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# 1. Overview

## 1.1 Features

UV2600 is a dual beam UV/Vis scanning spectrophotometer with a large LED screen. The instrument uses an intelligence modular design. It has friendly user interface, automatic operation system, powerful functions, advanced optical and circuit system and mechanical structure, and provides excellent technical specifications and long-time stable operating performance. So it can fit requirements by various users in different fields for any level's analysis applications.

UV2600 spectrophotometer operates with man-machine interaction in English. It's easy to be operated and mastered. To achieve a function is only by selecting and confirming the relevant items in the menu shown on the big LED screen. To replace light source lamps of the instrument is also very simple, only rotating some screws is needed. And the light source will be on the optimal position without tedious adjustment step.

UV2600 spectrophotometer can be widely used in organic, inorganic, petroleum, pharmacy, environment, biochemistry, clinic, food and feedstuffs etc. fields. It's essential equipment for quality control (QC) and quality assurance (QA).

## 1.2 Technical Specifications

### 1.2.1 Technical Parameters

|                              |   |
|------------------------------|---|
| Wavelength range:            | 190 - 1100 nm   |
| Wavelength accuracy:         | $\pm 0.3$ nm  |
| Wavelength repeatability :   | $\leq 0.2$ nm   |
| Transmittance range:         | 0 - 200% T  |
| Absorbance range:            | -0.301 - 4.000 A  |
| Transmittance accuracy:      | $\pm 0.3\%$ T   |
| Transmittance repeatability: | $\leq 0.1\%$ T  |
| Drift:                       | $\leq 0.001$ A/h @500 nm<br>(Power on the instrument after 2 hours) |
| Baseline straightness:       | $\pm 0.002$ A   |
| Stray light:                 | $\leq 0.05\%$ T   |
| Noise:                       | $\leq 0.1\%$ T @ 100%; $\leq 0.05\%$ T @ 0%                         |
| Scan speed:                  | 3 modes: fast, median and slow                                      |
| Spectral Bandwidth:          | 1.8 nm  |

### 1.2.2 Operation Conditions

|                          |   |
|--------------------------|---|
| Environment Temperature: | 5 - 35°C  |
| Environment humidity:    | $\leq 85\%$   |
| Working voltage:         | 110 ~ 220 V 50 ~ 60 Hz  |
| Power consumption:       | 200W  |
| Main accessories:        | Printer   |
| Working place:           | Should avoid strong electro-magnetic interference and vibration around the work place |

### 1.2.3 Size

|           |                               |
|-----------|-------------------------------|
| Dimension | 540 mm(L)×430 mm(W)×220 mm(H) |
| Weight    | 18 kg                         |

## **1.3 Main functions**

The functions of the instrument can be divided into two groups: automatic control functions and analytical operation and data processing functions.

### **1.3.1 Automatic control**

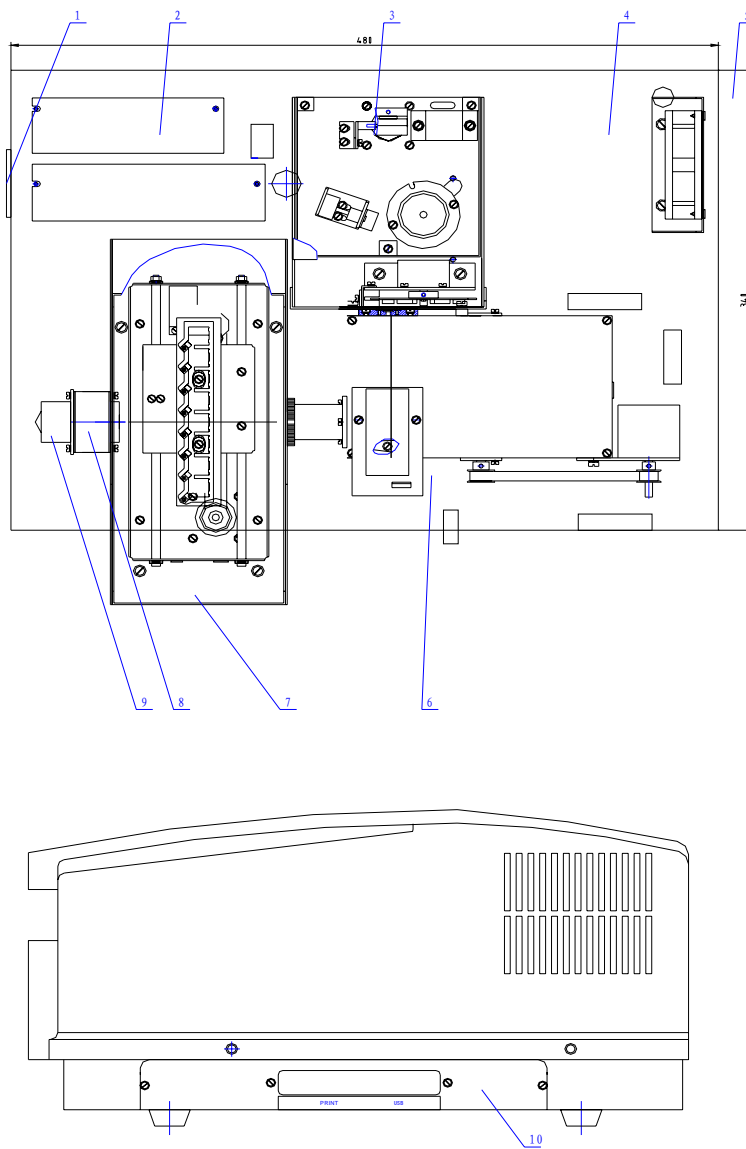
- 1) Self-check and wavelength auto-calibrate when power on;
- 2) Auto-set wavelength position;
- 3) Auto-switch filter;
- 4) Auto-switch light source;
- 5) Auto-optimize light source switching point;
- 6) Display and print spectrograms and data;
- 7) Display error messages.

### **1.3.2 Analytical operation and data processing**

- 1) Photometric measurement
- 2) Spectrometric scanning
- 3) Quantitative analysis
- 4) Multi-wavelength measurement
- 5) Chemical kinetics measurement
- 6) Spectrogram zoom, save and load
- 7) Peaks' values determination, searching and printing

# 1.4 Instrument's structure

## 1.4.1 Internal layout



- 1. Power switch      2. Power supply      3. Monochromator and light house
- 4. Basement          5. Fan                  6. Light splitter
- 7. Sample house      8. Lenses              9. Pre-amplifier
- 10. CPU circuit, USB and Printer port

### 1.4.2 Optical system

UV2600 optical system is shown in Figure 2

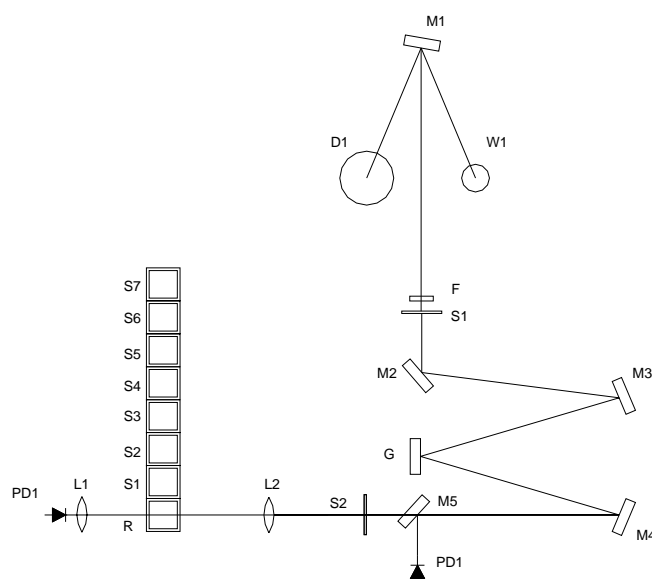


Figure 2

The light source of the instrument is composed by a tungsten lamp (W1), a deuterium lamp (D2) and a spherical mirror (M1). It can focus the light from W1 or D2 onto the incidence slit of the monochromator. Switching lamp is achieved by a stepmotor to rotate M1 under program controlling.

The monochromatic system of the instrument is composed by an incidence slit (S1), an exit slit (S2), a plane reflection mirror (M2), collimation mirrors (M3, M4), a grating (G) and filters (F). A wavelength stepmotor and a filters stepmotor are used to rotate the G and F under program controlling.

Cuvettes will be put on the stand (R and S position) in the sample house. And lenses L1 and L2 focus the light on photoelectric cells. Reference sample should put on R position, and standard or sample should put on S position.

The optical system structure is using an asymmetry aberration correction C-T arrangement, which can give out high quality homogeneous light.

### 1.4.3 Electric circuit system

The circuit system is composed by power supply, regulated voltage circuit, stepmotor drive circuits, pre-amplifier circuit and microcontroller circuit.

The regulated voltage circuit can give out 12 V 20 W for tungsten lamp, 300 mA current for deuterium lamp,  $\pm 15$  V working voltage, 12 V for fan and stepmotors and 5 V for microcontroller.

The pre-amplifier circuit includes photocurrent amplifier, programming gain amplifier and V/F transformer.

The photodetector is high quality silicon photocell, which is long life, anti-fatigue and anti-damp.

#### **1.4.4 Microcontroller system**

The MCS-51 microcontroller is used for program control in UV2600. A USB interface is used for communication between instrument and PC computer. A standard parallel port is provided for printer. A big LED screen is used to provide clear display and the light of the background can be adjusted. And the instrument also provide 256K ROM and power-off protected 128K RAM.



## 1.5 The basic principle

Although the instrument of UV/Vis keeps in growing, the basic work principle is still based on Lambert-Beer's law, as following:

$$A = KLC$$

Where: A is the absorbance of the sample at a special wavelength;

K is a coefficient, named absorbance coefficient.

L is the thickness of the sample. Normally it is the cuvette's size.

C is the concentration of the sample.

It can be found that the absorbance of the sample under homogeneous light is directly proportional to the concentration of the sample.

When a homogeneous light goes through the sample and arrives the detector, the photoelectric cell transfers this light into photocurrent. The strength of the photocurrent determines the absorbance's value. If  $I_0$  represents the photocurrent that comes from the light through the reference sample, I represents the light that goes through the sample and the ratio between them is represented by  $\tau$  named transmittance, or T % named light transmittance, we can get the following equation:

$$\tau = I / I_0 \times 100\%$$

The Lambert-Beer's law points out that the negative logarithm value of the transmittance is the absorbance, and it is directly proportional to the concentration of the sample, as equation:

$$A = -\lg \tau = \lg (I_0/I) = KCL$$

At the same time, different substances at different wavelengths will have different absorbance. This character of substances becomes the basic principle for compounds' quantitative and qualitative analysis by spectrophotometry method.

## **2 Installing the instrument**

### **2.1 Checking the accessories**

Besides UV2600 UV/Vis machine, the essential accessories are also shipped inside the packing. And depend on customer's choice when order, optional accessories will also be shipped together. Please check that you get the complete set using packing list and accessories list after unpacking. If there are any damage or lost, please contact with us immediately.

#### **2.1.1 Standard packing list**

- |                             |                     |
|-----------------------------|---------------------|
| 1) Machine                  | 1                   |
| 2) Power cord               | 1                   |
| 3) Quartz cuvettes          | 2 pair (optional)   |
| 4) 5A fuse                  | 2 (duplicate parts) |
| 5) User Manual              | 1                   |
| 6) Certification of quality | 1                   |
| 7) Packing list             | 1                   |

#### **NOTE:**

The accessories list inside the packing box is the actual accessories in the packing.

## 2.2 Choosing a Suitable Place

In order to keep the instrument operating in good condition for long time, please check the working place for the instrument carefully before you begin to install it.

The place you have chosen should meet the following requirements:

- 1) Avoid high temperature and high humidity place

Do not install the instrument at high temperature and high humidity place. The instrument should work at 5 - 35°C and humidity  $\leq 85\%$ .

- 2) Avoid strong electro-magnetic interference

The instrument should be as far as possible away devices that can give out magnetic field, electronic field or high-frequency wave.

- 3) Avoid corrosive gas

Do not install the instrument at the place that have corrosive gases, such as chlorine, hydrochloric acid, hydrogen sulfide, sulfurous acid, beyond the standard.

- 4) Place on stable workbench

The workbench for the instrument should be flat, stable and avoid vibration. There should have enough space beside the fan to achieve good ventilation.

- 5) Avoid using the same power outlet with other instruments

The instrument should use a power outlet alone. Do not plug it with any other electronic devices. The power outlet should have protection ground line.

- 6) Avoid the instrument directly exposure under sun light.

- 7) Avoid installing the instrument at overmuch dust place

## 2.3 Working power voltage

### **WARNING:**

Unsuitable power voltage can damage the instrument!

UV2600 UV/Vis can work under AC 110~220 V 50~60 Hz. This range can cover most of countries' electric standard in the world wide. But please check the power voltage inside the range before plugging in the instrument to avoid the damage.

The metal parts of the instrument can be electrified if there is no ground line. And it also affect the signal's stability if there is no good ground. So please check the ground line before power on the instrument. The ground line should fit the relative electrician standards.

### **WARNING**

The neutral line and ground must not connect inside power outlet!

## 2.4 The instrument installing

It's very simple to install the UV2600 instrument. Only four steps are needed as following describe.

**First step:** Unpacking the instrument and place it on a stable workbench.

**Second step:** Connect power cord and plug it into power outlet.

**Third step:** Power on the machine. The instrument goes into system initialization process. The screen display:

```
Initialization

LSI System      ..... OK
Sample Room     ..... OK
Filter zero     ..... OK
Switch zero     ..... OK
WaveLen zero    ..... OK
Wi Energy       ..... OK
D2 Energy       ..... OK
Locate Wave     .....
```

**Fourth step:** Main menu display on the screen after initialization. Now the instrument is ready for using. The screen display:

|                     |         |         |
|---------------------|---------|---------|
| 12 : 30 : 10        | 500.0nm | 0.0000A |
| <Main Menu>         |         |         |
| 1. Photometer       |         |         |
| 2. Spectrum         |         |         |
| 3. Quantitative     |         |         |
| 4. Kinetics         |         |         |
| 5. Data processing  |         |         |
| 6. Multi-wavelength |         |         |
| 7. Utilities        |         |         |
| <hr/>               |         |         |
| Select item:        |         |         |

**WARNING:**

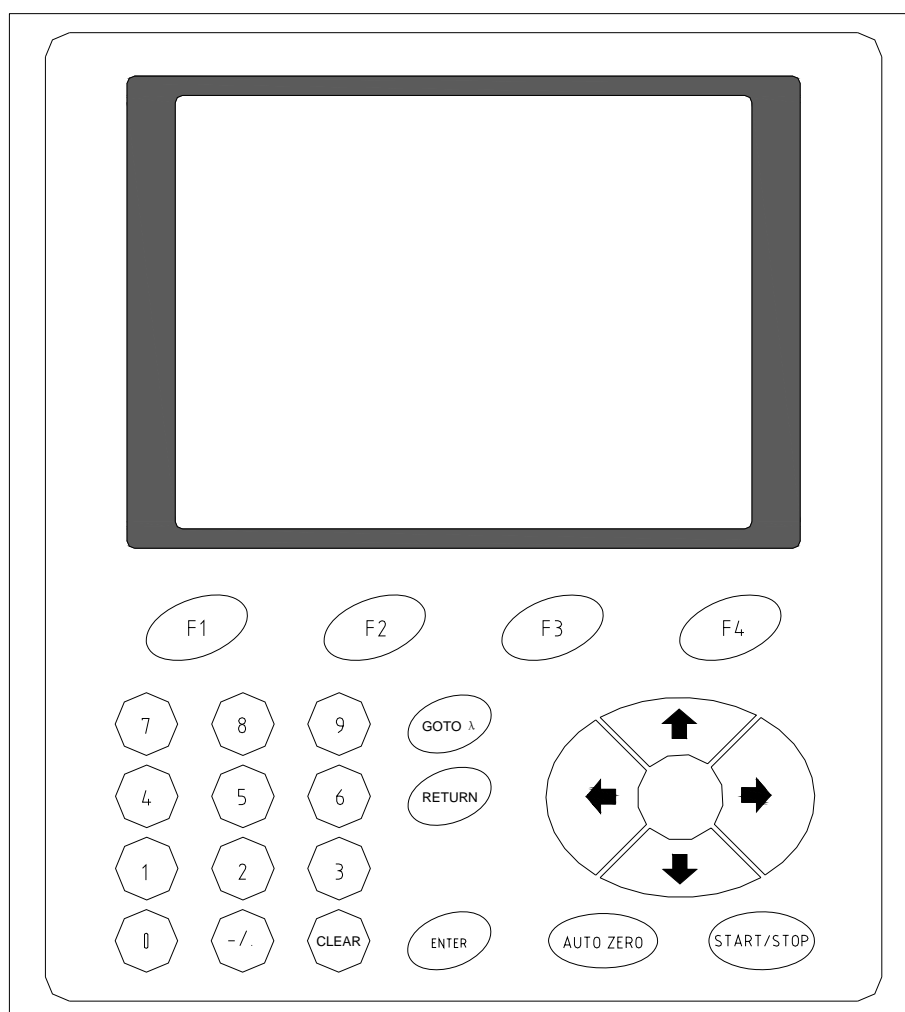
Do not open the door of the sample house during the initialization process!

## 3 Operating instrument

### 3.1 Keypad description

UV2600 UV/Vis instrument use a special cord to connect keypad and the microcontroller. All functions will be setup through keypad inputting and the statuses or menu will be displayed on the screen.

The layout of the keypad is shown in figure 4.



There are 25 keys on the keypad, include 11 number keys, 4 arrow keys and 10 function keys. Each key's function are described in this section.

#### **F1 to F4**

Functions of these keys will be different under the different menu. They correspond with functions in four blocks displayed at the bottom of the screen. The detail will be described in each function's descriptions.

#### **0 – 9, -/.**

0-9 are number keys and -/. is point and sign key. They are used for input number

parameters, such as wavelength value, limit values for A, T or E and concentration values etc.

**[↑], [↓], [←] [→]**

These four arrow keys can move the cursor to up, down, left or right direction. Press once, the cursor on the screen move one position. Then the items can be selected.

**[ENTER]**

This is the confirming key. After input new value or select a menu item, this key must be pressed to confirm.

**[CE]**

This is the clear key. After input a new value and before confirm it, this value can be cleared by pressing this key.

**[GOTO  $\lambda$ ]**

Under single wavelength measurement, this key is used for setting a new wavelength value.

**[AUTO ZERO]**

This key is the auto zero adjustment key. After press this key, the instrument will set  $\tau$  (T) =100% or A=0.000.

**[START/STOP]**

This key is running or stop key. After set all parameters, the instrument will begin measurement when press this key. After the measurement finished, it can be run again if press this key again. When this key is pressed in measurement process, the measurement will be stopped and the instrument will go into parameter setting status.

**[RETURN]**

This key is used for return to the upper-level menu.

### 3.2 System initializing and self-checking

When power on the instrument, it will go into system initializing and self-checking status first. The screen display:

```
Initialization

LSI System      ..... OK
Sample Room     ..... OK
Filter zero     ..... OK
Switch zero    ..... OK
WaveLen zero   ..... OK
Wi Energy       ..... OK
D2 Energy       ..... OK
Locate Wave     .....
```

All items must be display OK in this process. If any error happed in this step, a “Failure” will display in that item’s line and the instrument will be stopped.

After the instrument passed self-checking process, main menu will display on the screen. The instrument needs warm-up 30 minutes before any measurement process. The main menu displayed on the screen is shown below:



|                     |         |         |
|---------------------|---------|---------|
| 12 : 30 : 10        | 500.0nm | 0.0000A |
| <Main Menu>         |         |         |
| 1. Photometer       |         |         |
| 2. Spectrum         |         |         |
| 3. Quantitative     |         |         |
| 4. Kinetics         |         |         |
| 5. Data processing  |         |         |
| 6. Multi-wavelength |         |         |
| 7. Utilities        |         |         |
| <hr/>               |         |         |
| Select item:        |         |         |

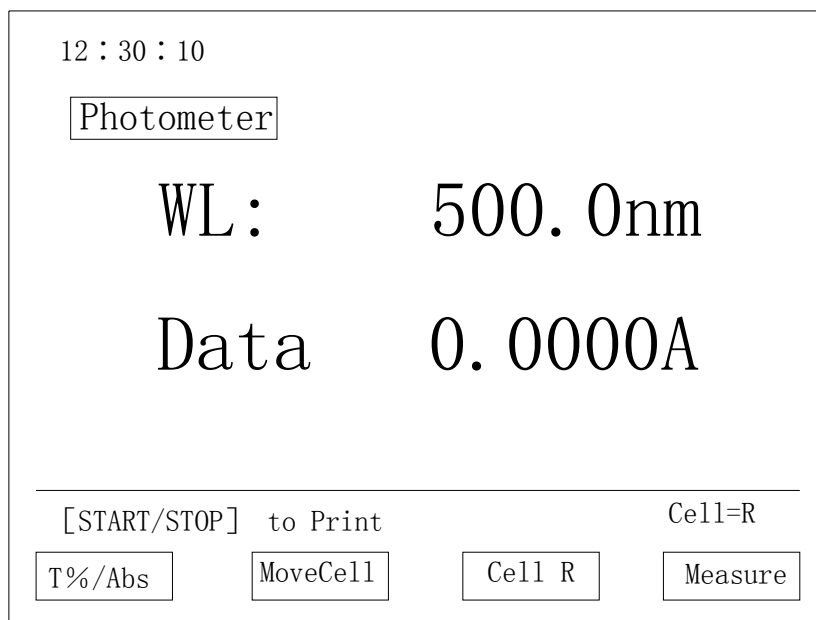
Using ↑ or ↓ keys to select one function, the selected item will be displayed in the inverse color. Using [ENTER] key to confirm and go into the down-level menu.

**NOTE:**

If only one lamp wants to be used for measurement, the other lamp can be turned off to prolong the lamp's life. After self-checking, select item 7 [System set] function, deuterium and tungsten lamp can be set as on or off.

### 3.3 Photometric measurement

Select [Photometric] in the main menu and press [ENTER] to go into this function.  
The screen display:



Now four functions will display at the bottom of the screen. F1-F4 keys are used to select them.

**F1: T%/Abs**

Switch functions between light transmittance T% and absorbance Abs.

**F2: MoveSmpl**

Move cuvette stand forward. The cuvette stand moves one position when press this key once. The order is R, S1, S2, S3, S4, S5, S6, S7.

**F3: MoveHome**

Reset cuvette stand to beginning position. The cuvette stand will move to the R position.

**F4: SmplMeas**

Measure the Sample. The detail will be described in 3.3.1

Cell =R means the R position on the stand is on the light path now.

Press [GOTO  $\lambda$ ] key to set the wavelength. Input wavelength value (500 for this example as shown in the figure) and press [ENTER] to confirm.

The screen display: Wavelength setting...

The instrument will set the wavelength to the inputting value position.

After set all parameters, pour the reference sample (air in the example) and test sample (the solution of holmium oxide) into the pair of silicon cuvettes and put reference at R and sample at S1 position on the stand. Close the sample house door and press [AUTO ZERO].

“Auto zero...” will display on the screen until instrument auto zero correction finished.

Press F2 to move the stand to S1 position. Then the measurement result will display on the screen.

12 : 30 : 10

Photometer

WL: 500.0nm

Data 0.0368A

---

[START/STOP] to Print Cell=R

T%/Abs MoveCell Cell R Measure

Each time after finished measurement, pressing [START/STOP] can print out the result of this measurement.

### 3.3.1 Sample measurement

Press F4, the screen display:

12 : 30 : 10

Photometer K=1.0000 600.0nm 0.0120A

| SN. | Cell | WaveLen | Abs    | K*Abs  |
|-----|------|---------|--------|--------|
| 001 | R    | 500.0   | 0.0370 | 0.0370 |
| 002 | R    | 500.0   | 0.0370 | 0.0370 |
| 003 | R    | 550.0   | 0.0325 | 0.0325 |
| 004 | R    | 550.0   | 0.0326 | 0.0326 |
| 005 | R    | 600.0   | 0.0120 | 0.0120 |

[START/STOP] to Start Cell=R

Browse MoveCell Cell R Factor

Press [START/STOP] once after put in one sample for measurement. Functions display on the screen means:

F1: DispData

Data display. The detail described in 3.3.1.1

F2: MoveSmpl

Move cuvette stand forward. The cuvette stand moves one position when press this key once. The order is R, S1, S2, S3, S4, S5, S6, S7.

F3: MoveHome

Reset cuvette stand to beginning position. The cuvette stand will move to the R position.

F4: K-Facto

Set K value.

SN: Sample's order number

Cell: The cuvette stand position that is measurement now.

WaveLen: The work wavelength

The [GOTO  $\lambda$ ] and [AUTO ZERO] keys can be used to change wavelength and adjust zero under this menu.

### 3.3.1.1 Data display

Press F1, the screen display:

| 12 : 30 : 10 |      | K=1.0000 |        | 600.0nm | 0.0120A |
|--------------|------|----------|--------|---------|---------|
| Photometer   |      |          |        |         |         |
| SN.          | Cell | WaveLen  | Abs    | K*Abs   |         |
| 001          | R    | 500.0    | 0.0370 | 0.0370  |         |
| 002          | R    | 500.0    | 0.0370 | 0.0370  |         |
| 003          | R    | 550.0    | 0.0325 | 0.0325  |         |
| 004          | R    | 550.0    | 0.0326 | 0.0326  |         |
| 005          | R    | 600.0    | 0.0120 | 0.0120  |         |
| Clear        |      | ▲        | ▼      | Return  |         |

F1: Mea Stat

Measurement status. Pressing this key can go back measurement status.

F2: Pre Page

Display previous page.

F3: NextPage

Display next page.

F4: Print

Print out data.

#### NOTE:

- 1) The lamp used for measurement should select in item 7[System set] in main menu.
- 2) Using [RETURN] key go back to the main menu.

## 3.4 Spectrometric measurement

### 3.4.1 Spectrum menu

Select [Spectrum] item in the main menu, press [ENTER] to go into this function.  
The screen display:

|   |                                       |                                     |                                       |
|---|---------------------------------------|-------------------------------------|---------------------------------------|
| 12 : 30 : 10                                      |                                       |                                     |                                       |
| Parameter   | 230.0nm   0.0120A                     |                                     |                                       |
| 1. Measure mode :T%                               | <input type="text" value="ABS"/> E    |                                     |                                       |
| 2. Scan range :230.0nm ~ 660.0nm                  |                                       |                                     |                                       |
| 3. Record range :0.0000A ~ 1.2000A                |                                       |                                     |                                       |
| 4. Scan speed :F                                  | <input type="text" value="M"/> S      |                                     |                                       |
| 5. Scan Inter. : <input type="text" value="0.1"/> | 0.5 1 2 5                             |                                     |                                       |
| 6. Repeat num : 1                                 |                                       |                                     |                                       |
| 7. Draw mode : <input type="text" value="Seq."/>  | Over                                  |                                     |                                       |
| [START/STOP] to scan Cell=R                       |                                       |                                     |                                       |
| <input type="text" value="Baseline"/>             | <input type="text" value="MoveCell"/> | <input type="text" value="Cell R"/> | <input type="text" value="LoadFile"/> |

#### 3.4.1.1 Setting parameters

1) Using number keys select the item which wants to set a new value. Then input a new value. Press [RETURN] key to return the upper menu.

2) After input new value, press [ENTER] key to confirm.

3) Press [RETURN] key to return the spectrum menu after setting all parameters.  
Then do the baseline correction.

#### 3.4.1.2 Menu items description

1. Meas. Mode: Measurement mode

There are 3 modes that can be select: T- light transmittance, ABS – absorbance and E - energy.

If E is selected, 2 new lines will display on the screen:

factor 1 2 3 4

light select: D2, W and auto.

2. Scan range

Input beginning and stop wavelength. The left number in the line is beginning wavelength, the right is stop wavelength. The scan range should be inside 190 – 1100 nm.

3. Rec. Rang: Record range

The valid values for record range are different with different measurement mode. Left number in this line is low limit, right is upper limit.

4. Scan speed

Three speed rates can be selected: slow, median and fast

5. Wave Gap: Wavelength interval

Five intervals can be selected: 0.1, 0.5, 1, 2, and 5 nm.

6. Scan times

Valid value is 1 – 20.

If more than 2 times is set, the interval time between scanning should be set.

7. Disp Mode: Display mode

Sequ or OvLy can be selected.

Sequ mode: only one curve will be display on the screen.

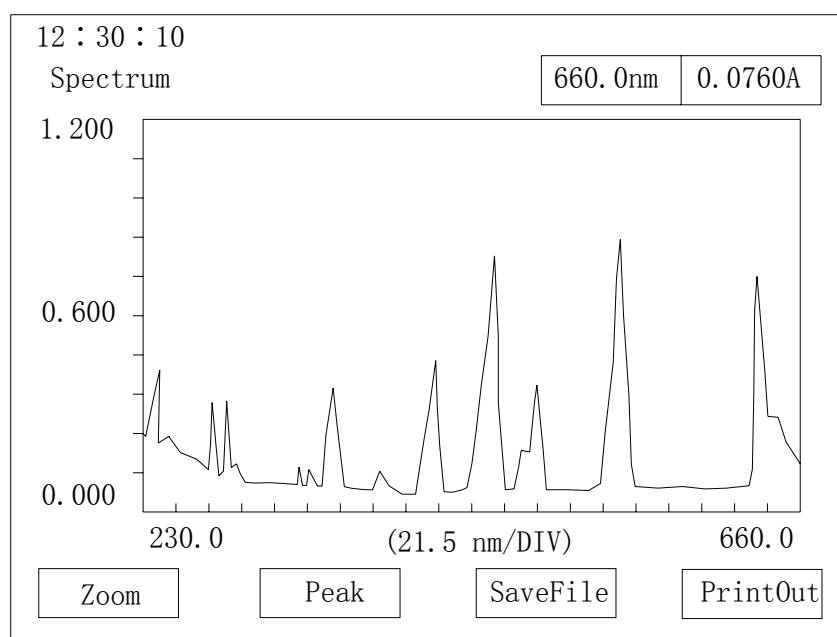
OvLy mode: all scanning curves will display on the screen. The number of curves is the same as scanning times.

### 3.4.2 Spectrum Scanning

After set all parameters, pour the reference sample (air in the example) and test sample (the solution of holmium oxide) into the pair of silicon cuvettes and put reference at R and sample at S1 position on the stand. Close the sample house door and press F1 for baseline correction.

“Baseline correction...Press [START/STOP] to stop” will display on the screen. Now the process can be stopped using [START/STOP] key.

Press F2 to move the stand to S position. Then press [START/STOP] to begin scanning. The screen display:



Four functions which can be selected by F1-F4 keys will display at the bottom of the screen.

#### **F1: Zoom:**

Modify the scale of display. Press F1, the value which can be changed will display in inverse color. Input new value, then press [ENTER] to confirm. The next value that can be changed will be display in inverse color. After finished setting the last parameter and when press [ENTER], the screen will be redrawn with the new ruler scale. This function is used to zoom in or out the curve in the interesting range.

#### **F2: Peak/Valley:**

When press F2, all peaks' and valleys' values will be display.



| Peak  |         | Valley |         |
|-------|---------|--------|---------|
| WL.   | Abs     | WL.    | Abs     |
| 249.0 | 0.2110A | 246.0  | 0.1733A |
| 277.0 | 0.3198A | 256.5  | 0.1443A |
| 286.5 | 0.3684A | 268.0  | 0.1100A |
| 332.5 | 0.1641A | 281.5  | 0.0930A |
| 360.0 | 0.3973A | 290.0  | 0.1243A |
| 385.0 | 0.1221A | 327.0  | 0.0527A |
| 416.5 | 0.4143A | 337.5  | 0.0521A |
| 485.5 | 0.8243A | 351.0  | 0.0540A |
| 537.5 | 0.9343A | 462.0  | 0.0545A |
| 640.5 | 0.7143A | 469.5  | 0.1196A |

If all peaks and valleys value can not display in one page, use PrePage (F2) or Nextpage (F3) to scroll the screen. Use Print (F4) to print out the data.

**F3: Save curve:**

Save spectrogram curve. Maximum 8 curves can be saved in the instrument.

The screen display is shown as below after press F3.

Input Chars  
 <>:select

ABCDEFGHIJKLMN**OP**QRSTUVWXYZ 0123456789--\*\*

Chars:

Using arrow keys ← or → to select in 10 numbers and 26 letters to give a name to the file. Press [ENTER] key to confirm. The file name should less than 8 characters.

Then press F4 [Save&Esc] to save the file. Now the screen display:

| Curve files (Spectrum) |    |
|------------------------|----|
| File-1                 | AA |
| File-2                 |    |
| File-3                 |    |
| File-4                 |    |
| File-5                 |    |
| File-6                 |    |
| File-7                 |    |
| File-8                 |    |

---

The saved file NO. (1-8)

Input an order number after “Input file No. to save”. Press [ENTER] to save the file. If the order number was already used, old file will be erased and new file will be created. The valid value is 1 – 8.

**F4: Print**

Print out the spectrogram curve, peaks’ values and valleys’ values depend on which one display on the screen.

### 3.4.3 Loading file

In spectrum menu, F4 key is used for loading curve from file. Press F4, the screen display:

| Curve files(Spectrum) |    |
|-----------------------|----|
| File-1                | AA |
| File-2                |    |
| File-3                |    |
| File-4                |    |
| File-5                |    |
| File-6                |    |
| File-7                |    |
| File-8                |    |

---

The loaded file NO. (1-8)

Inputs file order number at “Input file No. to call” position and press [ENTER]. The screen will display the curve that saved in the file. This curve can also be zoom, detect peaks and valleys and print out.

If no curve exists in the input file, the screen will display to ask for new order number. Input new one at that time.

#### **NOTE:**

Baseline correction in scanning range must be done for spectrum after power on. After that, the correction does not need for each scanning if keep the same scanning range. But it should do again when change the scanning range.

## 3.5 Quantitative measurement

### 3.5.1 Quantitative measurement menu

Select this item on the main menu, press [ENTER] to go into the function. This function supports to create concentration curve under different measurement mode. The screen display:

|  |   |
|--|---|
| 12 : 30 : 10   |   |
| Quantitative   | 525.0nm 0.0000A                         |
| 1. WL: 525.0nm 0.0nm                                     |   |
| 2. Method: <input type="text" value="K,B"/> Point Points |   |
| K=10.00  |   |
| B=2.00   |   |
| 3. Unit: mg/ml   |   |
| <hr/>  |   |
| <input type="button" value="LoadFile"/>                  | <input type="button" value="MoveCell"/> |
| <input type="button" value="Cell R"/>                    | <input type="button" value="Start"/>    |
|  | Cell=R                                  |

#### 3.5.1.1 Setting parameters

- 1) Use the number keys to select items that want to be set. Input new value when cursor stops on the item.
- 2) After input new value, press [ENTER] to confirm. If the input value is invalid, "error" will display on the screen. Input the correct value at this time.

#### 3.5.1.2 Menu items description

##### 1) Meas $\lambda$ :

set the work wavelength. After pressing [ENTER] to confirm, the instrument will set the wavelength to the input value and "waiting..." display on the screen. When wavelength setup finished, the screen display the menu again.

##### 2) Method:

There are 3 methods can be selected: K factor, one-point calibration and multi-point calibration.

Select one then press [ENTER] to confirm. The relative parameter setting screen will be display. The detail will descript in 3.5.2, 3.5.3 and 3.5.4.

##### 3) Unit:

Set the unit used for measurement. 8 units can be selected.

### 3.5.2 K factor method

K factor method is a simple application of work curve. First it measured absorbance

value of the sample. Then the sample's concentration can be calculated by an equation using this Abs value. The equation's parameters should be setting by user and input by keypad.

Select K-Fact in Mode item, then press [ENTER] to confirm. The screen will display:

```

12 : 30 : 10
Quantitative                               525.0nm | 0.0000A
1. WL: 525.0nm 0.0nm
2. Method: [K,B] Point Points
      K=10.00
      B=2.00
3. Unit: mg/ml

Cell=R
LoadFile  MoveCell  Cell R  Start
  
```

Press F2 [EditFact], then input k and b values to setup work curve for k factor method. Press [ENTER] to confirm.

After set all parameters, pour the reference sample into a silicon cuvette and put cuvette at the R position. Close the sample house door and press [AUTO ZERO] to adjust the zero point. Then press [F4] to measure the concentration of the unknown sample. The detail process can refer 3.5.2.1.

### 3.5.2.1 Measuring the concentration of unknown sample

After input the work curve, press [F4] to begin the measurement of the concentration of the unknown sample. The screen display:

```

12 : 30 : 10
Measure data                               525.0nm | 0.6487A
+-----+-----+-----+-----+
| SN. | Cell | Abs | Conc (ug/ml) |
+-----+-----+-----+-----+
| 001 | R    | 0.0000 | 0.0000 |
| 002 |      |      |      |
+-----+-----+-----+-----+
Press [START] to Measure                    Cell=R
Browse  MoveCell  Cell R  [ ]
  
```

Put the sample solution at a position. Press [START/STOP] to measure the concentration of unknown sample. After measure the absorbance of the unknown sample, the result will display on the screen.

There are three functions display at the bottom of the screen.



F1: DispData: Display data. Descript in 3.5.2.2.

F2: MoveSmpl: The cuvette stand moves one position when press this key once. The order is R, S1, S2, S3, S4, S5, S6, S7.

F3: MoveHome: The cuvette stand will move back to the R position.

### 3.5.2.2 Display data

Press F1, the screen display:

| 12 : 30 : 10 |   |   |                   |
|--------------|---|---|-------------------|
| Measure data |   |   | 525.0nm   0.0326A |
| SN.          | Cell  | Abs   | Conc (ug/ml)      |
| 001          | R   | 0.0000  | 0.0000            |
| 002          | S1  | 0.0370  | 0.0370            |
| 003          | S2  | 0.0325  | 0.0325            |
| 004          | S4  | 0.0326  | 0.0326            |
|              |   |   | Cell=R            |
| SaveFile     |  |  | ReadFile          |

If data more than one page, F2 (Pre Page) and F3 (Nextpage) can scroll the screen display. F1 save the data to a file. F4 can open the data file and read the data.

### 3.5.3 Single-point calibration method

Single-point calibration method only measure one standard sample's absorbance. Then a work curve is created by this value and the zero point. The unknown sample's concentration will be calculated by the work curve.

Pour the reference sample (blank) into a silicon cuvettes and put cuvettes at R position on the stand. Close the sample house door and press [AUTO ZERO] to adjust the zero point.

Select 1point in method item and press [ENTER] to confirm. The screen display:

|                 |          |         |
|-----------------|----------|---------|
| 12 : 30 : 10    |          |         |
| Quantitative    | 525.0nm  | 0.0000A |
| 1. WL: 525.0nm  | 0.0nm    |         |
| 2. Method: K, B | Point    | Points  |
|                 | C=10.00  |         |
|                 | A=       |         |
| 3. Unit: mg/ml  |          |         |
| Cell=R          |          |         |
| LoadFile        | MoveCell | Cell R  |
|                 |          | Start   |

Input the concentration of the standard sample. Press [ENTER] to confirm and then begin standard sample measurement.

Replace the blank sample with the standard sample solution. Close the sample house door and press [START/STOP] to measure the absorbance of the standard sample. When measurement finished, the k and Abs value will be display on the screen. The work curve is created. Replace the standard sample with unknown sample and press [F4] key to measure unknown sample's concentration. The detail processes refer 3.5.2.1.

### 3.5.4 Multi-point calibration method

Multi-point calibration method will measure a serial of standard samples' absorbances. Then a work curve is created by these values. The unknown sample's concentration will be calculated by the work curve.

Select Multipoint in Method item and press [ENTER] to confirm. The screen display:

|                 |              |         |
|-----------------|--------------|---------|
| 12 : 30 : 10    |              |         |
| Quantitative    | 525.0nm      | 0.0000A |
| 1. WL: 525.0nm  | 0.0nm        |         |
| 2. Method: K, B | Point        | Points  |
|                 | Std. Num.    | =3      |
|                 | Order        | =1      |
|                 | 0 intercept: | NO      |
| 3. Unit: mg/ml  |              |         |
|                 |              | Cell=R  |
| Between 2 and 8 |              |         |

Input standards number (Std. Num), order of the work curve (Order) and curve if go through the original point (0 intercept) based on the screen request. The details refer to 3.5.4.2.

Press F1 to load the work curve which saved before. The details refer to 3.5.4.1.

#### 3.5.4.1 Call equation

Press F1, the screen display:

|                           |    |
|---------------------------|----|
| Formula files             |    |
| File-1                    | AA |
| File-2                    |    |
| File-3                    |    |
| File-4                    |    |
| File-5                    |    |
| File-6                    |    |
| File-7                    |    |
| File-8                    |    |
| The loaded file NO. (1-8) |    |



Input the file order number and press [ENTER], the screen will return to quantitative measurement menu and the work curve is already loaded. Put reference sample cuvette at R position on the stand. Close the sample house door and press [AUTO ZERO] to adjust the zero point. Then press F4 for unknown sample's concentration measurement. The detail processes refer 3.5.2.1.

### 3.5.4.2 Standards measurement

Before press F4, pour the reference sample into cuvette and put it at R position on the stand. Close the sample house door and press [AUTO ZERO] to adjust the zero point. Then press F4. The screen display

|                       |      |              |     |         |         |
|-----------------------|------|--------------|-----|---------|---------|
| 12 : 30 : 10          |      | Standard     |     | 525.0nm | 0.0120A |
| No.                   | Cell | Conc (ug/ml) | ABS |         |         |
| 1                     | R    |              |     |         |         |
| 2                     |      |              |     |         |         |
| 3                     |      |              |     |         |         |
| [F2] , [F3] to select |      |              |     | Cell=R  |         |
| NextSmp1              |      | MoveCell     |     | Cell R  |         |

Three functions display at the bottom of the screen.

F1: Next sample. Use for inputting the next standard sample's concentration.

F2: MoveSmp1. The cuvette stand moves one position when press this key once. The order is R, S1, S2, S3, S4, S5, S6, S7.

F3: MoveHome. The cuvette stand will move back to the R position.

Select the positions of each standard. Then input the standards concentrations relative the positions (in the order from low to high). Put each standard in the inputting order (from low to high) at the S position. Press [START/STOP] to measure. Repeat these processes till finished all standard samples' measurements.

The screen display:

12 : 30 : 10

Standard 525.0nm 0.0120A

| No. | Cell | Conc (ug/ml) | ABS    |
|-----|------|--------------|--------|
| 1   | R    | 0.0000       | 0.0000 |
| 2   | S1   | 40.000       | 0.6387 |
| 3   | S2   | 100.00       | 1.5850 |

BuildCuv      SaveFile      Measure      Set Std.

The first column is the order number of standard samples. Second column is the sample stand's position. Third column is concentrations of standard samples. And fourth column is absorbances of the standard samples.

Four functions display at the bottom of the screen.

F1: BuildCuv. Display the equation's curve. The detail refers 3.5.4.2.1

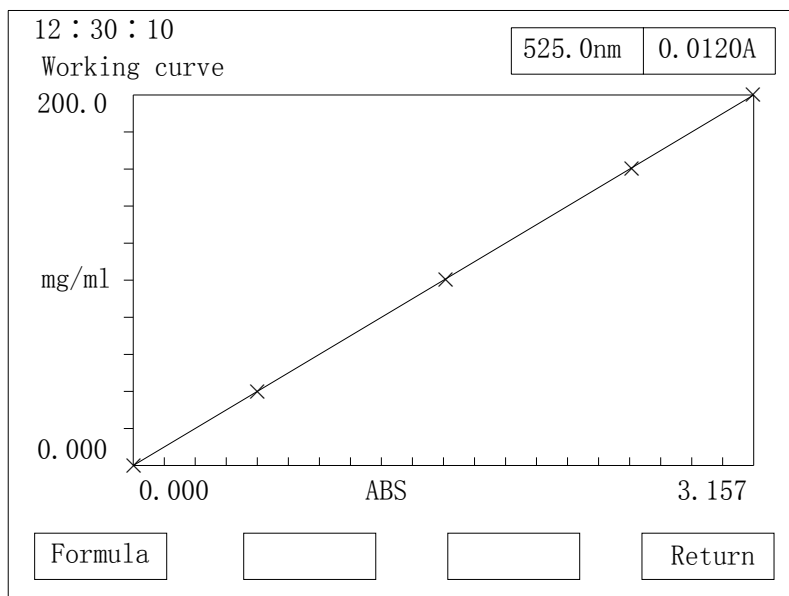
F2: SaveFile. Save the work curve and data.

F3: Measure. The detail refers 3.5.2.1.

F4: Set Std. Modify standards concentration if the inputting is wrong.

### 3.5.4.2.1 Equation curve

Press F1 to display the equation curve as shown in the figure:



Two functions display at the bottom of the screen.

F1: Formula. Display the curve's equation.

```
Working Curve  
Conc=K*Abs+B  
K=100.0000  
B=0.0000  
R*R=1.0000
```

Conc: The concentration of the sample.

K: The factor.

Abs: The abs value.

B: Interception.

R\*R: Related coefficients.

F4: Return. Return to the upper menu.

## 3.6 Kinetics measurement

### 3.6.1 Menu

Select the item in the main menu, then press [ENTER] to go into this function. The screen display:

|  |   |
|--|---|
| 12 : 30 : 10                                 |   |
| Parameter                                    | 500.0nm 0.0000A   |
| 1. Measure mode : ABS                        | <input type="checkbox"/> T% <input type="checkbox"/> E  |
| 2. Time range : 0.0s                         | ~ 120.0s  |
| 3. Record range : -0.001A                    | ~ 0.001A  |
| 4. Wavelength : 500nm                        |   |
| 5. Scan Inter : 0.2                          | <input type="checkbox"/> 0.5 <input type="checkbox"/> 1.0 <input type="checkbox"/> 2.0 <input type="checkbox"/> 5.0 |
| 6. Repeat num : 1                            |   |
| 7. Draw mode : <input type="checkbox"/> Seq. | <input type="checkbox"/> Over   |
| [START/STOP] to scan Cell=R                  |   |
| <input type="text"/>                         | <input type="text"/> MoveCell <input type="text"/> Cell R <input type="text"/> LoadFile                             |

#### 3.6.1.1 Operation

- 1) Using number keys select the line which wants to set a new value. Using [RETURN] key returns to the upper level menu.
- 2) After input new value, press [ENTER] key to confirm.

#### 3.6.1.2 Description of items in the menu

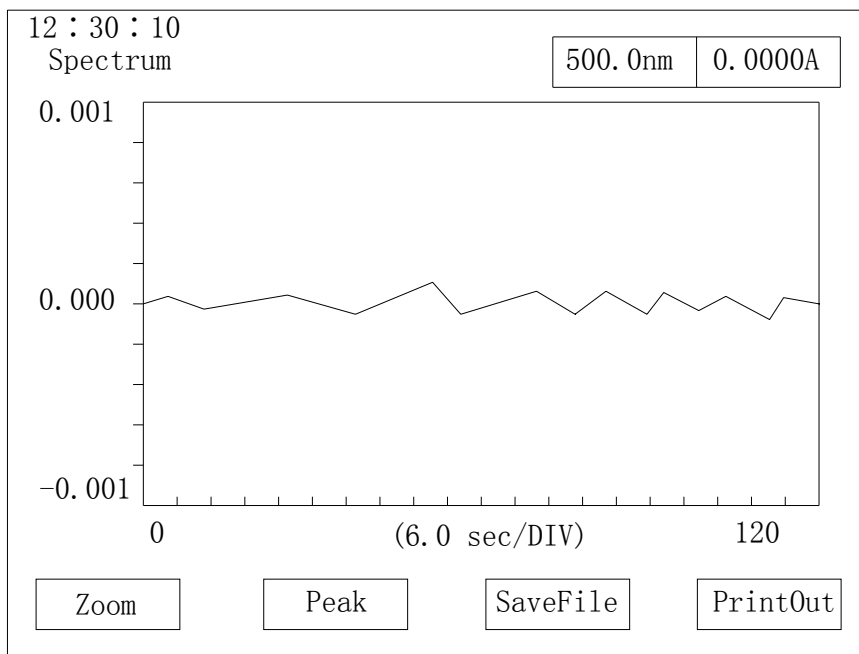
1. Measure mode: Three modes can be selected: T%- light transmittance, Abs – absorbance and E-energy.
2. Time range: Valid values are no more than 6000 seconds.
3. Record range
4. Wavelength: work wavelength. Valid values are in the range of 190-1100 nm.
5. Scan Inter: time interval between two times measurements. Five number can be selected: 0.2, 0.5, 1, 2 and 5 second.
6. Repeat num: Can be 1-20. If more than 1, time interval between each times need to be input.
7. Draw mode: Sequence or overlay.  
If select E measure mode, 2 new lines will display
8. Energy gain: 1-8
9. Lamp: Deuterium, tungsten, auto

After set all parameters, pour the reference sample into a pair of silicon cuvettes

and put cuvettes at R and S position on the stand. Close the sample house door and press [AUTO ZERO].

“Blanking...” will display on the screen.

Replace the reference sample inside S position’s cuvette with the sample solution after zero correction finished. Close the sample house door, press [START/STOP] key to begin measurement. The screen display:



**NOTE:**

- 1) The lamp used for measurement should be selected in item 7[Utilities] in main menu.
- 2) Using [RETURN] go back to the main menu.

**NOTE:**

The spectrogram’s saving, loading and printing are same as the description in 3.4.

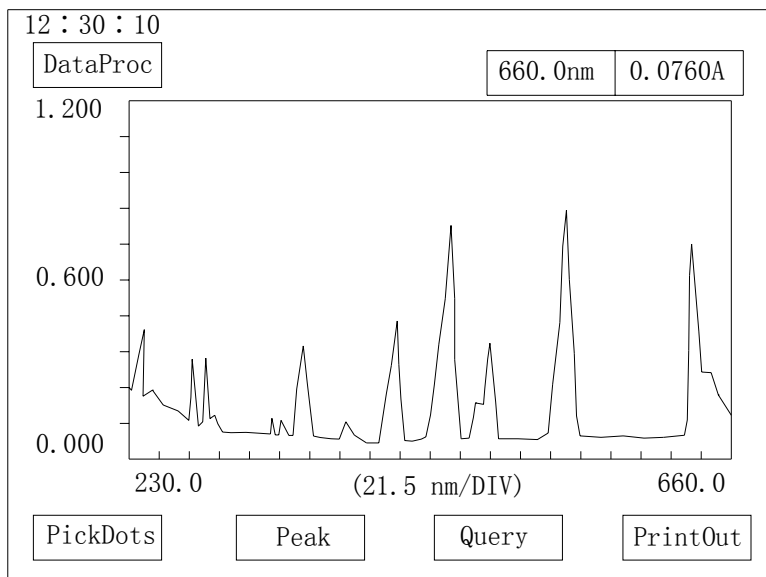
### 3.7 Data processing

Select the item in the main menu, then press [ENTER] to go into this function. The screen display:

| Curve files(Spectrum) |    |
|-----------------------|----|
| File-1                | AA |
| File-2                |    |
| File-3                |    |
| File-4                |    |
| File-5                |    |
| File-6                |    |
| File-7                |    |
| File-8                |    |

The loaded file NO. (1-8)

Input the order number of the file and press [ENTER] to confirm, the screen will redraw and display the loading curve.



Four functions display at the bottom of the screen.

F1: PickDots: Multi-points display. The detail refers 3.7.1

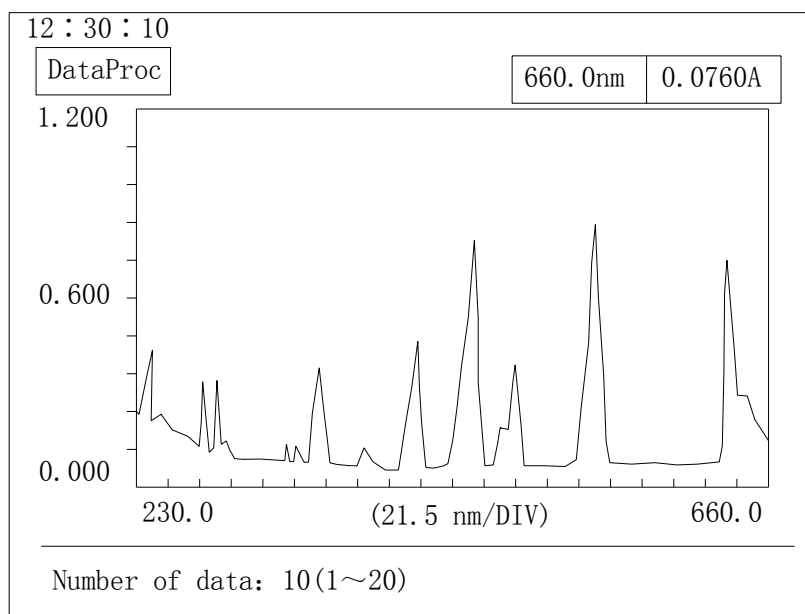
F2: Peak: Detect peaks and valleys and display them.

F3: Query: Display data in a range. The detail refers 3.7.2

F4: PrintOut. Print out the data or graph displayed on the screen.

### 3.7.1 Multi-points display

Multi-points display is used to display data at the user input wavelength positions. When press F1, the screen display:



Input how many points want to be displayed and then input wavelength (WL) and press [ENTER], the relative data value will display. The screen display:

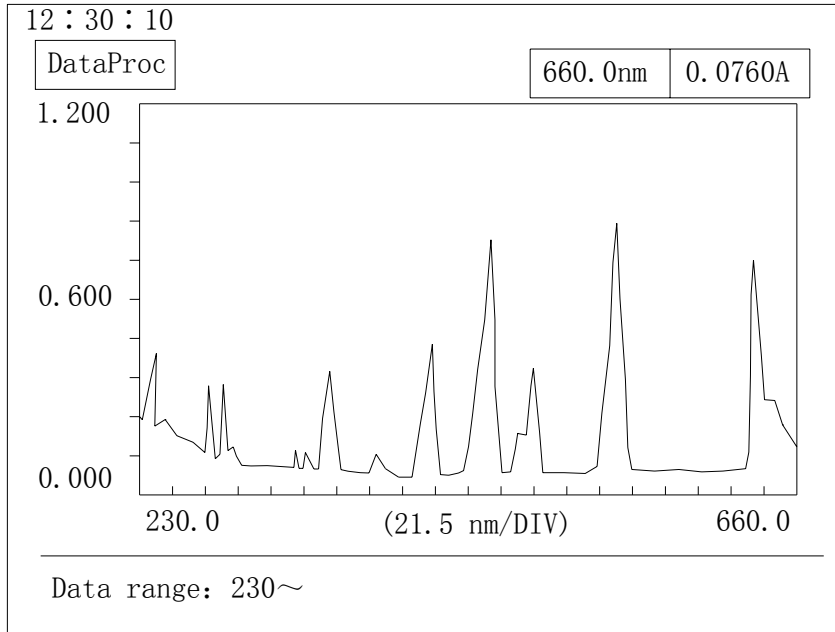
| SN | WL    | DATA   | SN | WL | DATA |
|----|-------|--------|----|----|------|
| 01 | 235.0 | 0.2242 |    |    |      |
| 02 | 240.0 | 0.3481 |    |    |      |
| 03 | 250.0 | 0.2238 |    |    |      |
| 04 | 400.0 | 0.0437 |    |    |      |
| 05 | 500.0 | 0.0318 |    |    |      |

Exit                  PrintOut

### 3.7.2 Query data

Query data is used to display all data in an input wavelength range.

Press F3, the screen display:



Input wavelength range and interval, then press [ENTER]. The screen display:

Query

| SN.  | WaveLen | Abs    |
|------|---------|--------|
| 0001 | 235.5   | 0.2242 |
| 0002 | 240.0   | 0.3481 |
| 0003 | 245.0   | 0.2238 |
| 0004 | 250.0   | 0.0437 |
| 0005 | 255.0   | 0.0318 |

Prev Next PrintOut

If data is more than one page, press F2 or F3 to scroll the screen.  
Press F4 to print out the result.



## 3.8 Multi-wavelength measurement

### 3.8.1 Measurement menu

Select the item Multi- $\lambda$  measure and press [ENTER] to go into the function. The screen show:

| Multi $\lambda$ Measure (T%) |         | 500.0nm |          | 0.0000A |  |
|------------------------------|---------|---------|----------|---------|--|
| No of $\lambda$ :1(1~5)      |         |         |          |         |  |
| No of Smp1:1(1~3)            |         |         |          |         |  |
| SN                           | WaveLen | Cell-S1 |          |         |  |
| 1                            | 500.0   |         |          |         |  |
| Press [START] to Measure     |         |         |          |         |  |
| T%/Abs                       |         |         | SetParam | Print   |  |

#### 3.8.1.1 Operation

1) Using arrow keys select the item which wants to set a new value. Then input a new value. If the value is invalid, "error" will display on the screen. Then input a correct value at this time.

2) After input a new value, press [ENTER] to confirm.

#### 3.8.1.2 Description of menu items

F1: Switch functions between light transmittance T and absorbance Abs.

F3: Set parameters. The detail refers 3.8.1.3

F4: Print.

#### 3.8.1.3 Set parameters and operation

Press F3, set the number of wavelengths and input wavelengths' values from short to long in sequence. Put reference sample or blank and samples at R and S1, S2, S3 etc. positions on the cuvettes stand and press [START/STOP] to begin measurement. When finished, the result will display on the screen as shown in the figure:

| Multi $\lambda$ Measure (T%) |         | 635.0nm 30.65% |         |         |
|------------------------------|---------|----------------|---------|---------|
| No of $\lambda$ :3(1~5)      |         |                |         |         |
| No of Smpl:3(1~3)            |         |                |         |         |
| SN                           | WaveLen | Cell-S1        | Cell-S2 | Cell-S3 |
| 1                            | 440.0   | 11.27          | 18.38   | 29.89   |
| 2                            | 546.0   | 11.82          | 19.55   | 32.43   |
| 3                            | 635.0   | 11.17          | 18.95   | 30.65   |
| Press [START] to Measure     |         |                |         |         |
| T%/Abs                       |         | SetParam       | Print   |         |

Pressing F4 can print out results after measurement finished.

**NOTE:**

- 1) The lamp used for measurement should be selected in item 7[System set] in main menu.
- 2) Using [RETURN] go back to the main menu.

## 3.9 System setting (Utilities)

### 3.9.1 System setting menu

Select the item “Utilities” and press [ENTER] key to go into this function. The screen display:

|                       |              |         |
|-----------------------|--------------|---------|
| 12 : 30 : 10          | 500.0nm      | 0.0000A |
| Utilities             |              |         |
| 1. Beep : ON          |              |         |
| 2. Lamp WL: 340nm     |              |         |
| 3. Time: 10 \ 04 \ 15 | 13:22:10     |         |
| 4. Timer: Time        | 5. Adjust WL |         |
| 6. Decimal: 3         | 7. Reset     |         |
| 8. WI: ON             | 9. D2: ON    |         |
| <hr/>                 |              |         |
| Select:               |              |         |

#### 3.9.1.1 Operation

- 1) Using number keys select the line which wants to set a new value.
- 2) After input new value, press [ENTER] key to confirm.

#### 3.9.1.2 Description of items

1. Beep: Set beep on or off
2. Light switch: Set the switch lamp's wavelength. Default wavelength is 340 nm. The valid values are 294 - 364 nm.
3. Time: Set the date and time.
4. Timer: set to display time or date
5. Adjust WL: let user adjust wavelength accuracy by inputting a bias value. The bias value is the difference between the measure value and standard. The bias value is in the range of -2 nm to 2 nm. And value 1 means that the bias is 0.1 nm.
6. Decimal: set digit after the decimal point. 3 or 4 can be selected.
7. Reset: reset parameters to the default.
8. W lamp stat: On or Off
9. D2 lamp stat: On or Off

Press [RETURN] will return to the main menu after setting all the parameters.

## 4. Maintenance and troublesome

### 4.1 Maintenance

The key points for the maintaining UV2600 are operation in correct way and keep the environment fitting the requirements described in 2.2. And also:

- 1) Keep the environment clean. Cover the instrument when do not use. Keep the environment dry and temperature stable.
- 2) Do not splash solution into sample house. If measure the volatile sample, use cuvette cover.
- 3) Do not loose any screws except light house.
- 4) Do not touch any mirror or glass parts' surfaces by hands or soft or hard material. It not only decrease the accuracy of the instrument, but also can even destroy the instrument.
- 5) When move the instrument, should move carefully and gently. Avoid fierce vibration. And do not put any heavy things upon the instrument cover.
- 6) When do not use the instrument for a long time, should power on the instrument about half hour 1 or 2 times each week.
- 7) Do not splash any solution onto the instrument cover.
- 8) The solution inside the cuvettes should be around 3/4 height of it to avoid spill-out.

#### 4.1.1.1 Checking Method

The 656.1 nm of deuterium lamp is used to do the checking work.

- 1) Select [Spectrum] item in the main menu.
- 2) Set measurement mode as E mode, factor 1, scanning range 653 – 659 nm, record range 0.0000 – 50.000 E, median speed, interval 0.1 nm and scanning times 1.
- 3) Press [START/STOP] to scan.
- 4) When scanning finished, press F2 to get the peak value. It should be  $656.1 \pm 0.3$  nm. Beyond this range, should set Adjust WL value in Utilities menu as description in 3.9.

#### 4.1.1.2 Frequency for checking

Should be checked 1 to 2 times each year.

## 4.2 Troublesome

When instrument have problem in the work, please check the troublesome list here. The troublesome list lists almost all errors can be happened and how to solve it. If the problem does not solve after following how to do or user can not handle it by self, please contact our technical support immediately.

### 4.2.1 Instrument do not work

| Phenomena                              | Possible reason   | How to do  |
|--|---|--|
| The screen do not light after power on | a. No 110 -220 V power<br>b. Power cord loosen<br>c. Fuse broken<br>d. Power switch broken<br>e. Screen cable loosen<br>f. Circuit work wrong<br>g. CPU broken.<br>h. Screen broken | a. Check the power outlet<br>b. Re-plug the power cord.<br>c. Replace 2.5 A fuse<br>d. Replace power switch<br>e. Re-plug the cable<br>f. Repair or replace.<br>g. Repair or replace<br>h. Repair or replace |

### 4.2.2 Error when initialization

| Phenomena                     | Possible reason  | How to do  |
|-------------------------------|--|--|
| System check error            | a. ROM broken<br>b. RAM broken   | a. Replace ROM<br>b. Replace RAM   |
| Sample initial position error | a. photoelectric switch broken<br>b. Step-motor work wrong<br>-1. Step-motor broken<br>-2. Step-motor's drive circuit work wrong | a. Replace the switch<br><br>-1. Replace step-motor<br>-2. Replace CPU circuit |
| Filter initial position error | a. photoelectric switch broken<br>b. Step-motor work wrong<br>-1. Step-motor broken<br>-2. Step-motor's drive circuit work wrong | a. Replace the switch<br><br>-1. Replace step-motor<br>-2. Replace CPU circuit |
| Lamp initial error            | a. photoelectric switch broken<br>b. Step-motor work wrong<br>-1. Step-motor broken<br>-2. Step-motor's drive circuit work wrong | a. Replace the switch<br><br>-1. Replace step-motor<br>-2. Replace CPU circuit |
| Tungsten lamp energy error    | a. Tungsten lamp do not be lighten   | a.   |

|                             |   |   |
|-----------------------------|---|---|
|                             | <ul style="list-style-type: none"> <li>-1. Lamp broken</li> <li>-2. Lamp's power circuit work wrong.</li> <li>b. Tungsten lamp ageing</li> <li>c. Pre-amplification circuit work wrong</li> <li>d. CPU circuit work wrong</li> <li>e. Something in sample house block the light path</li> </ul> | <ul style="list-style-type: none"> <li>-1. Replace a new lamp</li> <li>-2. Repair the circuit</li> <li>b. Replace a new lamp</li> <li>c. Repair the circuit</li> <li>d. Repair the circuit</li> <li>e. Remove all other things inside the sample house</li> </ul> |
| Deuterium lamp energy error | <ul style="list-style-type: none"> <li>a. Deuterium lamp do not be lighten</li> <li>-1. Lamp broken</li> <li>-2. Lamp's power circuit work wrong.</li> <li>b. Deuterium lamp ageing</li> <li>c. Pre-amplification circuit work wrong</li> <li>d. CPU circuit work wrong</li> </ul>              | <ul style="list-style-type: none"> <li>a.</li> <li>-1. Replace a new lamp</li> <li>-2. Repair the circuit</li> <li>b. Replace a new lamp</li> <li>c. Repair the circuit</li> <li>d. Repair the circuit</li> </ul>   |
| Wavelength location error   | <ul style="list-style-type: none"> <li>a. Deuterium lamp ageing</li> <li>b. Step-motor work wrong</li> </ul>  | <ul style="list-style-type: none"> <li>a. Replace a new lamp</li> <li>b. Replace the step-motor</li> </ul>  |

#### 4.2.3 Deuterium lamp work wrong

| Phenomena  | Possible reason  | How to do  |
|--|--|--|
| Lamp do not light, but can hear the sound of relay working | <ul style="list-style-type: none"> <li>a. Lamp loosen</li> <li>b. Lamp broken</li> <li>c. Lamp power circuit work wrong</li> </ul>   | <ul style="list-style-type: none"> <li>a. Re-plug the lamp</li> <li>b. Replace a new one</li> <li>c. Repair the circuit</li> </ul>         |
| Lamp do not light and can not hear any sound               | Lamp power circuit work wrong  | Repair the circuit   |
| Lamp light, but the instrument do not work                 | <ul style="list-style-type: none"> <li>a. Something inside sample house block the light path</li> <li>b. Lamp ageing</li> <li>c. Light do not focus to the slit</li> </ul> | <ul style="list-style-type: none"> <li>a. Remove block things</li> <li>b. Replace a new lamp</li> <li>c. Replace the step-motor</li> </ul> |

#### 4.2.4 Tungsten lamp work wrong

| Phenomena                                       | Possible reason  | How to do  |
|---|--|--|
| Lamp do not light, but have about 11.5 V DC     | <ul style="list-style-type: none"> <li>a. Lamp loosen</li> <li>b. Lamp broken</li> </ul> | <ul style="list-style-type: none"> <li>a. Re-plug the lamp</li> <li>b. Change a new one</li> </ul> |
| Lamp do not light and no 11.5 V DC can be found | Lamp power circuit work wrong  | Repair the circuit   |
| Lamp light, but the instrument do not           | a. Something inside sample house block the light path                                    | a. Remove block things   |

|      |   |  |
|------|---|--|
| work | b. Lamp ageing<br>c. Light do not focus to the slit | b. Replace a new lamp<br>c. Replace the step-motor |
|------|---|--|

#### 4.2.5 Energy low

If low deuterium lamp's energy is happened at the very first time powering on the instrument after unpacking, please keep the sample house door opening about 1 to 2 days. Then power on again.

| Phenomena                               | Possible reason   | How to do  |
|---|---|--|
| Lamps can light, but report energy low  | a. Filters do not at the correct position<br>b. Pre-amplification circuit work wrong<br>c. Light switch mirror work wrong<br>d. The mirror aging<br>e. Something inside sample house block the light path | a. Power off the instrument. After about 10 second, power on again.<br>b. Repair<br>c. Replace the step-motor<br>d. Replace the mirror<br>e. Remove block things |
| Energy low only at UV range             | Wrong cuvettes used   | Should use quartz cuvettes   |
| Lamp do not light                       | Refer list 4.2.3 and 4.2.4  | Refer list 4.2.3 and 4.2.4   |
| Lamp light, but can not find light spot | Light do not focus on the slit. Step-motor work wrong   | Replace the step-motor   |

#### 4.2.6 Can not print out

| Phenomena             | Possible reason  | How to do  |
|-----------------------|--|--|
| Screen display normal | a. Printer do not power on<br>b. Printer cable loosen<br>c. Printer work wrong<br>d. Print out system work wrong | a. Power on the printer<br>b. Re-plug the cable<br>c. Replace a printer<br>d. Repair |
| Printer work wrong    | Printer broken   | Replace the printer  |

#### 4.2.7 Readout unstable on the screen

| Phenomena                      | Possible reason  | How to do  |
|--------------------------------|--|--|
| Readout drift to one direction | a. Warm-up time is not enough<br>b. Damp inside the instrument | a. Warm-up more than 30 min.<br>b. Work at dry surroundings and increase the warm-up time. |
| Readout jump                   | a. Instrument do not ground                                    | a. Connect the instrument to the ground line   |

|  |   |   |
|--|---|---|
|  | <ul style="list-style-type: none"> <li>b. Damp inside the instrument</li> <li>c. Lamp ageing</li> <li>d. Temperature of the surroundings is too high</li> <li>e. Power source drift</li> <li>f. Light path or circuit work wrong</li> </ul> | <ul style="list-style-type: none"> <li>b. Work at dry place</li> <li>c. Replace a new lamp</li> <li>d. Decrease the temperature</li> <li>e. Use stabilized power source</li> <li>f. Adjust the light path, repair or replace the circuit</li> </ul> |
|--|---|---|

#### 4.2.8 Readouts do not accuracy

| Phenomena                     | Possible reason  | How to do  |
|-------------------------------|--|--|
| Readout far from the standard | <ul style="list-style-type: none"> <li>a. Standards are polluted</li> <li>b. Cuvettes pair do not fit each other</li> <li>c. Cuvettes are polluted</li> <li>d. Instrument do not stable</li> <li>e. Sample's change for time or temperature</li> </ul> | <ul style="list-style-type: none"> <li>a. Check the standard samples</li> <li>b. Adjust or replace cuvettes</li> <li>c. Clean the cuvettes</li> <li>d. Repair the instrument</li> <li>e. Follow the process of the sample test.</li> </ul> |

#### 4.2.9 Can not adjust zero or full scale

| Phenomena                                      | Possible reason  | How to do   |
|--|--|---|
| [AUTO ZERO] can not adjust 100 % T or 0.0000 A | <ul style="list-style-type: none"> <li>a. Something inside sample house block the light path</li> <li>b. Pre-amplification circuit work wrong</li> <li>c. Filters do not at the correct position</li> <li>d. Light switch mirror work wrong</li> <li>e. The mirror ageing</li> <li>f. Lamp broken</li> </ul> | <ul style="list-style-type: none"> <li>a. Remove block things</li> <li>b. Repair the circuit</li> <li>c. Replace the step-motor</li> <li>d. Replace the step-motor</li> <li>e. Replace the mirror</li> <li>f. Replace a new lamp</li> </ul> |



## 5 Replacing Lamp

### 5.1 Replacing process

When lamp arrive its life or damaged, replace it as following steps,

- 1) Power off the instrument and unplug the cord from power outlet.
- 2) Remove screws on the both sides of the instrument.
- 3) Remove the shell and place it at the left side of the instrument. If necessary, unplug the cable connected between the screen and the motherboard.
- 4) Loosen screws of the light source cover and remove it.
- 5) Replace the corresponding lamp.
  - a) Replacement of tungsten lamp

Take off the damaged tungsten lamps (Please wear cotton gloves to keep safe) and replace a new one (12V 20W) as shown in figure 5.

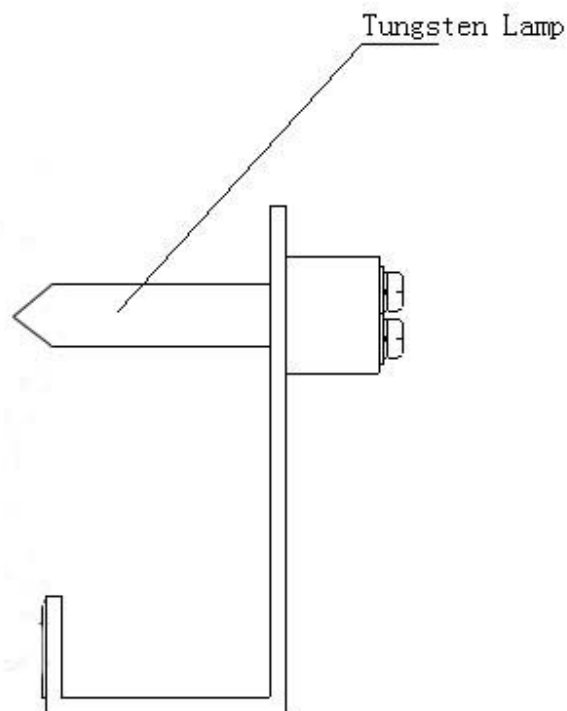


Figure 5

### b) Replacements of the deuterium lamp

First loosen the three screws on the connectors and remove three down-lead wires of deuterium lamp. Remember the sequence of the down-lead wires. Then loosen the two fix-screws of the deuterium lamp and remove the damaged lamp, as shown in figure 6. Put on new deuterium lamp with cotton gloves. Tighten fix-screws to fix the deuterium lamp on the position and connect the three down-lead wires to the connectors in original sequence. Take care of that three down-lead wires do not touch with the metal shell.

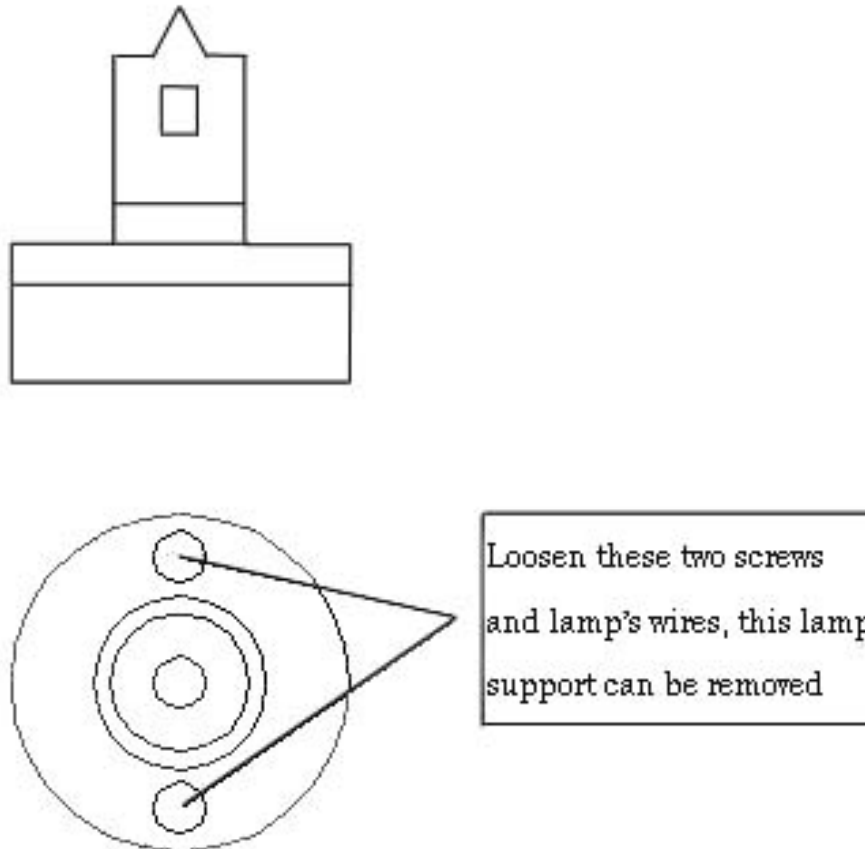


Figure 6

### **WARNING:**

The sequence of three down-lead wires must be same as the original.

### **5.2 Supplement of replacement**

- 1) Do not touch the window of the lamp with bare hands. If touched, must clean all fingerprints with ethanol and dry it before light the lamp. Otherwise, the window will be polluted and can not be removed forever.
- 2) Do not loosen any other screws except requirement.