



SPECTROPHOTOMETER UV-1600PC UV-VIS

INSTRUCTION MANUAL

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Legal Address of Manufacturer

United States

VWR International, LLC

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Made in China

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Part 1: Spectrophotometer

Safety Information

Please follow the guidelines below, and read this manual in its entirety to ensure safe operation of the unit.

VWR recommends against the use of SPECTROPHOTOMETER UV-1600PC UV-VIS.



- Do not open the device.
- Disconnect the device from the mains supply before carrying out maintenance work or changing the fuses.
- The inside of the device is a high-voltage area Danger!
- Do not use the device if it is damaged, especially if the main power cable way is in any damaged or defective.
- Repairs may only be carried out by the service technicians from your local VWR office and authorized contractual partners.
- The device must be connected to a power outlet that has a protective ground connection.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.



- Do not allow any liquid to enter into the device.
- Do not operate the device in a hazardous location or potentially explosive environment.

Package Contents

Description	Quantity
Spectrophotometer	1PC
Glass Cuvette	4PCS
Quartz Cuvette	2PCS
Power Cord (US Plug)	1PC
USB Cable	1PC
CD-ROM	1PC
Quick Manual	1PC
Instruction Manual	1PC
Dust Cover	1PC

Unpacking

Open the package, according to carefully check the packaging packing list items, if found inside the packaging are missing or damaged items please contact your local VWR office and authorized contractual partners.

Installation

Placement

Place the instrument on the stable table carefully.

Install printer (Optional)

Check to confirm instrument power switch is turned off, connect the printer's data cable to the Instrument's parallel port.

Link the power cord

Check to confirm instrument power switch is turned off, the power cord plug into two separate power interface and power supply socket apparatus.

Intended Use

SPECTROPHOTOMETER UV-1600PC UV-VIS used in Chemistry, Pharmaceuticals, Biochemical, metallurgy, Light Industry, Textile, Material, Environments, Medical, Education and some other fields. It is one of the most important instruments in Quality Control and an essential in normal laboratories.

Symbols and Conventions

The following chart is an illustrated glossary of the symbols that are used in this manual.

	CAUTION This symbol indicates a potential risk and alerts you to proceed with caution
	CAUTION This symbol indicates the presence of high voltage and warns the user to proceed with caution
	CAUTION This symbol indicates risks associated with hot surfaces

Specifications

Optical System	Single Beam
Wavelength Range	190-1100nm
Band Width	4nm
Stray Light	≤0.05%T @ 220nm & 360nm
Photometric Range	0 to 200%T, -0.3 to 3.0A, 0 to 9999C
Wavelength Accuracy	±0.5nm
Photometric Accuracy	±0.5%T or ±0.005A @ 1A
Stability	0.002A/h @ 500nm
Memory	200 Results & 200 Standard Curves
Language	English, French, German, Spanish

Display	128×64 Dots Matrix LCD
Interface	USB, Parallel
Measuring Procedure:	Photometry, Quantitation, Kinetics
Power Supply	AC 110V, 60Hz, 120W
Dimension	490×360×240
Weight	14kg
Work Environment	15 to 35°C, 15 to 70% relative humidity
Store Environment	-10 to 50°C, 15 to 70% relative humidity

This instrument is compliant to the U.S. and Canada Directives on

UL 61010-1 Issued: 2012/05/11 Ed: 3

CSA-C22.2 No. 61010-1 Issued: 2012/05/11 Ed: 3

47CFR Part 15 (2011)

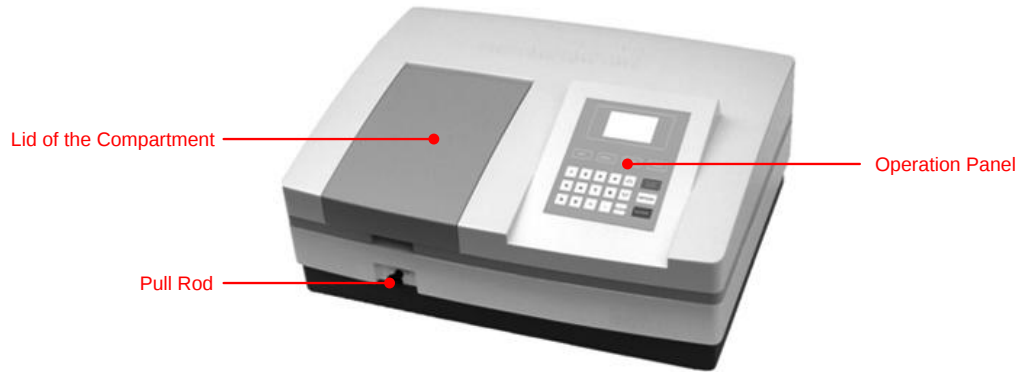
ANSI C63.4 (2009)

Overview

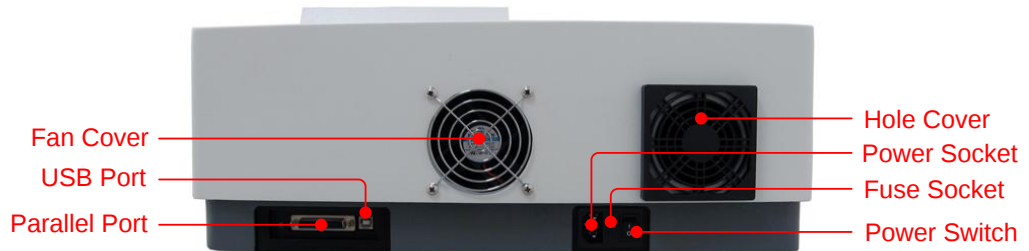
SPECTROPHOTOMETER UV-1600PC UV-VIS has the characters of wide range of wavelength, high sensitivity, powerful function, easy to use, simple structure and pretty figure. Besides these, the large LCD, High Precise A/D and easy to store RAM makes the instrument much more superior than other originals. It is widely used in Chemistry, Pharmaceuticals, Biochemical, metallurgy, Light Industry, Textile, Material, Environments, Medical, Education and some other fields. It is one of the most important instruments in Quality Control and an essential in normal laboratories.

Description of Buttons and Switches

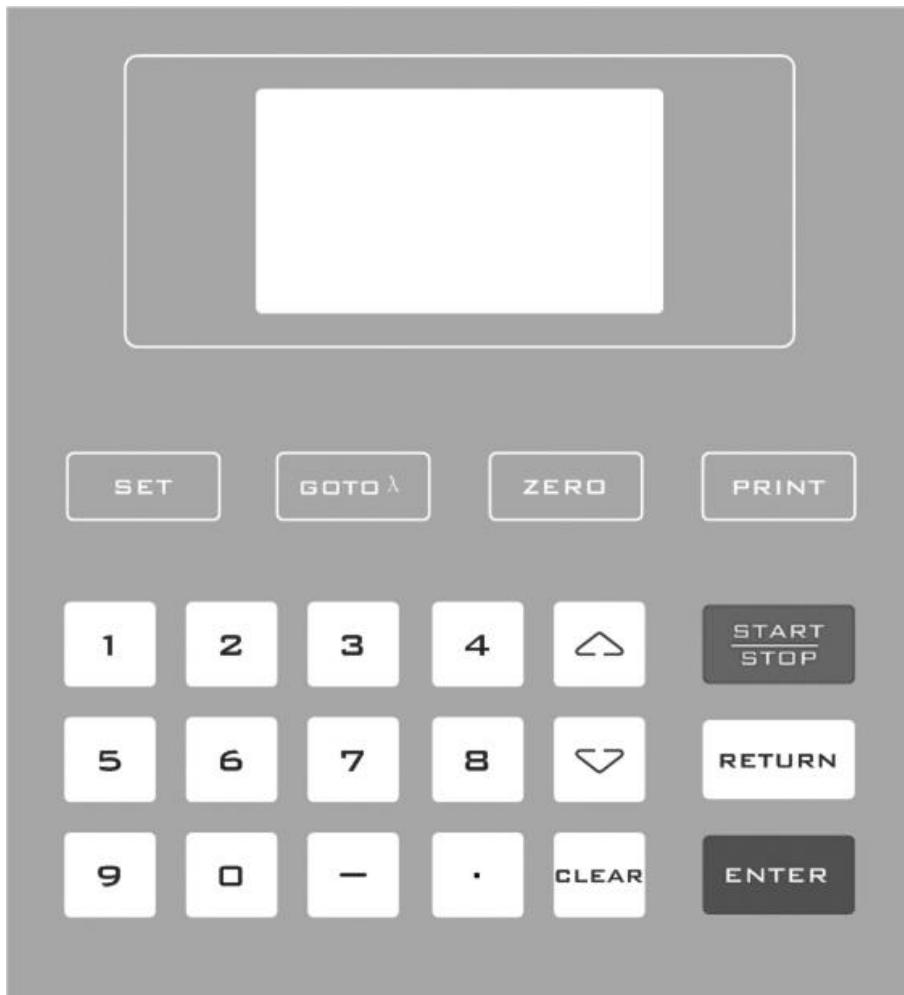
Front View



Rear View



Operational Keys



Key



Functions

SET Key: Set Parameters



GOTO λ Key: Set Wavelength

ZERO

ZERO Key: Blank

PRINT

PRINT Key: Print measuring result

0

9

.

...

Numeric Keys: Enter numbers

CLEAR

CLEAR Key: Delete the input value or stored data

RETURN

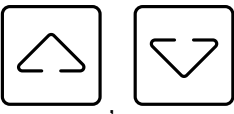
RETURN Key: Return to previous interface

START
STOP

START/STOP Key: Start/Stop testing

ENTER

ENTER Key: Confirm operation



UP, DOWN Keys: Scroll menu/data and set Y scale

Getting Started

The following chart describes the basic operation of the instrument.

Turn On and Self-check

Switch on the power. Then the instrument begins to self-check and 20 minutes' warm up.

Self-check includes the following steps:

✓ **Self-testing**

- ☒ Filter
- ☐ W Lamp
- ☐ D2 Lamp

Turn on lamps → Check Sensor → Initialize AD → System position → Get Dark Current
→ Warm up.

Warm up 20 Minutes,
“Enter” to skip

Important Guidelines

- Reagents and dilution buffers can cause cauterization and other damage to health.
- Samples (nucleic acids, proteins, bacteria cultures) can be infectious and cause serious damage to health.
- During sample preparation, measuring procedures and maintenance and cleaning work, observe all local laboratory safety precautions (e.g. wear protective clothing and gloves, use of disinfectant) regarding the handling of sample material.
- Dispose of measuring solutions and cleaning and disinfectant materials in accordance with the relevant local laboratory regulations.

General Operating Instructions

Select Application

Main menu, press numeric keys or use the key ,  to choose corresponding menu, then press  to enter into.

Set Wavelength

Press  to set wavelength, use numeric keys to input the values, press  to confirm and go to the point you set, then do blank automatically.

Set Parameters

In different application, press  to set parameters, press ,  to choose or input the values by numeric keys, press  to enter into, press  to return.

Set Auto-cell Holder (optional)

Press the numeric key (1-8) to make corresponding cell position at the light path.

Delete the Input Value

Press  to delete all the characters.

Delete the test result and stored data

Press  to delete the test result or stored data.

Blank

Put the Reference in the light path, press  to do blank.

Measure Samples

Put the samples in the light path, press  to measure.

Print the test results

Press  to print the test results.

Store the Standard Curve

After got the Standard Curve by Marked, press ,  to input the file name and press  to save.

Load the Standard Curve

“Quantitation” interface, Press ,  to select “Load Curve”, press ,  to choose the curve you want, press  to open.

Operation

Self-check

Remove all the blocks in the light path and close the lid of the compartment; Switch on the power supply to begin the self-test.

Warm up

After self-test, the instrument goes into pre-warm state. For accurate test, at least 30 minutes of warm up is required.

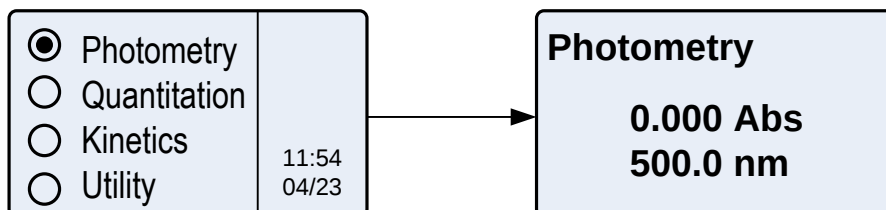
Check the cuvettes

The cuvettes must be clear and there's no remains of the samples on the surface of it. Only Silicon (Quartz) cuvettes are permitted to be used in the range of UV area.

Photometry

1. Enter into Photometry

Main menu, press numeric key  or ,  to choose “Photometry”, then press  to go into.



2. Set Photometric Mode

Press  to set photometric mode. Press ,  to choose “Abs.”, “T%” or “Energy” and press  to confirm. If user choose “Abs.” or “T%”. Press  to return.

3. Set Wavelength

Press  to set wavelength, input the value by the numeric keypad followed with  pressed to confirm.

4. Blank

Put the Reference in the light path and press  to do blank.

5. Measurement samples

Put the sample to be measured in the light path, then the result displays on the screen

automatically, press  to record.

6. Print Test Results

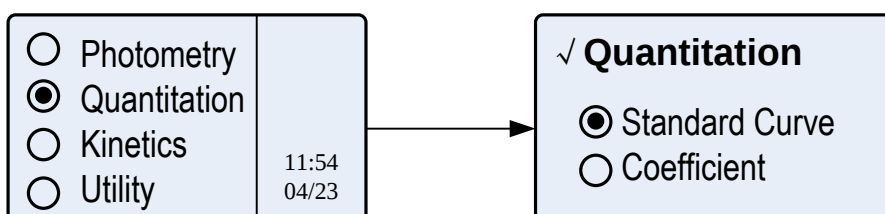
Press the key  to print the Test Results.

```
Photometry
Date&Time: mm-dd-yyyy, hh:mm:ss
Model: UV-1600
Serial No.: UEEXXXXXXX
Firmware Version: x.x.x
VWR International, LLC
No.  WL.(nm)  Abs  %T
1      500.0  0.000 100.0
2      500.0  0.000 100.0
3      500.0  0.000 100.0
End.
```

Quantitation

1. Enter into Quantitation

Main menu, press  or ,  to choose “Quantitation” followed with  pressed to confirm.



2. To establish the standard curve, or call the stored standard curve

Method 1: Use Standard Samples

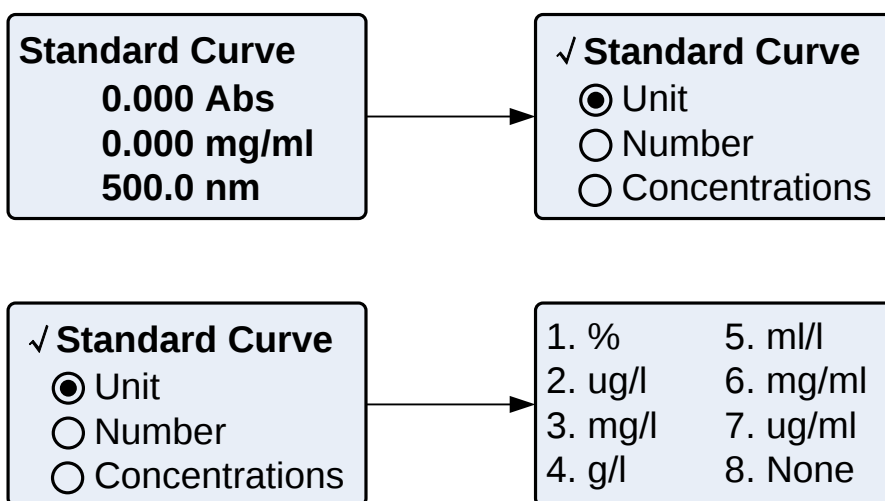
1) Enter into calibration standard samples. Press ,  to select “Standard Curve”, then press  to confirm.

2) **Set Wavelength.** Press **GOTO λ** to go into wavelength setting interface. Input

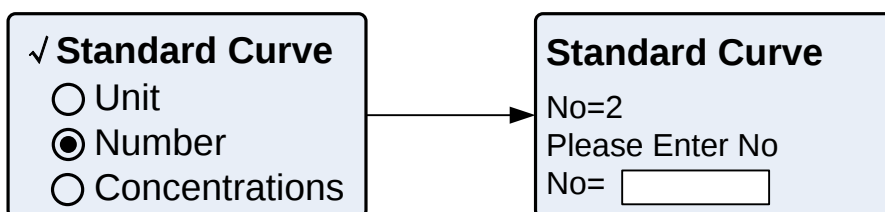
the value of the wavelength and press **ENTER** to confirm.

3) **Blank.** Put the Reference Sample in the light path and press **ZERO** to do blank.

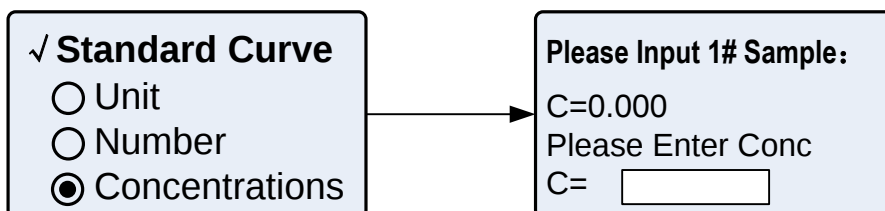
4) **Set Unit.** Press ,  to set "Unit", press **ENTER** to select, press ,  to choose and press **ENTER** to select Unit.



5) **Setup number of Standard Samples.** Press ,  to select "Number", setup number of Standard Samples, press **ENTER** to confirm.



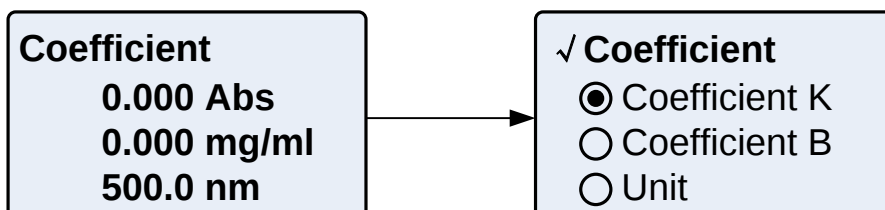
- 6) **Calibrate Standard Samples.** Put the corresponding standard samples in the light path as the screen indicates, input the concentration of the corresponding and press **ENTER** to measure. Press ,  and **ENTER** to input curve name and confirm.

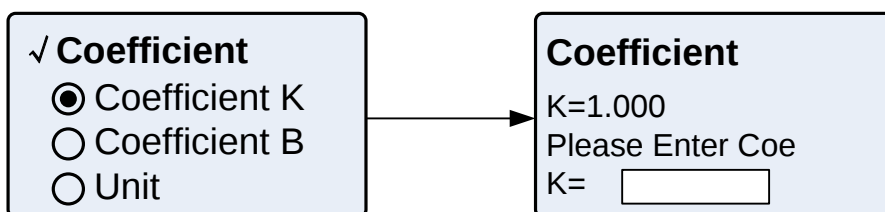


Method 2: Input Regression Equation

- 1) **Enter into Coefficient.** Press ,  to select "Coefficient", then press **ENTER** to confirm.

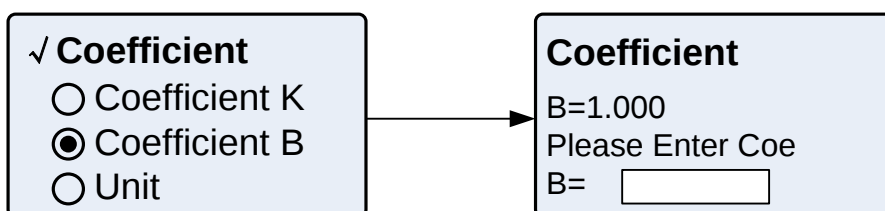
- 2) **Set test coefficient K.** Press ,  to select "Coefficient K", input test coefficient K, press **ENTER** to confirm.



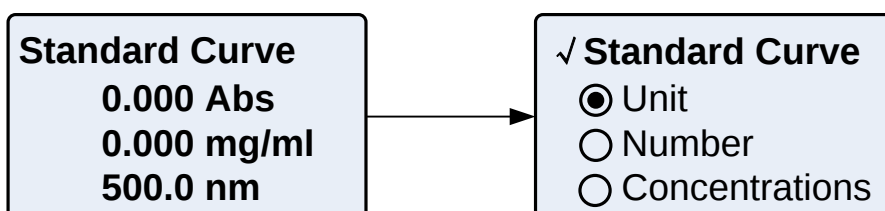


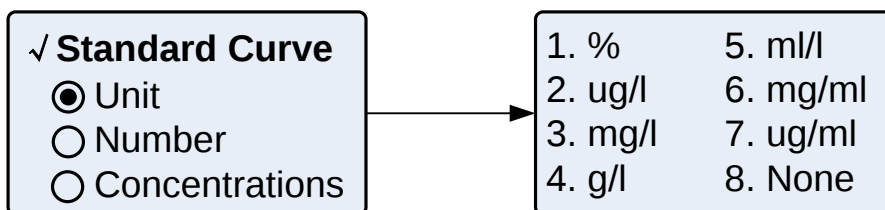
3) **Set test coefficient B.** Press ,  to select “Coefficient B”, input

test coefficient K, press  to confirm.



4) **Set Unit.** Press ,  to set “Unit”, press  to select, press ,  to choose and press  to select Unit.



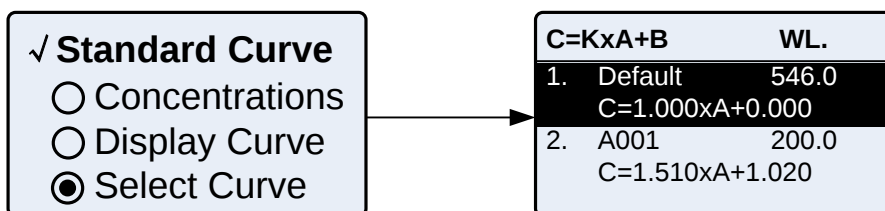


5) **Set Wavelength.** Press GOTO λ to go into wavelength setting interface.

Input the value of the wavelength and press ENTER to confirm.

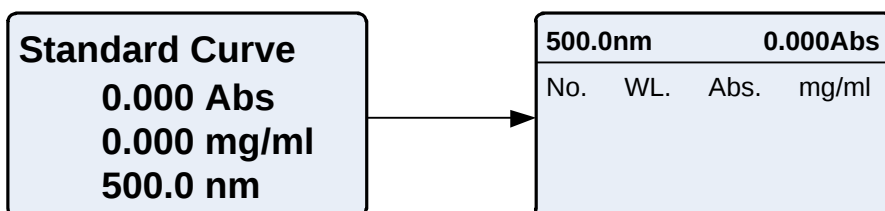
Load the Stored Curve

Press ⬆, ⬇ to choose "Select Curve", press ⬆, ⬇ to choose the cursor, press ENTER to confirm.



3. Return the sample measurement interface

Press START
STOP to return the Quantitative Test interface.



4. Blank

Put the reference in the light path, press **ZERO** to do blank.

5. Measure Samples

Place the sample to be tested in the light path, press **START STOP** to measure. Then the test result will display in the data sheet. Repeat this step to finish measuring all the samples.

6. Print Test Results

Press the key **PRINT** to print the Test Results.

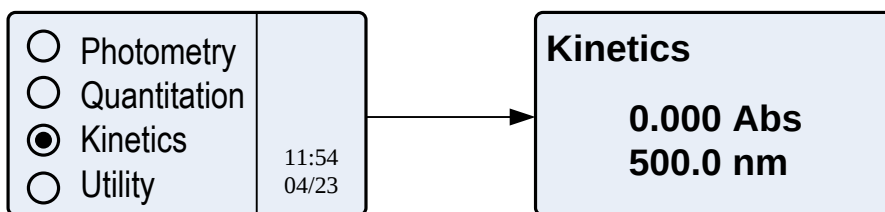
```

Quantitation
Date& Time: mm-dd-yyyy, hh:mm:ss
Model: UV-1600PC
Serial No.: UEEXXXXXXX
Firmware Version: x.x.x
VWR International, LLC
C=1.000*A+1.000
r=1.0000
No.  WL.(nm)  Abs  C(mg/L)
1      500.0  0.120  1.120
2      500.0  0.127  1.127
3      500.0  0.121  1.121
End.
    
```

Kinetics

1. Enter into Kinetics

Main menu, press **3** or ,  to select "Kinetics" and press **ENTER** to confirm.

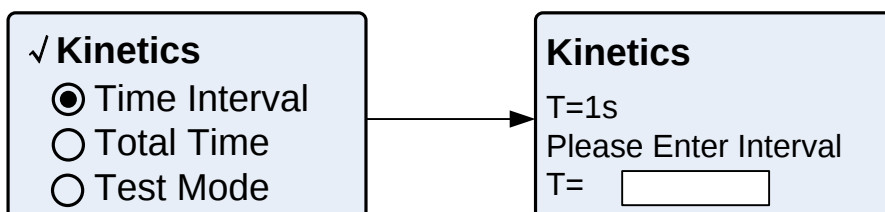


2. Set Wavelength

Press **GOTO λ** to set wavelength, input the value of the wavelength by numeric keypad and press **ENTER** to confirm.

3. Setup Parameters

Press  ,  to select values of "Time Intervals" , "Total Time" , "Test Mode" , "Upper Limited" and "Lower Limited". Press **ENTER** to confirm.

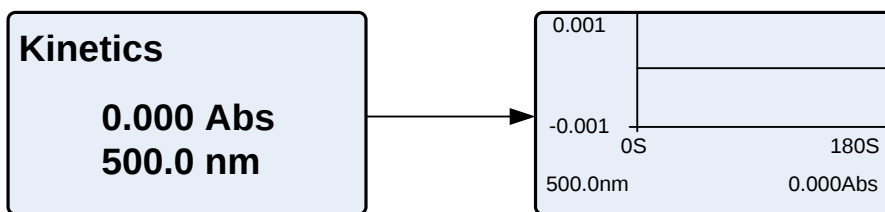


4. Blank

Put the Reference Sample in the light path, press **ZERO** to do blank.

5. Measure Samples

Put the sample in the light path and press **START STOP** to begin the test, repress it to stop, press **RETURN** to cancel.



6. Print Test Results

Press the key **PRINT** to print the Test Results.

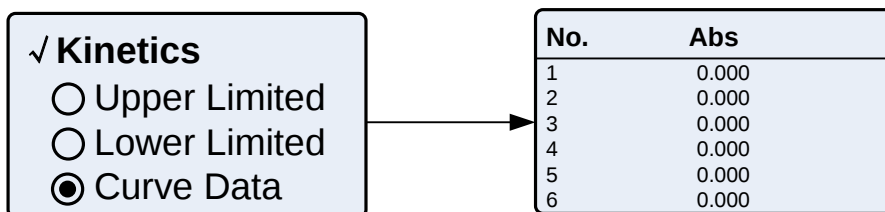
```

Kinetics
Date& Time: mm-dd-yyyy, hh:mm:ss
Model: UV-1600PC
Serial No.: UEEXXXXXXX
Firmware Version: x.x.x
VWR International, LLC WL=500nm
Total Time: 5s
Interval: 1s
No.  Time(s)  Abs    %T
1      1.0  0.000  100.0
2      2.0  0.000  100.0
3      3.0  0.000  100.0
4      4.0  0.000  100.0
5      5.0  0.000  100.0
End.
    
```

7. View Values

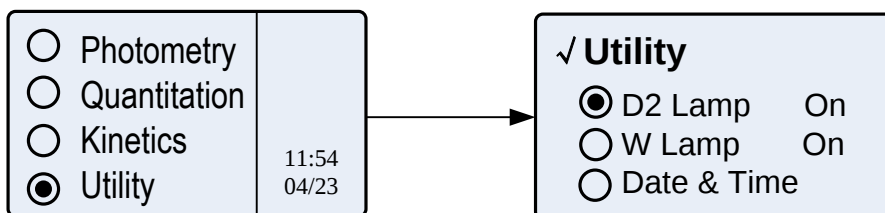
After scan finished, press **RETURN** back to previous interface. Press ,  to

select "Curve Data", press **ENTER** to list all the values..



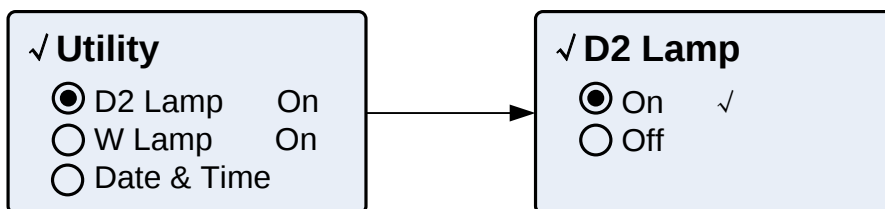
Utility

Main menu, press or use , to select "System Utility" and press to confirm.



Turn On/Off D2 Lamp

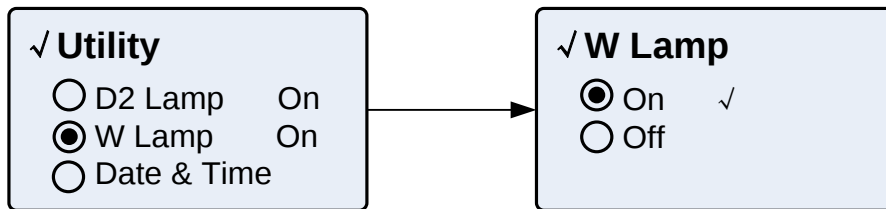
Press , to choose "D2 Lamp", then press to enter into. Press , to choose "On" or "Off", press to turn on/off.



Turn On/Off W Lamp

Press , to choose "W Lamp", then press to enter into. Press

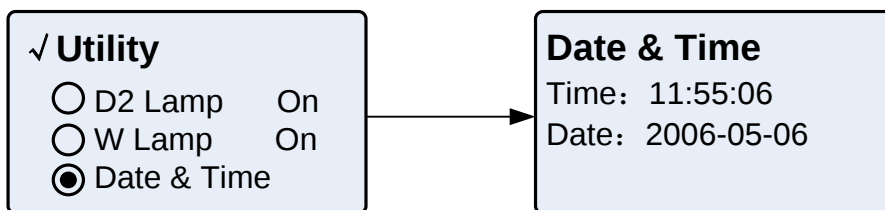
 ,  to choose “On” or “Off”, .press  to turn on/off.



Set Date & Time

Press  ,  to choose “Date & Time”, then press  to enter into. Input

hh:mm:ss and yy-mm-dd, .press  to confirm.

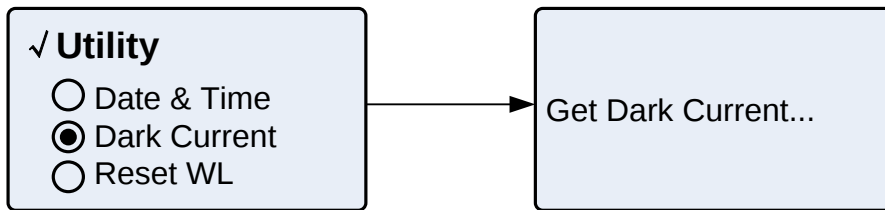


Get Dark Current

Keep the light path without anything blocking, press  ,  to choose “Dark

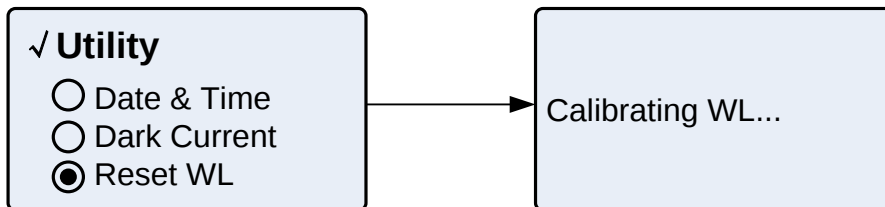
Current”, then press  to resample Dark Current.

Note: During the course, open the lid of the compartment is prohibited.



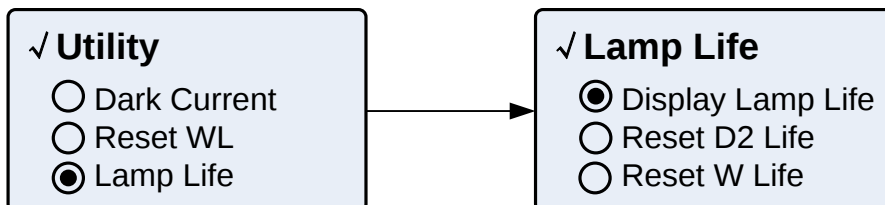
Reset Wavelength

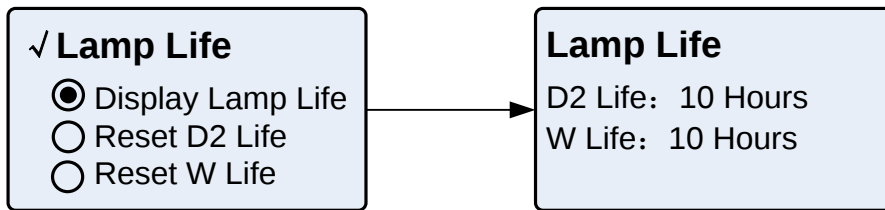
Keep the light path without anything blocking, press ,  to choose “Reset WL”, then press  to reset wavelength.



Lamp Life

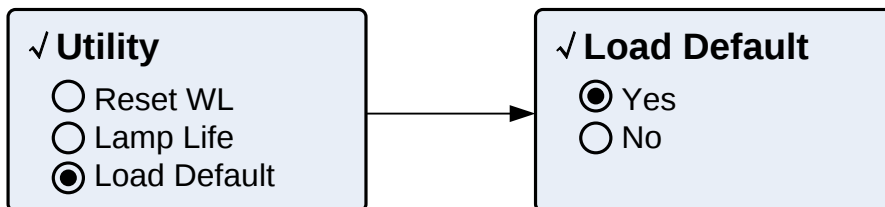
Press ,  to choose “Lamp Life”, then press  to enter into. Select “Display Lamp Life” to view the W Lamp and D2 Lamp has been used time. Select “Reset D2 Life” or “Reset W Life” to reset the time.





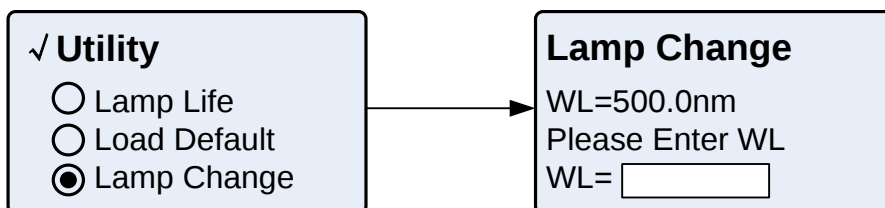
Load Default Parameter

Press ,  to choose "Load Default", then press  to enter into. Select "Yes" to load the parameters to factory setting and the Instrument will restart.



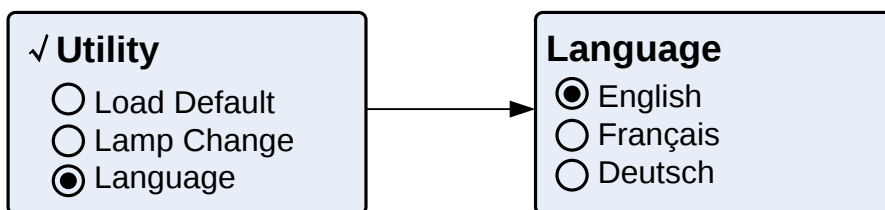
Lamp Change

Press ,  to choose "Lamp Change", then press  to enter into. Input switch wavelength(325—375nm)and press  to confirm.



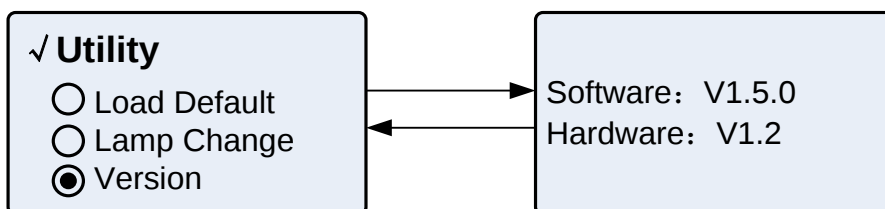
Select Language

Press ,  to choose Language (English, French, German or Spanish), then press  to enter into. ,  to choose and press  to confirm.



About Version

Press ,  to choose "Version", press  to view version information, press any key to return.



Troubleshooting

Review the information in the table below to troubleshoot operating problems.

Problem	Cause	Solution
Power on, no response	Power cord connection is not reliable	Improve connectivity
	Fuse burning	Replace fuse
Measurement uncertainty	Warm up is not enough	Warm up more time
	Glass cuvettes used in UV Range	Use quartz cuvettes
	Sample is not Stable	Improve the sample
	The concentration of sample is too high	Diluted sample

	Power Supply Voltage Low or not Stable	Improve the Power Supply
	Lamp damage or lamp life maturity	Replace lamp
Dark Current Error when self-check	The lid of the compartment is open during self-check	Close the lid, restart
System Calibrate Failed	Something block the Light path	Remove it, calibrate again
Power on, back light is OK, but nothing display on the screen or display is not clear	Display Contrast problem	Adjust the contrast potentiometer
Measurements inaccurate	Cuvettes were contaminated	Clean cuvettes
	Samples were contaminated	Improve samples
	Worse matching of the cuvettes	Improve the matching of the cuvettes
	Dark current error	Resample dark current

Repair and Maintenance

Daily Maintain

Check the compartment

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

Surface clean

The cover of the instrument is with paint. Please use wet towel to wipe off the drips on the surface immediately. Organic solution is forbidden to be used to clean the cover. Please wipe off the dirt on the cover timely.

Clean the cuvettes

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

Check Lamp

Check the W lamp

In “Photometry” mode, set the test parameters as follow:

WL.: 500nm

Test Mode: Energy

Gain: 1

Check the energy, you need replace W lamp as following two cases:

Energy < 20 W lamp is damaged

Energy < 5000 W lamp energy is too low

Check the D2 lamp

In “Photometry” mode, set the test parameters as follow:

WL.: 200nm

Test Mode: Energy

Gain: 1

Check the energy, you need replace D2 lamp as following two cases:

Energy < 20 W lamp is damaged

Energy < 1000 W lamp energy is too low

Spare Parts Replacement

Replace the fuse



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

1. Tools preparation

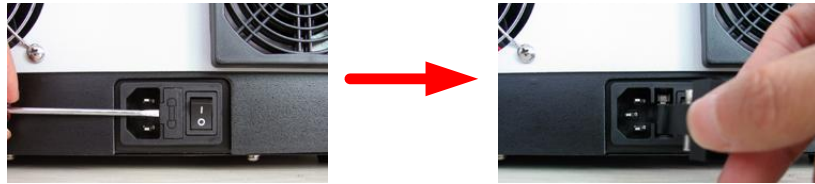
Prepare a 3×75 Flat Blade screwdriver.

2. Switch Off the power supply

Switch off the power supply, and unplug the socket.

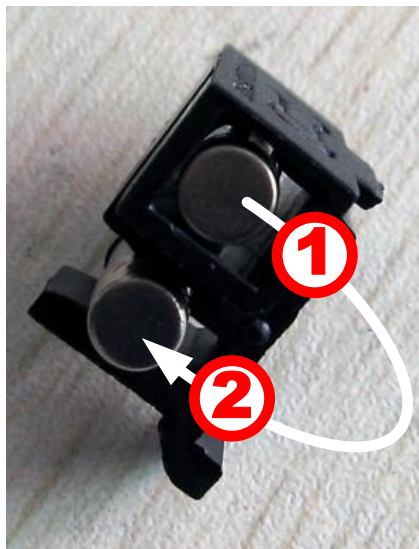
3. Take out the Fuse Seat

Take out the fuse seat by the screwdriver.



4. Replace a new fuse

Pick out the spare fuse (3.15A/250V) and replace it to the working position.



5. Reset the fuse seat

Replace the fuse seat in the power socket.

6. Switch on the power

Plug the socket and switch on the power.

Replace lamps



Hot ! Wait 20 minutes before open the lamp chamber after power off to avoid scald!

1. Tools preparation

Prepare a 6×150mm Cross Blade screwdriver and a pair of glove.

2. Power Off

Switch off the power supply and unplug the socket.

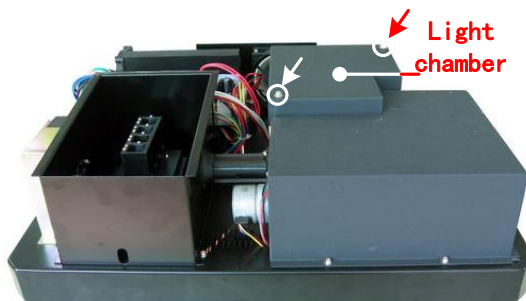
3. Open the cover

Unscrew the 4 screws indicated(Each side with 2 screws) and remove the cover.



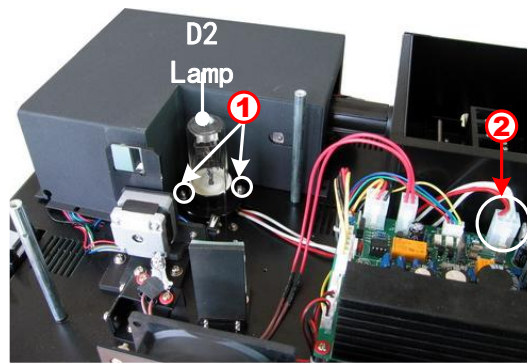
4. Open the cover of the light chamber

Unscrew the 2 screws on the light chamber cover and remove it.



5. Replace the D2 lamp

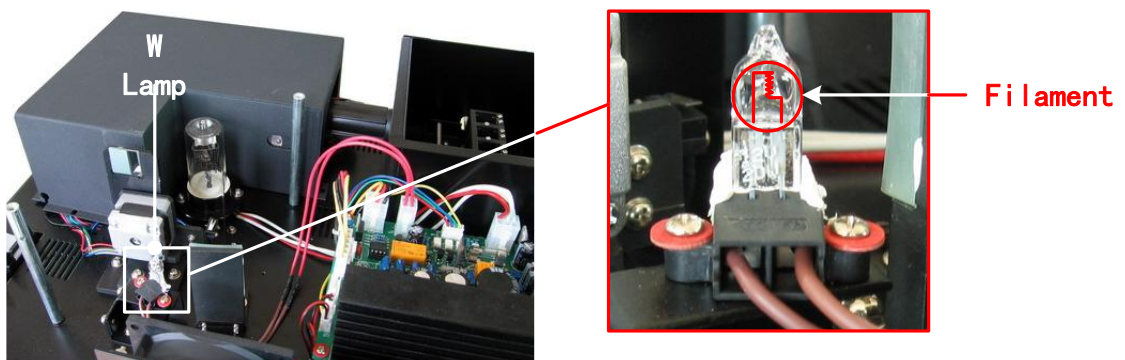
Unscrew the 2 screws on the D2 Flange (No.1), unplug the connector in the power board(No. 2) and remove the D2 lamp. Draw on the cotton glove and replace a new lamp. Fix the 2 screws and plug the connector again.



6. Replace W lamp

The Tungsten lamp is equipped with a blue-grey silicon coating by manufacturer. This coating is only a transport safety device. It can be removed with the first exchange of lamp.

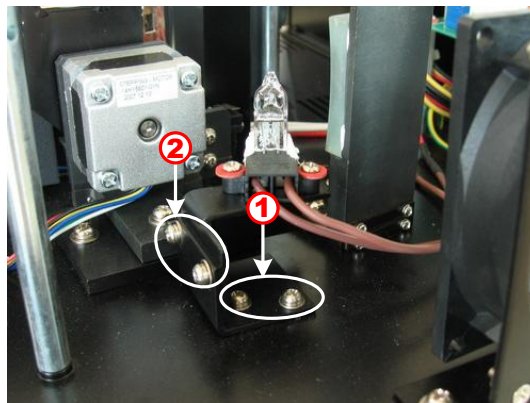
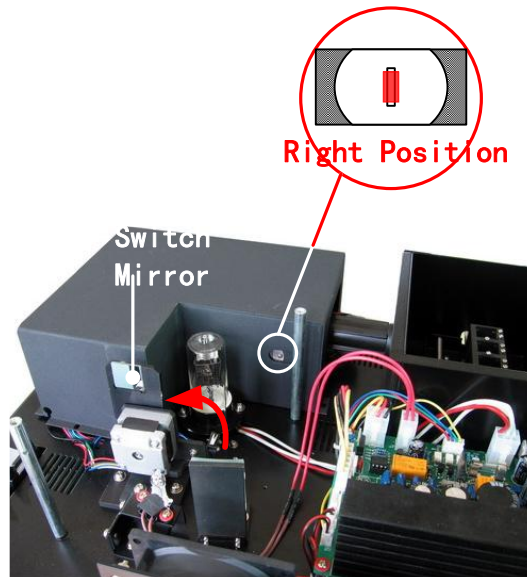
Pull out the defected W lamp and draw on the cotton glove. Insert the new W lamp as deep as possible on the lamp seat. Be sure to keep the filament in the same direction as the old one face.



7. Adjust the position of the W lamp

Switch on the power(the Switch Mirror should be placed to the position as indicates). Observe the entrance facular, and it should in the center of the entrance hole. If the facular deviate to Left or Right, then loosen the No.1 screws in Fig. 5-8 and move the lamp seat to Left or Right until it focus on the center of the slot. Then fix the screws. If the facular deviate to Up and Down, then loosen the No.2 screws and move the lamp

seat Up and Down until the facular focus on the center of the slot. Then fix the No. 2 screws again.



8. Finish

Reset the cover of the light chamber and fix the screws. Reset the cover of the instrument and fix the screws. Recover the Pole in the compartment, then the course finished.

Replace the Battery



Be sure to switch off the power supply and unplug the socket before open the Bottom Cover !

1. Prepare the tools

Prepare a 6×150mm Cross Blade Screwdriver.

2. Switch off the power supply

Switch off the power supply and unplug the socket

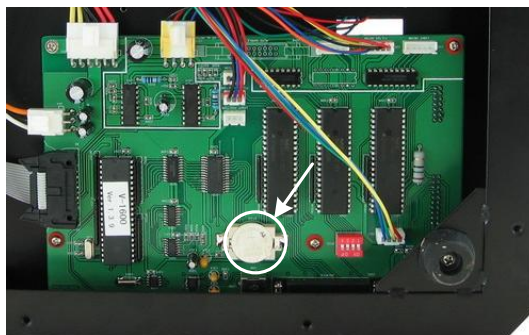
3. Open the Bottom cover plate

Unscrew all the screws indicated then remove the bottom plate.



4. Replace the Battery

Pick out the old battery and replace a new one.



5. Finish

Recover the bottom plate and fix all the screws, then the course finishes.

Accessories and Spare Parts

Description	Quantity	Cat. No.
CELL HOLDER, 4-CELL, 10MM	1PC	10037-444
CELL HOLDER, 4-CELL,10 TO 50MM	1PC	10037-446
CELL HOLDER, 4-CELL, 100MM	1PC	10037-448
CELL HOLDER, FOR CYLINDRICAL CELL	1PC	10037-450
CELL HOLDER, WATER-JACKETED, 1 CELL, 10MM	1PC	10037-452
CELL HOLDER FOR TEST TUBES	1PC	10037-454
CELL HOLDER,8-POSITION AUTO CELL CHANGER	1PC	10037-456
CELL HOLDER, SOLID SAMPLE	1PC	10037-458
CELL HOLDER, WATER-JACKED, 4 CELL, 10MM	1PC	10037-460
CUVETTE, SQUARE.GLASS,10MM	4PCS	10037-462
CUVETTE, SQUARE.GLASS,20MM	2PCS	10037-464
CUVETTE, SQUARE.GLASS,30MM	2PCS	10037-466
CUVETTE, SQUARE.GLASS,50MM	2PCS	10037-468
CUVETTE, SQUARE.GLASS,100MM	1PC	10037-470
CUVETTE, SQUARE.QUARTZ,10MM	2PCS	10037-472
CUVETTE, SQUARE.QUARTZ,20MM	2PCS	10037-474
CUVETTE, SQUARE.QUARTZ,30MM	2PCS	10037-476
CUVETTE, SQUARE.QUARTZ,50MM	2PCS	10037-478
CUVETTE, SQUARE.QUARTZ,100MM	1PC	10037-480
CELL,QUARTZ, 500UL, 10MM	1PC	10037-482
LAMP, HALOGEN, 12V20W	1PC	10037-484
LAMP, DEUTERIUM	1PC	10037-486
PRINTER, THERMAL PRINTER	1PC	10037-488
CELL HOLDER FOR MICRO CELLS	1PC	10037-490
CELL,QUARTZ, 100UL, 10MM	1PC	10037-492
CELL,QUARTZ, 200UL, 10MM	1PC	10037-494
THERMAL PAPER	1PC	10037-504
SILICON TUBE	1PC	10037-506

FLOW CELL, 5 MM, OPTICAL GLASS	1PC	10037-524
FLOW CELL, 10 MM, OPTICAL GLASS	1PC	10037-526
FLOW CELL, 20 MM, OPTICAL GLASS	1PC	10037-528
FLOW CELL, 30 MM, OPTICAL GLASS	1PC	10037-530
FLOW CELL, 5 MM, QUARTZ	1PC	10037-532
FLOW CELL, 10 MM, QUARTZ	1PC	10037-534
FLOW CELL, 20 MM, QUARTZ	1PC	10037-536
FLOW CELL, 30 MM, QUARTZ	1PC	10037-538
PELTIER UNIT	1PC	10037-540
SIPPER UNIT WITHOUT TEMP. CONTROL	1PC	10037-542
SIPPER UNIT WITH PELTIER TEMP. CONTROL	1PC	10037-544
DUST COVER	1PC	10037-546

Technical Service

Web Resources

Visit the VWR's website at www.vwr.com for:

- Complete technical service contact information
- Access to VWR's Online Catalogue, and information about accessories and related products
- Additional product information and special offers

Contact us For information or technical assistance contact your local VWR representative or visit. www.vwr.com.

Warranty

VWR International warrants that this product will be free from defects in material and workmanship for a period of two (2) years from date of purchase. If a defect is present, VWR will, at its option, repair, replace, or refund the purchase price of this product at no charge to you, provided it is returned during the warranty period. This warranty does not apply if the product has been damaged by accident, abuse, misuse, or misapplication, or

from ordinary wear and tear.

For your protection, items being returned must be insured against possible damage or loss. This warranty shall be limited to the replacement of defective products. IT IS EXPRESSLY AGREED THAT THIS WARRANTY WILL BE IN LIEU OF ALL WARRANTIES OF FITNESS AND IN LIEU OF THE WARRANTY OF MERCHANTABILITY.

Equipment Disposal



This equipment is marked with the crossed out wheeled bin symbol to indicate that this equipment must not be disposed of with unsorted waste.

Instead it's your responsibility to correctly dispose of your equipment at lifecycle -end by handling it over to an authorized facility for separate collection and recycling. It's also your responsibility to decontaminate the equipment in case of biological, chemical and/or radiological contamination, so as to protect from health hazards the persons involved in the disposal and recycling of the equipment.

For more information about where you can drop off your waste of equipment, please contact your local dealer from whom you originally purchased this equipment.

By doing so, you will help to conserve natural and environmental resources and you will ensure that your equipment is recycled in a manner that protects human health.

Thank you!

Part 2 : Software

Functions

We'll introduce the main functions of M.Wave Professional in this chapter.

Quantitative Analysis

- Provide 2 methods to establish a Standard Curve;
- Up to 20 standard samples to establish a new curve or input the coefficients to make a standard curve;
- There are three methods, which are Linear zero , Linear and Square to fit the standard curve.

Kinetics Analysis

- We can choose the Time Intervals(0.5, 1.0, 2.0, 5.0, 10.0, 30.0 or 60.0 Seconds);
- You can choose different Photometric Mode to display the curve (Transmittance-Time & Absorbance-Time).

Spectrum Scan

- You can choose the Scan Intervals(0.1, 0.2, 0.5, 1.0, 2.0 and 5nm);
- You can choose the Photometric Mode to display the spectrum (Wavelength-Transmittance, Wavelength-Absorbance);
- Automatically list spectrum peaks;
- Mathematics and smooth.

Multi-wavelength Analysis

- Up to 20 wavelengths to measure a sample.

DNA/Protein Analysis

- We provide 2 methods;
- You can input the coefficients by yourself.

Energy Scan

- You can switch the light source point(W Lamp, D2 Lamp or automatically switch);
- You can choose the scanning intervals(0.1,0.2,0.5,1.0,2.0 and 5.0);
- You can set the gain(1 to 8 times);
- Automatically list spectrum peaks;

Installation

We will show you how to install M.Wave Professional on your PC in this chapter.

PC System Requirements

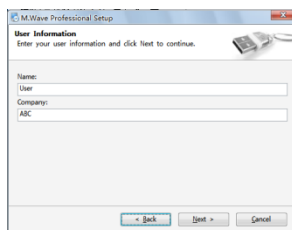
- Pentium or above PC;
- CD-ROM;
- USB Ports.
- 32MB Memory(256MB or Above is strongly recommended);
- 50MB or above hard disc Space;
- Microsoft Windows 2000/XP/Vista/7.

Install M.Wave Professional

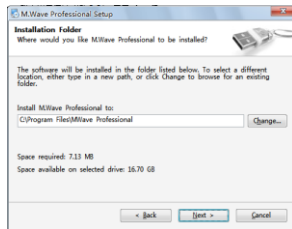
1. Put M.Wave Professional disc in the CD-ROM;
2. Double Click to open the CD-ROM, and then, double click **Setup.exe** which is under the root directory of CD to start installation , click **Next**;



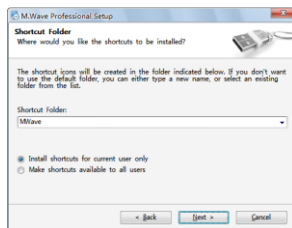
3. Input user's information, click **Next**;



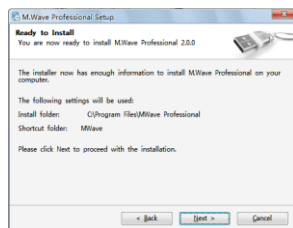
4. Choose install path, then click **Next**;



5. Choose Shortcut file folder, then click **Next**, all the setting information will be displayed on the screen, click **Next** to copy files to Hard disc;



6. Click **Finish** to finish the installation.



Uninstall M.Wave Professional

1. **Start**→**All Files**→**M.Wave Professional**→**Uninstall M.Wave Professional 2.0**, click **Next** to uninstall.
2. After all the files were removed, click **Finish** to end.

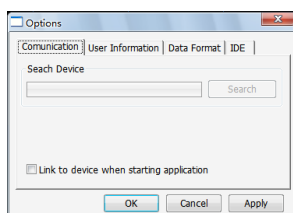


Run M.Wave Professional

- Double click the icon  on desktop.
- **Start→All Files→M.Wave Professional→M.Wave Professional 2.0.**

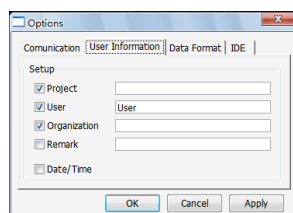
Set up Communication Port

Be sure that the USB line which is connecting PC with instrument is working and the spectrophotometer is at the standby state interface. After M.Wave Professional being started, then click **Main Menu→Options**, a dialog box of **Options** will display in the screen, click **Search** to automatically search the instrument's communication port, after get the communication port, click **OK** to save setting. If you choose the option of Connect to Spectrophotometer When Start, the instrument will connect to the PC automatically when you run M.Wave Professional next time.



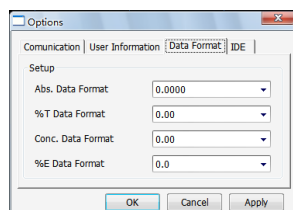
Set User's Information

Click **Main Menu→Options**, pop-up **Options** window, click **User's Information** tag, choose it and input relative user information, click **OK** to save settings, all this information will appear in your testing report.



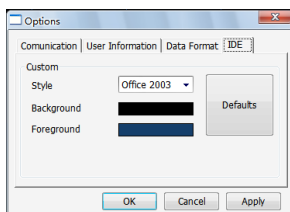
Set Data Format

Click **Main Menu→Options**, a dialog box of **Options** will display in the screen, click **Data Format** tag, choose the displaying format, and click **OK** to save setting.



Set Interface Style

Click **Main Menu**→**Options**, a dialog box of **Options** will display in the screen, and click **Interface** tag. You can custom the style and color schemes of the interface as you like. Click **OK** to save setting.



Connect to PC

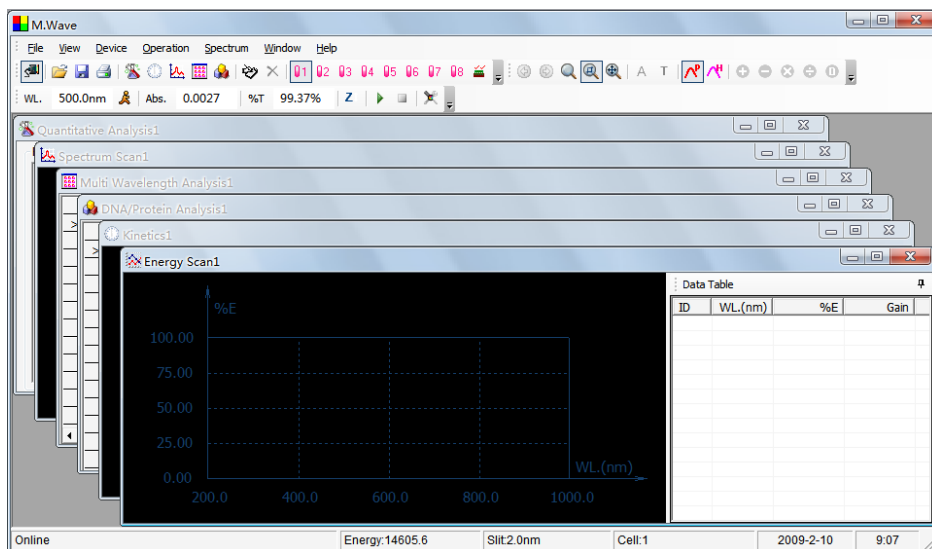
After enter the Main Interface, click  in the Tool Bar to connect with PC. After connection, the icon is on the pitched on state, you can release PC if you click the icon again.

Introduction

We will introduce the M.Wave Professional in this chapter.

Main Interface

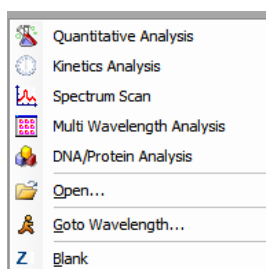
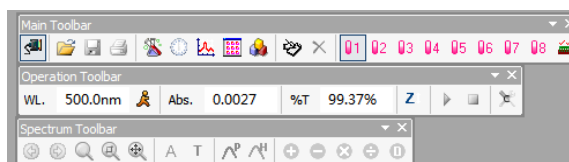
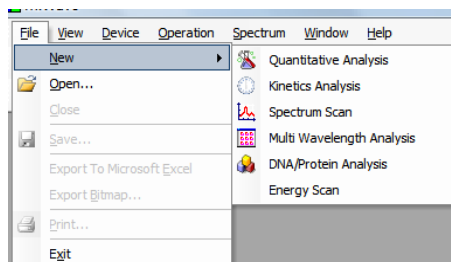
This is the main interface after start.



Menus Bar and Tools Bar

Menus Bar and Tools Bar provide three different ways to operate this software.

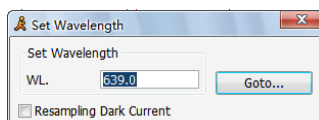
- You can finish all the operation through Keyboard or Mouse.
- Most of the functions can be finished through the Shortcut Bar.
- Most of the functions can be finished through the menu by Right-hand button.



General Operating Instructions

Set Wavelength

Click the icon  on the Tools Bar to set wavelength. Input the value of wavelength in the frame of **Set Wavelength**, click **Goto** to confirm. Then the instrument will move the wavelength to the point you want, then it blanks automatically.



Blank

Put reference into the light path, click the icon  in the Tool Bar.

New a Testing

Main Menu→**File**→**New**, select a testing to click.

Lists of the file's type

- Quantity Analysis File *.qua
- Kinetics Analysis File *.kin
- Spectrum Scan File *.wls
- Multi-wavelength File *.mti

- DNA/Protein Analysis File *.dna
- Energy Scan File *.ens
- Standard Curve *.std

Test a Sample

Put sample into the light path, click the icon  in the Tool Bar.

Set Test Parameters

Click the button of  to set the parameters.

Modify a Sample

1. Choose the data frame you want to modify or set the curve as current curve;
2. Pull the unknown sample in light path;
3. Click the icon  in Tools Bar to re-measure it, and save the current result to substitute the original one.

Delete a Test Result

1. Choose the data frame you want to modify or set the curve as current curve;
2. Click the icon  in the Tools Bar to delete the data.

Name a Sample

1. Select the line you want to rename.
2. Double-click **Sample Name**, input the sample's name, and press **Enter** on the keyboard to confirm.

Save a Testing

Click the icon  in Tools Bar, input the file name and click **Save** to confirm in the dialog box.

Open a Testing

Click the icon  in Tools Bar, choose the file name you need in the dialog box, then click **Open** to confirm.

Print Test Report

Click the icon  in Tools Bar, then set Print Parameters in the dialog box, press **Print** to confirm.

Export Data to Excel (the Microsoft Excel should be installed)

Click **Main Menu**→**File**→**Export to Microsoft Excel**, Excel will be started up, and data will be stored in it.

Export Curve as bmp Picture

Click **Main Menu**→**File**→**Export Bitmap**, input the file name and click save to confirm the dialogue box.

Switch Display Mode

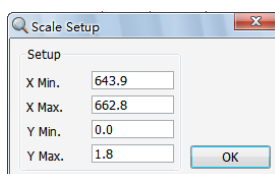
Click the icon  or  in the Tools Bar to switch the display mode (Abs. or Transmit).

Zoom Selected Area

Click the icon  in Tools Bar, choose the area you want to magnify, then you'll see the magnified one, the Mouse's cursor turns into the form of "+". Click the icon  again to cancel the current status.

Modify Scale

Click the icon  on Tools Bar to display coordinate as you like.



Auto Fitting

Click the icon on Tools Bar to change the scale to appropriate value.

Select as Current Curve

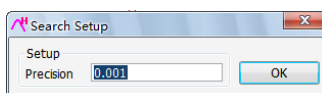
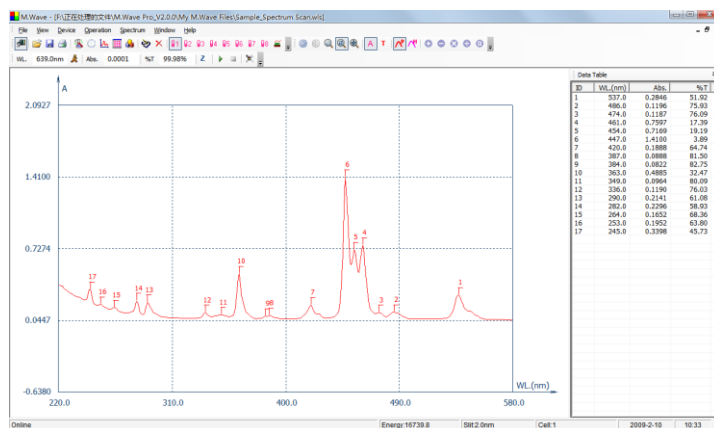
Click **Main Menu**→**Curve Operate**→Choose the curve as you like.

Change the Color of Current Spectrum

Click **Main Menu**→**Curve Operate**→Choose the color as you like.

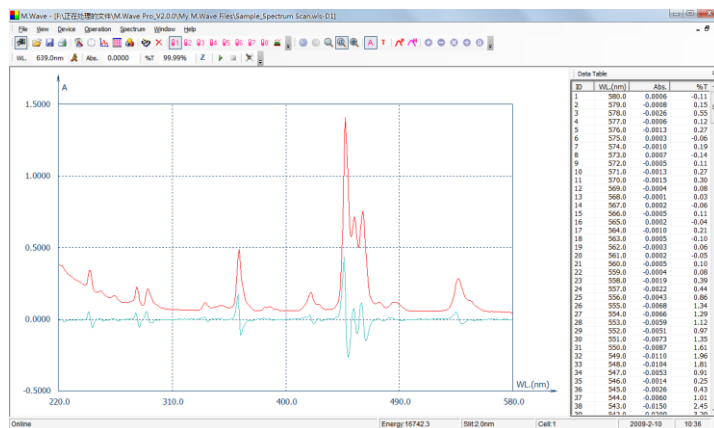
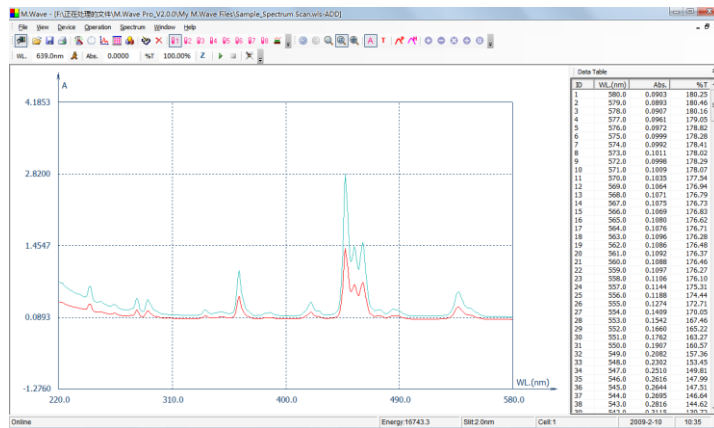
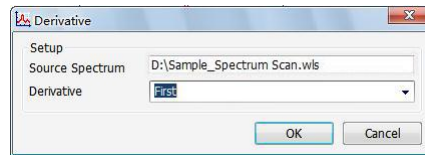
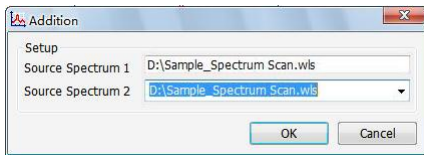
Search Peaks

Click the icon  in Tools Bar to search the peaks, they labeled automatically on the curve, and the peaks will be listed in the Right Frame. You can set the Peak height by clicking  icon.



Mathematics Function

Click the icons     or  in the Tools Bar, a new dialog box will display on the screen respectively. You can add, subtract, multiply or divide two spectrums.



Spectrum Smooth

We use this function to wipe off the interferer of noise during the course of scan, so as to make the spectrum look much smoother. Click **Main Menu**→**Spectrum**→**Spectrum Smooth**.

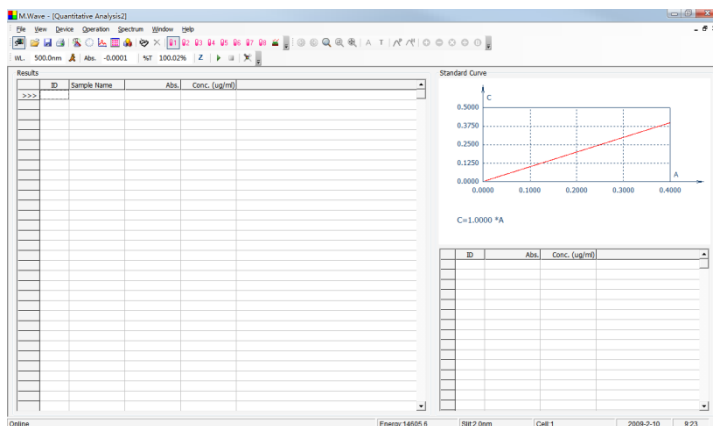
Operation

We will introduce you how to use M.Wave Professional.

Quantitative Analysis

M.Wave Professional use Standard Curve to test the sample's concentration at a fixed wavelength point.

1. Click the icon  in the Tools Bar shortcut to create a new Quantitative Analysis.



2. Click the icon  in the Tools Bar Shortcut to set the parameters of Quantitative Analysis.

- Choose test method;
- Input test wavelength in **WL** Frame;
- Choose the Concentration Unit ;
- Choose curve fitting method;

Create Standard Curve

Two methods are under your choice to create a new curve.

Method 1: Coefficient

- (1) Click Coefficient option;
- (2) Click Fit Method to choose Fit Curve method;
- (3) Input the curve equation's coefficients in corresponding frames;
- (4) Click **OK** to finish setting.

Coefficient

k0

k1

k2

Method 2: Use Standard Samples to create a new curve

- (1) Click **Standard Sampling** option;
- (2) Click **Standard Sample Quantity** to choose the quantity(≤ 20);
- (3) Input the sample concentration in corresponding Frame;

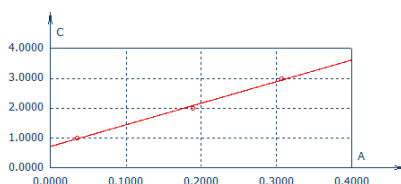
Conc.
Standard Sample Quantity

Conc. 1	1.000	Conc. 11	11
Conc. 2	2.000	Conc. 12	12
Conc. 3	3.000	Conc. 13	13
Conc. 4	4	Conc. 14	14
Conc. 5	5	Conc. 15	15
Conc. 6	6	Conc. 16	16
Conc. 7	7	Conc. 17	17
Conc. 8	8	Conc. 18	18
Conc. 9	9	Conc. 19	19
Conc. 10	10	Conc. 20	20

- (4) Click **OK** to finish setting;
- (5) Pull the Reference into the light path and click the icon , then the system will move the wavelength to the one you just set, it blanks then;
- (6) Put **1# standard sample** into the light path and move the cursor on the first frame of Abs. The sample Absorbance value will appear in this frame after click  in the shortcut toolbar;
- (7) Measure other standard samples in the same way as step (6) shows. The curve displays automatically when finish;

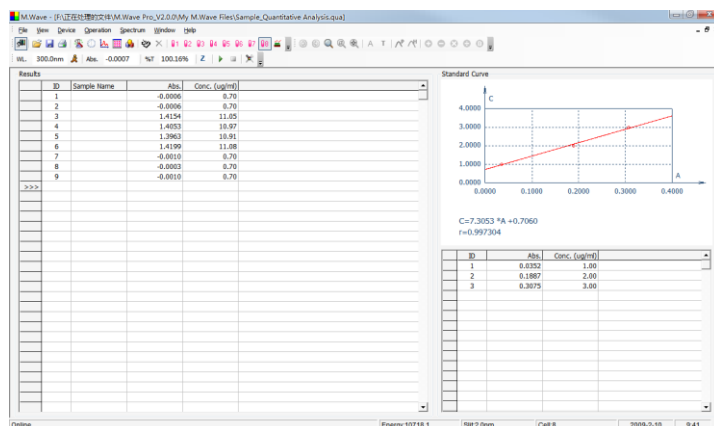
	ID	Abs.	Conc. (ug/ml)	
	1	0.0352	1.00	
	2	0.1887	2.00	
	3	0.3075	3.00	

You can modify the curve's coordinates by Clicking the icon . You can also save the curve by clicking , and you can reload it by clicking  next time.



3. Pull the unknown into the light path (if it is Automatic 8-cell Holder in the instruments,

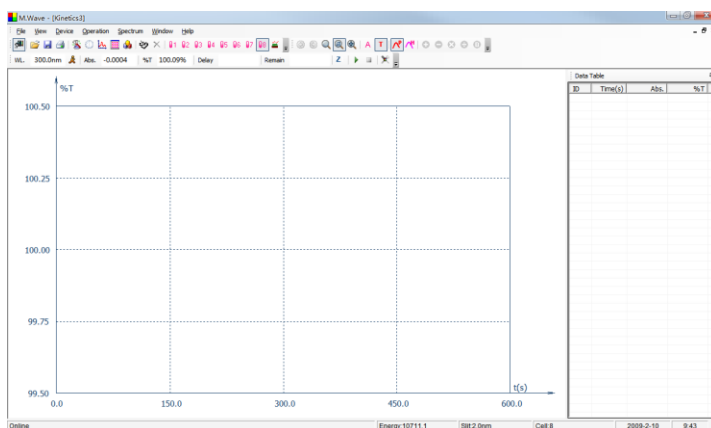
click to set the location of the relative cell first), Then click the icon, click in the shortcut toolbar to test, the test result will display in the data sheet.



Kinetics Analysis

We will introduce how to measure a sample's change over a selected period of time.

1. Click the icon  to begin a new test of Kinetics;



2. Click the button of  to set the parameters;

Kinetics Setting

Photometric Mode

☐ Abs.

☒ % T

Response Mode

☐ Normal

☒ Slow

Parameter

Wavelength(nm) 546.0

Delay(s) 0.0

Total(s) 60.0

Interval(s) 0.5

Display

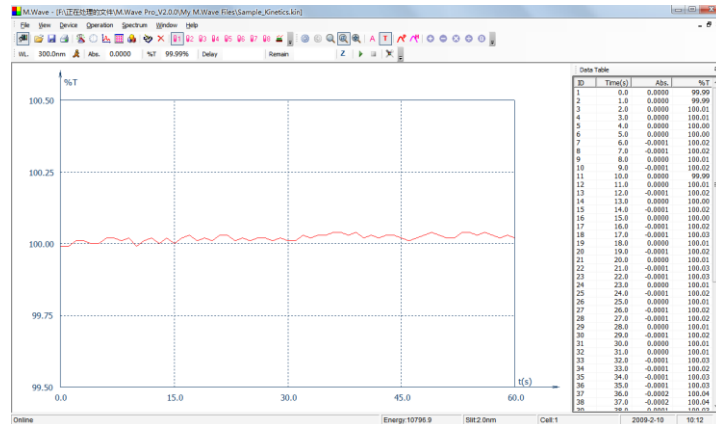
Max. 100.50

Min. 99.50

☒ Display All Curves

OK Cancel

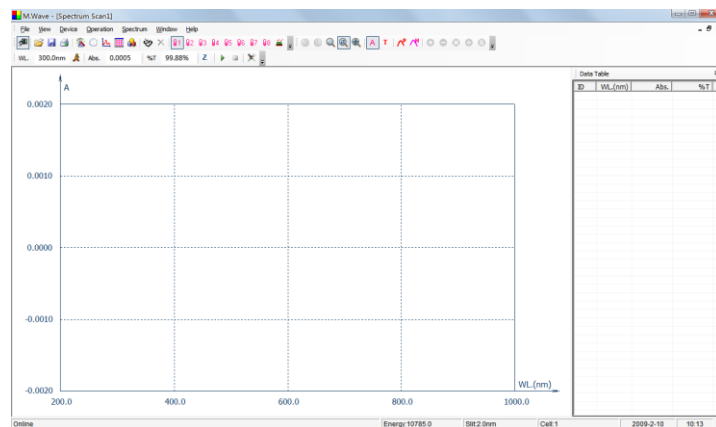
3. Choose Photometric Display Mode, input the Wavelength, Display Time, Total Time, Intervals, Responsible Mode and Coordinates Values;
4. Click OK to finish and exit setting;
5. Pull the reference into the light path and click icon  in the Tool Bar to do blank.
6. Pull the sample into the light path and click the button of to begin the test. You can click icon in the Tools Bar to cancel at any time.



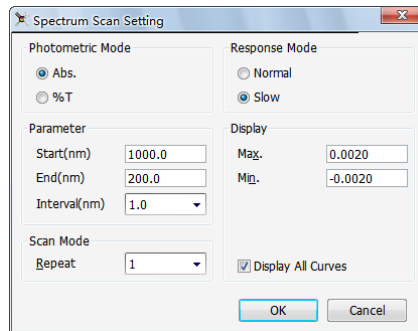
Spectrum Scan

We'll introduce how to create the spectrum while using Spectrum Scan function.

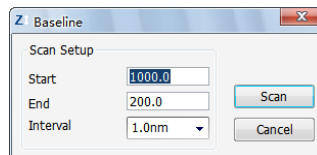
1. Click the icon  on the Tools Bar to start a new Spectrum scan;



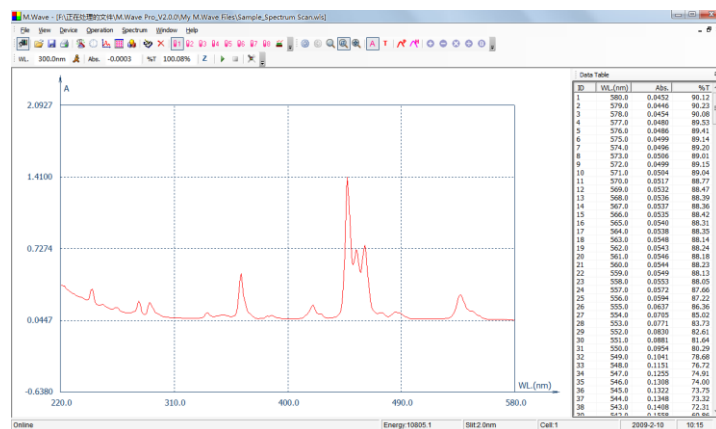
2. Click the icon  in the Tool Bar to set the parameters of Wavelength Scan;



3. Choose the Photometric Mode, Wavelength Range for Scanning, Intervals, Repeat Times, Response Mode, and Coordinate Range;
4. Click **OK** to finish and exit setting;
5. Put reference into the light path, click the icon  in the Tool Bar, then the dialog box of **Baseline** displays in the screen, click **Scan** to scan baseline, click **Cancel** to interrupt scanning and exit the course;



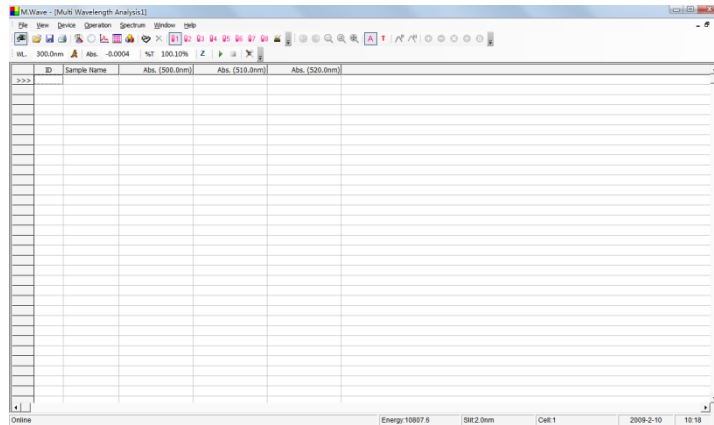
6. Put the unknown sample in the light path, click the icon  in the Tools Bar to start scanning, click  to interrupt and **cancel** scanning.



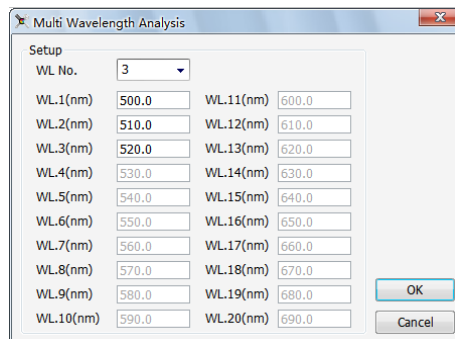
Multi-wavelength Analysis

We'll introduce how to measure a sample in different wavelengths (≤ 20).

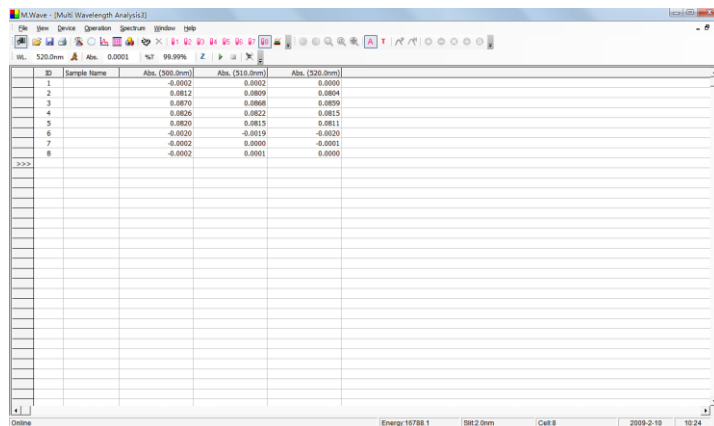
1. Click the icon  on the Tools Bar, a new form appears on the screen;



- Click the icon  on the Tools Bar to set the parameters;



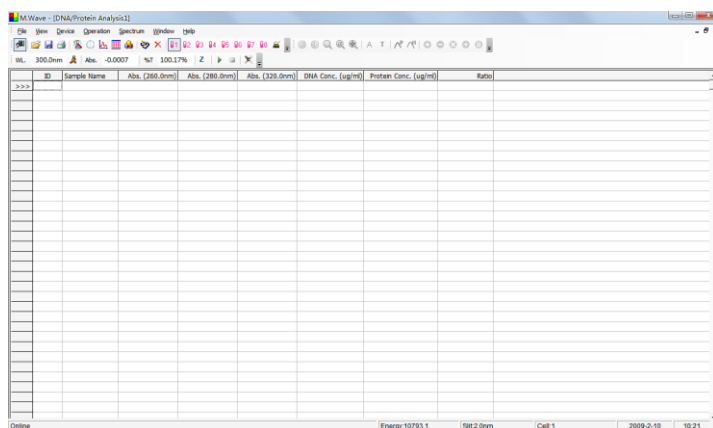
- Choose the quantity of the wavelength, you need input the value of each wavelength;
- Click **OK** to finish and exit setting;
- Pull the reference into the light path, click the icon  in the Tools Bar to do blank;
- Pull the sample into the light path, click  to start test. And the test result will be listed in the data sheet.



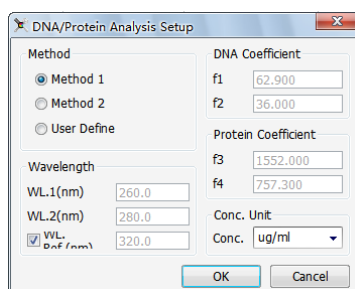
DNA/Protein Analysis

We will introduce how to operate a DNA/Protein Analysis.

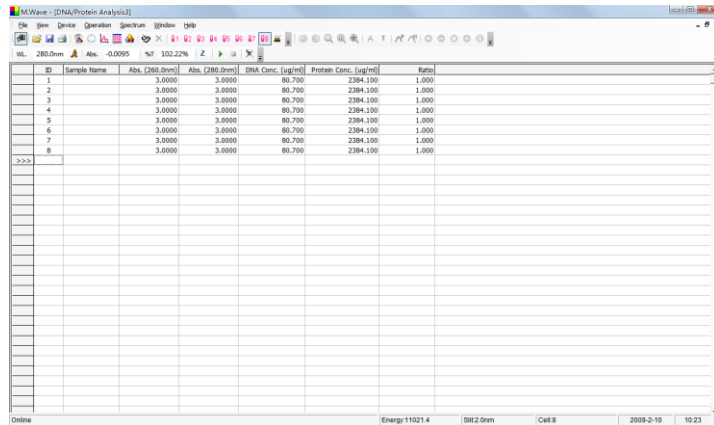
1. Click the icon  on the Tools Bar to begin a DNA/Protein Analysis;



2. Click the icon  to set parameters;



3. Choose the measure method first. We provide you 2 methods to measure, and you can also define the coefficients and wavelength by yourself;
4. Click **OK** to finish and exit the setting;
5. Pull the reference into the light path, click  in the Tools Bar to do blank;
6. Pull the sample in the light path, click the icon  to measure. The result will display in the data sheet.

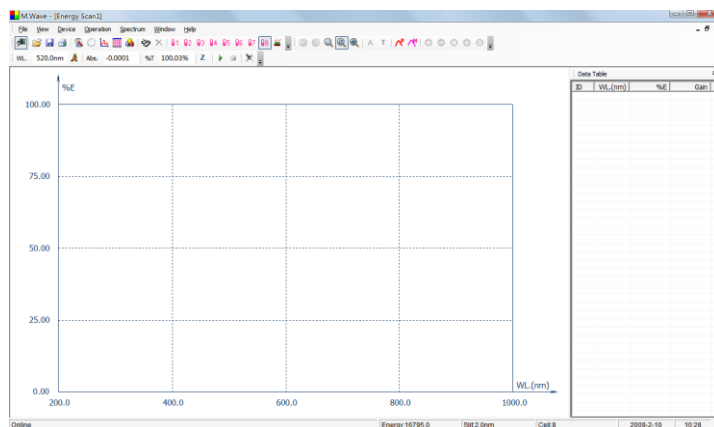


ID	Sample Name	Abs. (280.0nm)	Abs. (280.0nm)	DNA Conc. (µg/ml)	Protein Conc. (µg/ml)	Ratio
1		3.0000	3.0000	80.700	2384.100	1.000
2		3.0000	3.0000	80.700	2384.100	1.000
3		3.0000	3.0000	80.700	2384.100	1.000
4		3.0000	3.0000	80.700	2384.100	1.000
5		3.0000	3.0000	80.700	2384.100	1.000
6		3.0000	3.0000	80.700	2384.100	1.000
7		3.0000	3.0000	80.700	2384.100	1.000
8		3.0000	3.0000	80.700	2384.100	1.000

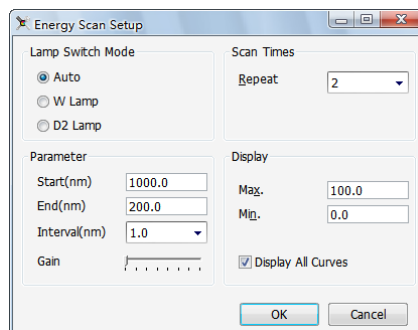
Energy Scan

We will introduce how to scan the variability of energy in the range of wavelength.

1. Click **Main Menu**→**File**→**New**→**Energy Scan** to build Energy Scanning;



2. Click the icon  on the Tools Bar to set parameter;



Energy Scan Setup

Lamp Switch Mode

- ☒ Auto
- ☐ W Lamp
- ☐ D2 Lamp

Scan Times

Repeat:

Parameter

Start(nm):
 End(nm):
 Interval(nm):
 Gain:

Display

Mag.:
 Min.:
☒ Display All Curves

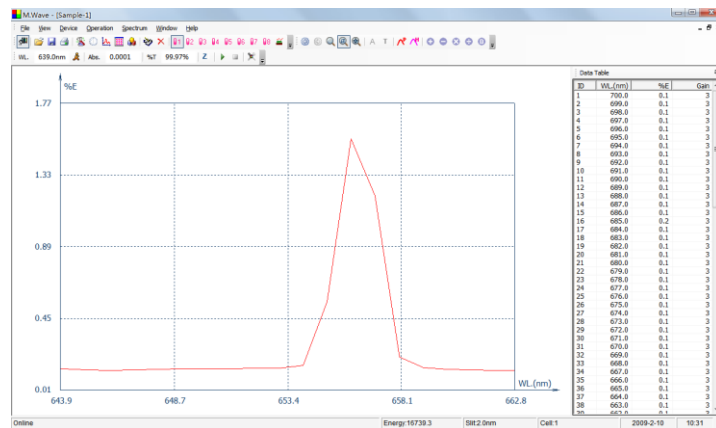
OK Cancel

3. Select Lamp Switch Mode, Wavelength Range, Intervals, Repeat Times and Coordinate Range;



- **Automatic Switch Mode**---The instrument can choose D2 Lamp or W Lamp according to setting;
- **Deuterium Lamp Mode**---Using Deuterium Lamp in the whole wavelength;
- **Tungsten Lamp Mode**---Using Tungsten Lamp in whole wavelength.

4. Click **OK** to finish and exit setting;
5. Pull the unknown sample in the light path, click the icon  in Tools Bar to start scanning, click  to interrupt scanning and exit the course;



Other Functions

We will introduce the additional function about M.Wave Professional in this chapter.

Turn On/Off W Lamp

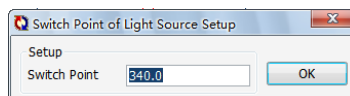
Click **Main Menu**→**Device**→**Turn On/Off W Lamp** to open or close W Lamp.

Turn On/Off D2 Lamp

Click **Main Menu**→**Device**→**Turn On/Off D2 Lamp** to open or close D2 Lamp.

Setup Switch Point of Light Source

Click **Main Menu**→**Device**→**Setup Switch Point of Light Source**, input the value of wavelength, and then click **OK** to confirm.



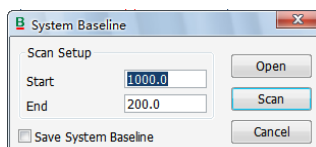
Get Dark Current

Click **Main Menu**→**Device**→**Get Dark Current**, the system will reset the dark current and

the new data will replace the old one.

Scan System Baseline

Click **Main Menu**→**Device**→**System Baseline**, the dialogue box will display in the screen, you can click **Open** to choose the storage base line to test, be sure that nothing in the light path, you can click **Scan** to build system base line. You can click **Cancel** to interrupt and exit the course. You can choose Save System Base Line option; a dialogue box will display in the screen and click **Save** to save system base line for your after use.



You needn't to build system base line normally, only when it is a very long time that the instrument wasn't be used or the environment changed much.

Automatic 8-Position Changer (Accessories)

Click the icon  ...  to pull the correspond cell in the light path.

Cell Calibration (Need install auto 8 cells Changer)

Click **Main Menu**→**Device**→**Cell Calibration**, this operation for matching difference of all the cells selected.

Appendix 1

Methods of Quantitative Analysis

Single Wavelength Method: $Abs.=A_1$

Double Wavelengths Method: $Abs.=m \cdot A_1 - n \cdot A_2$

Three Wavelengths Method: $Abs.=A_1 - (WL_1 - WL_2) \cdot (A_2 - A_3) / (WL_2 - WL_3) - A_3$

Appendix 2

Methods of DNA/Protein Analysis

Method 1:
 $C_{DNA} = (A_1 - A_{ref}) \cdot f_1 - (A_2 - A_{ref}) \cdot f_2$
 $C_{Protein} = (A_2 - A_{ref}) \cdot f_3 - (A_1 - A_{ref}) \cdot f_4$
 $Ratio = (A_1 - A_{ref}) / (A_2 - A_{ref})$

$A_1 = A_{260nm}$, $A_2 = A_{280nm}$, $A_{ref} = A_{320nm}$ (Optional)

$f_1 = 62.9$, $f_2 = 36.0$, $f_3 = 1552$, $f_4 = 757.3$

Method 2:
 $C_{DNA} = (A_1 - A_{ref}) \cdot f_1 - (A_2 - A_{ref}) \cdot f_2$
 $C_{Protein} = (A_2 - A_{ref}) \cdot f_3 - (A_1 - A_{ref}) \cdot f_4$
 $Ratio = (A_1 - A_{ref}) / (A_2 - A_{ref})$

$A_1 = A_{260nm}$, $A_2 = A_{230nm}$, $A_{ref} = A_{320nm}$ (Optional)

$f_1 = 49.1$, $f_2 = 3.48$, $f_3 = 183$, $f_4 = 75.8$