Instruction manual

VWR® UV-1600PC Spectrophotometer

EU cat. no   634-6001

CE

UK CA

Legal address of Manufacturer

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Made in China

Table of Contents

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 UV-1600PC Spectrophotometer.

- 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 (Euro Plug)	1PC
Power Cord (UK Plug)	1PC
Power Cord (CH 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.

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

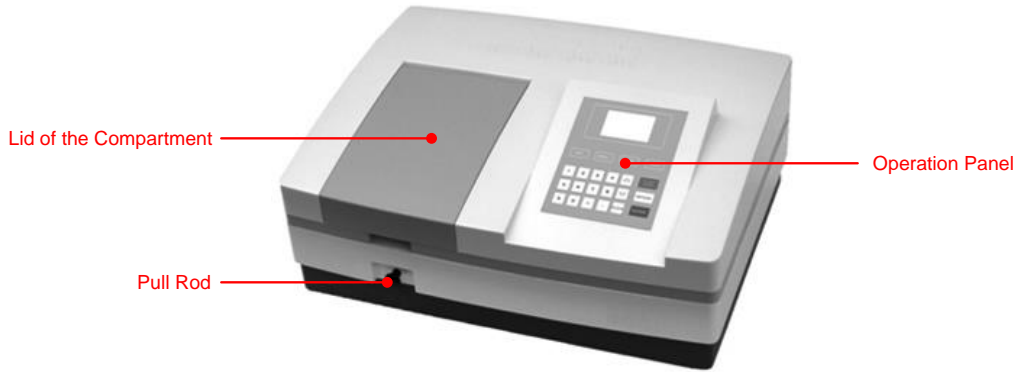|	
Language	English, French, German, Spanish
Display	128×64 Dots Matrix LCD
Interface	USB, Parallel
Measuring Procedure:	Photometry, Quantitation, Kinetics
Power Supply	AC 110/220V, 50/60Hz
Dimension	490×360×240
Weight	14kg
Work Environment	15 to 35℃, 15 to 70% relative humidity
Store Environment	-10 to 50℃, 15 to 70% relative humidity

This instrument is compliant to the European Directives on
Low Voltage Directive 2014/35/EU
Electromagnetic compatibility 2014/30/EU
Restriction on use of Hazardous Substances RoHS 2011/65/EU
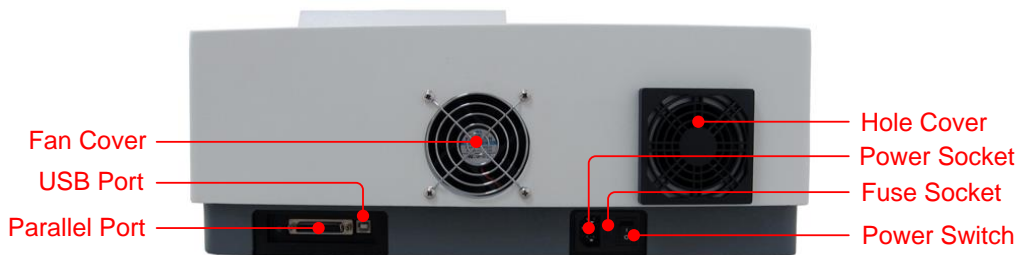and theirs amandements.

Overview

UV-1600PC Spectrophotometer used in Chemistry, Pharmaceuticals, Biochemical, Metallurgy, Light Industry, Textile, Material, Environments, Medical, Education and some other fields for Quality Control laboratories.
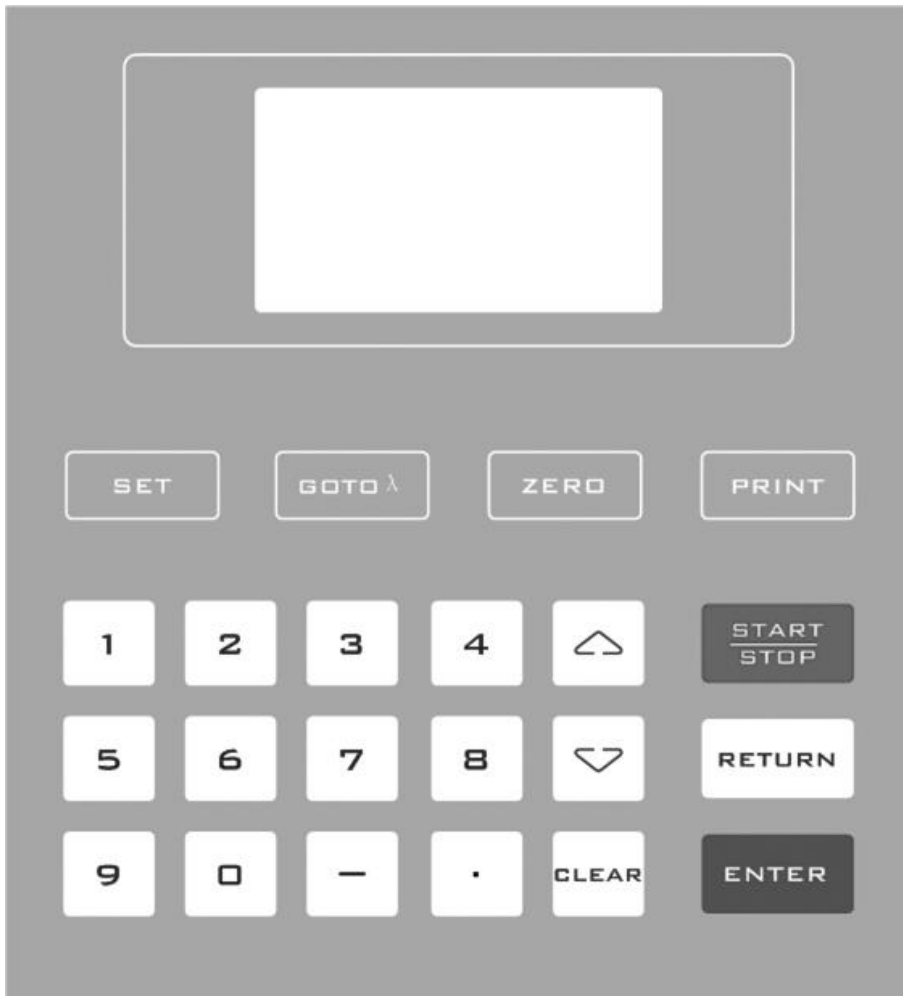
Description of Buttons and Switches

Front View

Lid of the Compartment

Operation Panel

Pull Rod

Rear View

Fan Cover

USB Port

Parallel Port

Hole Cover

Power Socket

Fuse Socket

Power Switch

Operational Keys

Key	Functions
SET	SET Key: Set Parameters
GOTO ʎ	GOTO ʎ 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

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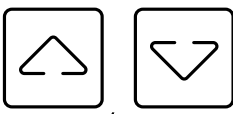
UP, DOWN Keys: Scroll menu/data and set Y scale

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
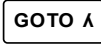
with the relevant local laboratory regulations.

General Operating Instructions

Select Application

Main menu, press numeric keys or use the key $\triangle$, $\triangledown$ to choose corresponding menu, then press $\boxed{\textbf{ENTER}}$ to enter into.

Set Wavelength

Press $\boxed{\textbf{GOTO λ}}$ to set wavelength, use numeric keys to input the values, press $\boxed{\textbf{ENTER}}$ to confirm and go to the point you set, then do blank automatically.

Set Parameters

In different application, press $\boxed{\textbf{SET}}$ to set parameters, press $\triangle$, $\triangledown$ to choose or input the values by numeric keys, press $\boxed{\textbf{ENTER}}$ to enter into, press $\boxed{\textbf{RETURN}}$ 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 $\boxed{\textbf{CLEAR}}$ to delete all the characters.

Delete the test result and stored data

Press [CLEAR] to delete the test result or stored data.

Blank

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

Measure Samples

Put the samples in the light path, press [START STOP] to measure.

Print the test results

Press [PRINT] to print the test results.

Store the Standard Curve

After got the Standard Curve by Marked, press [△], [▽] to input the file name and press [ENTER] to save.

Load the Standard Curve

"Quantitation" interface, Press [△], [▽] to select "Load Curve", press [△], [▽] to choose the curve you want, press [ENTER] 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.
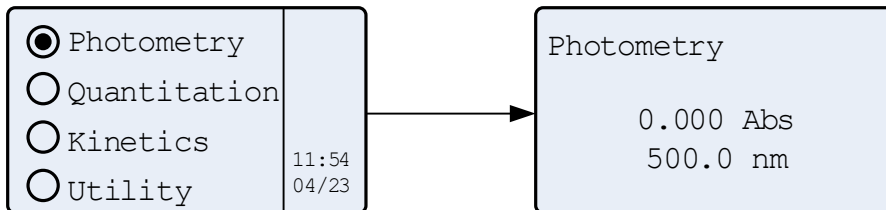
Check the cuvettes

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 [1] or [△], [▽] to choose "Photometry", then press [ENTER] to go into.

```
  ◉ Photometry            Photometry
  ○ Quantitation
  ○ Kinetics                 0.000 Abs
                11:54        500.0 nm
  ○ Utility     04/23
```

2. Set Photometric Mode

Press [SET] to set photometric mode. Press [△], [▽] to choose "Abs.", "T%" or "Energy" and press [ENTER] to confirm. If user choose "Abs." or "T%". Press [RETURN] to return.

3. Set Wavelength

Press $\boxed{\text{GOTO } \lambda}$ to set wavelength, input the value by the numeric keypad followed with $\boxed{\text{ENTER}}$ pressed to confirm.

4. Blank

Put the Reference in the light path and press $\boxed{\text{ZERO}}$ 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 $\boxed{\begin{array}{c}\text{START}\\\text{STOP}\end{array}}$ to record.

6. Print Test Results

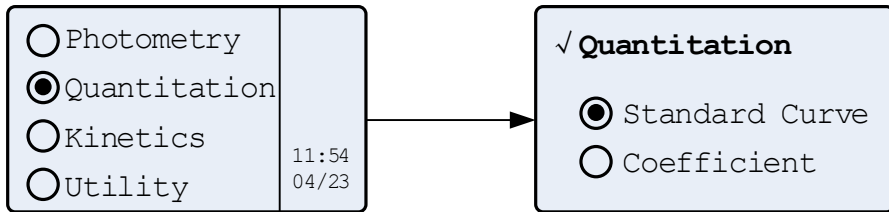Press the key $\boxed{\text{PRINT}}$ to print the Test Results.

```
Photometry
Date&Time: mm-dd-yyyy, hh:mm:ss
Model: UV-1600
Serial No.: UEEXXXXXXX
Firmware Version: 1.5.0
VWR International bvba.
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
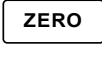
Main menu, press $\boxed{2}$ or $\boxed{\triangle}$, $\boxed{\triangledown}$ to choose "Quantitation" followed with $\boxed{\text{ENTER}}$

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 [ENTER] to confirm.

   2) **Set Wavelength.** Press [GOTO ʌ] 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 [SET] to set measurement parameters. Press ⬆, ⬇ to set "Unit", press [ENTER] to select, press ⬆, ⬇ to choose and press [ENTER] to select Unit.

```
Standard Curve

    0.000 Abs
    0.000 mg/ml
    500.0 nm
```

```
√ Standard Curve
   ◉ Unit
   ○ Number
   ○ Concentrations
```

```
√ Standard Curve
   ◉ Unit
   ○ Number
   ○ Concentrations
```

```
1. %        5. ml/l
2. ug/l     6. mg/ml
3. mg/l     7. ug/ml
4. g/l      8. None
```
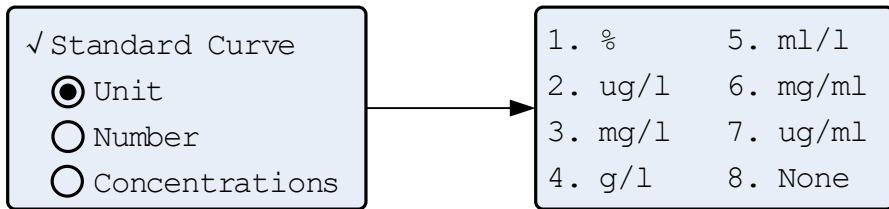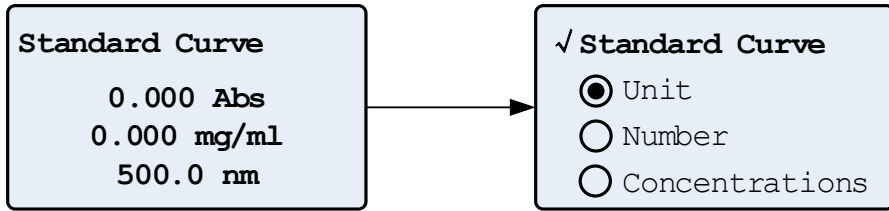
5) **Setup number of Standard Samples.** Press ⌃ , ⌄ to select "Number", setup number of Standard Samples, press [ENTER] to confirm.

```
√ Standard Curve
   ○ Unit
   ◉ Number
   ○ Concentrations
```

```
Standard Curve

No=2
Please Enter No
No= [        ]
```
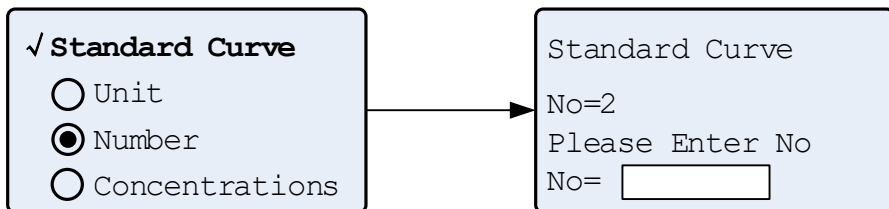
6) **Calibrate Standard Samples.** Put the corresponding standard samples in the light path as the screen indicates, input the concentration of the corresponding and press [ENTER] to measure. Press ⌃ , ⌄ and [ENTER] to input curve name and confirm.

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```
  ┌────────────────────────┐        ┌──────────────────────────┐
  │ √ Standard Curve       │        │ Please Input 1#          │
  │   ◯ Unit               │        │ Sample:                  │
  │   ◯ Number             │───────▶│ C=0.000                  │
  │   ◉ Concentrations     │        │ Please Enter Conc        │
  │                        │        │ C=  ┌──────────┐         │
  └────────────────────────┘        └──────────────────────────┘
```
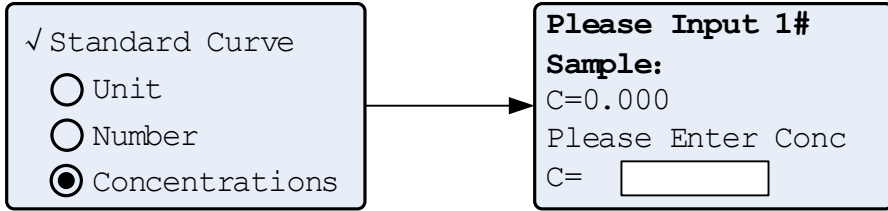
Method 2: Input Regression Equation

1) **Enter into Coefficient.** Press ⬆, ⬇ to select "Coefficient" , press **ENTER** to
    select equation type, then press **ENTER** to confirm.

2) **Set test coefficient K.** Press **SET** to set measurement parameters. Press ⬆,
    ⬇ to select "Coefficient K", input test coefficient K, press **ENTER** to confirm.

```
  ┌────────────────────────┐        ┌──────────────────────────┐
  │ Coefficient            │        │ √ Coefficient            │
  │      0.000 Abs         │        │   ◉ Coefficient K        │
  │    0.000 mg/ml         │───────▶│   ◯ Coefficient B        │
  │     500.0 nm           │        │   ◯ Unit                 │
  │                        │        │                          │
  └────────────────────────┘        └──────────────────────────┘


  ┌────────────────────────┐        ┌──────────────────────────┐
  │ √ Coefficient          │        │ Coefficient              │
  │   ◉ Coefficient K      │        │                          │
  │   ◯ Coefficient B      │───────▶│ K=1.000                  │
  │   ◯ Unit               │        │ Please Enter Coe         │
  │                        │        │ K=  ┌──────────┐         │
  └────────────────────────┘        └──────────────────────────┘
```
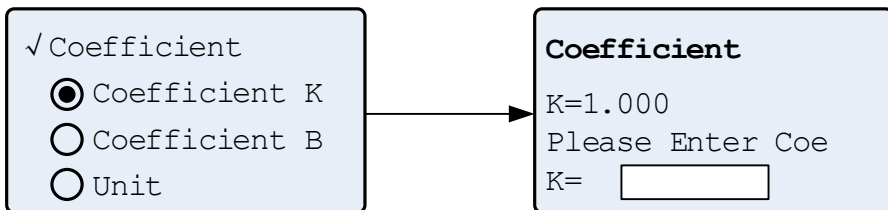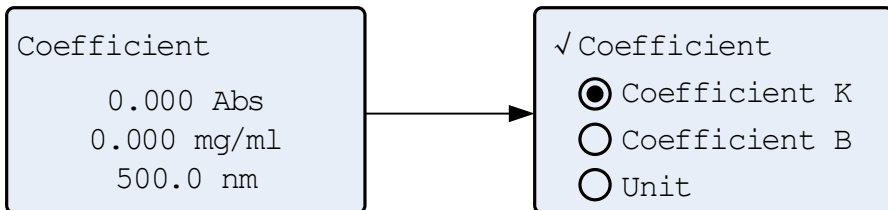
3) Set test coefficient B. Press △ , ▽ to select "Coefficient B", input test coefficient K, press ENTER to confirm.

```
√ Coefficient              Coefficient
   ◯ Coefficient K
   ◉ Coefficient B          B=1.000
   ◯ Unit                   Please Enter Coe
                            B=  [        ]
```
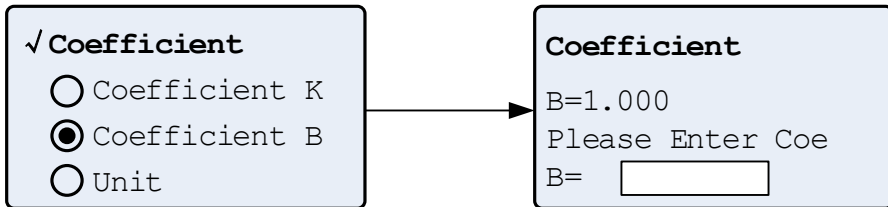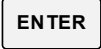
4) Set Unit. Press △ , ▽ to set "Unit", press ENTER to select, press △ , ▽ to choose and press ENTER to select Unit.

```
Standard Curve             √ Standard Curve
                              ◉ Unit
     0.000 Abs                ◯ Number
   0.000 mg/ml                ◯ Concentrations
     500.0 nm
```

```
√ Standard Curve           1. %        5. ml/l
   ◉ Unit                   2. ug/l     6. mg/ml
   ◯ Number                 3. mg/l     7. ug/ml
   ◯ Concentrations         4. g/l      8. None
```
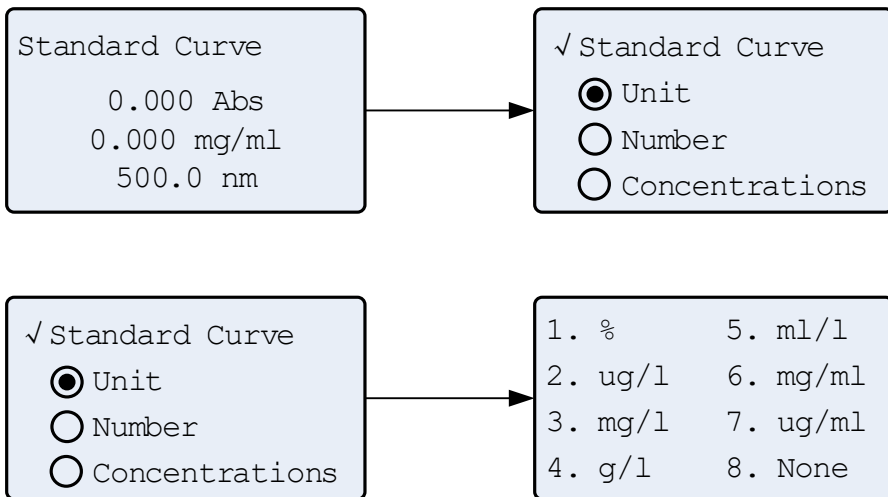
5) Set Wavelength. Press GOTO ʌ to go into wavelength setting interface. Input the value of the wavelength and press ENTER to confirm.

Load the Stored Curve

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

```
√ Standard Curve
  ◯ Concentrations
  ◯ Display Curve
  ⦿ Select Curve
```

```
C=KxA+B        WL.
1.    Default     546.0
      C=1.000xA+0.000
2.    A001        200.0
      C=1.510xA+1.020
```
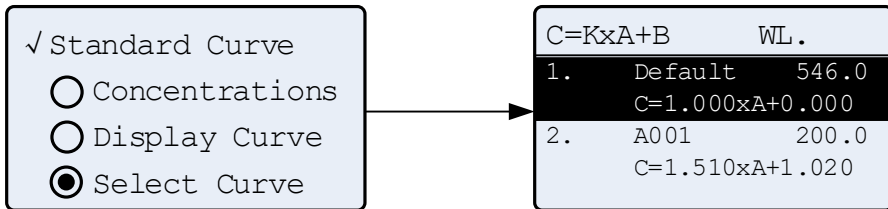
3. Return the sample measurement interface

Press [START STOP] to return the Quantitative Test interface.

```
Standard Curve

    0.000 Abs
  0.000 mg/ml
    500.0 nm
```

```
500.0nm      0.000Abs
No.   WL.    Abs.  mg/ml
```
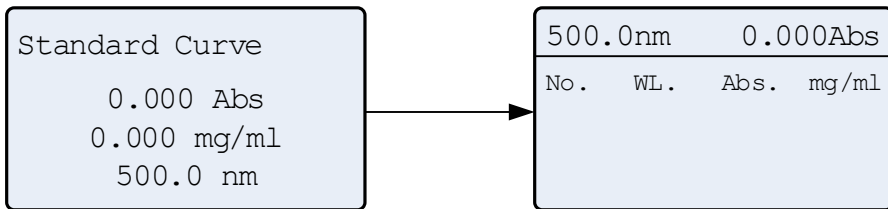
4. Blank

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: 1.5.0
VWR International bvba.
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.

```
○ Photometry          Kinetics
○ Quantitation
◉ Kinetics               0.000 Abs
              11:54       500.0 nm
○ Utility     04/23
```

2. Set Wavelength

Press GOTO ʌ to set wavelength, input the value of the wavelength by numeric keypad and

press $\boxed{\textbf{ENTER}}$ to confirm.

3. Setup Parameters

Press $\boxed{\textbf{SET}}$ to set measurement parameters. Press $\boxed{\triangle}$, $\boxed{\triangledown}$ to select values of "Time Intervals" , "Total Time", "Test Mode", "Upper Limited" and "Lower Limited". Press $\boxed{\textbf{ENTER}}$ to confirm.
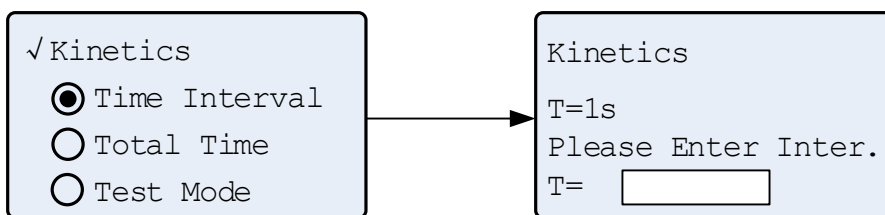
```
┌─────────────────────┐        ┌─────────────────────┐
│ √Kinetics           │        │ Kinetics            │
│    ◉ Time Interval  │   ──▶  │ T=1s                │
│    ○ Total Time     │        │ Please Enter Inter. │
│    ○ Test Mode      │        │ T=    [          ]  │
└─────────────────────┘        └─────────────────────┘
```

4. Blank

Put the Reference Sample in the light path, press $\boxed{\textbf{ZERO}}$ to do blank.

5. Measure Samples

Put the sample in the light path and press $\boxed{\substack{\textbf{START}\\\textbf{STOP}}}$ to enter the measurement interface, press $\boxed{\substack{\textbf{START}\\\textbf{STOP}}}$ to begin the test, repress it to stop, press $\boxed{\textbf{RETURN}}$ to cancel.

```
┌─────────────────────┐        ┌─────────────────────┐
│ Kinetics            │        │ 0.001               │
│                     │        │                     │
│     0.000 Abs       │   ──▶  │                     │
│     500.0 nm        │        │ -0.001              │
│                     │        │     0S        180S  │
└─────────────────────┘        │ 500.0nm      0.000Abs│
                               └─────────────────────┘
```
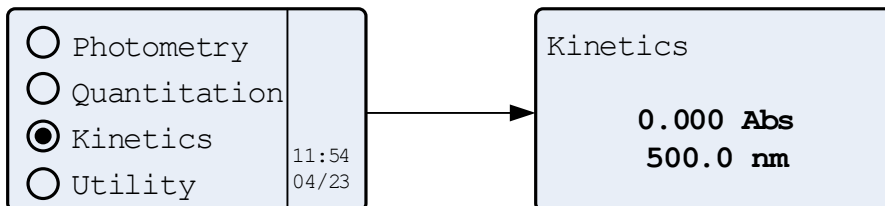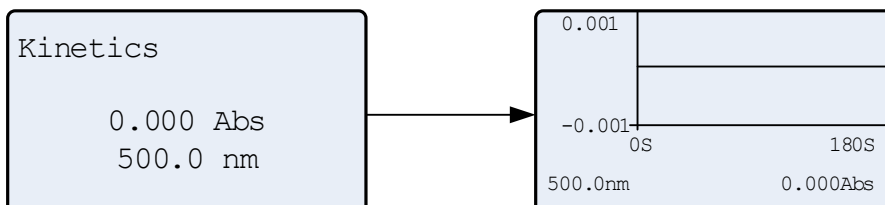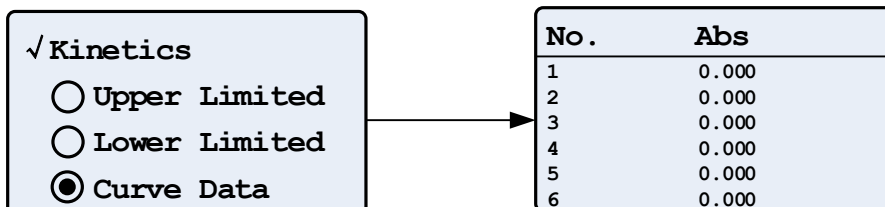
6. Print Test Results

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: 1.5.0
VWR International bvba.
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.
```
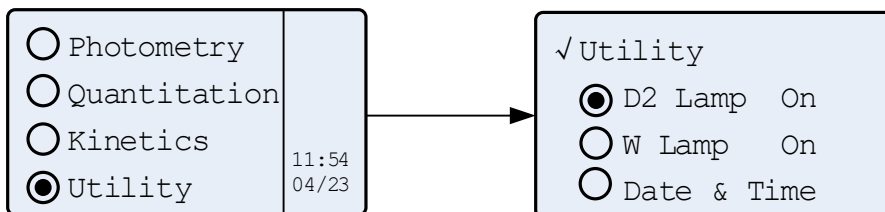
7. View Values

After scan finished, press SET and press △, ▽ to select "Curve Data", press ENTER to list all the values..

```
√Kinetics
  ○ Upper Limited
  ○ Lower Limited
  ● Curve Data
```

```
No.          Abs
1            0.000
2            0.000
3            0.000
4            0.000
5            0.000
6            0.000
```
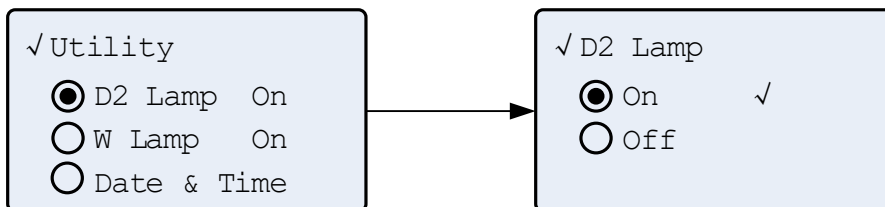
Utility

Main menu, press [4] or use [△], [▽] to select "System Utility" and press [ENTER] to confirm.

```
┌────────────────┬────────┐      ┌──────────────────────┐
│ ○ Photometry   │        │      │ √Utility             │
│ ○ Quantitation │        │  ──▶ │   ◉ D2 Lamp   On     │
│ ○ Kinetics     │ 11:54  │      │   ○ W Lamp    On     │
│ ◉ Utility      │ 04/23  │      │   ○ Date & Time      │
└────────────────┴────────┘      └──────────────────────┘
```

Turn On/Off D2 Lamp

Press [△], [▽] to choose "D2 Lamp", then press [ENTER] to enter into. Press [△], [▽] to choose "On" or "Off", press [ENTER] to turn on/off.

```
┌──────────────────────┐      ┌──────────────────────┐
│ √Utility             │      │ √D2 Lamp             │
│   ◉ D2 Lamp   On     │  ──▶ │   ◉ On        √      │
│   ○ W Lamp    On     │      │   ○ Off              │
│   ○ Date & Time      │      │                      │
└──────────────────────┘      └──────────────────────┘
```

Turn On/Off W Lamp

Press [△], [▽] to choose "W Lamp", then press [ENTER] to enter into. Press [△], [▽] to choose "On" or "Off", .press [ENTER] to turn on/off.
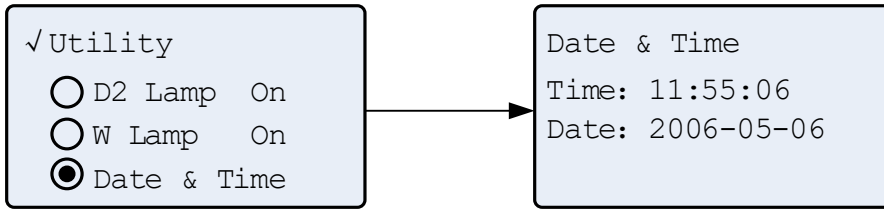
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```
┌────────────────────────┐          ┌────────────────────────┐
│ √Utility               │          │ √W Lamp                │
│    ◯ D2 Lamp   On      │          │    ⦿ On        √       │
│    ⦿ W  Lamp    On     │ ────────▶│    ◯ Off               │
│    ◯ Date & Time       │          │                        │
└────────────────────────┘          └────────────────────────┘
```
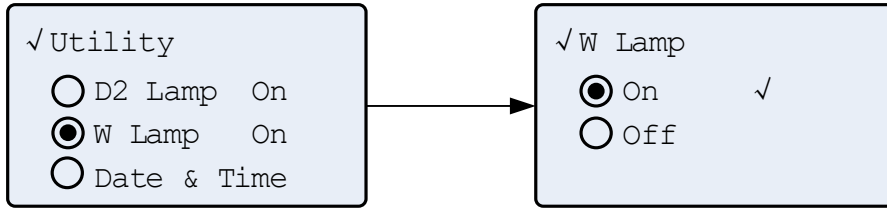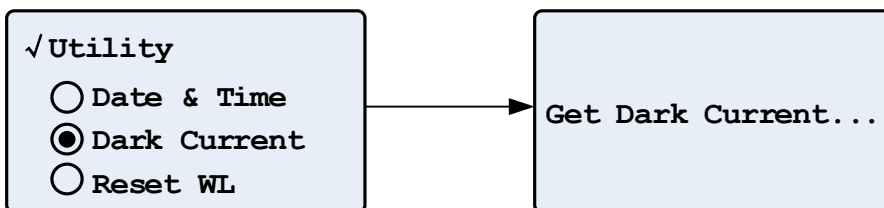
Set Date & Time

Press △ , ▽ to choose "Date & Time", then press ENTER to enter into. Input hh:mm:ss

and yy-mm-dd, .press ENTER to confirm.

```
┌────────────────────────┐          ┌────────────────────────┐
│ √Utility               │          │ Date & Time            │
│    ◯ D2 Lamp   On      │          │ Time: 11:55:06         │
│    ◯ W  Lamp    On     │ ────────▶│ Date: 2006-05-06       │
│    ⦿ Date & Time       │          │                        │
└────────────────────────┘          └────────────────────────┘
```

Get Dark Current

Keep the light path without anything blocking, press △ , ▽ to choose "Dark Current",

then press ENTER to resample Dark Current.

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

```
┌────────────────────────┐          ┌────────────────────────┐
│ √Utility               │          │                        │
│    ◯ Date & Time       │          │                        │
│    ⦿ Dark Current      │ ────────▶│  Get Dark Current...   │
│    ◯ Reset WL          │          │                        │
└────────────────────────┘          └────────────────────────┘
```
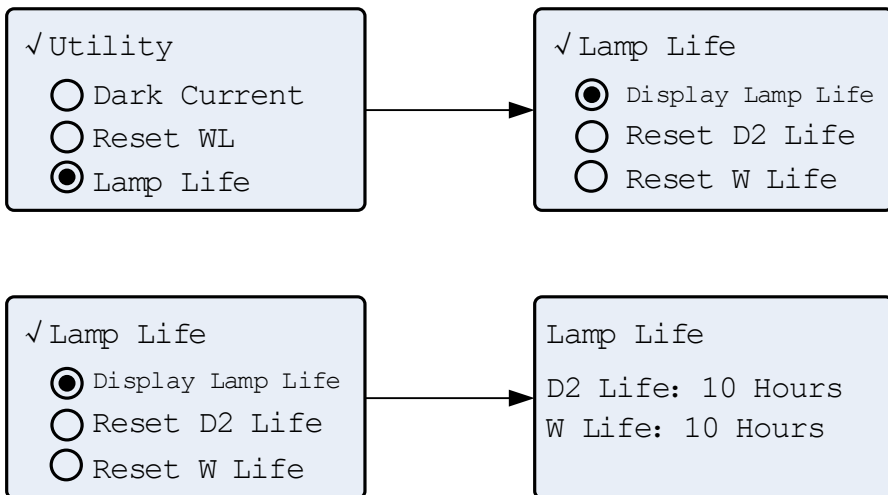
Reset Wavelength

Keep the light path without anything blocking, press [△], [▽] to choose "Reset WL", then press [ENTER] to reset wavelength.

```
√Utility                      Calibrating WL...
  ◯ Date & Time
  ◯ Dark Current
  ● Reset WL
```
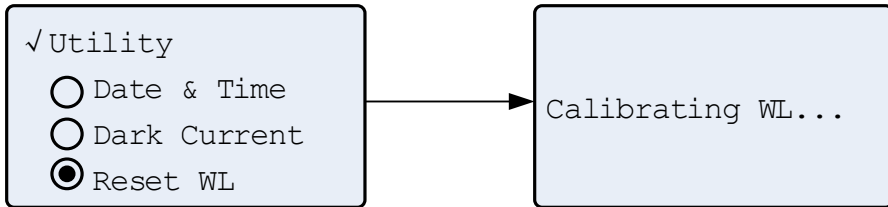
Lamp Life

Press [△], [▽] to choose "Lamp Life", then press [ENTER] 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.

```
√Utility                      √Lamp Life
  ◯ Dark Current                ● Display Lamp Life
  ◯ Reset WL                    ◯ Reset D2 Life
  ● Lamp Life                   ◯ Reset W Life
```

```
√Lamp Life                    Lamp Life
  ● Display Lamp Life          D2 Life: 10 Hours
  ◯ Reset D2 Life              W Life: 10 Hours
  ◯ Reset W Life
```

Load Default Parameter

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

```
√ Utility
   ◯ Reset WL
   ◯ Lamp Life
   ◉ Load Default
```
→
```
√ Load Default
   ◉ Yes
   ◯ No
```
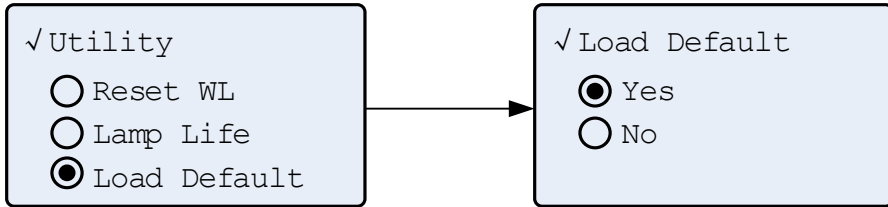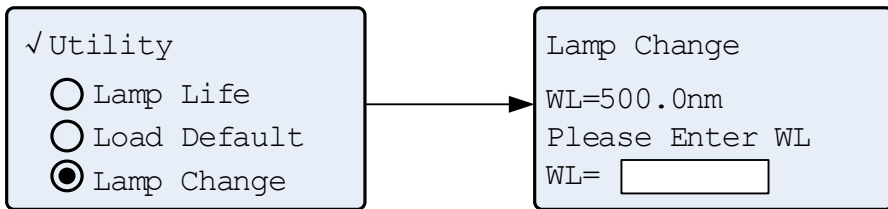
Lamp Change

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

```
√ Utility
   ◯ Lamp Life
   ◯ Load Default
   ◉ Lamp Change
```
→
```
Lamp Change

WL=500.0nm
Please Enter WL
WL= [        ]
```

Select Language

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

```
√ Utility
   ◯ Load Default
   ◯ Lamp Change
   ◉ Language
```
→
```
Language
   ◉ English
   ◯ Français
   ◯ Deutsch
```

About Version

Press $\boxed{\triangle}$, $\boxed{\triangledown}$ to choose "Version", press $\boxed{\text{ENTER}}$ to view version information, press any key to return.

```
√Utility
  ○ Load Default
  ○ Lamp Change          Software: V1.5.0
  ◉ Version              Hardware: V1.2
```
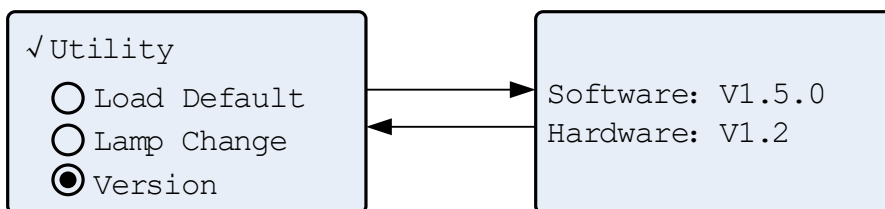
Troubleshooting

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	The lid of the compartment is	Close the lid, restart

when self-check	open during self-check	
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.
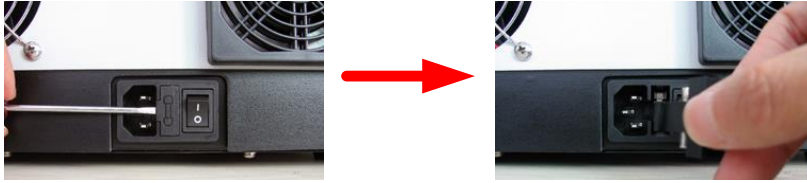
4. Replace a new fuse

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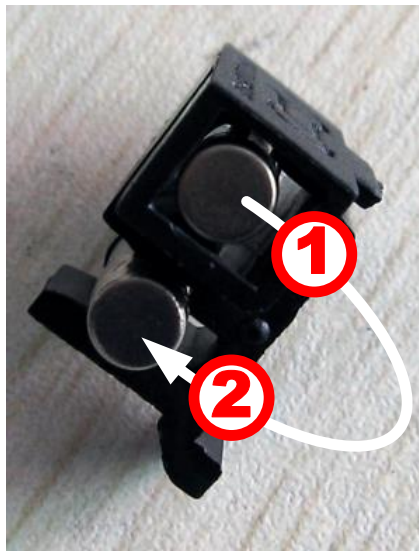
5. Reset the fuse seat

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!
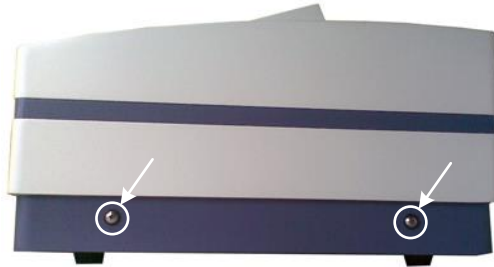
1. Tools preparation

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.
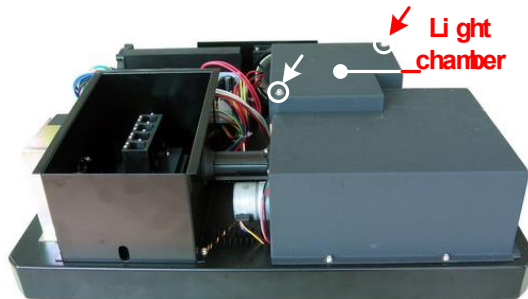
5. **Replace the D2 lamp**

    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.
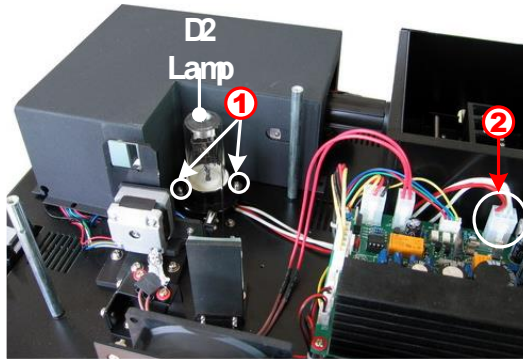
6. **Replace W lamp**

   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.
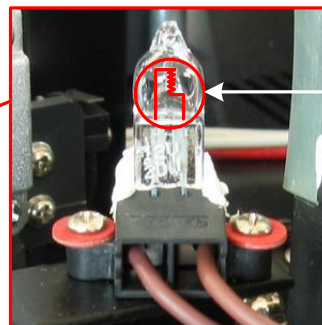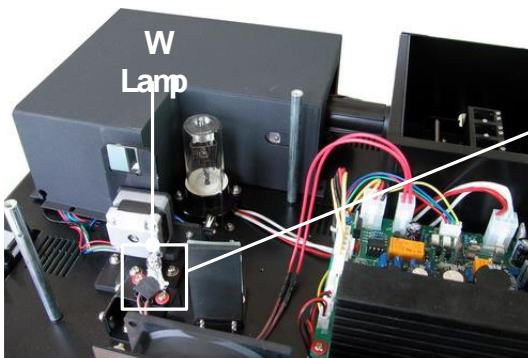
7. **Adjust the position of the W lamp**

   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.

Right Position
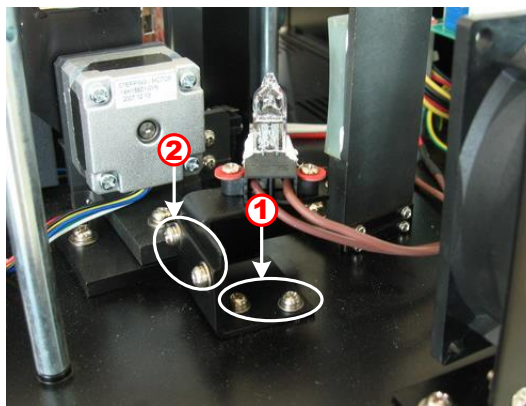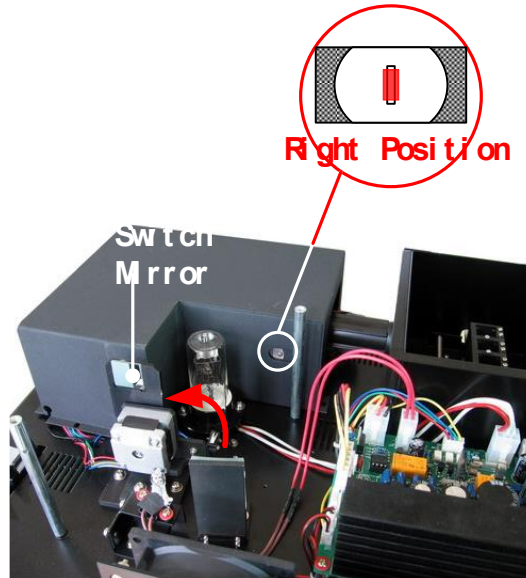
Switch
Mirror

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.
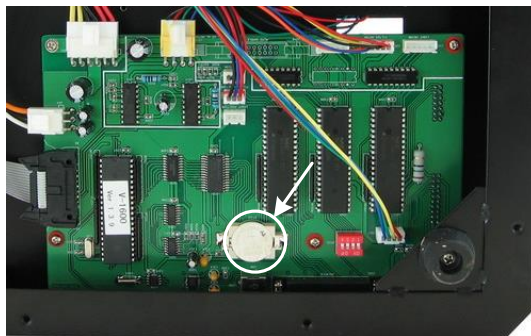
5. **Finish**

    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	634-6003
CELL HOLDER, 4-CELL,10 TO 50MM	1PC	634-6004
CELL HOLDER, 4-CELL, 10 TO 100MM	1PC	634-6005
CELL HOLDER, FOR CYLINDRICAL CELL	1PC	634-6006
CELL HOLDER, WATER-JACKETED, 1 CELL, 10MM	1PC	634-6007
CELL HOLDER FOR MICRO CELLS,BEAM HEIGHT:15MM	1PC	634-0687
CELL HOLDER FOR TEST TUBES	1PC	634-6009
CELL HOLDER,8-POSITION AUTO CELL CHANGER	1PC	634-6010
CELL HOLDER, SOLID SAMPLE	1PC	634-6011
CELL HOLDER, WATER-JACKED, 4 CELL, 10MM	1PC	634-6012
CUVETTE, SQUARE.GLASS,10MM	4PCS	634-6013
CUVETTE, SQUARE.GLASS,20MM	2PCS	634-6014
CUVETTE, SQUARE.GLASS,30MM	2PCS	634-6015
CUVETTE, SQUARE.GLASS,50MM	2PCS	634-6016
CUVETTE, SQUARE.GLASS,100MM	1PC	634-6017
CUVETTE, SQUARE.QUARTZ,10MM	2PCS	634-6018
CUVETTE, SQUARE.QUARTZ,20MM	2PCS	634-6019
CUVETTE, SQUARE.QUARTZ,30MM	2PCS	634-6020
CUVETTE, SQUARE.QUARTZ,50MM	2PCS	634-6021
CUVETTE, SQUARE.QUARTZ,100MM	1PC	634-6022
CELL,QUARTZ, 100UL, 10MM, BEAM HEIGHT:15MM	1PC	634-0688
CELL,QUARTZ, 200UL, 10MM, BEAM HEIGHT:15MM	1PC	634-0689
CELL,QUARTZ, 500UL, 10MM	1PC	634-6025
FLOW CELL, 5 MM, GLASS, BEAM HEIGHT:15MM	1PC	634-0690
FLOW CELL, 10 MM, GLASS, BEAM HEIGHT:15MM	1PC	634-0691
FLOW CELL, 20 MM, GLASS, BEAM HEIGHT:15MM	1PC	634-0692
FLOW CELL, 30 MM, GLASS, BEAM HEIGHT:15MM	1PC	634-0693
FLOW CELL, 5 MM, QUARTZ, BEAM HEIGHT:15MM	1PC	634-0694

FLOW CELL, 10 MM, QUARTZ, BEAM HEIGHT:15MM	1PC	634-0695
FLOW CELL, 20 MM, QUARTZ, BEAM HEIGHT:15MM	1PC	634-0696
FLOW CELL, 30 MM, QUARTZ, BEAM HEIGHT:15MM	1PC	634-0697
PELTIER UNIT, BEAM HEIGHT:15MM	1PC	634-0698
SIPPER UNIT WITHOUT TEMP. CONTROL, BEAM HEIGHT:15MM	1PC	634-0699
SIPPER UNIT WITH PELTIER TEMP. CONTROL, BEAM HEIGHT:15MM	1PC	634-0763
LAMP, HALOGEN, 12V20W	1PC	634-6037
LAMP, DEUTERIUM	1PC	634-6038
PRINTER, THERMAL PRINTER	1PC	634-6039
THERMAL PAPER	1PC	634-6043
FUSE, 3.15A/250V	1PC	634-0651
FUSE, 500MA/250V	1PC	634-0652
BATTERY, 3V, CR2032	1PC	634-0653

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 delivery except the lamps. Lamps have a warranty of 1000 h lamp usage time or 6 months max. If a defect is present, VWR will, at its option and cost, repair, replace, or refund the purchase price of this product to the customer, 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. If the required maintenance and inspection services are not performed according to the manuals and any local regulations, such warranty turns invalid, except to the extent, the defect of the product is not due to such non-performance.

Items being returned must be insured by the customer against possible damage or loss. This warranty shall be limited to the aforementioned remedies. IT IS EXPRESSLY AGREED THAT THIS WARRANTY WILL BE IN LIEU OF ALL WARRANTIES OF FITNESS AND IN LIEU OF THE WARRANTY OF MERCHANTABILITY.

Compliance with local laws and regulations
The customer is responsible for applying for and obtaining the necessary regulatory approvals or other authorisations necessary to run or use the Product in its local environment. VWR will not be held liable for any related omission or for not obtaining the required approval or authorisation, unless any refusal is due to a defect of the product.

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.

- 512MB Memory(1GB or Above is strongly recommended);

- 50MB or above hard disc Space;

- Microsoft Windows XP/Vista/7/8.

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 , "Notice" form appear, click **OK**;
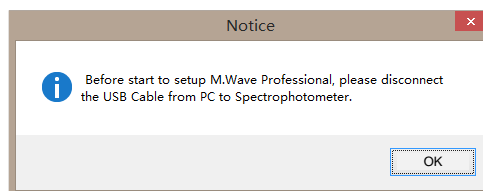
3. "Welcome" form appear, click **Next**;
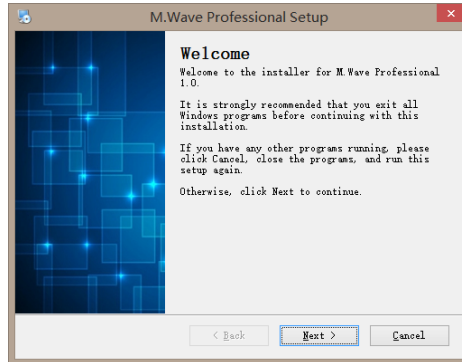
4. Input user's information, click **Next**;
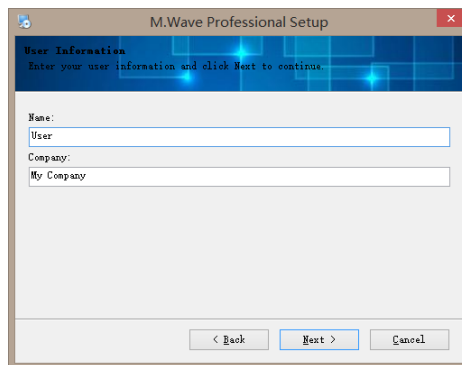
5. Choose install path, then click **Next**;
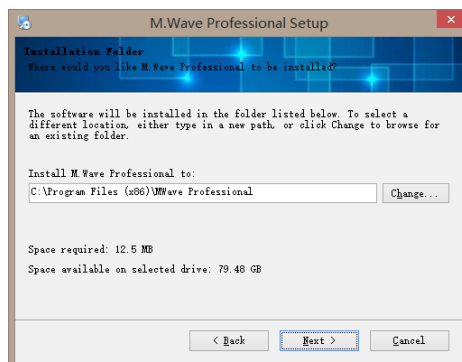
6. Choose Shortcut file folder, then click **Next**, all the setting information will be displayed on the screen, click **Next** to copy files to Hard disc;
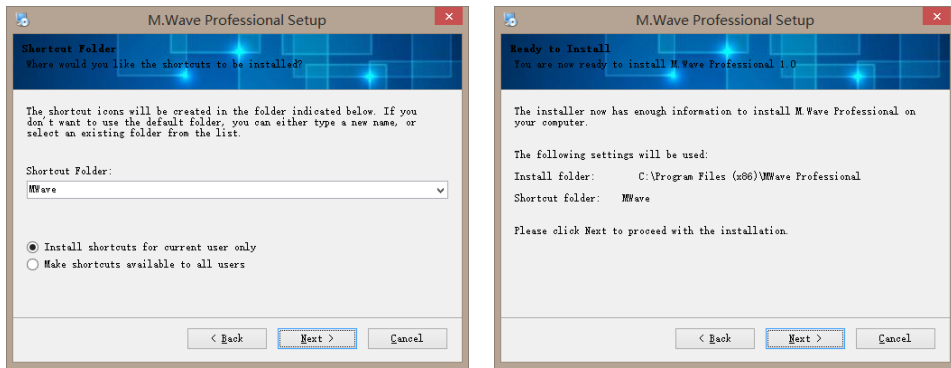
7.   After finished copy all files of M.Wave Professional, it will start install the USB Drive. Click **Next**;
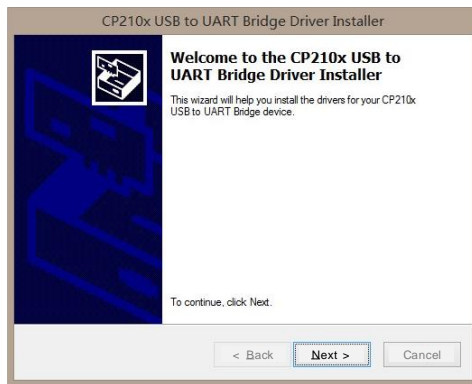
8.   Select "I accept this agreement". Click **Next** to copy files to PC;
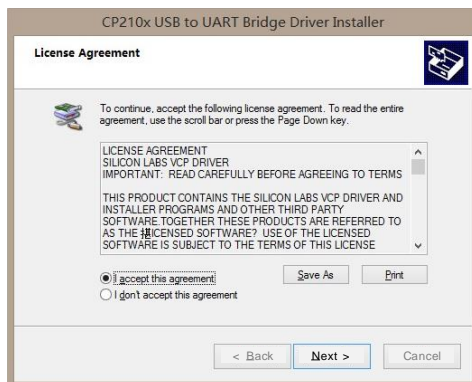
9. Click **Finish** to finish install USB Drive;
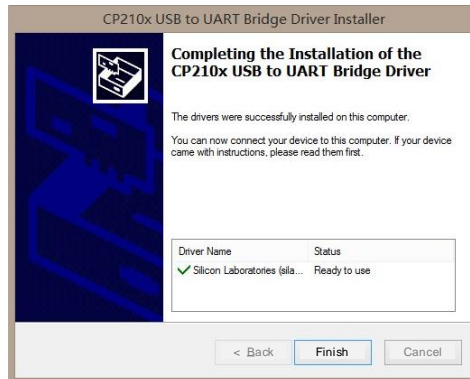
10. "Notice" form appear, click **OK**;
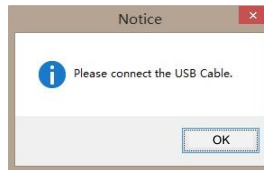
11. Click **Finish** to finish all the setup.
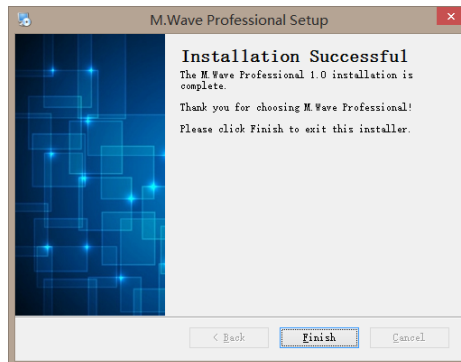
Uninstall M.Wave Professional
1. **Start→All Files→M.Wave Professional→Uninstall M.Wave Professional 2.0,** click **Next** to uninstall.
2. After all the files were removed, click **Finish** to end.
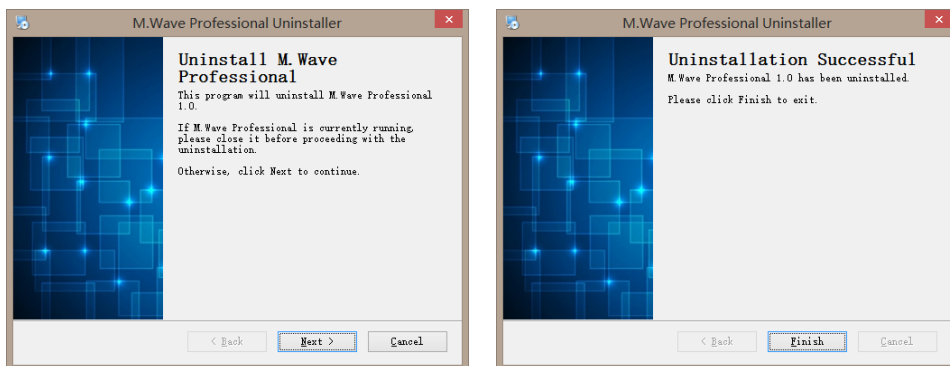
Run M.Wave Professional

- 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.
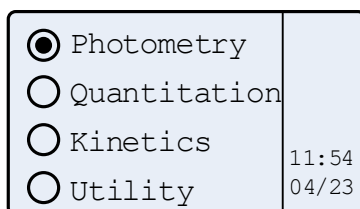
After M.Wave Professional being started, then click **Main Menu→Options**, a dialog box of **Options** will display in the screen, click **Search** to automatically search the instrument's communication port, after get the communication port, click **OK** to save setting. If you choose the option of Connect to Spectrophotometer When Start, the instrument will connect to the PC automatically when you run M.Wave Professional next time.

42
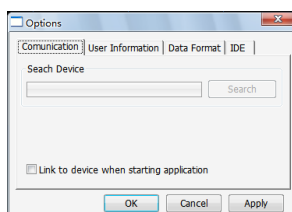
Set User's Information
Click **Main Menu→Options**, pop-up **Options** window, click **User's Information** tag, choose it and input relative user information, click **OK** to save settings, all this information will appear in your testing report.
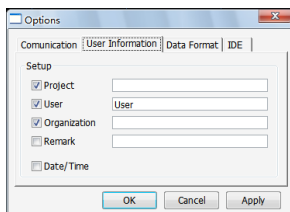
Set Data Format
Click **Main Menu→Options**, a dialog box of **Options** will display in the screen, click **Data Format** tag, choose the displaying format, and click **OK** to save setting.
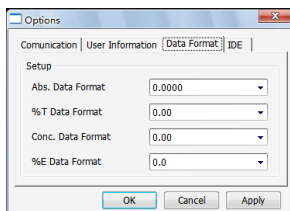
Set Interface Style
Click **Main Menu→Options**, a dialog box of **Options** will display in the screen, and click **Interface** tag. You can custom the style and color schemes of the interface as you like. Click **OK** to save setting.
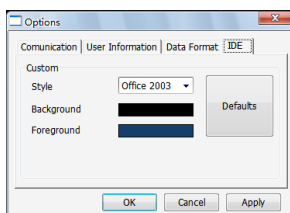
Connect to PC
After enter the Main Interface, click in the Tool Bar to connect with PC. After connection, the icon is on the pitched on state, you can release PC if you click the icon again.

Introduction

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

Main Interface

This is the main interface after start.
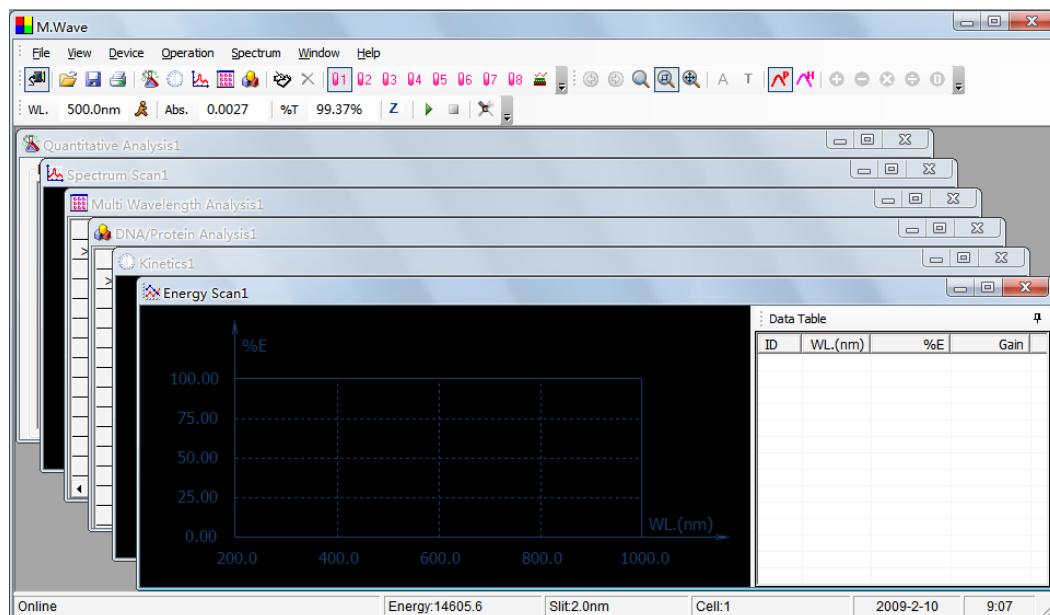
Menus Bar and Tools Bar

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.
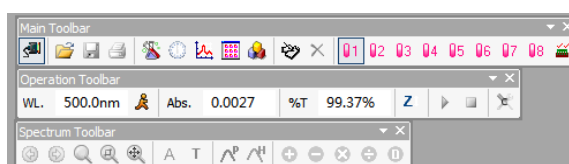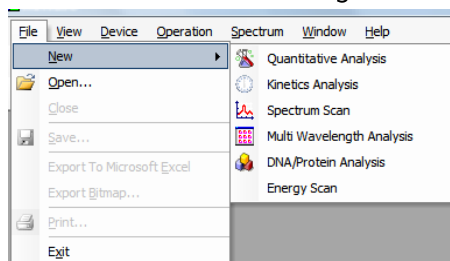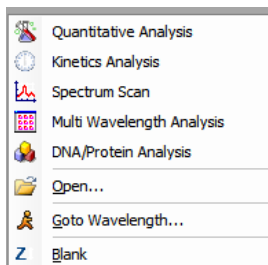
General Operating Instructions

Set Wavelength
Click the icon ![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.
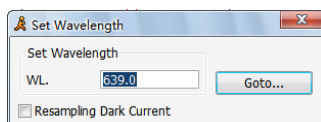
Blank
Put reference into the light path, click the icon ![icon] in the Tool Bar.

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 ![icon] in the Tool Bar.

Set Test Parameters
Click the button of ![icon] 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.
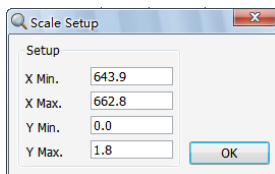
Auto Fitting
Click the icon on Tools Bar to change the scale to appropriate value.

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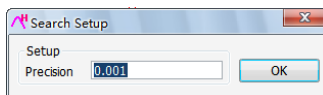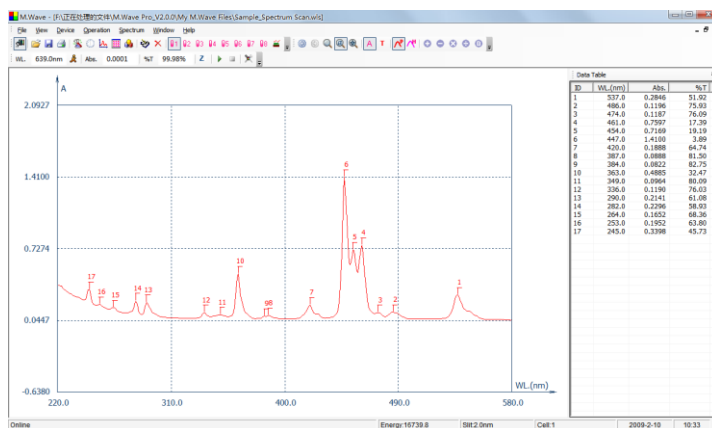
Mathematics Function
Click the icons or in the Tools Bar, a new dialog box will display on the screen respectively. You can add, subtract, multiply or divide two spectrums.

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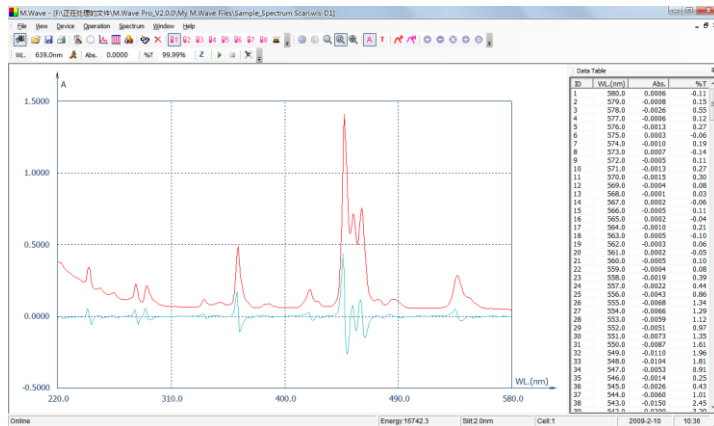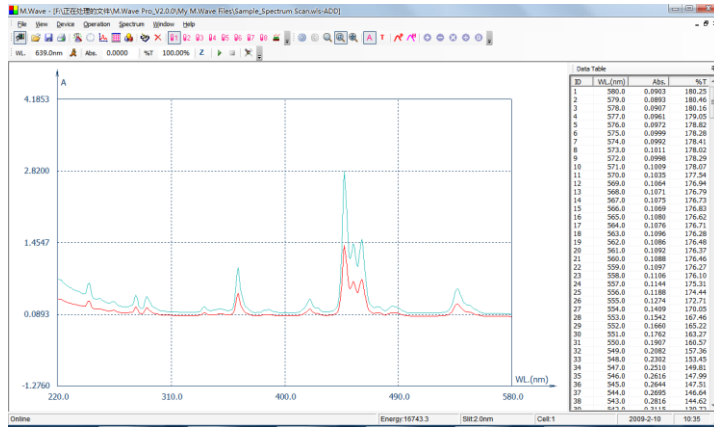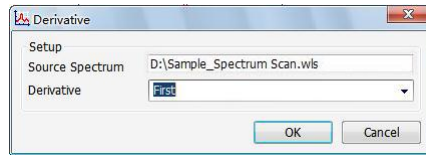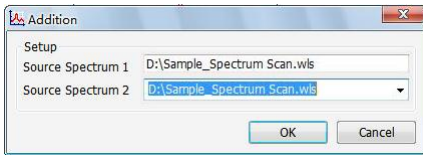
Spectrum Smooth
We use this function to wipe off the interferer of noise during the course of scan, so as to make the spectrum look much smoother. Click **Main Menu→Spectrum→Spectrum Smooth.**

Operation

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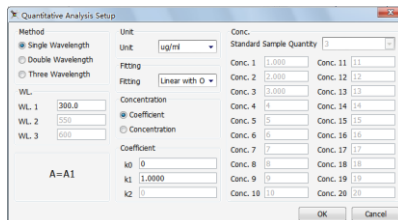
Quantitative Analysis

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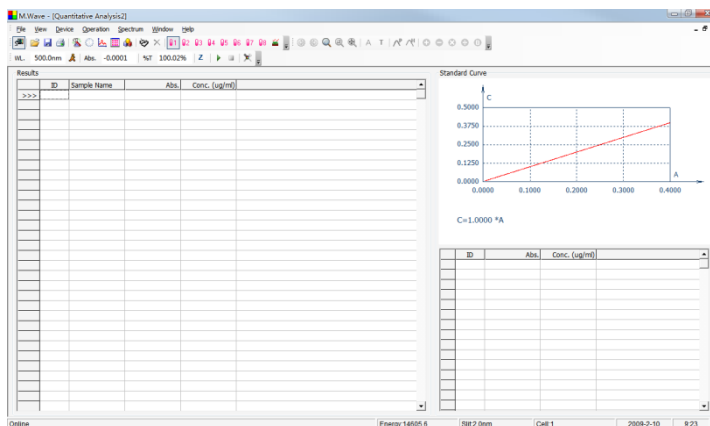
2. Click the icon in the Tools Bar Shortcut to set the parameters of Quantitative Analysis.

- 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.*

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;

(4) Click **OK** to finish setting;

(5) Pull the Reference into the light path and click the icon **Z↑**, 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 fist 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.


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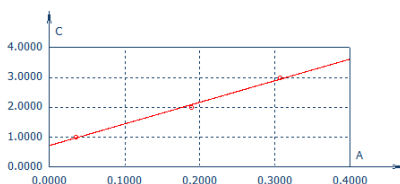
3. Pull the unknown into the light path (if it is Automatic 8-cell Holder in the instruments, click ![icon] to set the location of the relative cell first), Then click the icon, click ![icon] in the shortcut toolbar to test, the test result will display in the data sheet.
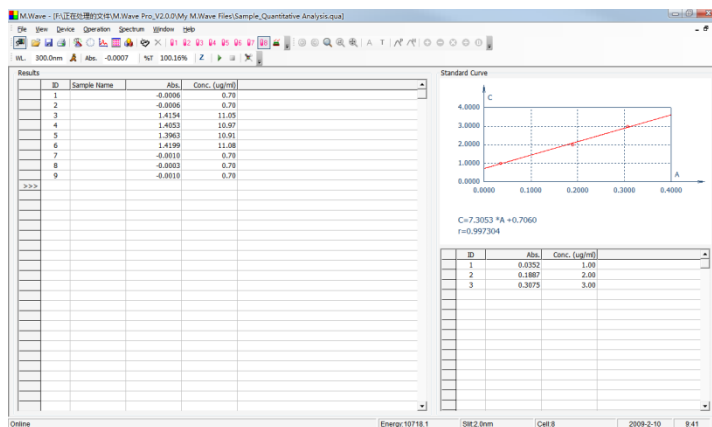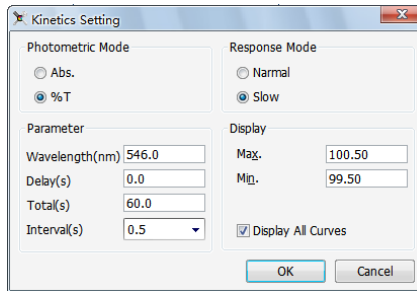

Kinetics Analysis

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

1. Click the icon ![icon] to begin a new test of Kinetics;
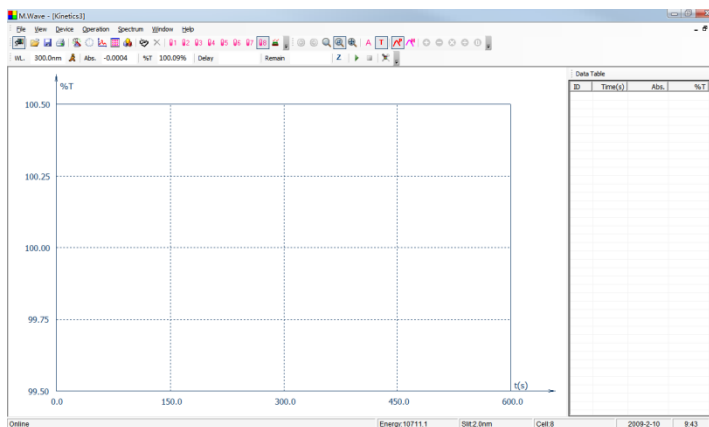
2. Click the button of ![icon] to set the parameters;

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 ![Z1] 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.
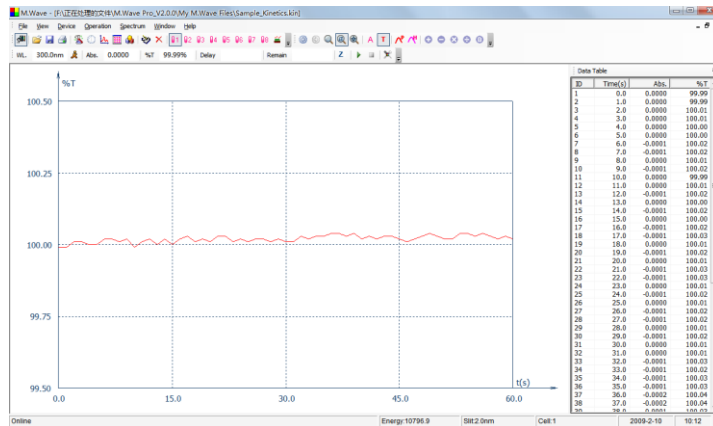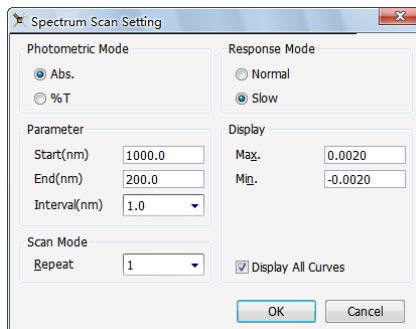

Spectrum Scan

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

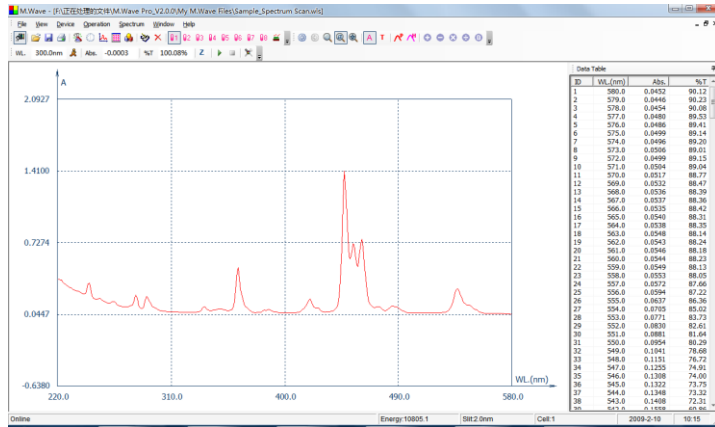1. Click the icon ![icon] on the Tools Bar to start a new Spectrum scan;

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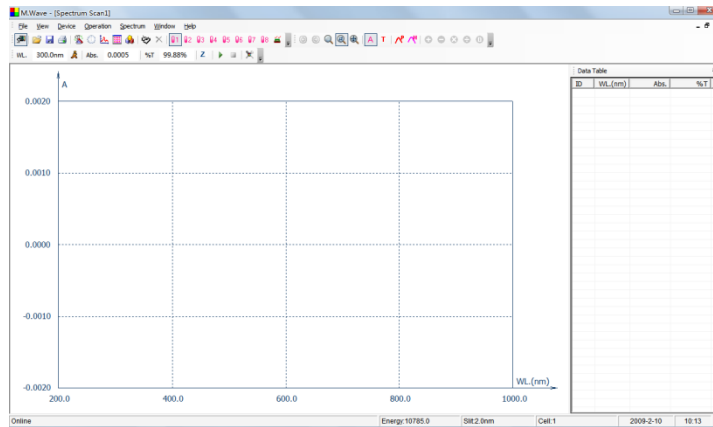
2. Click the icon ![icon] in the Tool Bar to set the parameters of Wavelength Scan;

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 ![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;
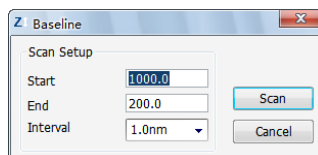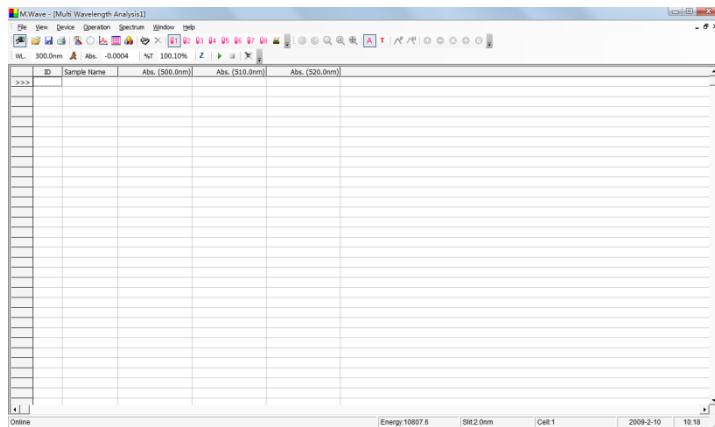

6. Put the unknown sample in the light path, click the icon ![icon] in the Tools Bar to start scanning, click ![icon] to interrupt and **cancel** scanning.

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;

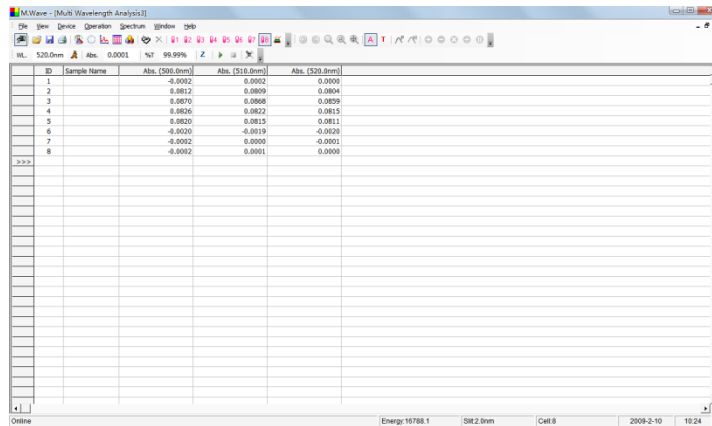2. Click the icon on the Tools Bar to set the parameters;

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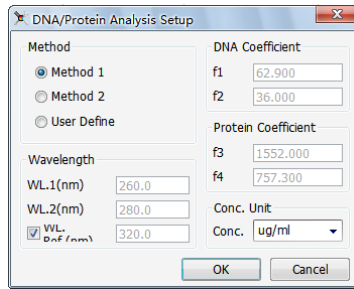
3. Choose the measure method first. We provide you 2 methods to measure, and you can also definite the coefficients and wavelength by yourself;
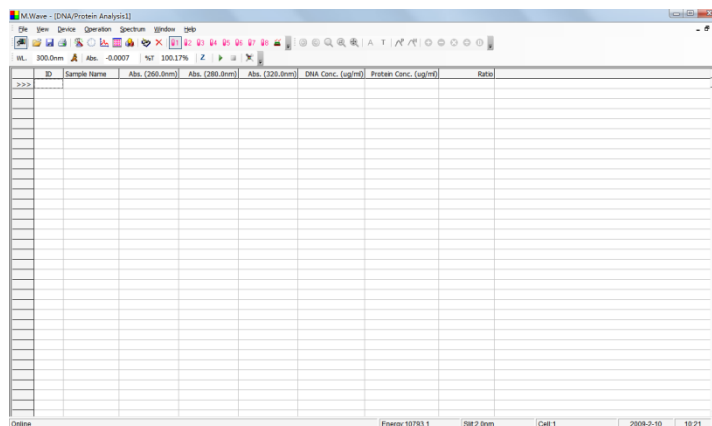4. Click **OK** to finish and exit the setting;
5. Pull the reference into the light path, click in the Tools Bar to do blank;
6. Pull the sample in the light path, click the icon to measure. The result will display in the data sheet.

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;
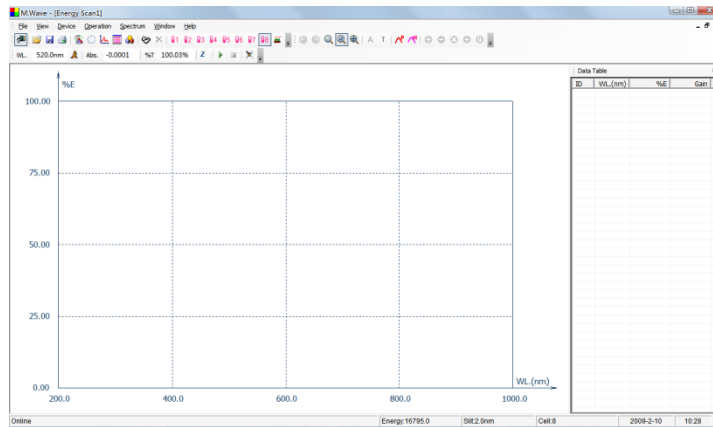
2.   Click the icon ![icon] on the Tools Bar to set parameter;
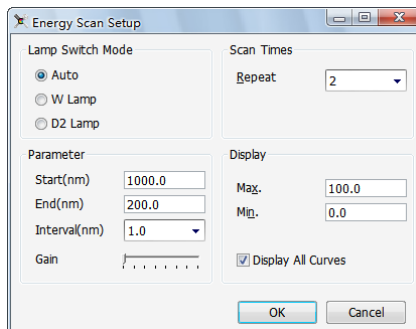
3.   Select Lamp Switch Mode, Wavelength Range, Intervals, Repeat Times and Coordinate Range;

> ℹ️
> ▪ **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 ![icon] in Tools Bar to start scanning, click ![icon] to interrupt scanning and exit the course;

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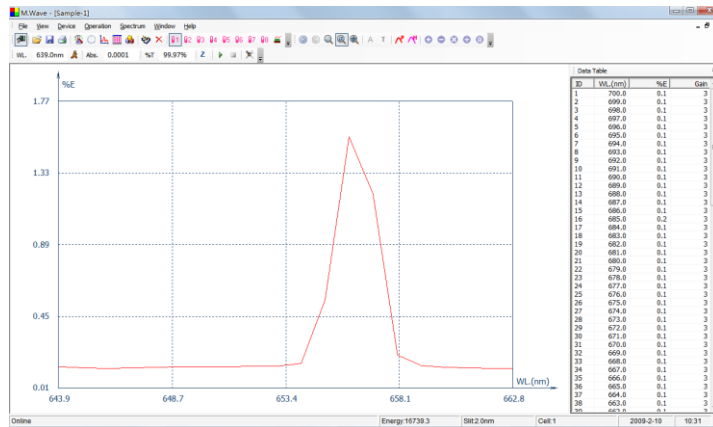
Other Functions

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.
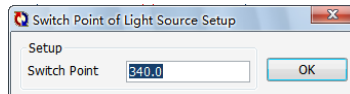
Get Dark Current
Click **Main Menu→Device→Get Dark Current**, the system will reget the dark current and the new data will replace the old one.

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.

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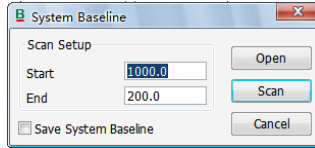
> You needn't to build system base line normally, only when it is a very long time that the instrument wasn't be used or the environment changed much.

Automatic 8-Position Changer (Accessories)
Click the icon 1… 8to 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： $Abs.=m*A_1-n*A_2$

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

Appendix 2

Methods of DNA/Protein Analysis

Method 1： $C_{DNA}=(A_1-A_{ref})*f_1-(A_2-A_{ref})*f_2$

        $C_{Protein}=(A_2-A_{ref})*f_3-(A_1-A_{ref})*f_4$

        $Ratio=(A_1-A_{ref})/(A_2-A_{ref})$

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

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

Method 2： $C_{DNA}=(A_1-A_{ref})*f_1-(A_2-A_{ref})*f_2$

        $C_{Protein}=(A_2-A_{ref})*f_3-(A_1-A_{ref})*f_4$

        $Ratio=(A_1-A_{ref})/(A_2-A_{ref})$

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

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

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