit.



3. Action buttons

There are eight action buttons in the lower right pane.

1) Blank: The spectrum of blank solution is taken and stored in memory as a reference light intensity. When the sample spectrum is taken, the intensity of light transmitted through the sample is recorded. The sample intensity along with the blank intensity is used to calculate the sample absorbance.

Blank measurement should be done at any situation described in following:

a. Before sample measurement.

b. When switching the measurement mode.

c. More than half an hour after last blank measurement.

Following are the blanking steps:

Step 1: Clean the pedestal surfaces.

Step 2: Load the blank solution onto the lower measurement pedestal, then, put down the sampling arm.

Step 3: Click the action button “  ” to measure and store the reference spectrum.

2) Measure: The spectrum of sample solution is taken, and the intensity of light transmitted through the sample is recorded. The sample intensity along with the blank intensity is used to calculate the sample absorbance. Then, the sample concentration calculated with the absorbance is obtained.

Following are the sample measuring steps:

Step 1: Make sure the blank measurement is already done. Then, wipe the blank solution from both measurement pedestal surfaces with a dry laboratory wiper.

Step 2: Load the sample solution onto the lower measurement pedestal and put down the sampling arm.

Step 3: Input the sample ID in the upper right pane.

Step 4: Click “  ” and the sample measurement result will be recorded.

3) New Blank: Establish a new blank measurement.

4) Save Data: User can click “Save Data” to save the measurement result. It will be saved in the specified path with “.xls” format.

5) Save Graph: Save the current measurement spectrum by clicking “Save Graph”. It will be saved in the specified path with “jpeg” format.

6) Batch Save Graphs: All current measurement spectrums can be saved by clicking “Batch Save Graphs”, and they will be saved in the specified path with “jpeg” format.

7) Clear Data: All current measured data will be deleted by clicking “Clear Data”. However, the

measuring data couldn’t be deleted.

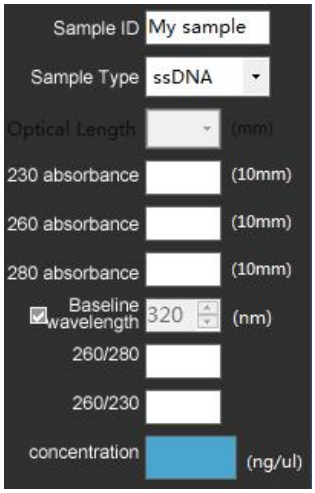
8) Delete Selected Data: User can delete the data of selected row by clicking “Delete Selected Data”.

5.4.3 Nucleic Acid

The interface of Nucleic Acid is similar to UV-VIS (refer to chapter 5.4.2). Some differences in the interface are described as following.

1. Measurement setting and current records

The measurement setting and current records area is shown in following picture:



1) Sample ID: User can input the sample ID with numbers and English characters.

2) Sample Type: Kinds type of nucleic acid sample can be chosen, such as dsDNA, ssDNA, RNA, Oligo and other types.

3) Concentration: It displays the sample concentration result which is calculated based on absorbance at 260 nm and the default or user defined extinction coefficient. The concentration unit is ng/μL.

Following are the calculation formulas for each type of nucleic acid sample:

Concentration of dsDNA = $A_{260nm} \times 50$

Concentration of ssDNA = $A_{260nm} \times 33$

Concentration of RNA = $A_{260nm} \times 40$

Concentration of Other Type = $A_{260nm} \times 1$

4) A_{230nm}: It displays the absorbance at 230 nm normalized to a 10 mm path length.

5) A_{260nm}: It displays the absorbance at 260 nm normalized to a 10 mm path length.

6) A_{280nm}: It displays the absorbance at 280 nm normalized to a 10 mm path length.

7) Baseline Wavelength: User can input a wavelength for dichromatic normalization of the absorbance data. If it is selected, the baseline will be automatically set to the absorbance value of the sample at this wavelength. And all wavelength data will be referenced off this value. However, to obtain a more stable and accurate result, a reference wavelength of 320nm is suggested.

8) 260/280: It’s a ratio of absorbance at 260 nm and 280 nm, which is used to assess the purity of DNA and RNA. A ratio of about 1.8 is generally accepted as “pure” for DNA, and a ratio of about 2.0 is generally accepted as “pure” for RNA. If the ratio is appreciably lower in either case, it may indicate the presence of protein, phenol or other contaminants that absorb strongly at or near 280 nm.

9) 260/230: It’s a ratio of absorbance at 260 nm and 230 nm, which is a secondary value to assess the nucleic acid purity. For a “pure” nucleic acid, the 260/230 value is often higher than the 260/280 value, and it is commonly in the range of 1.8-2.2. If the ratio is appreciably lower, it may indicate the presence of contaminants.

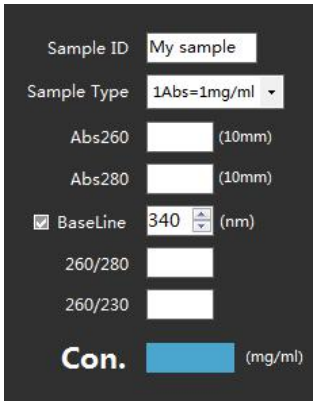
10) Path Length: The path length selection is available only for cuvette measurement mode.

5.4.4 Protein Concentration A280

The interface of Protein Concentration A280 Measurement is similar to Full Spectrum Measurement (refer to chapter 5.4.2). Some differences in the interface are described as following.

1. Measurement setting and current records

The measurement setting and current records area is shown in following picture:



1) Sample ID: User can input the sample ID with numbers and English characters.

2) Sample Type: Kinds type of protein sample can be chosen, such as 1 Abs = 1 mg/ml, BSA, IgG, Lysozyme, and other types. The choice of sample type has a great influence on the final result, so that it should be chosen correctly.

Following are detail descriptions of above types:

1 Abs= 1 mg/ml: A general reference setting based on a 0.1% (1 mg/ml) protein solution that producing an Absorbance of 1.0 A at 280 nm (with a normal path length of 10 mm).

BSA: Bovine Serum Albumin reference. The sample concentration is calculated with the mass extinction coefficient of 6.7 (with a normal path length of 10 mm) at 280 nm for a 1% (10 mg/ml) BSA solution.

IgG: IgG reference. The sample concentration is calculated with the mass extinction coefficient of 13.7 (with a normal path length of 10 mm) at 280 nm for a 1% (10 mg/ml) IgG solution.

Lysozyme: Lysozyme reference. The sample concentration is calculated with the mass extinction coefficient of 26.4 (with a normal path length of 10 mm) at 280 nm for a 1% (10 mg/ml) Lysozyme solution.

Other types: User-entered mass extinction coefficient (L/gm-1cm-1) for a 1% (10 mg/ml) solution of the respective reference protein.

3) Concentration: It displays the sample concentration result which is calculated based on absorbance at 280 nm and the selected extinction coefficient. The concentration unit is mg/ml.

Following are the calculation formulas for each type of nucleic acid sample:

Concentration of 1 Abs= 1 mg/ml = $A_{280nm} \times 10$

Concentration of BSA = $A_{280nm} \times 10 / 6.7$

Concentration of IgG = $A_{280nm} \times 10 / 13.7$

Concentration of Lysozyme = $A_{280nm} \times 10 / 26.4$

Concentration of Other Type = $A_{260nm} \times 1$

4) A_{260nm}: It displays the absorbance at 260 nm normalized to a 10 mm path length.

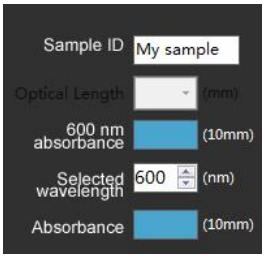
5) A_{280nm}: It displays the absorbance at 280 nm normalized to a 10 mm path length.

6) Baseline Wavelength: User can input a wavelength for dichromatic normalization of the absorbance data. If it is selected, the baseline will be automatically set to the absorbance value of the sample at this wavelength. And all wavelength data will be referenced off this value. However, to obtain a more stable and accurate result, a reference wavelength of 340nm is suggested.

7) 260/280: It's a ratio of absorbance at 260 nm and 280 nm, which is used to assess the purity of DNA and RNA. A ratio of about 1.8 is generally accepted as "pure" for DNA, and a ratio of about 2.0 is generally accepted as "pure" for RNA. If the ratio is appreciably lower in either case, it may indicate the presence of protein, phenol or other contaminants that absorb strongly at or near 280 nm.
8) Path Length: The path length selection is available only for cuvette measurement mode.

5.4.5 Cell Culture

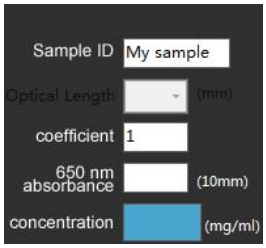
The interface of Cell Culture Measurement is similar to Full Spectrum Measurement (refer to chapter 5.4.2). Some differences in the interface are described as following.



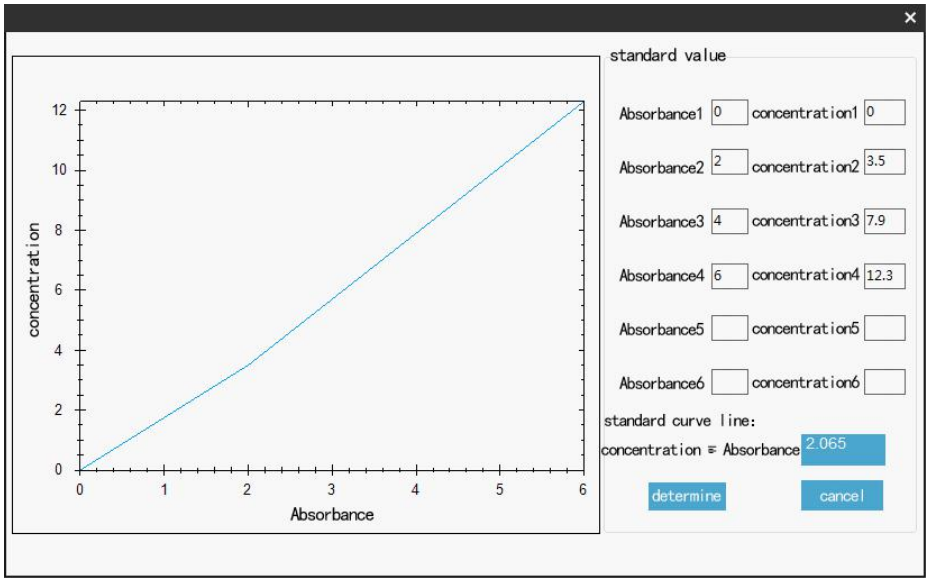
1) Sample ID: User can input the sample ID with numbers and English characters.
2) A_{600nm}: It displays the absorbance at 600 nm.
3) Selected Wavelength: User entered wavelength in a range of 250 nm-700 nm, to obtain the absorbance at the selected wavelength.
4) Absorbance: It displays the absorbance at the selected wavelength.
5) Path Length: The path length selection is available only for cuvette measurement mode.

5.4.6 Protein Concentration Lowry

The system provides several protein quantitation methods and this method is based on Lowry procedure at the specified wavelength (650 nm).
The interface of Protein Concentration Lowry Measurement is similar to Full Spectrum Measurement (refer to chapter 5.4.2). Some differences in the interface are described as following.



1) Sample ID: User can input the sample ID with numbers and English characters.
2) Coefficient: It's a slope of the standard curve, which is used together with the absorbance to calculate the sample concentration.
3) A_{650nm}: It displays the absorbance at 650 nm normalized to a 10 mm path length.
4) Concentration: It displays the concentration result of sample measurement, and uses mg/ml as the concentration unit.
The concentration calculation formula is as following:
Concentration = $A_{650nm} \times$ Coefficient
5) Standard Curve: The standard curve is established based on the concentrations of standard samples and relative absorbance values, which is used to calculation the concentration of samples of the same type. Following is the plot of standard curve.



User can prepare a group of standard solutions that diluted from a certain concentration with different ratios. Then, respectively input the concentration value and measure each to obtain its absorbance value. After that, the system will calculate the coefficient between the concentration and the absorbance, and displays the standard curve and its coefficient. Up to six points of the standard solutions group can be input.

6) Path Length: The path length selection is available only for cuvette measurement mode.

5.4.7 Protein Concentration Bradford

The protein quantitation method is based on Bradford procedure at the specified wavelength (595 nm).

The interface of Protein Concentration Bradford Measurement is similar to Protein Concentration Lowry Measurement (refer to chapter 5.4.6).

5.4.8 Protein Concentration BCA

The protein quantitation method is based on BCA procedure at the specified wavelength (562 nm).

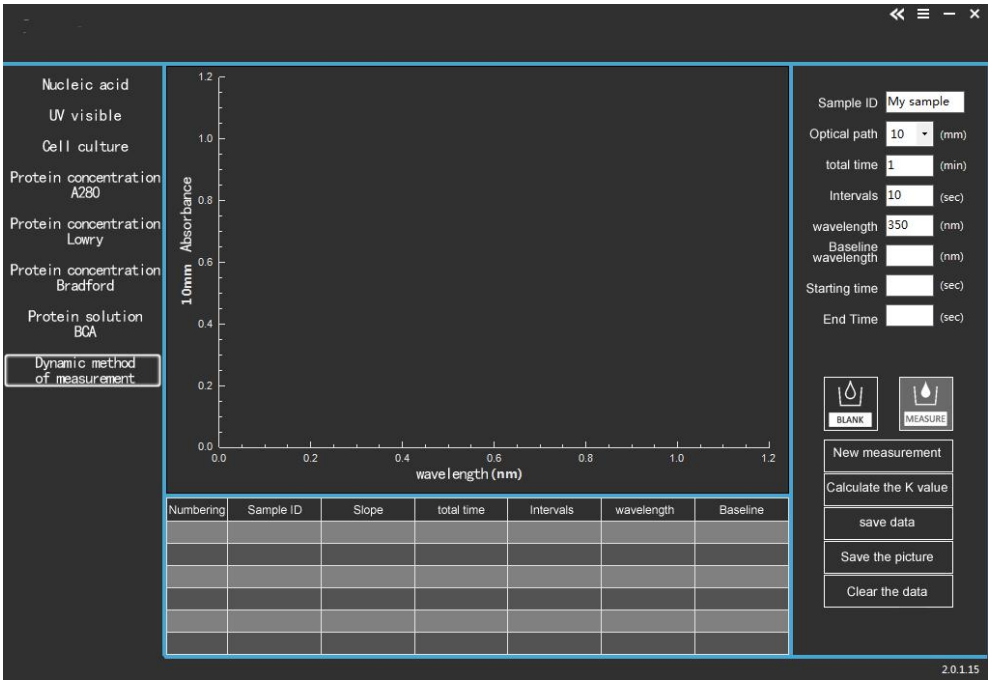
The interface of Protein Concentration BCA Measurement is similar to Protein Concentration Lowry Measurement (refer to chapter 5.4.6).

5.4.9 Kinetics

The Kinetics Measurement can be chosen under the cuvette measurement mode.

User can select cuvette mode to enter the interface of the cuvette measurement mode (refer to chapter 5.3).

The interface of Kinetics Measurement is as following:



1) Sample ID: User can input the sample ID with numbers and English characters.
2) Path Length: User can select the path length for measurement.
3) Total Time: Input the total measurement time.
4) Intervals: Input the time interval for each measurement.
5) Wavelength: Input the measurement wavelength, and the absorbance used to calculate the concentration will be obtained at this wavelength.
6) Baseline Wavelength: It allows for specification of a wavelength for the dichromatic normalization of absorbance data for the entire spectrum. If it is selected, the baseline will be automatically set to the absorbance value of the sample at this wavelength. And the measurement wavelength data will be referenced off this value.
7) Starting Time: Set the starting time for calculation.
8) End Time: Set the end time for calculation.

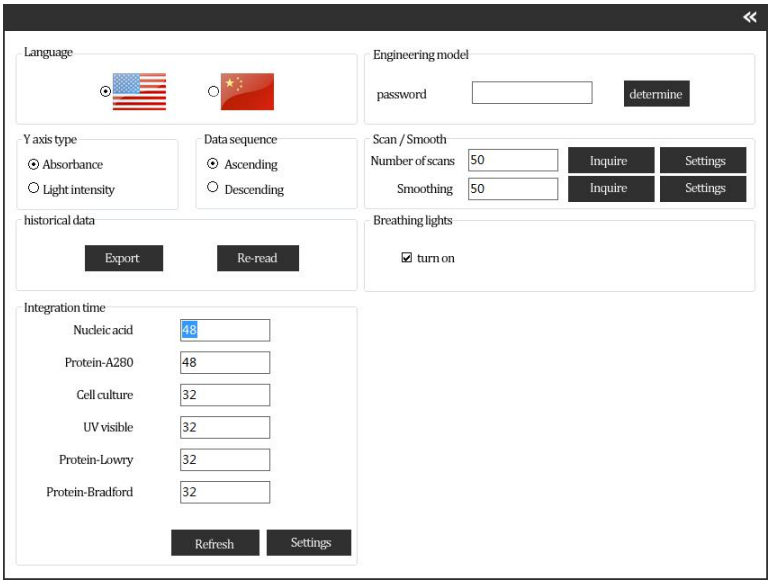
Do blanking with a blank solution after completing the measurement settings, then, add the sample solution and click " 

", it will be automatically heated to 37℃. Then, the kinetics measurement will start. User can select the calculation time range after completing the measurement, input the starting time and click " 

" to obtain the result.

5.4.10 Setting

The system provides the function of parameters setting. User can select certain settings as demanded. The setting interface is shown as following.

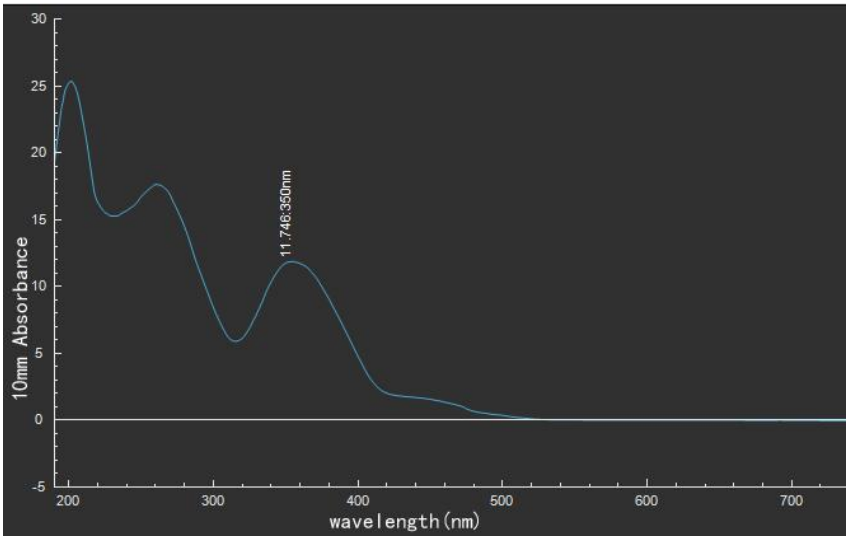


1. Language

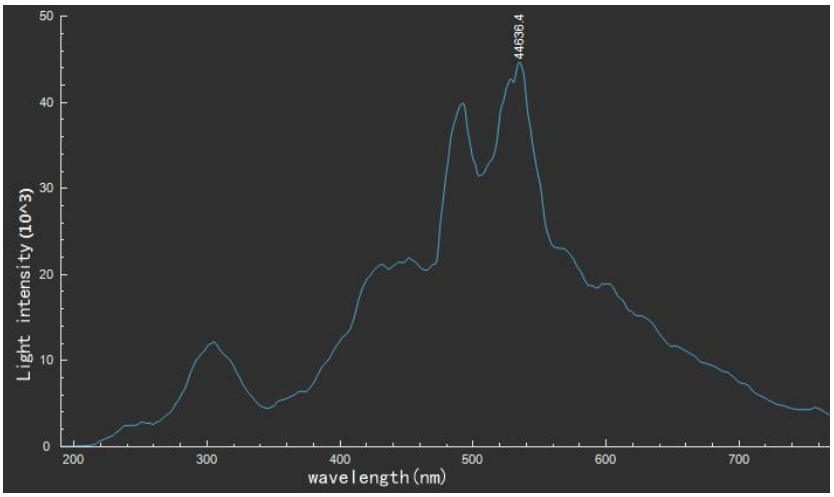
If necessary, user can switch the language from English to Chinese.

2. Y-axis

The display of Y-axis can be switched between Absorbance and Light Intensity. If “Absorbance” is chosen, it displays the absorbance spectra that shown as following:



If “Light Intensity” is chosen, it displays the spectra of blank intensities or sample intensities that shown as following:



3. Data Sequence

Data in the datasheet can be recorded in ascending or descending order.

4. History Data

The system will automatically back-up real-time data during the measurement, so that user can click "Reload" to retrieve the data and continue the measurement in case of power off, computer faults or other unexpected situations.

5. Integration Time

Generally, it's no need to change the default value of integration time that set for each measurement mode.

6. Engineering model (Debugging Module)?

This module is only for the maintenance service. In the case of instrument faults, the parameters adjustments in this module should be done under the guidance of the technical personnel.

Chapter 6. Basic Operation

First, select the right measurement function mode after entering the software interface. Then, continue the operation procedures as following.

6.1 Pedestal Measurement

6.1.1 Path Length Selection

There are two path lengths for chosen, 1 mm and 0.2mm. Absorbance values under each path length will be obtained automatically during the measurement. However, the measurement result will be given based on 1 mm path length when the sample absorbance value is less than 10, otherwise, the measurement result will be given based on 0.2mm.

6.1.2 Operation Procedures

The operation procedures include three steps, measurement function mode selection, blanking, and sample measurement.

Step 1: Measurement Function Mode Selection

User should select the right measurement mode first.

Step 2: Blanking

First, clean the measurement pedestal. Load the blank solution onto the lower measurement pedestal and put down the sampling arm, wipe the blank solution from both measurement pedestal surfaces with a dry laboratory wiper.

Then, do blanking. Load the blank solution onto the lower measurement pedestal and put down the sampling arm, click the action button “ 

” to do blanking. Then, replace with a fresh aliquot of blank solution and take it as a sample, click “ 

” to record the value. The measuring result (equivalent to 10 mm path length) should be no more than the value described in following table. Otherwise, repeat the blanking circle.

	ssDNA (ng/μL)	dsDNA (ng/μL)	RNA (ng/μL)	BSA (mg/mL)
Measurement Result for Blank Solution	±0.3	±0.5	±0.4	±15

Step 3: Sample Measurement

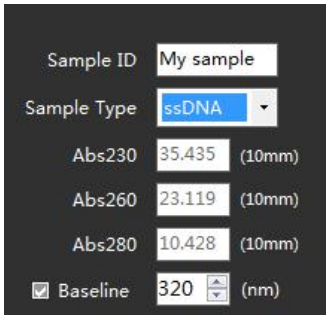
Wipe the blank solution from both measurement pedestal surfaces with a dry laboratory wiper. Then, load the sample solution onto the lower measurement pedestal and put down the sampling arm. Click " 

" to record the value.

At last, data processing can be done as user demanded.

Following are the operation procedures of ssDNA Measurement as an example:

1. Enter the Nucleic Acid measurement interface.
2. Select "ssDNA" as the sample type in the upper right pane.



3. Load 1.5 μL blank solution onto the lower measurement pedestal and put down the sampling arm, click the action button " 

" to do blanking.

Note: The reference, or blank solution, generally is the buffer that the molecule of interest is suspended or dissolved in. It should be the same pH and of a similar ionic strength as the sample solution.

4. Wipe the blank solution from both measurement pedestal surfaces with a dry laboratory wiper. Then, load 1.5μL sample solution onto the lower measurement pedestal and put down the sampling arm. Click " 

" after inputting the sample ID, and the sample result will be obtained.

Note: A fresh aliquot of sample should be used for each measurement. Wipe off the sample solution from both measurement pedestal surfaces with a dry laboratory wiper after completing the measurement. So that it is ready for next sample measurement.

6.2 Cuvette Measurement

6.2.1 Path Length Selection

There are four path lengths for chosen, 10 mm, 5 mm, 2mm and 1mm. Absorbance value under the selected path length will be obtained during the measurement. The final measurement result will be given equivalent to 10 mm path length.

6.2.2 Operation Procedures

The operation procedures include three steps, measurement function mode selection, blanking, and sample measurement.

Step 1: Measurement Function Mode Selection

User should select the right measurement mode first.

Step 2: Blanking

First, clean the measurement pedestal and put down the sampling arm. Rinse the cuvette with blank solution. Then, add blank solution to the cuvette and make sure that the height of liquid is more than 12 mm.

Click “ 

” to do blanking. Then, click “ 

” to record the value. The measuring result (equivalent to 10 mm path length) should be no more than the value described in following table. Otherwise, repeat the blanking circle.

	ssDNA (ng/μL)	dsDNA (ng/μL)	RNA (ng/μL)	BSA (mg/mL)
Measurement Result for Blank Solution	±0.03	±0.05	±0.04	±1.5

Step 3: Sample Measurement

Replace the blank solution with sample solution. Input the sample ID and click “ 

” to record the value.

6.3 Implications of Indicator Lamps

Implications of the instrument's indicator lamps are described in following table.

System Status	Indicator Lamp of Micro-Volume Measurement Mode	Indicator Lamp of Cuvette Measurement Mode
Instrument Power On & Initialization	Shining in red	Shining in red
Entering the main interface of the software	Blue constant light	Blue constant light
After selecting the measurement mode	Blue constant light / Light went out	Light went out / Blue constant light
Raise the sampling arm (Micro-Volume Measurement Mode)	Red constant light	Light went out
Measuring (Micro-Volume Measurement Mode)	Shining in blue	Light went out
Measurement is completed (Micro-Volume Measurement Mode)	Blue constant light	Light went out
Measuring (Cuvette Measurement Mode, excluding Kinetics)	Light went out	Shining in blue
Kinetics Heating	Light went out	Shining in red
Constant temperature during Kinetics	Light went out	Red constant light
Kinetics Measuring	Light went out	Shining in red
Kinetics Measurement is completed	Light went out	Blue constant light

Chapter 7. Maintenance

7.1 Consumables and Replacement

Generally, the Xenon flash lamp is the only consumable that maybe replaced. 30 million times measurement with the Xenon flash lamp of BK-CW2000 is possible in theory. However, the residual service life of the Xenon flash lamp couldn't be detected. Its output turns extremely unstable or even completely dark when approaching to the exhaustion. There are two methods to estimate the situation:

1. In the UV-VIS measurement interface, do blanking and measurement, check the absorbance curve and the absorbance readings. It's normal for the absorbance fluctuation in the range of ±0.01. However, if the absorbance fluctuation is greatly out of the range, there may be some problem of stability or service life of the light source.
2. Check the light intensity. If the peak value of light intensity is still lower than 30000 when "Integration Time" setting value reaches 80 ms, it means the light source is too weak to continue the use.

Please contact us or the distributor to replace the light source when appearing above situation.

7.2 Cleaning

The primary maintenance requirement for BK-CW2000 Micro-Volume Spectrophotometer is keeping the measurement pedestal surfaces clean. After completing each sample measurement, wipe the sample from the upper and lower pedestals with a clean, lint-free laboratory wiper to prevent sample carryover and avoid residual accumulation. And thoroughly cleaning the measurement surfaces with ionized water after completing the last measurement is suggested.

The metal part of the instrument is made of stainless steel, and it is resistant to general laboratory solvents. However, it is no need to use special detergent to clean the measurement surfaces. If there is some residue on the surfaces, just use the laboratory wiper dipped with a little medical alcohol to wipe it off. For residue of biological contamination, just wipe with fresh prepared solution of 5.25% sodium hypochlorite to eliminate biological contamination.

7.3 Sample Solvents Applicability

Most solvents used in biological laboratory are applicable to BK-CW2000. However, to prevent the optical fiber surface from corrosion, strong acids and alkalis such as hydrochloric acid, sulphuric acid, hydrofluoric acid and sodium hydroxide are excluded.

7.4 Wavelength Calibration

To obtain the best performance from your instrument, calibrating the wavelength once a year is necessary and it is free. User can contact us or the distributor for wavelength calibration as demanded.

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