

Contents

SAFETY	1
General	1
Electrical	1
Warning	1
Working Principle	2
Unpacking Instructions	2
Specifications	3
Installation	3
Operation	4
Prepare the Spectrophotometer	4
Description of keys	5
Turn on spectrophotometer	6
Basic operation.....	7
Analyse Sample	12
Basic Mode	12
Quantitative	14
WL Scan	20
Kinetics	25
DNA/Protein	28
Multi Wavelength	31
Utility	33
Appendix A	41
Appendix B	42
Appendix C	44
Lamp replacement.....	44
Replace W lamp.....	44
Replace D2 lamp.....	45
Battery replacement.....	46
Trouble shooting.....	47

Safety:

The safety statements in this manual comply with the requirements of the HEALTH AND SAFETY AT WORK ACT, 1974.

Read the following before installing and using the instrument and its accessories. The 4255 MODEL should be operated by appropriate laboratory technicians.

General:

The apparatus described in this manual is designed to be used by properly trained personnel in a suitable equipped laboratory. For the correct and safe use of this apparatus it is essential that laboratory personnel follow generally accepted safe procedures in addition to the safety precautions called for in this manual.

The covers on this instrument may be removed for servicing. However, the inside of the power supply unit is a hazardous area and its cover should not be removed under any circumstances. There are no serviceable components inside this power supply unit. For 4255 MODEL, avoid touching the high voltage power supply at all times.

Some of the chemicals used in spectrophotometry are corrosive and/or inflammable and samples may be radioactive, toxic, or potentially infective. Care should be taken to follow the normal laboratory procedures for handling chemicals and samples.

Electrical:

Before switching on the apparatus, make sure it is set to the voltage of the local power supply (see Fig.1-1).



Fig. 1-1

Voltage Switch

The power cord shall be inserted in a socket provided with a protective earth contact. The protective action must not be negated by the use of an extension cord without a protective conductor.

Warning:

Any interruption of the protective conductor inside or outside the apparatus or disconnection of the protective earth terminal is likely to make the apparatus dangerous. Intentional interruption is prohibited.

Whenever it is likely that the protection has been impaired, the apparatus shall

be made inoperative and be secured against any unintended operation.

NEVER touch or handle the power supply on 4255 MODEL due to the high voltage.

The protection is likely to be impaired if, for example, the apparatus

- Shows visible damage
- Fails to perform the intended measurements
- Has been subjected to prolonged storage under unfavorable conditions
- Has been subjected to severe transport stresses

Working Principle:

The spectrophotometer consists of five parts: 1) Halogen or deuterium lamps to supply the light; 2) A Monochromator to isolate the wavelength of interest and eliminate the unwanted second order radiation; 3) A sample compartment to accommodate the sample solution; 4) A detector to receive the transmitted light and convert it to an electrical signal; and 5) A digital display to indicate absorbance or transmittance. The block diagram (Fig 1) below illustrates the relationship between these parts.

Block diagram for the Spectrophotometer

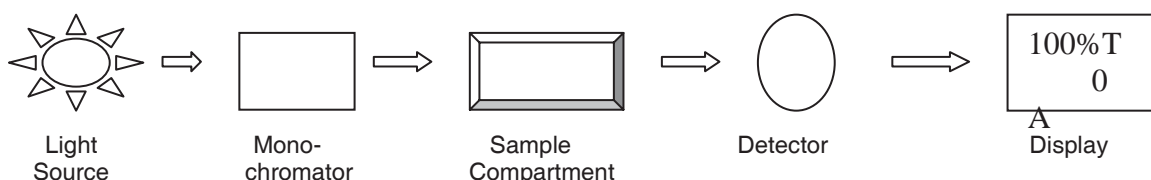


Fig1

In your spectrophotometer, light from the lamp is focused on the entrance slit of the monochromator where the collimating mirror directs the beam onto the grating. The grating disperses the light beam to produce the spectrum, a portion of which is focused on the exit slit of the monochromator by a collimating mirror. From here the beam is passed to a sample compartment through one of the filters, which helps to eliminate unwanted second order radiation from the diffraction grating. Upon leaving the sample compartment, the beam is passed to the silicon photodiode detector and causes the detector to produce an electrical signal that is displayed on the digital display.

Unpacking Instructions:

Carefully unpack the contents and check the materials against the following packing list to ensure that you have received everything in good condition.

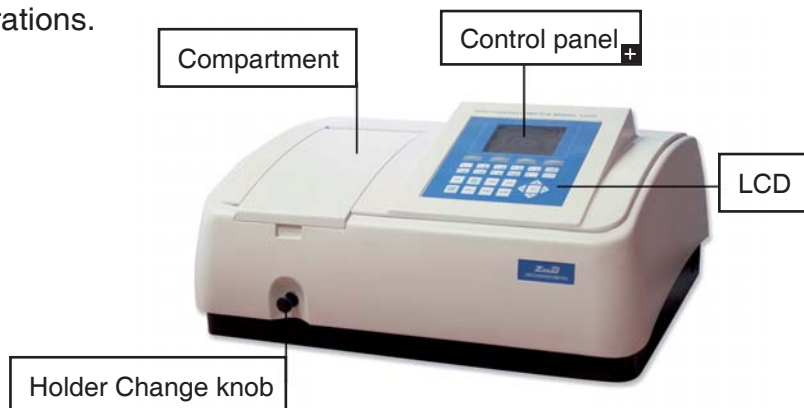
Packing List	
<u>Description</u>	<u>Quantity</u>
• Spectrophotometer	1
• Mains Lead	1
• Cuvettes	Set of 4, glass
•	Set of 2, quartz
• Dust Cover	1
• Manual	1

Specifications:

Code	54255050
Model	4255
Wavelength range	190-1100 nm
Bandwidth	2 nm
Optical system	Single beam, grating 1200 lines/mm
Wavelength accuracy	± 0.5 nm
Wavelength repeatability	0.3 nm
Scanning speed	High Medium. Low, max. 3000 nm/min
Photometric range	-0.3 to 3 A; 0 to 200% T; 0-9999 C
Photometric accuracy	± 0.3% T
Photometric repeatability	± 0.2% T
Stray light	0.05% T
Stability	± 0.002 A/h
Screen	LCD (320x240 bits) or PC model
Baseline flatness	± 0.002 A (200-1000 nm)
Light source*	Tungsten and Deuterium lamps
Detector	Silicon photodiode
Sample compartment	Cells 100 mm path length
Output	USB and parallel ports (printer)
Power supply	CA 220 V / 50 Hz
Dimensions	480x360x160 mm
Weight	16 Kg

Installation:

1. After carefully unpacking the contents, check the materials with the packing list (page 2) to ensure that you have received everything in good condition.
2. Place the instrument (Fig.1-3) in a suitable location away from direct sunlight. In order to have the best performance from your instrument, keep it as far as possible from any strong magnetic or electrical fields or any electrical device that may generate high-frequency fields. Set the unit up in an area that is free of dust, corrosive gases and strong vibrations.



3. Remove any obstructions or materials that could hinder the flow of air under and around the instrument.
4. Use the appropriate power cord and plug into a grounded outlet.

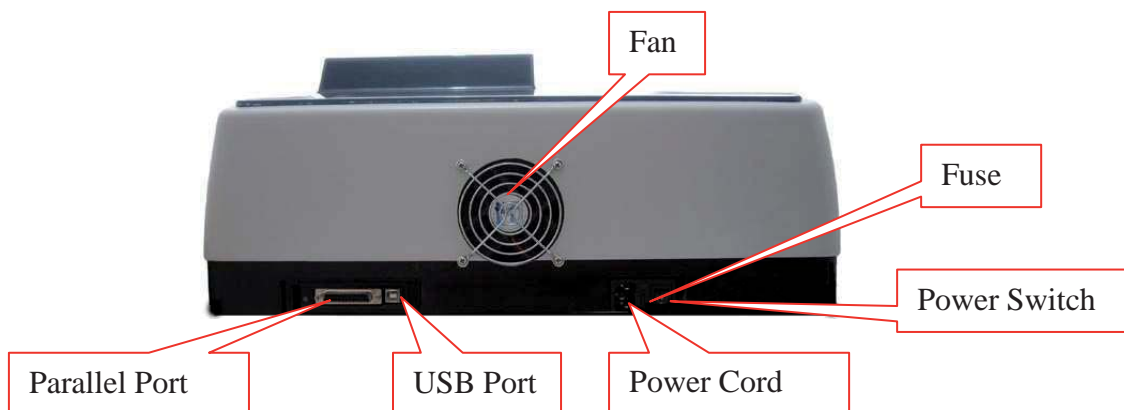


Fig.1-4

5. Turn on your spectrophotometer. Allow it to warm up for 15 minutes before taking any readings. We suggest you then do the Calibrate System with the Search 656.1nm to set the wavelength to the deuterium lamp emission line.

NOTE:



This symbol means Caution, Risk of Danger.

Operation:

Prepare the spectrophotometer

Fig 2 is the control panel. User can perform all operations by pressing the keys and all the results and operation information are displayed on the LCD.

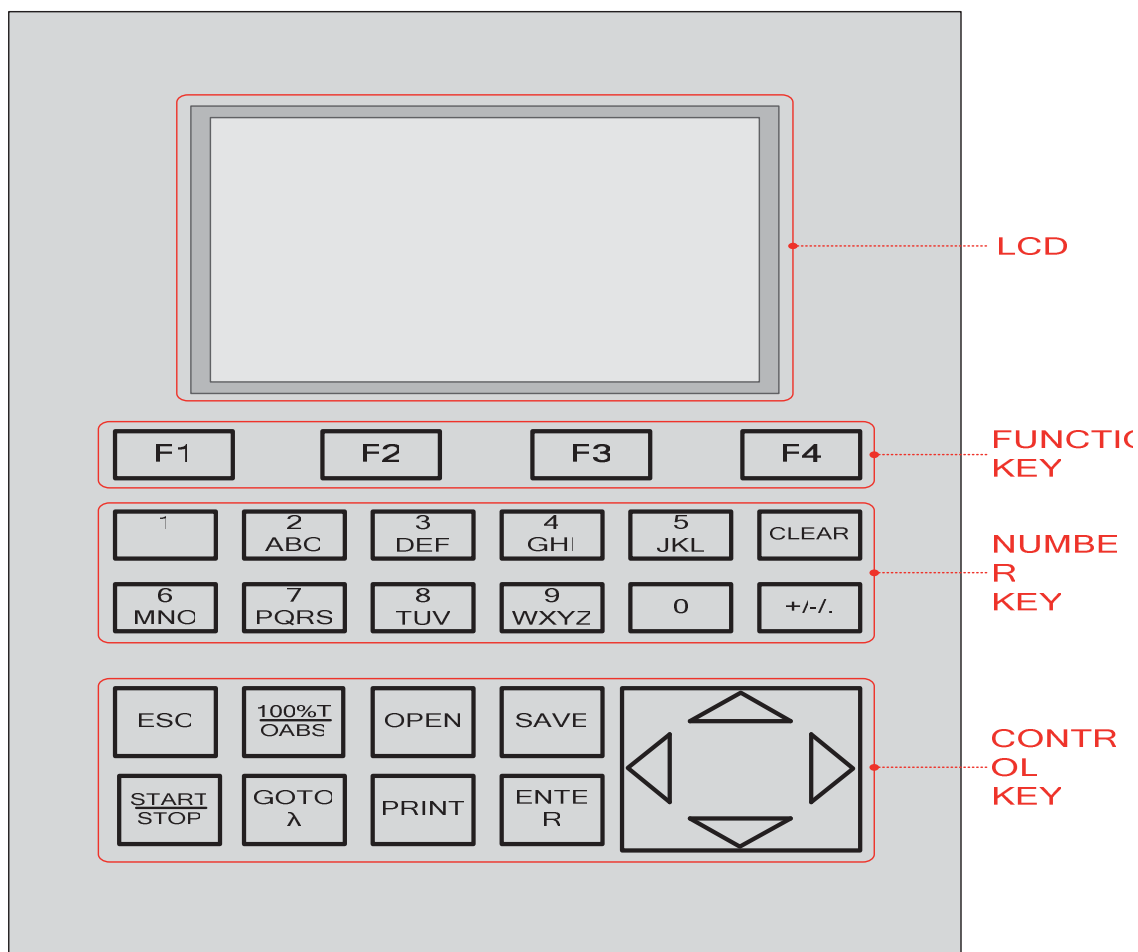


Fig 2

- **Description of keys**

- 【ESC】 Exit to previous screen or cancel the operation;
 - 【100%T /0Abs】 Blank or scan the base line;
 - 【OPEN】 open data or curve saved before;
 - 【SAVE】 Save data or curve;
 - 【START/STOP】 Start testing or scanning sample;
 - 【GOTO λ 】 Set wavelength;
 - 【PRINT】 Print test results or screen
 - 【ENTER】 Confirm the inputted data or selected item; Go into next setup or screen;
 - 【F1】 – 【F4】 Function based on the information on the screen;
- Note: No symbols printed on the Function Keys! For convenient description in the manual, we call them F1, F2, F3 and F4 respectively.
- 【0】 – 【9】 Input number or letter, consecutively press a numeric key to select a character;
 - 【+/-/.】 Input +,- or dot;
 - 【CLEAR】 Clear all characters when you are inputting or clear curve displays on the screen;

- 【<】 , 【>】 Change “x” scale; Search point after scan; 【<】 clear a character;
- 【^】 , 【v】 Change “y” scale; Search peak after scan; Scroll items for selecting; Change capital/small letter last typed in; Browse the items for selection;
- **Turn on spectrophotometer**

Turn on spectrophotometer by pressing the Power Switch (IO). The instrument starts to initiate and the steps are as below:

1. The instrument will warm up D2 lamp first(Fig 3), then initialize com-port and printer, then start kernel, after positioning filter, auto-cell changer(if installed) and D2 / W lamps, the screen display as Fig 3A. 15 minutes pass or press **【ESC】** , the screen display as Fig 4, Select “No” to skip to main menu(Fig 6) or select “Yes”(recommended) to calibrate system (Fig 5). The calibrating process include “get dark current”, “searching 656.1nm” and “check energy”. After finish the calibration system, go to main menu too (Fig 6).

2. If the data in memory has been lost, the instrument will directly calibrate system without any choice for you.

3. If no auto-cell changer installed, “cell #1” will disappear in Fig6

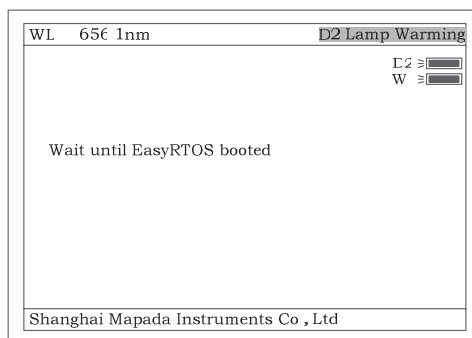


Fig 3

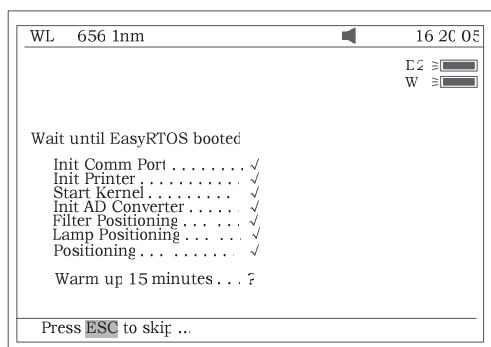


Fig 3A

Note: The instruments only display one checking step at a time, not display as Fig 3A indicated.

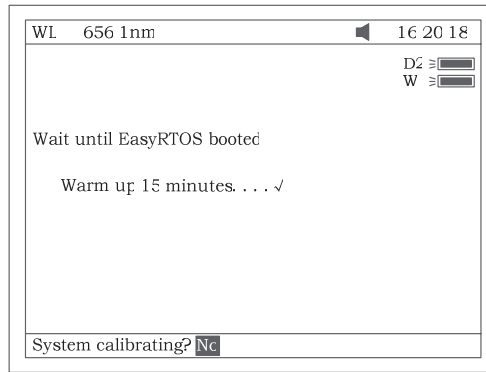


Fig 4

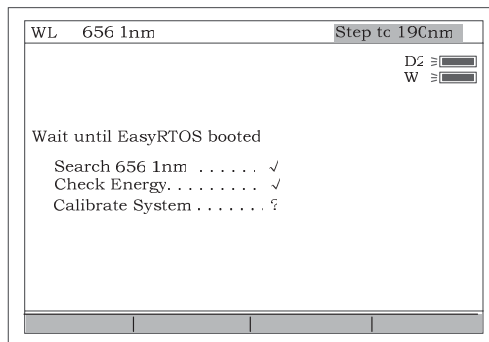


Fig 5

Note: The instruments only display one checking step at a time, not display as Fig 5 indicated.

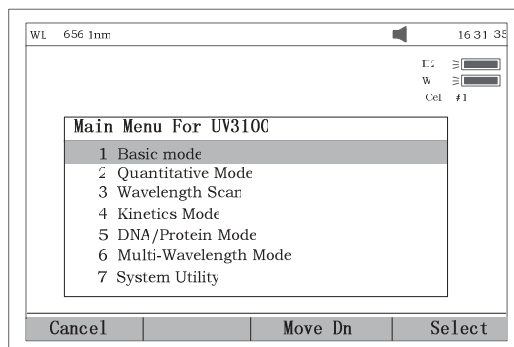


Fig 6

• **Basic operation**

Blank

- ✧ Push the blank cuvette into the lightpath.
- ✧ Press the key **【0Abs/100%T】** for blanking

Note:1. If the reference solution is too thick, “Energy Low...” will appear following the “Blanking...” on the screen (Fig 7). If “Energy too Low...” appears following the “Blanking...”, the test will be paused and “Warning...” will appear on the screen. (Fig 8).

2. If no automatic changer installed “cell #1” and “Max E” will disappear in Fig 7

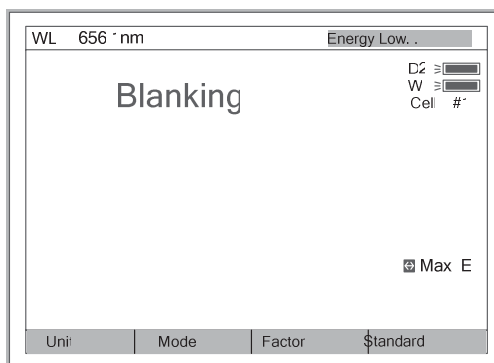


Fig 7

- NOTE: 1. Blanking is automatic after a wavelength change
DO NOT OPEN SAMPLE COMPARTMENT LID DURING BLANKING.
 2. The dark current doesn't be taken after power on, if you bypass the calibrating system. It is recommended to take the dark current after warm up. (See page 38)

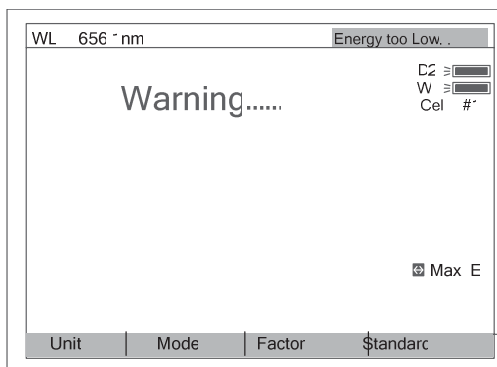


Fig 8

Set wavelength (Example: set wavelength in "Basic mode")

✧ Press **【GOTO λ】** (Fig 9).

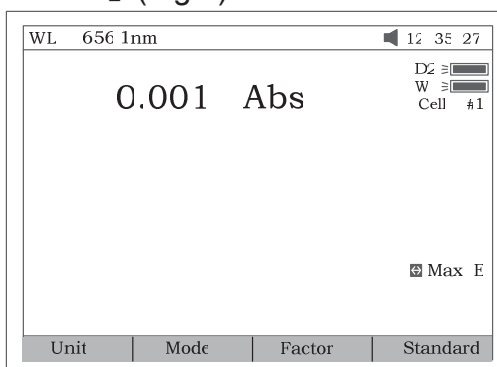


Fig 9

✧ Use numeric keypad to input wavelength (Fig 10).

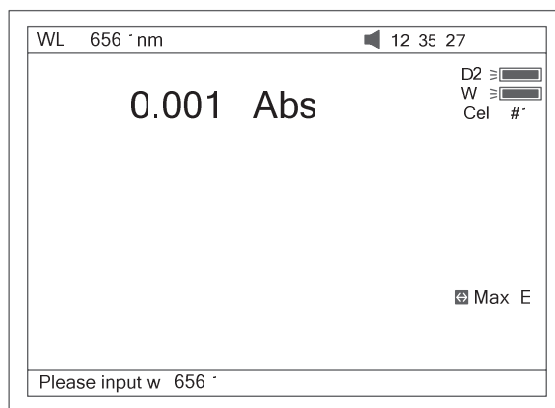


Fig 10

- ✧ Press **【ENTER】** to change the wavelength from 656.1nm to 450.0nm, and then blank; After blanking, the screen displays as Fig 11.

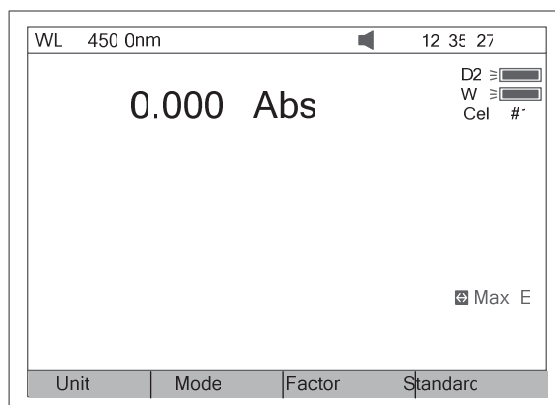


Fig 11

open or delete data or curve (Take the “WL scan” test for example)

Press **【3】** in Fig.6 go into “WL scan”. After **【OPEN】** being pressed, the first file (ABC.wav) in memory will appear on the bottom lines of screen. Shown as Fig 12. Press **【^】** or **【v】** to browse the files stored in memory. Then if

1. The key **【ENTER】** be pressed, the file selected will be opened and displays on the screen. Fig 13.

Note (1).The file selected must match “WL scan” test’s type. if not , the “file type error...” will appear on the right of top line.

(2).Different test has different file type. Refer to table 1 on page9.

2. The key **【CLEAR】** be pressed the file selected will be deleted by selecting “Yes”.

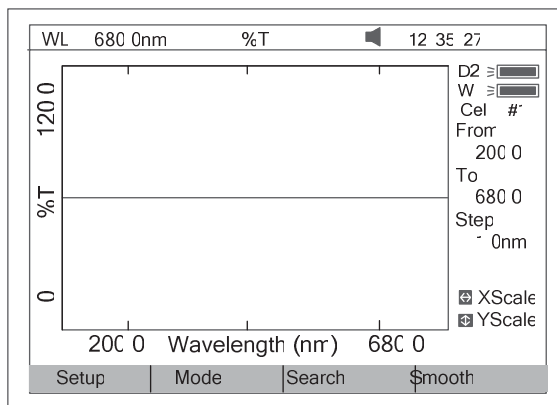


Fig 12

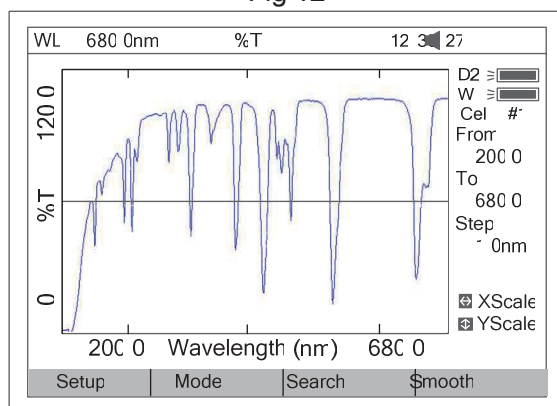


Fig 13

Table 1

Test	File Type
Quantitative Curve	***.fit
Quantitative Test Result	***.qua
WL Scan	***.wav
Kinetics	***.kin
DNA/Protein	***.dna
Multi WL	***.mul
WL Validity	***.wlv
Accu. Validity	***.phv

Save data or curve (Example: Save curve in “WL scan”)

- ✧ Press the key **【SAVE】** in Fig13 to save curve.
- ✧ Name the curve by pressing the numeric keypad (Fig 14), press the key **【ENTER】** to confirm.
- . Note(1). Pressing numeric key continually to scroll characters and pressing **【^】**, **【v】** to alter capital letter to miniscule. Table 2 shows all characters built in.
- (2) If the name already exists in memory, the warning “duplicated name, are you sure? ” will appear . “Yes” for overwrite and “No” for Exit.

(3) The length of filename is less than 4.

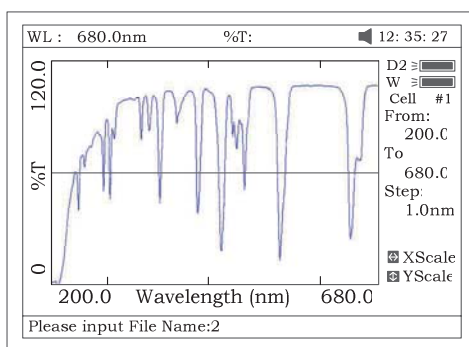


Fig 14

Table 2

key	representing	key	representing	key	representing
0	0,+,-,*,/	1	1,#,?,;,	2	2,A,B,C,=
3	3,D,E,F,%	4	4,G,H,I,{	5	5,J,K,L,}
6	6,M,N,O,~	7	7,P,Q,R,S,	8	8,T,U,V,“
9	9,W,X,Y,Z	+/-.	-,.,		

Print test report (For example: Print the report in “Basic mode”, Fig 16)

Press the key **【PRINT】** to print the report (curve or data you have opened or tested, Fig 16).

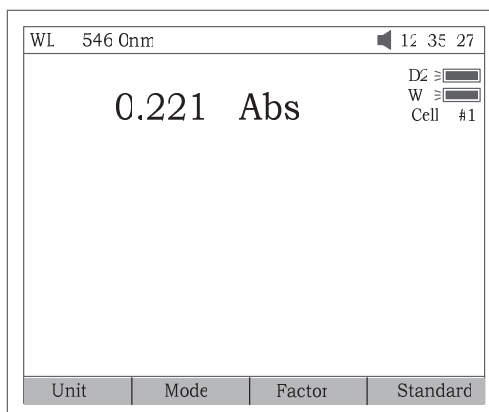


Fig 15

Basic Mode Test Report

Wavelength: 546.0nm
 Result: 0.221 Abs
 Date and Time: 25-06-2003 13:55:53

Fig 16

Before measurement

- Make a blank reference solution by filling a clean cuvette (or test tube) half full with distilled or de-ionized water or other specified solvent. Wipe the cuvette with tissue to remove the fingerprints and droplets of liquid.

- Fit the blank cuvette into the 4-cell linear changer and place the cuvette in the slot nearest you. For the UV-3 SERIES, push the changer so that the cuvette is in the light path (Push the rod in). Close the lid.

Analyze Sample

For different user requirements, we have provided different test methods.

Basic Mode

Push the blank cuvette into the light path. In main menu (Fig6),press **【1】** to enter “Basic mode” test . After automatically blanking, it will display as Fig 17 (automatic changer installed) or Fig 18 (automatic changer uninstalled) and wait for the operator. **【ESC】** to exit.

Note: .If no automatic changer installed “cell #1” and “Max E” will disappear in Fig17

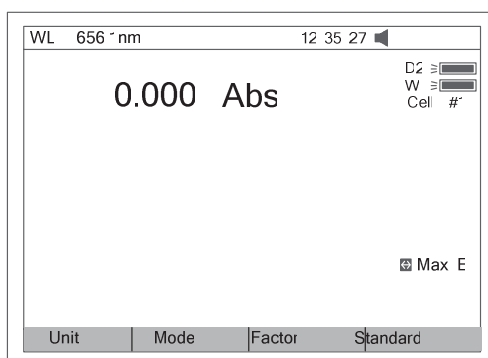


Fig17

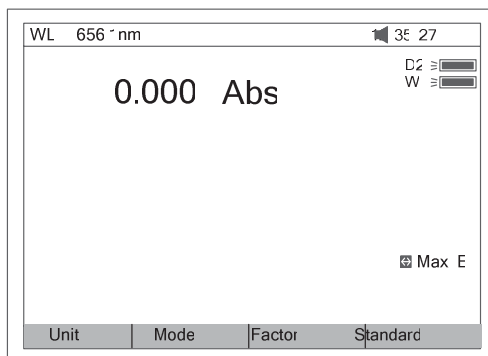


Fig18

☺ Test

There are three modes (T%, Abs, Conc / factor) for you to select by pressing **【F2】** to make choice.

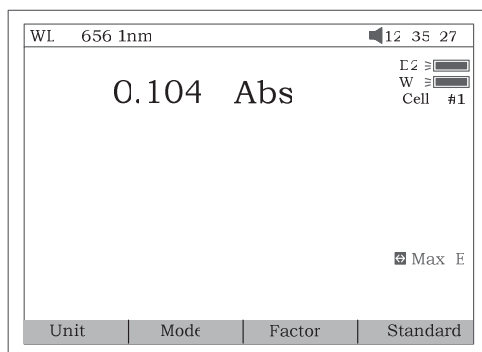


Fig 19

1. Abs mode

Push the blank cuvette into the light path. Press **【F2】** to select Abs mode, Press **【0Abs/100%T】** for Blanking, and then Push the sample into light path to take reading (Fig 19)

2. T% mode

The operation is the same as Abs test mode but pressing **【F2】** to select T% mode.

3. Conc/Factor mode

Press **【F1】** to select a concentration unit (Fig 20). If no unit is suitable for your test, please select the item "Other", press **【Enter】** and input a new unit by pressing the numeric keypad (Fig 21).

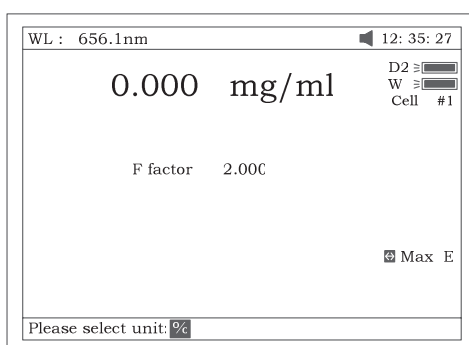


Fig 20

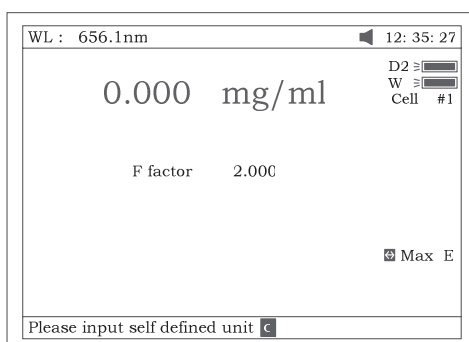


Fig 21

4. Push the blank cuvette into the light path and press **【0Abs/100%T】** for Blanking. There are now two choices for you to take:
 - 4.1 Press **【F3】** to input known F value, Fig 22. Then push the sample into

- light path to take reading of concentration
- 4.2 Push sample of known concentration into the light path
 Press **【F4】** to input known Conc value, Fig 23. Then push the sample into light path to take reading of concentration.
 Note:1.You can select wavelength at any time by pressing **【GOTO λ】**. After your selection, instrument always blanks automatically.
 2. If F value is more than 9999, the “out of range” will display on screen.

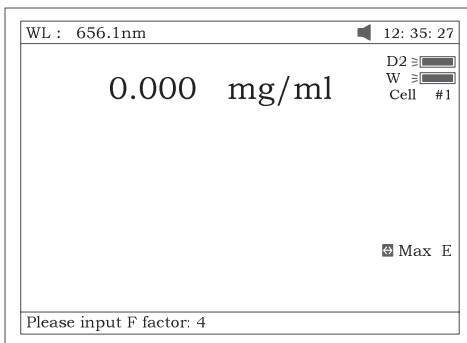


Fig 22

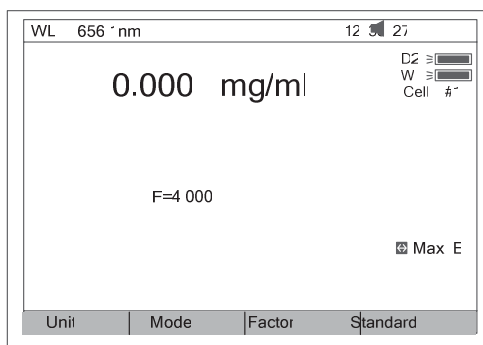


Fig 23

☺ **Print Test Report**

Press **【PRINT】** to print test results (Fig 24).

```

Basic Mode Test Report

Wavelength: 546.0nm
Result:      0.221 Abs
Date and Time: 25-06-2003 13:55:53
    
```

Fig 24

Quantitative

Press **【2】** in Main Menu for “Quantitative” Test (Fig 25). Press **【ESC】** to exit.

Note: .If no automatic changer installed “cell #1” will disappear in Fig25.

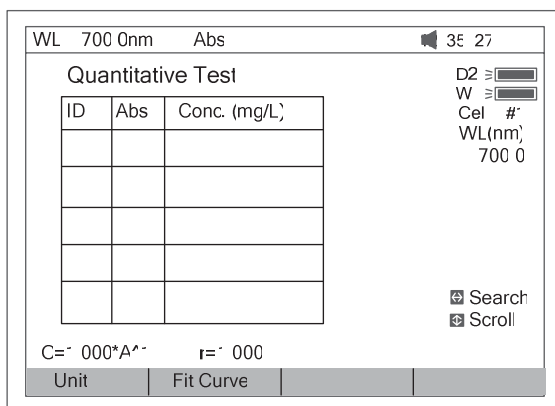


Fig 25

☺ How to operation

1. Press **【F1】** to select unit of concentration (Fig 26).

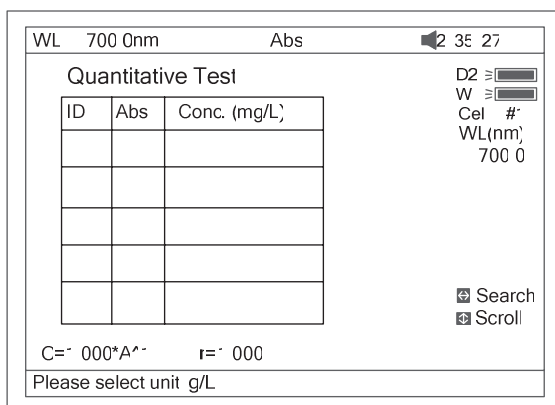


Fig 26

- 2 Press **【GOTO λ】** to select correction methods and enter the wavelength. There are three correction methods (single WL, Iso-absorbance and 3 point, Fig 27) .

Note: Please refer to the Appendix B for the correction method.

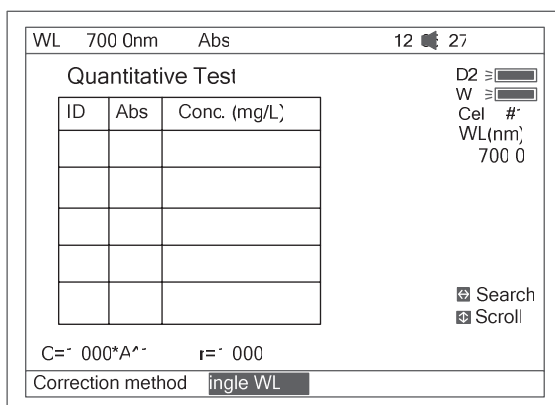


Fig 27

3. Press **【F2】** in Fig 25 for more items to select .See Fig 28.

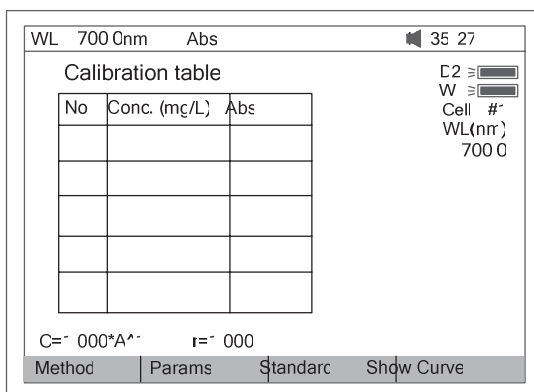


Fig 28

3.1 Press **【F1】** in Fig 28 to select fitting method. There are 4 methods for you to choose: Linear fit, linear fit through zero, square fit and cubic fit.

3.2 Press **【F2】** in Fig 28 to enter directly a known standard curve. Fig 29.

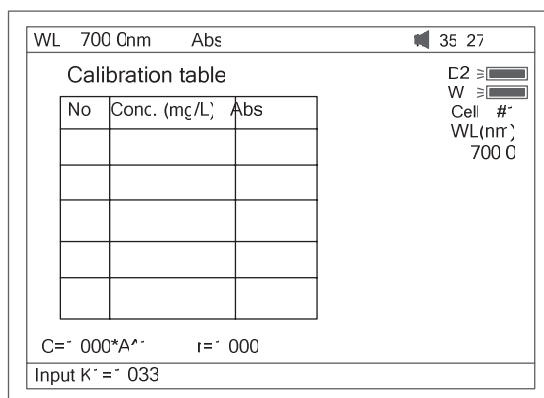


Fig 29

The constants to be entered are depending on which fitting method selected. The table below lists their relation:

Fitting Method	Fitting Equation	constants
linear fit through zero	$C = K1 \times A$	$K1, r^*$
Linear fit	$C = K0 + K1 \times A$	$K0, K1, r^*$
square fit	$C = K0 + K1 \times A + K2 \times A^2$	$K0, K1, K2$
cubic fit	$C = K0 + K1 \times A + K2 \times A^2 + K3 \times A^3$	$K0, K1, K2, K3$

* r : regression coefficients, default=1

3.3 Press **【F3】** in Fig 28 to establish a standard curve by measuring a group of standard samples. See Fig 30.

3.3.1 Enter standard concentrations of samples by pressing the Numeric keypad followed by **【ENTER】**. Press **【^】** or **【V】** to modify the inputted data (Fig31). Press **【ESC】** to finish inputting and to exit (Fig 32).

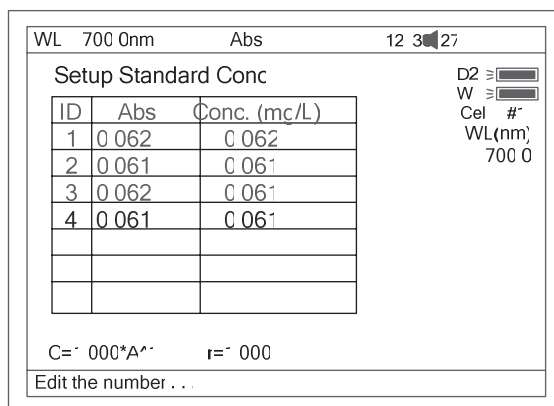


Fig 30

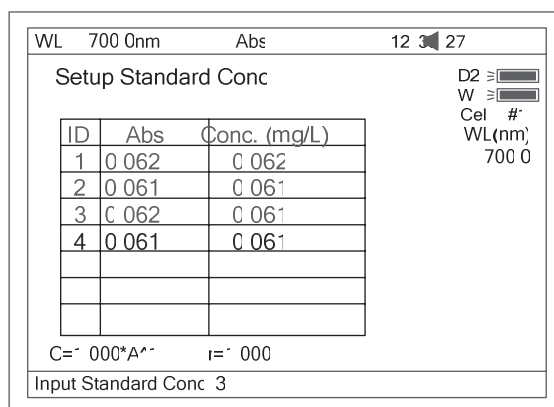


Fig 31

3.3.2 Push the blank cuvette into the light path, press **【0Abs/%100T】**, the instrument will step to the wavelength and blank. See Fig 32.

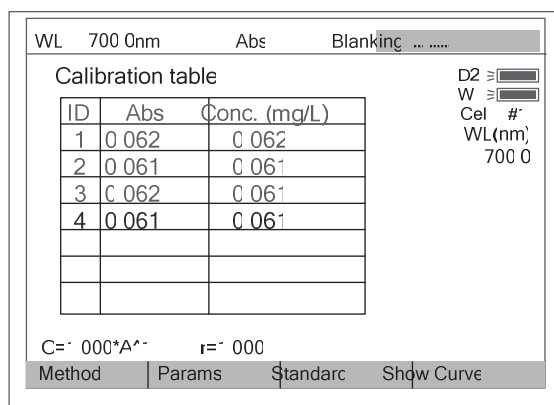


Fig 32

3.3.3 Pull the first sample cuvette of known concentration into the light path, Press the key **【START/STOP】** to get values of standard curve one by one (Fig 33).

3.3.4 Press **【F4】** to draw the curve. You can get a different curve by pressing **【F1】** to select a different fitting method. See Fig 34 - Fig37.

For linear fits, " r " represent fitting coefficient of linear

regression $r=1$ is best fitting. Usually “ r ” is very close to 1.
 Note: If there are few standard samples, it is not suitable for selecting square fitting, especially cubic fitting, otherwise invalid fitting result will be obtained.

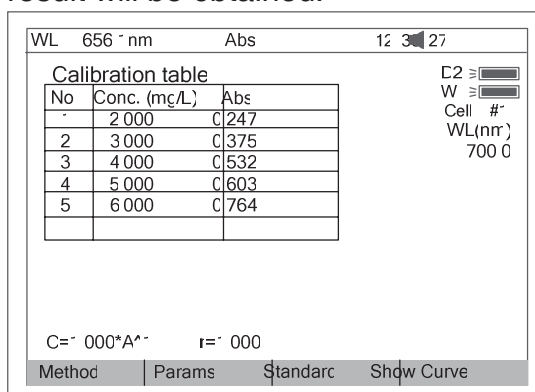


Fig 33

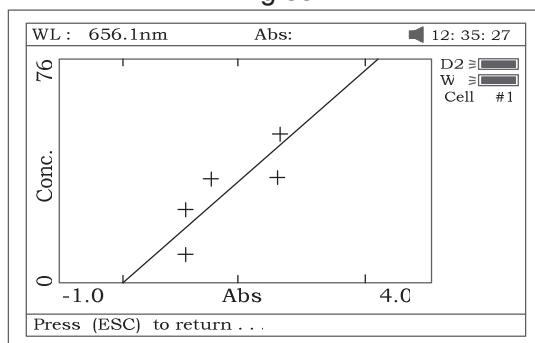


Fig 34 linear through zero fit

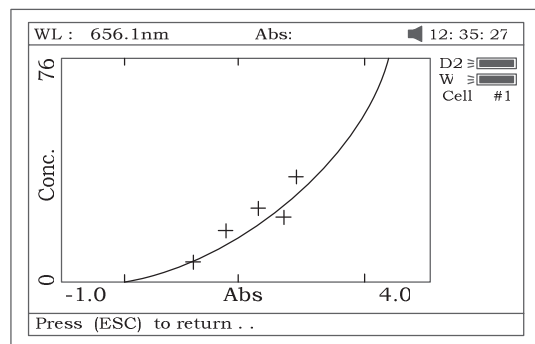


Fig 35 square fit

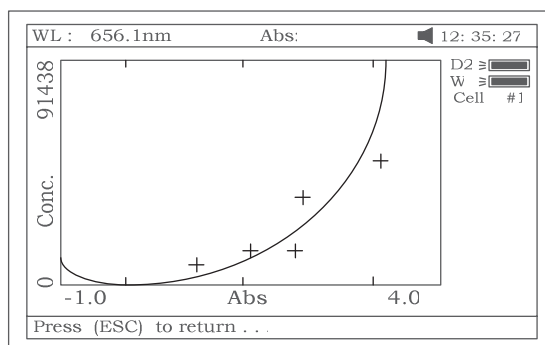


Fig 36 cubic fit

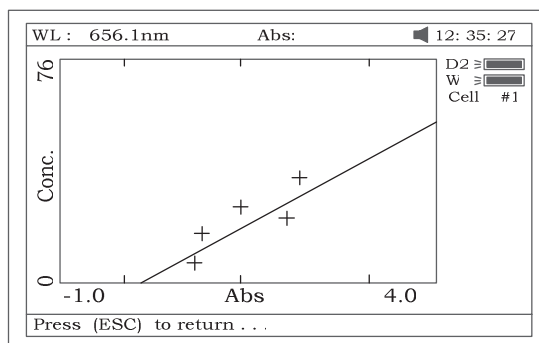


Fig 37 linear fit

3.3.5 Press **【SAVE】** to save calibration if required

3.3.6 Press **【ESC】** to exit

4. Quantitative Test

Before test, the standard curve must be obtained. There are three ways for you to obtained it (a, b or c).

- a) Standard curve built up and saved in the instrument.
In Fig 33 press **【OPEN】** and then press **【^】** or **【v】** to select the file with type *****.fit**. At last press **【ENTER】** to confirm.
- b) Known standard curve, which is not saved in the instrument.
See 3.2. For Fig 28 enter a known standard curve directly.
- c) Use the standard samples for the test. First the standard curve must be established using the method shown in 3.3.

Note: All sample results must be taken in screen (Fig25).

4.1 Push the blank cuvette into the light path and press **【0Abs/100%T】** for blanking.

4.2 Pull the sample cuvette into the light path, press the key **【START/STOP】**, the results will be displayed on the screen (Fig 38).

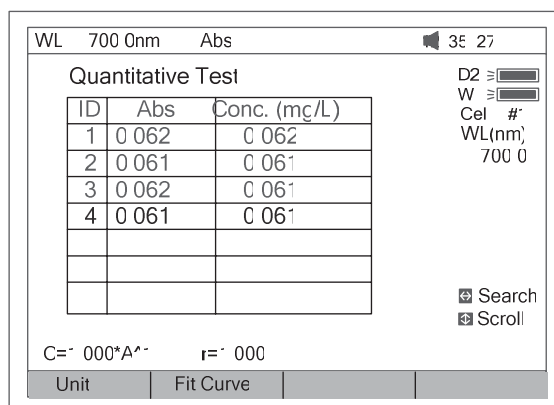


Fig 38

4.3 If there is more than one sample, repeat step 4.2 for the next sample

4.4 Press **【SAVE】** to save the results and fitting parameters

☺ Print Test Report

Press the key **【PRINT】** to print the test report (Fig 39).

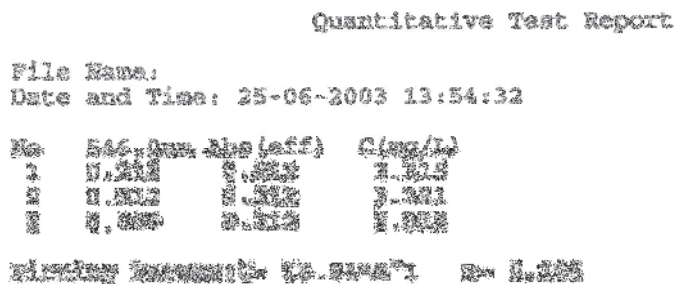


Fig 39

WL Scan

Press **【3】** in main menu for “WL Scan” test (Fig 40). **【ESC】** to exit.

To open a previous curve, press **【OPEN】** and select a previously stored curve (.wav)

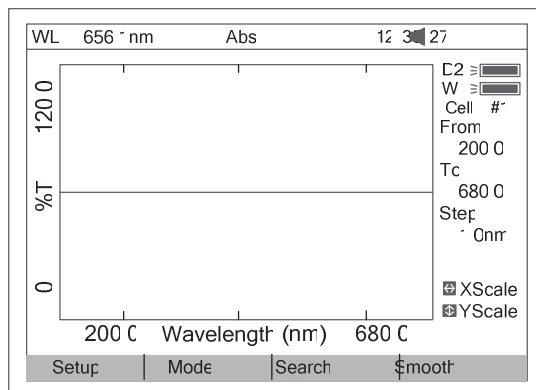


Fig 40

☺ Scan sample

1. Press **【F1】** to setup, input the start wavelength, and end wavelength by pressing the numeric keypad (Fig 41). Note: The uv-3 SERIES scans from high to low wavelength. Browse and select the items of scan step and scan speed by pressing **【^】** or **【v】**.

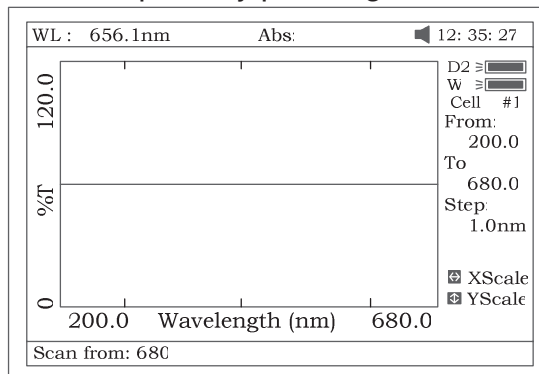


Fig 41

Note: “Scan step” allows the selection of 0.1nm, 0.2nm, 0.5nm, 1nm, 2nm

and 5nm. "Scan speed" allows the selection of "HI", "MEDIUM" and "LOW". For survey scan we suggest 5nm, HI. For detailed scan we suggest 0.5nm, HI

2. Press **【F2】** to select the test mode, "Abs", "%T" or "E" (Fig 42).

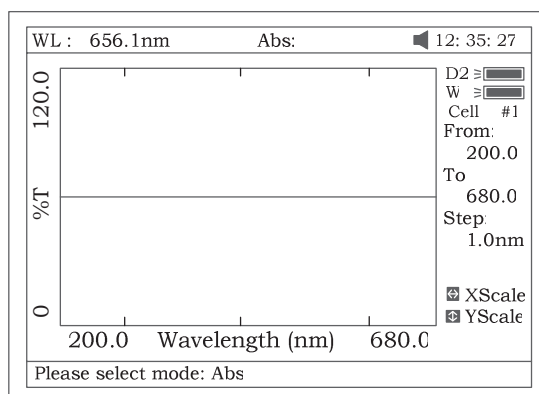


Fig 42

3. Push the blank cuvette into the light path, press **【0Abs/100%T】** to scan the base line (Fig 43). Press the key **【ESC】** to stop scanning;

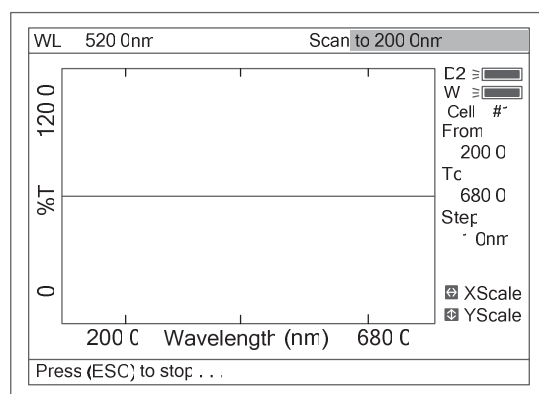


Fig 43

4. Pull the sample cuvette into the light path, press **【START/STOP】** to scan the sample (Fig 44) **【ESC】** to stop scanning. When scan has finished the beeper beeps 3 times (Fig 45).

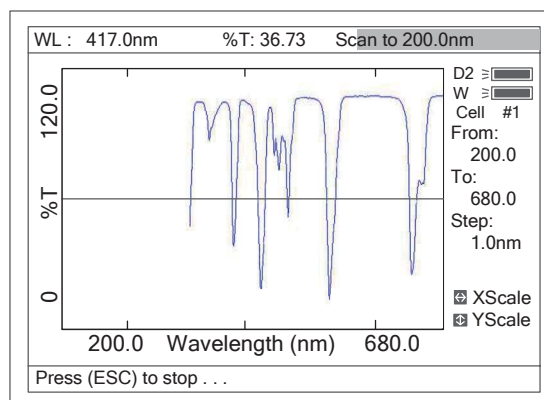


Fig 44

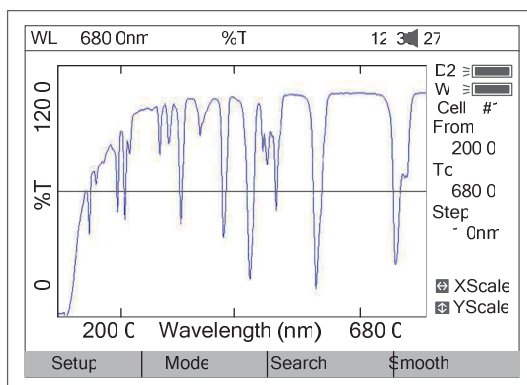


Fig 45

- 5 If you want to change the scale, press **[<]** or **[>]** to change “x” scale (Fig 46), input upper limit and lower limit by pressing the numeric keypad. To change “y” scale press **[^]** or **[v]**. After these inputs the instrument will redraw the curve (Fig 47).

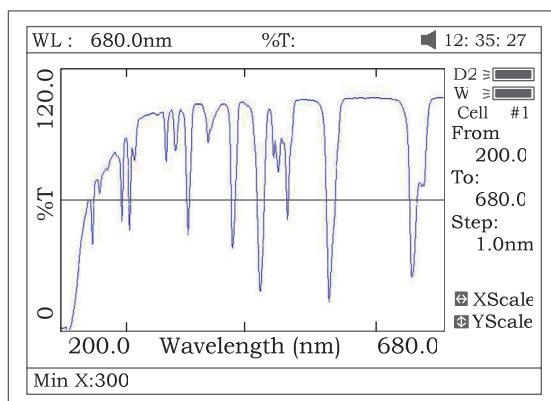


Fig46

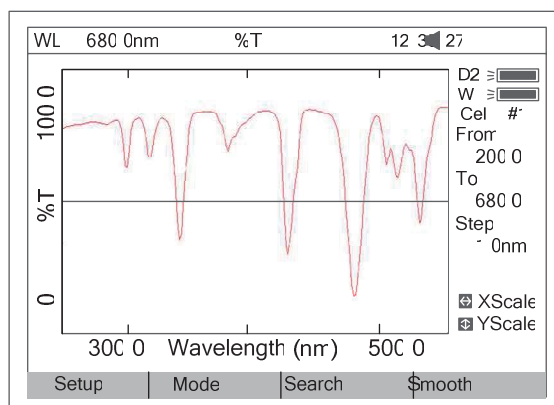


Fig 47

- 6 Press **[F3]** to search the Abs/%T value of the scan. There are two ways for you to search (Fig 48).

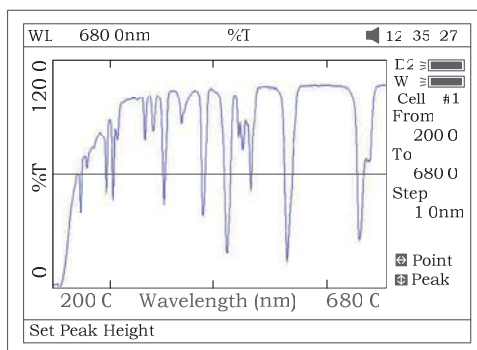


Fig 48

- a) *Peak to peak, press **[F1]** to set “peak height” and input value by pressing the numeric keypad (Fig 49). Press **[^]** to search the peak from left to right and press **[v]** to search from right to left. The value of every peak found will be displayed on the screen one at a time (Fig 50).*

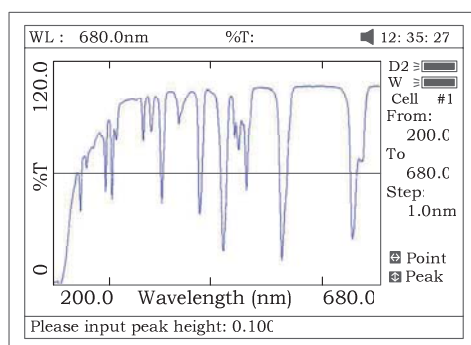


Fig 49

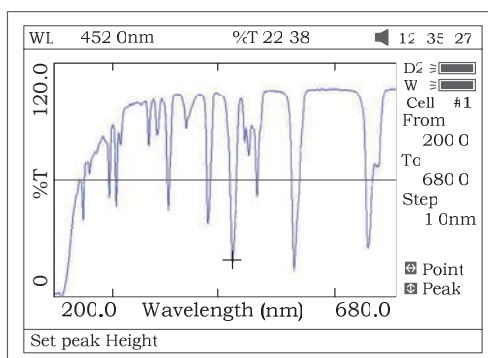


Fig 50

- b) *Point to point, Press **[>]** to search the point from left to right and press **[<]** to search from right to left. The search step interval is the same as the scan step. The value of every point searched will be displayed on the screen.*

☺ Save Curve

Press **[SAVE]** to save the curve. Note: Open/Save requires the first scan display page Fig. 47. Press **[ESC]** if in Search to return to the required page

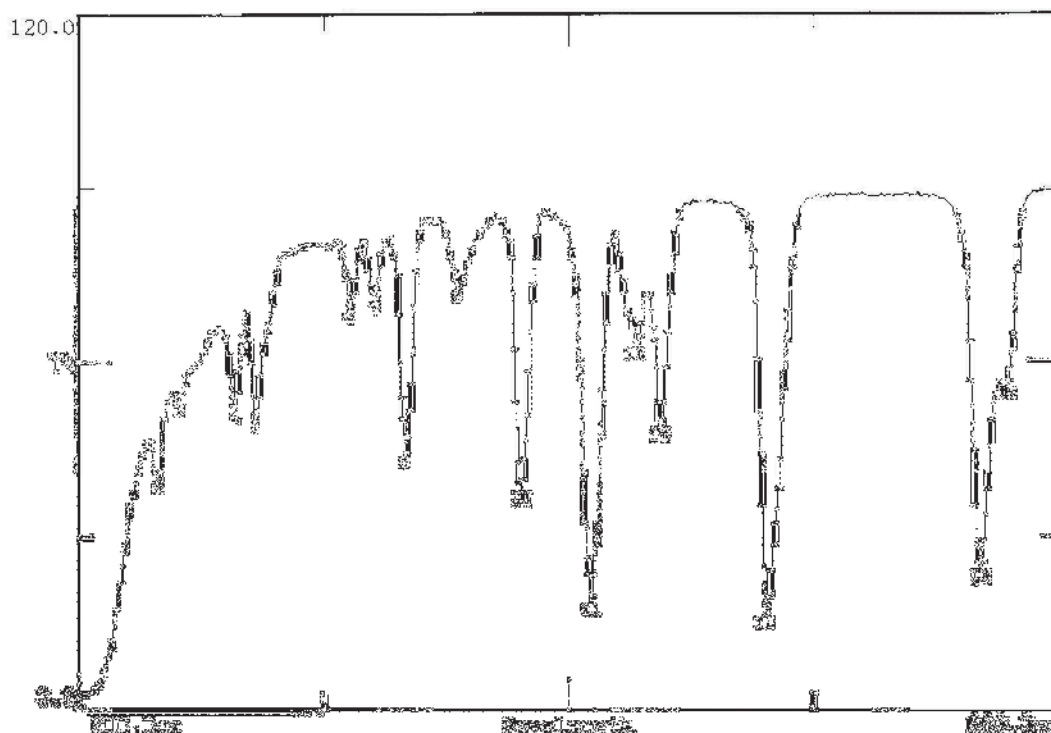
☺ Print Test Report

Press **【PRINT】** to print the curve you have opened or scanned (Fig 51).

Note: The report always is printed in Fig 45

Wavelength Scan Test Report

File Name:
 Date and Time: 25-06-2003 13:47:54
 Scan From: 680.0nm
 Scan To: 200.0nm
 Scan Step: 1.0nm
 Peak Height: 0.030Abs



Peak list:

No.	Wavelength(nm)	Abs	T%
1	202.0	1.585	2.60
2	240.0	0.397	40.08
3	249.0	0.274	53.18
4	277.0	0.285	51.93
5	287.0	0.298	50.30
6	323.0	0.161	68.98
7	345.0	0.154	70.19
8	367.0	0.259	62.25
9	388.0	0.141	72.28
10	419.0	0.422	37.63
11	437.0	0.771	21.08
12	457.0	0.252	62.28
13	485.0	0.212	68.01
14	524.0	0.732	18.22
15	541.0	0.221	23.92
16	559.0	0.222	23.92

Fig 51

Kinetics

Press **【4】** in main menu for “Kinetics” (Fig 52). **【ESC】** to exit.
To open a previous kinetics result, press **【OPEN】** and select a previously stored result (.kin)

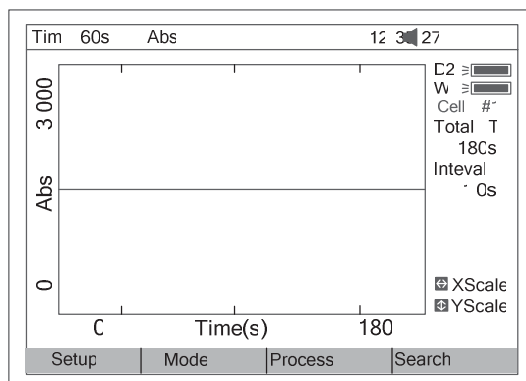


Fig 52

☺ Test

1. Press **【F1】** to set “Total Time”, ”Delay Time”, ”Time interval”, and input the value by pressing the numeric keypad (Fig 53).

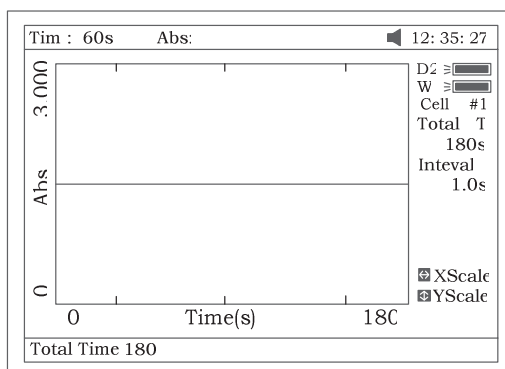


Fig 53

2. Select the test mode (“Abs” or “%T”) by pressing **【F2】** (Fig 54).

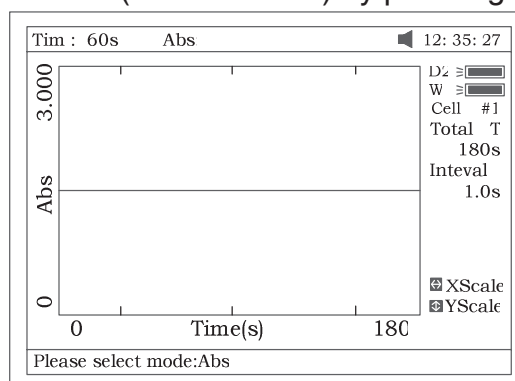


Fig 54

3. Set wavelength by pressing **【GOTO λ 】**. Pull the blank cuvette into the light path, press **【0Abs/100%T】** for blanking
4. Pull the sample cuvette into the light path, press **【START/STOP】** to

scan the sample. After the delay time, the beeper beeps 3 times and time -scan starts. At the end of the time-scan, the beeper also beeps 3 times (Fig 55);

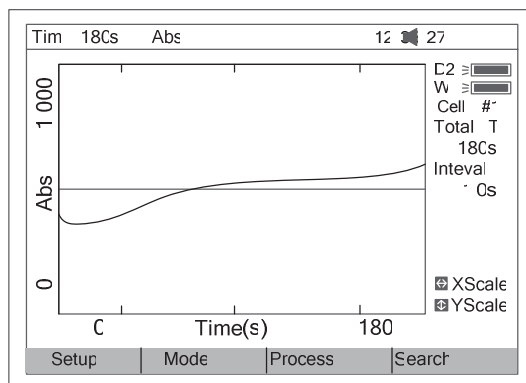


Fig 55

5. Press **[F3]** to process the data, and enter “Begin Time”, “End Time” and “Factor” (Fig 56) and the value in I.U. will be calculated and displayed (Fig 57). The average straight line between the Begin Time and End Time will be calculated. The gradient of this line gives the rate of change of $\Delta A/\text{min}$.

Note: $I.U. = \text{Factor} \times \Delta A/\text{min}$

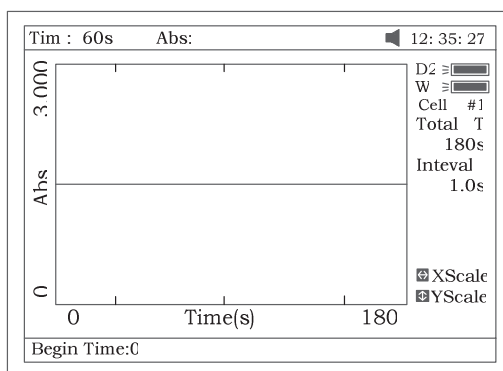


Fig 56

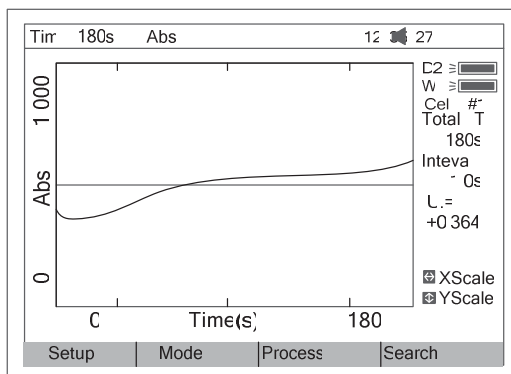


Fig 57

6. If you want to change the scale, please refer to step 5 of "WL scan".
7. Press **【F4】** to search the Abs/%T value in relation to the time axis. Search point to point by pressing the key **【<】** or **【>】**. Please refer to step 6 of "WL scan".

☺ Save Curve

Press the key **【SAVE】** to save curve. Note: Open/Save requires the first kinetics display page Fig. 55. Press **ESC** if in Search to return to the required page.

☺ Print Test Report

Press the key **【PRINT】** to print the curve you have opened or scanned (Fig 58).

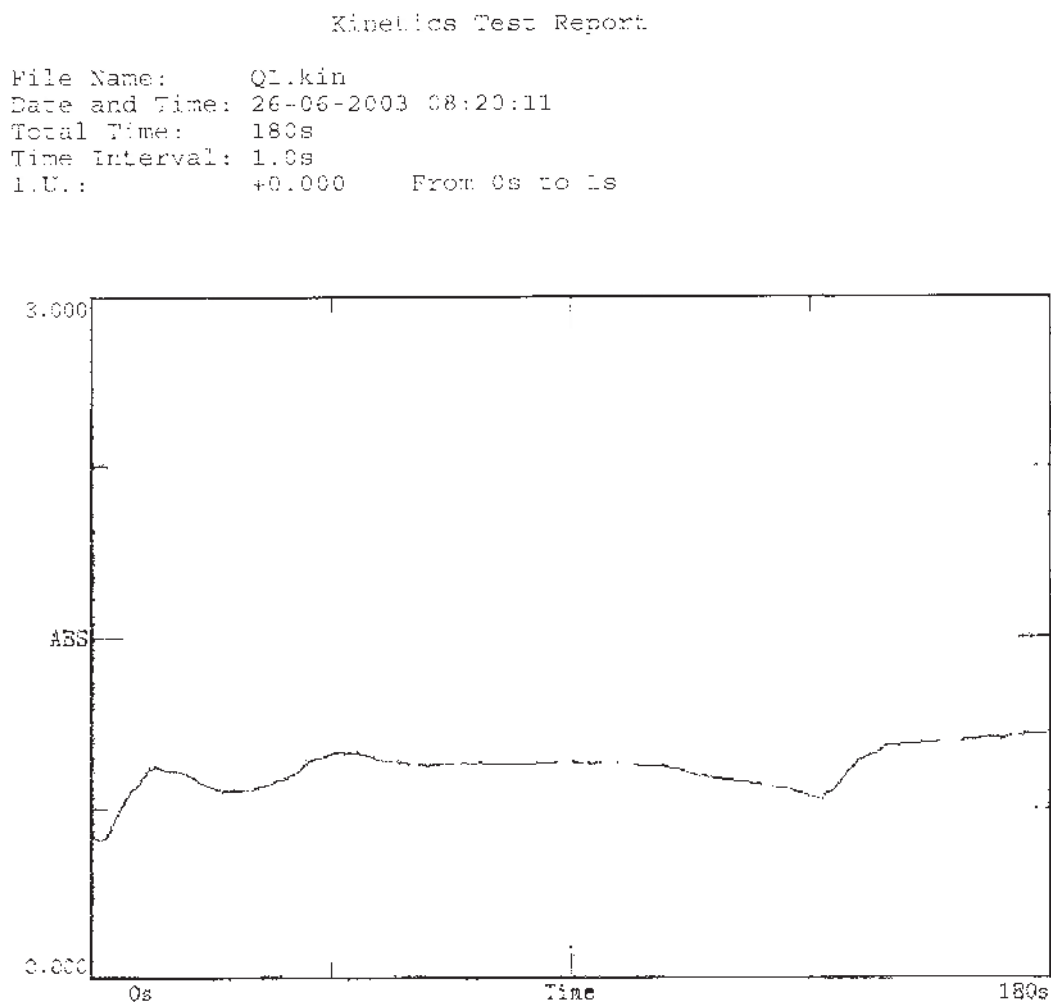


Fig 58

DNA/Protein

Press **【5】** in main menu for “DNA/Protein” (Fig 59). **【ESC】** to exit.

Note: The algorithm of the test refer to Appendix A please.

No	Items	Result	Unit

Fig 59

To open previous DNA results, press **【OPEN】** and select a previously stored result (.dna)

☺ Test

1. To use a simpler or different algorithm, you can enter your own values for f1-f4. Press **【F1】** to set f1-f4. Input the value by pressing the numeric keypad (Fig 61).

No	Items	Result	Unit

Input f1 = 62.90

Fig 60

2. Press **【F2】** to select test mode. "Absorbance difference 1" is for testing at the wavelength 260nm, 280nm and 320nm (optional), and the "Absorbance difference 2" is for testing at the wavelength 260nm, 280nm and 320nm (Optional, Fig 61). Then select with/without reference. If selected with reference (no), the A ref. will be "0" (Fig 62).

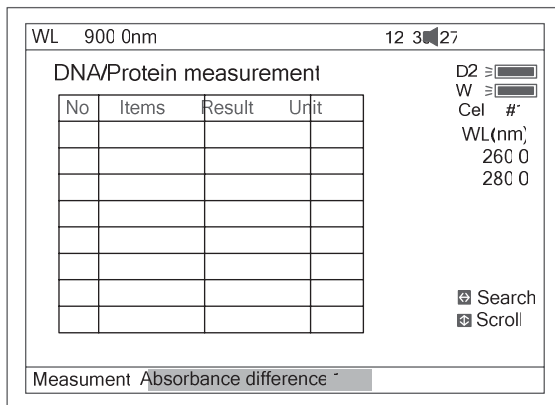


Fig 61

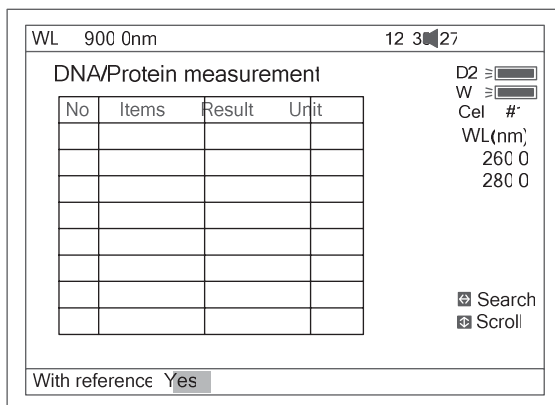


Fig 62

3. Press **[F3]** to select the unit of concentration (Fig 63).

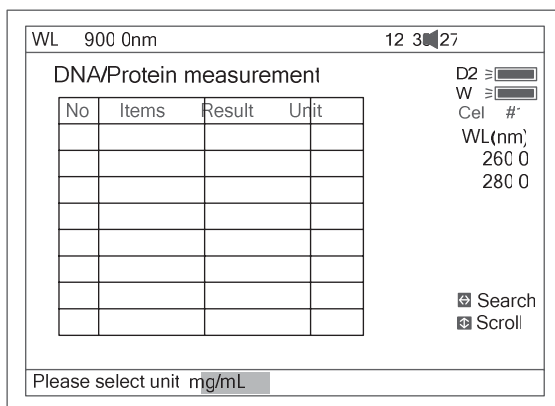


Fig 63

4. Push the blank cuvette into the light path, then press **[0Abs/100%T]** for blanking .
5. Pull the sample cuvette into the light path, press **[START/STOP]** to test the sample. The test result will be displayed on the screen (Fig 64).

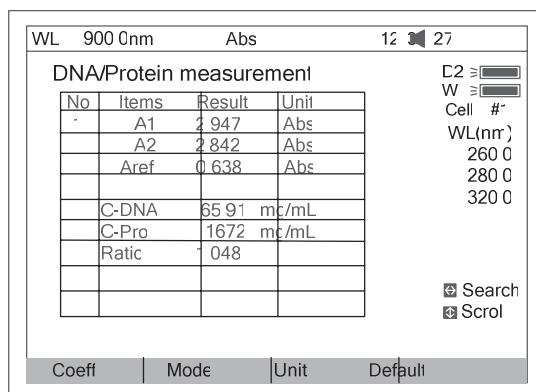


Fig 64

6. If there is more than one sample, repeat step 5 for the next sample.
7. Press the key **<** or **>** for searching. Input the sample number (Fig 65), the result will be displayed on the screen. Press the key **^** or **v** to browse the test results one by one.

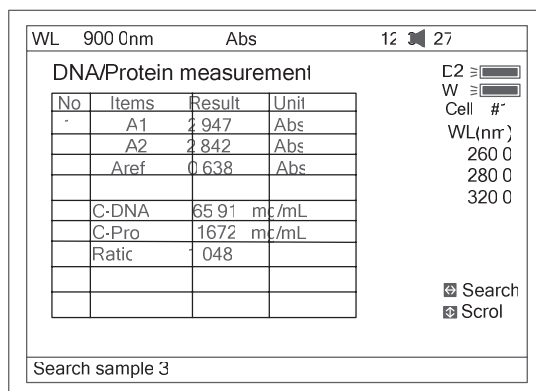


Fig 65

☺ Recall the default

Press the key **F4** to recall the default of the f1-f4.

☺ Save Data

Press the key **SAVE** to save data.

☺ Print Test Report

Press the key **PRINT** to print the test result (Fig 66).

DNA / Protein Test Report

File Name:

Date and Time: 26-06-2003 09:16:33

No	260.0nm	280.0nm	320.0nm	C-DNA	C-Pro	Ratio
1	0.226	0.212	0.102	3.825	76.60	1.127
2	0.226	0.213	0.102	3.803	79.32	1.113

Unit:ug/mL

Fig 66

Multi Wavelength

Press **【6】** in main menu for “Multi WL” (Fig 67). **【ESC】** to exit.

No	WL(nm)	Abs
	500 C	

Fig 67

To open previous Multi Wavelength results, press **【OPEN】** and select previously stored results (.mul)

☺ Test

1. Press **【F1】** to setup a group of wavelengths for testing by pressing the numeric keypad followed by **【ENTER】**. (^) or (v) to modify the inputted data (Fig. 68). Press **【ESC】** to finish setup and exit.
Note: It is recommended to enter the highest wavelength first.

No	WL(nm)	Abs
1	500 C	
2	400 C	
3	300 C	
4		

Fig 68

2. Press **【F2】** to select mode (Fig 69).

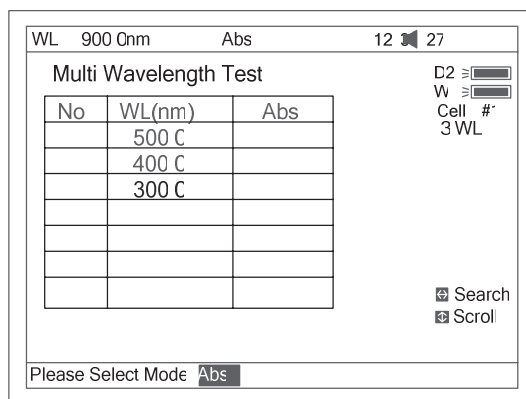


Fig69

3. Push the blank cuvette into the light path, then press **【0Abs/100%T】** for Blanking .
4. Pull the sample cuvette into the light path, press **【START/STOP】** to test. The test results will be displayed on the screen (Fig 70).

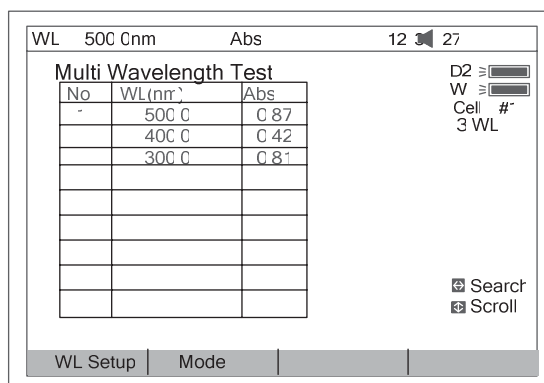


Fig 70

5. If there is more than one sample, repeat step 4 for the next sample.
Note: When the test has finished, the wavelength will go to the first WL.
6. Press **【<】** or **【>】** for searching. Input the sample number, the result will be displayed on the screen. Press **【^】** or **【v】** to browse the test results one by one.

☺ Save Data

Press **【SAVE】** to save data.

☺ Print Test Report

Press **【PRINT】** to print the test results (Fig 71).

Multi-Wavelength Test Report

File Name: M1.mul
 Date and Time: 26-06-2003 09:25:16

No	300.0nm	400.0nm	500.0nm
1	0.107	0.074	0.054
2	0.106	0.073	0.055
3	0.106	0.072	0.054

Unit: Abs

Fig 71

Utility

Press **[7]** in Main menu for “Utility” (Fig 72). **[ESC]** to exit.

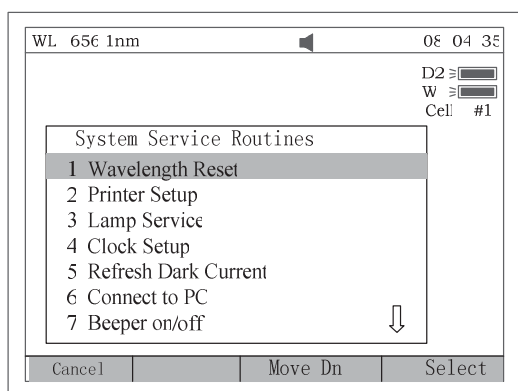


Fig 72

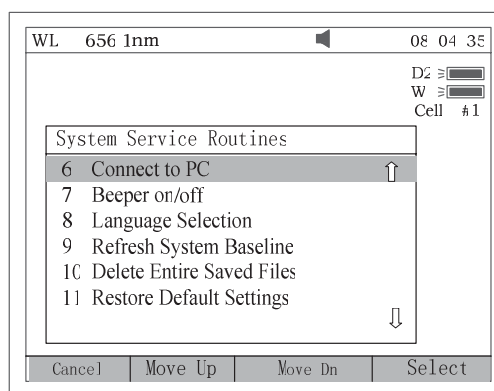


Fig 72A

☺ **WL Reset**

Press **[1]** to reset wavelength (Fig73).

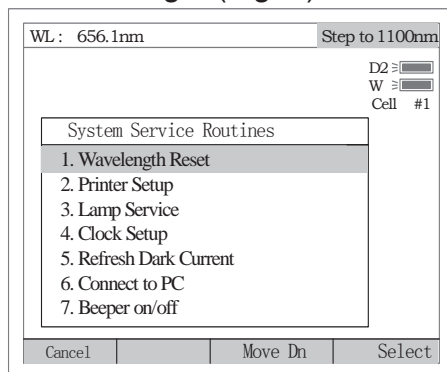


Fig 73

☺ **Printer**

Press **[2]** to set printer (Fig 74). **[ESC]** to exit.

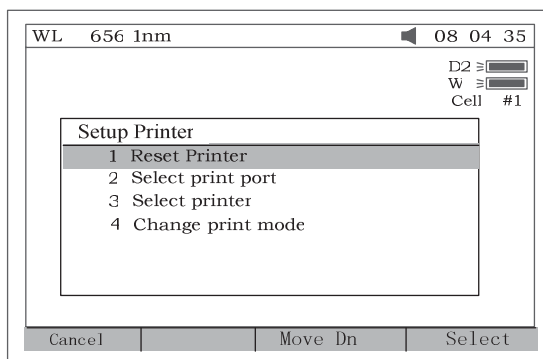


Fig 74

1. Press **【1】** in Fig 74 to Reset Printer.
2. Press **【2】** in Fig 74 to select print port (LPT or Comm., Fig 75).

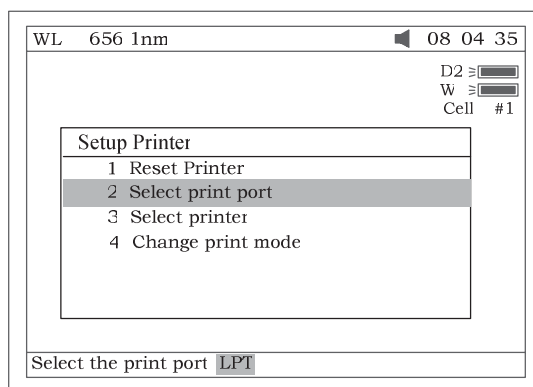


Fig 75

3. Press **【3】** in Fig 74 to select printer (HP PCL (1 color cartridge), PCL (black mode), Epson ESC/P or Epson/P2 or above, Fig76).

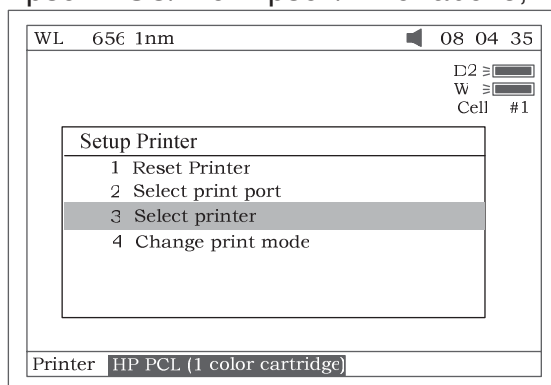


Fig 76

4. Press **【4】** in Fig 74 to change print mode. The first time **【4】** be pressed, a little icon will be displayed on the top line of the screen (Fig 77). At this mode, When **【Print】** be pressed, all the items on the screen will be printed. The second time **【4】** be pressed, the little icon will disappear. At this mode, when **【Print】** be pressed, a test report will be printed.

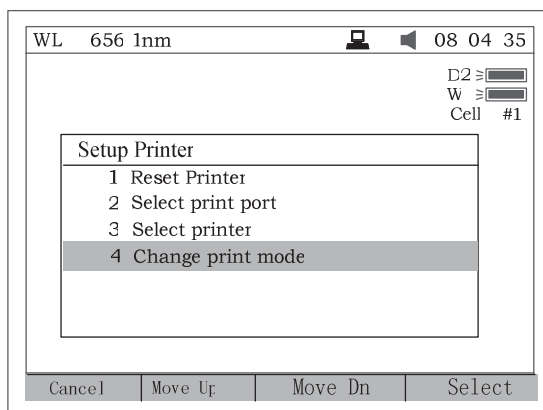


Fig77

☺ Lamp

Press **【3】** to set lamp (Fig 78). **【ESC】** to exit.

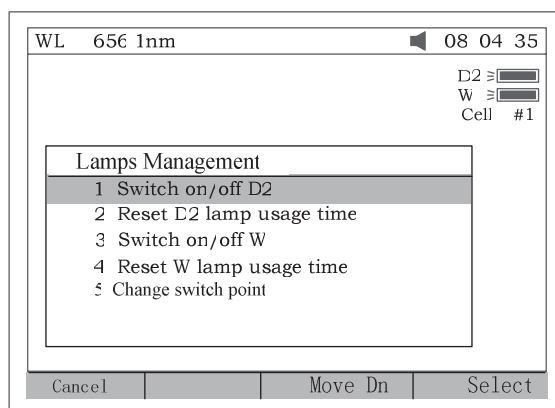


Fig 78

1. Press **【1】** in Fig 78 to switch on/off D2. (Fig 79). Pay attention to the D2 icon on the top of the right screen.

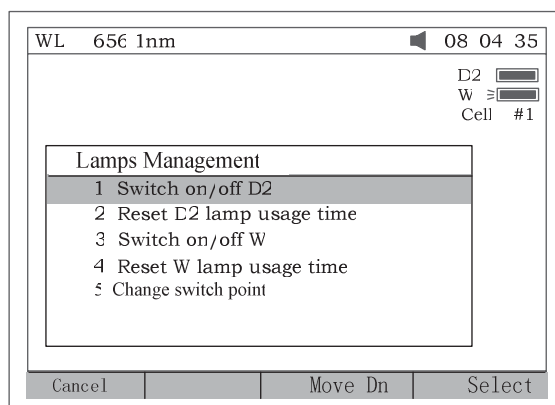


Fig 79

2. Press **【2】** in Fig 78 to reset usage time of D2 (Fig 80). Press **【^】** or **【v】** to select "Yes" or "No", and then press **【ENTER】**.

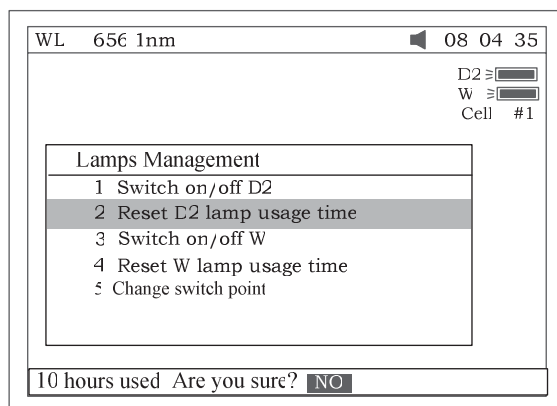


Fig 80

3. Press **【3】** in Fig 78 to switch on/off W. The indication is also on the top right corner of the screen (Fig 81).

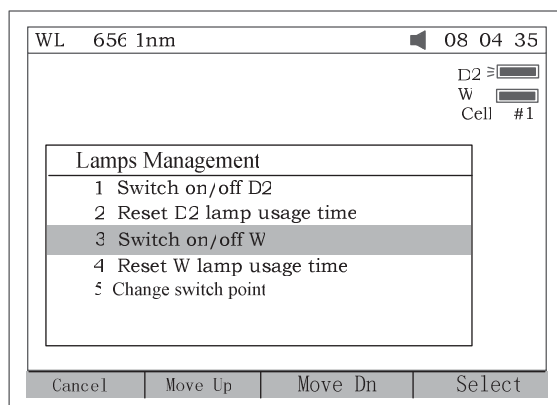


Fig 81

4. Press **【4】** in Fig 78 to reset usage of W (Fig 82). Press **【^】** or **【v】** to select “Yes” or “No”, and then press **【ENTER】**.

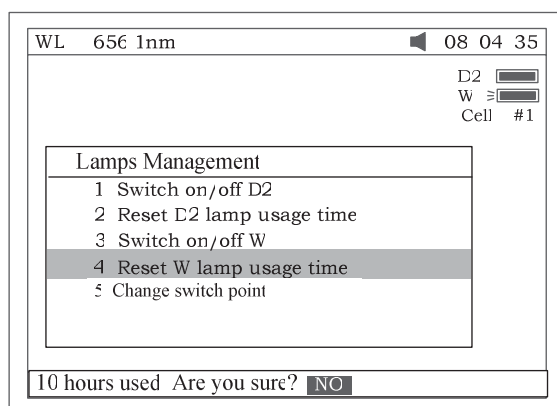
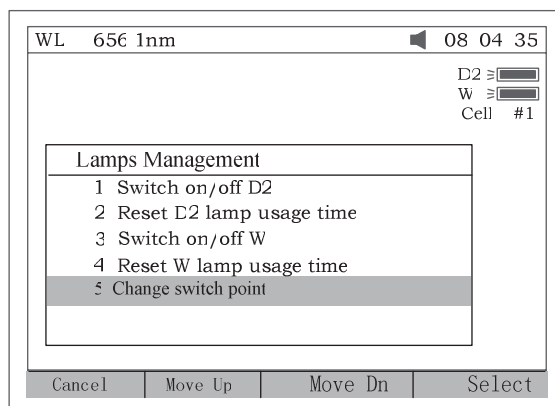


Fig 82

5. Press **【5】** in Fig 78 to set the switch usage wavelength point of D2 and W lamp (Fig 83).



83

☺ Clock

Press **【4】** In Fig72 to set the display mode and modify the clock (Fig 84).
【ESC】 to exit.

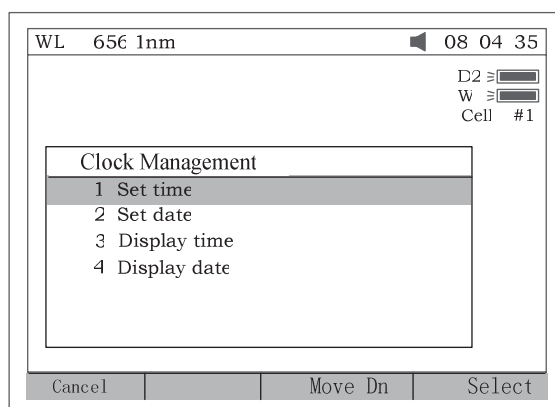


Fig 84

1. Press **【1】** in Fig 84 to modify time by pressing the numeric keypad (Fig 85).

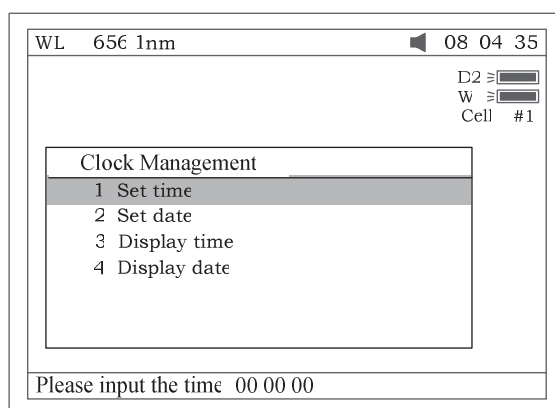


Fig 85

2. Press **【2】** in Fig 84 to modify date by pressing the numeric keypad.
3. Press **【3】** in Fig 84 to set the time display on the top right corner of the screen. (Fig 86).

4. Press **【4】** in Fig 84 to set the date display on the top right corner of the

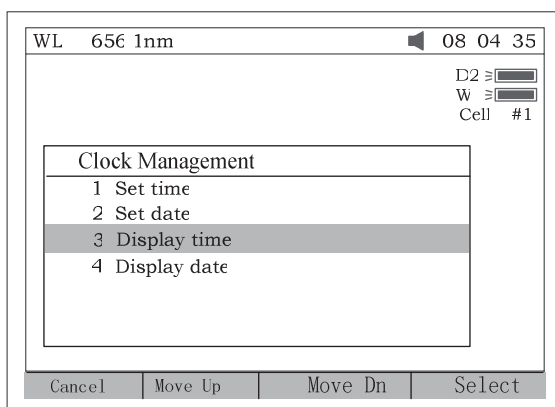


Fig 86

☺ Dark Current

Press **【5】** In Fig72 to get dark current (Fig 87).

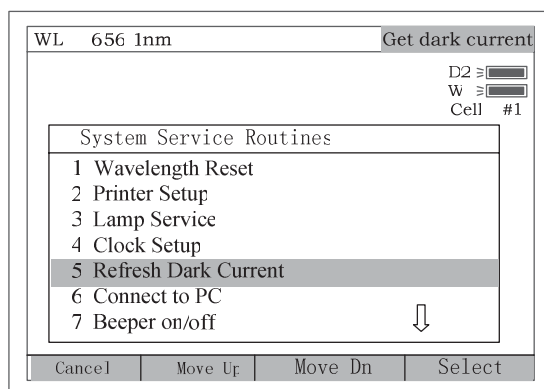


Fig 87

☺ Connect to PC

Press**【6】**in Fig 72 to connect to PC (Fig 88), if the instrument is on-line with the PC. The screen displays as Fig 89. Press **【ESC】** to exit.

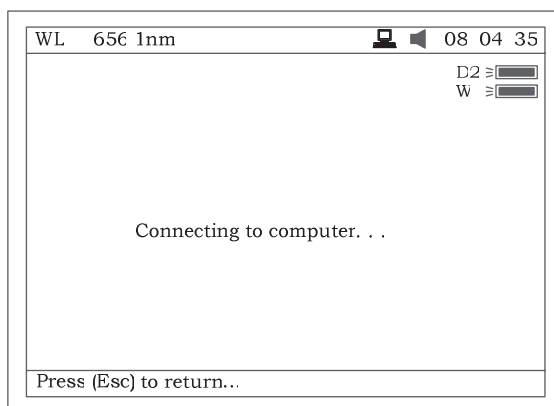


Fig 88

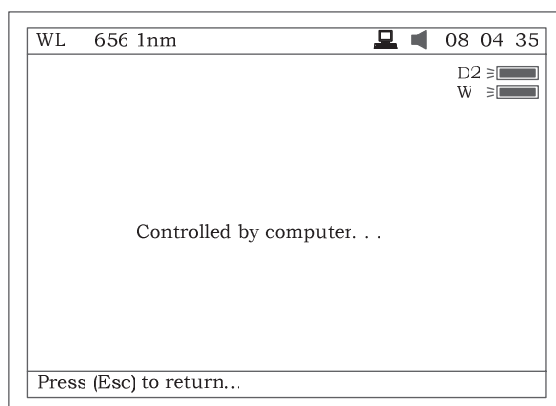


Fig 89

☺ **Beeper on/off**

Press **【7】** in Fig 72 to turn on/off the beeper

☺ **Language selection**

Press **【8】** in Fig 72 to select working language, English and Chinese are under your choice. (Fig 90)

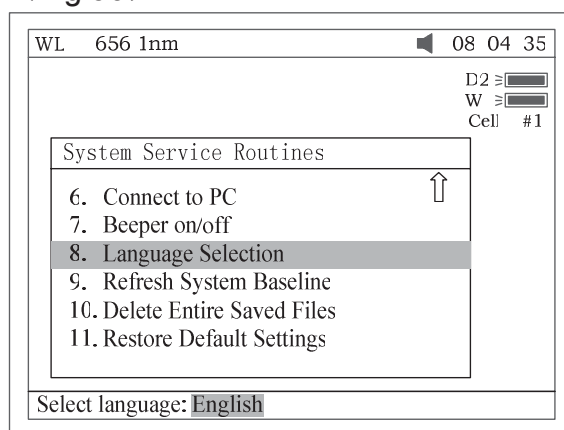


Fig 90

☺ **Refresh System Baseline**

Press **【9】** in Fig 72 to refresh system baseline.

☺ **Delete entire saved files**

Move the cursor onto the tenth menu in Fig 72, then press **【ENTER】**, all the saved files will be deleted. Before deleting the files, double confirm need to do.(Fig 91)

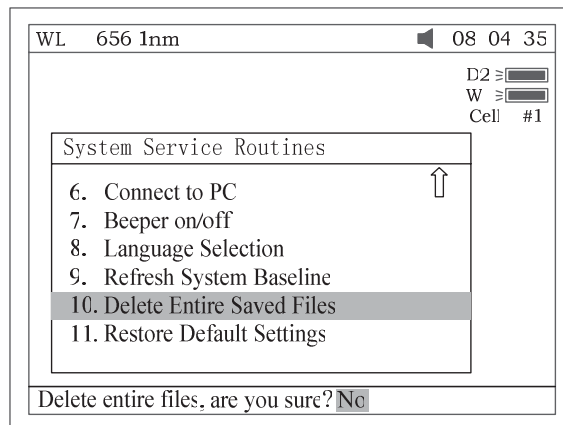


Fig 91

☺ Restore Default Settings

Move the cursor onto the eleventh menu in Fig 72, then press **【ENTER】** to restore the default parameters.(Fig 92)

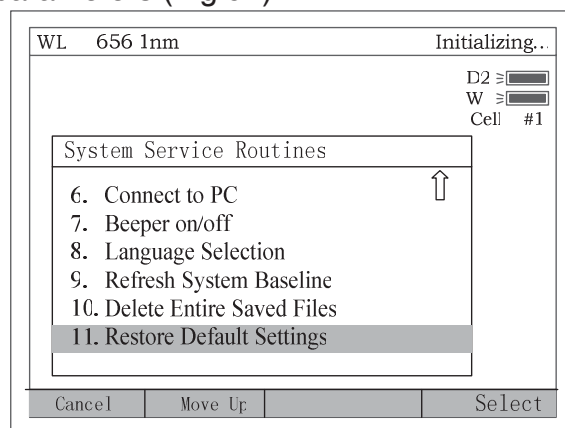


Fig 92

Appendix A

DNA/Protein Test Algorithm

Test Name	Method	Wavelength(s)	Calculations	Parameters	Displayed Units
DNA MEASUREMENT					
DNA/Protein Concentration and DNA purity	Absorbance difference (260,280)	$A_1=A_{260nm}$ $A_2=A_{280nm}$ $A_{ref}=A_{320nm}$ (optional)	DNA concentration: $(A_1-A_{ref})f_1-(A_2-A_{ref})f_2$ Protein concentration $(A_2-A_{ref})f_3-(A_1-A_{ref})f_4$	$f_1=62.9$ $f_2=36.0$ $f_3=1552$ $f_4=757.3$	DNA: μ g/ml Protein: μ g/ml
	Absorbance difference (260,230)	$A_1=A_{260nm}$ $A_2=A_{230nm}$ $A_{ref}=A_{320nm}$ (optional)	DNA concentration: $(A_1-A_{ref})f_1-(A_2-A_{ref})f_2$ Protein concentration $(A_2-A_{ref})f_3-(A_1-A_{ref})f_4$	$f_1=49.1$ $f_2=3.48$ $f_3=183$ $f_4=75.8$	
	Absorbance ratio	$A_1=A_{260nm}$ $A_2=A_{280nm}$ or A_{230nm} $A_{ref}=A_{320nm}$ (optional)	Ratio= $\frac{A_1-A_{ref}}{A_2-A_{ref}}$	None	No units(ratio)

Appendix B

A number of correction techniques can be used to eliminate or reduce interference errors. In general, if the source of the error is known and is consistent from sample to sample, the error can be eliminated. On the other hand, if the source is unknown and varies from sample to sample, the error can be reduced but not eliminated. Correction techniques can always require data from at least two wavelengths. The more sophisticated correction techniques require multi-wavelength or spectral data.

A.1 Iso-absorbance

When a known interfering component with a known spectrum is present, the error introduced by this component at the analytical wavelength for the target analyte can be eliminated by selecting a reference wavelength at which the interfering compound exhibits the same absorbance as it does at the analytical wavelength. The absorbance at this reference wavelength is subtracted from the absorbance at the analytical wavelength, as shown in Figure A1. The residual absorbance is the true absorbance of the analyte.

This technique is less reliable when the spectra of the analyte and of the interferent are highly similar. Moreover, it can correct for only one interference

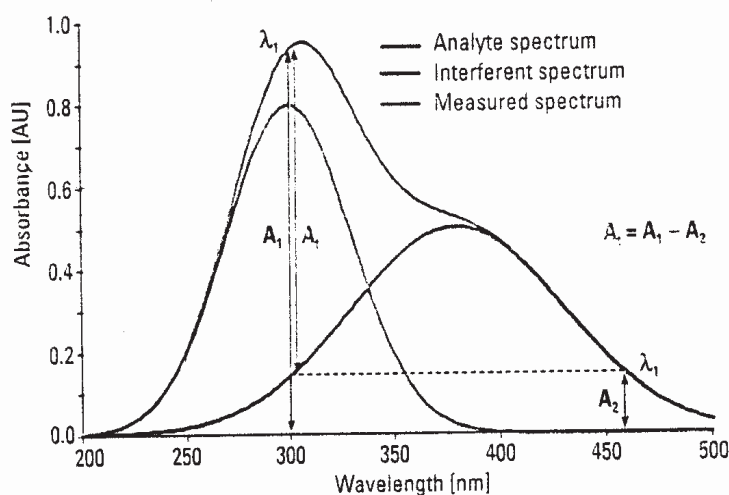


Fig A1 Iso-absorbance correction

A.2 Three-point correction

The three-point, or Morton-Stubbs correction uses two reference wavelengths, usually those on either side of the analytical wavelength.

The background interfering absorbance at the analytical wavelength is then estimated using linear interpolation (see Figure A2). This method represents an improvement over the single-wavelength reference technique because it corrects for any background absorbance that exhibits a linear relationship to the wavelength. In many cases, if the wavelength range is narrow, it will be a reasonable correction for non-linear background absorbance such as that resulting from scattering of from a complex matrix.

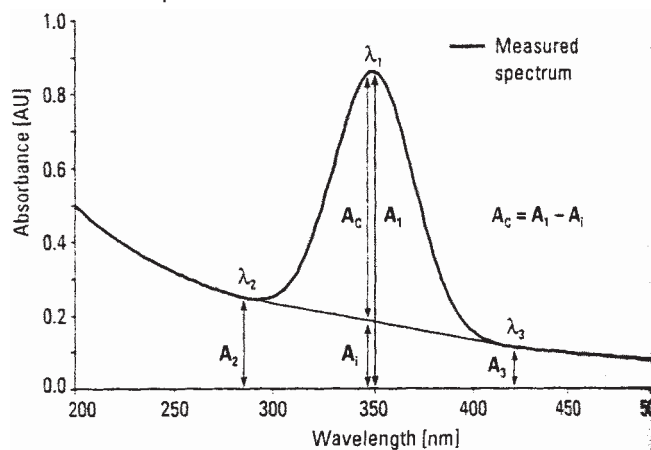


Fig A2

Appendix C

Maintenance Inside Structure

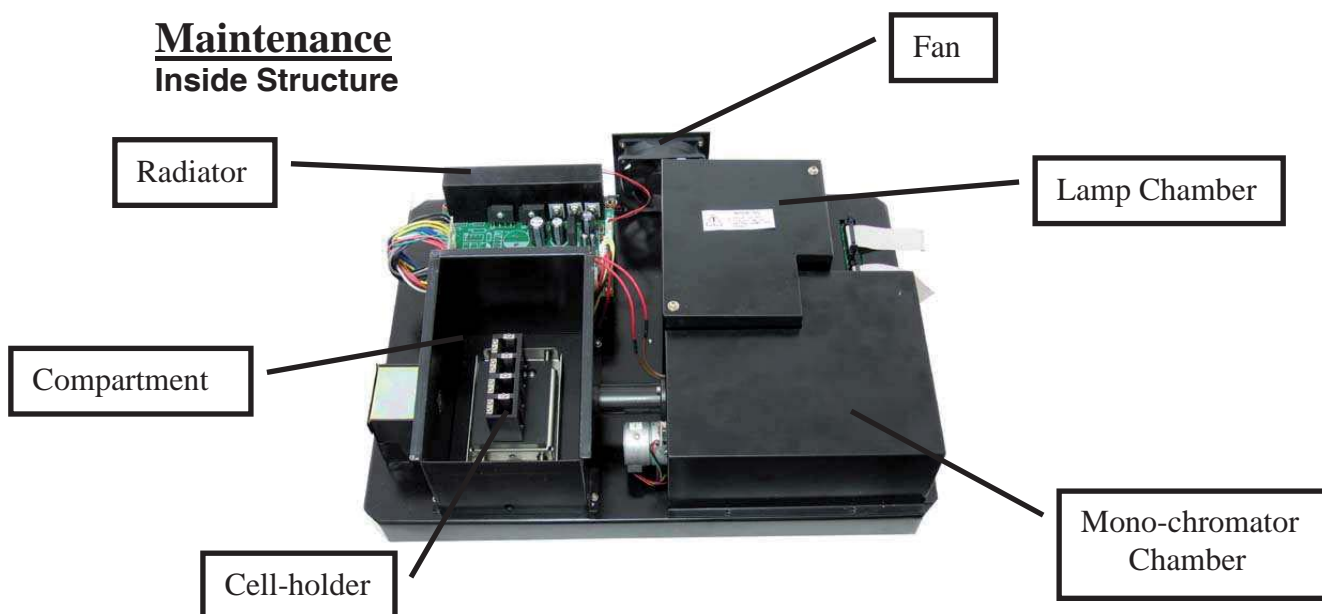


Fig.4-1 Inside Planform

1. Lamp Replacement

A. Replace Tungsten-Halogen Lamp

1. Turn off and unplug the instrument.
2. Remove the four screws on the sides of the spectrophotometer.
3. Remove the **Cuvette Holder Control Knob** by unscrewing the rod counterclockwise.
4. Remove the cover of the instrument very carefully and place it in the right of the instrument.

BE SURE NOT TO PULL PANEL WIRING LOOSE!

5. Unscrew the two screws from the **Lamp Chamber** and remove its cover.
(**Caution: The cover may be HOT, be sure to wear gloves when act**)

6. Unplug and remove the lamp from ceramic base (the black connector).
Insert the new lamp; pushing it in as far as it will go.

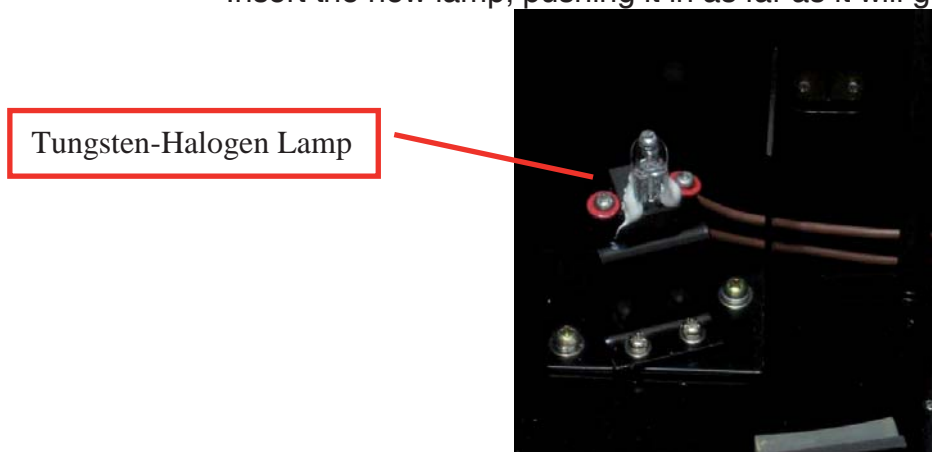


Fig.4-2

CAUTION:

- 1) do not handle the lamp with bare fingers. Use tissue or cloth when handling lamp.
- 2) There's no difference in polarity of the two legs of Tungsten-halogen lamp.
7. Switch the instrument on. Set the wavelength at 340 nm, insert an empty cuvette, and blank the instrument. If the energy is low, adjust the lamp by "pulling" or "pushing" it so that the light beam is focused on the entrance slot of the mono-chromator. Since the lamp socket is pre-aligned, there will be minimum, if any, adjustment required.
8. Switch the instrument off, re-cover the lamp chamber and tighten the two screws.
9. Reinstall the instrument cover by positioning the front of the cover first and then sliding the back of the cover over the backside grill plate. Be sure to prevent all wires from being pinched in the process.
10. Reinstall the four screws and the **Cuvette Holder Control Knob**.

B. Replace Deuterium Lamp**WARNING: Wear UV protection Glasses before changing the Deuterium Lamp!**

1. Turn off and unplug the instrument (**VERY IMPORTANT: HIGH VOLTAGE**).
2. Remove the four screws on the sides of the spectrophotometer.
3. Remove the **Cuvette Holder Control Knob** by unscrewing the rod counterclockwise.
4. Remove the cover of the instrument very carefully and place it in the right of the instrument.

BE SURE NOT TO PULL PANEL WIRING LOOSE!

5. Unscrew the two screws from the **Lamp Chamber** and remove its cover. (**Caution: The cover may be HOT, be sure to wear gloves when act**)
6. Disconnecting the 3-wire connector by pulling it straight up. Remember the direction of the white connector. (**Fig. IV** in the following picture)
7. Loosen and remove the two white screws (**Fig. I** and **II** in the following picture) from the deuterium flange. Then pull the Deuterium lamp out by pinching its flange. (Note: **Fig. III** is a positioning bolt, there's no need to loosen it)

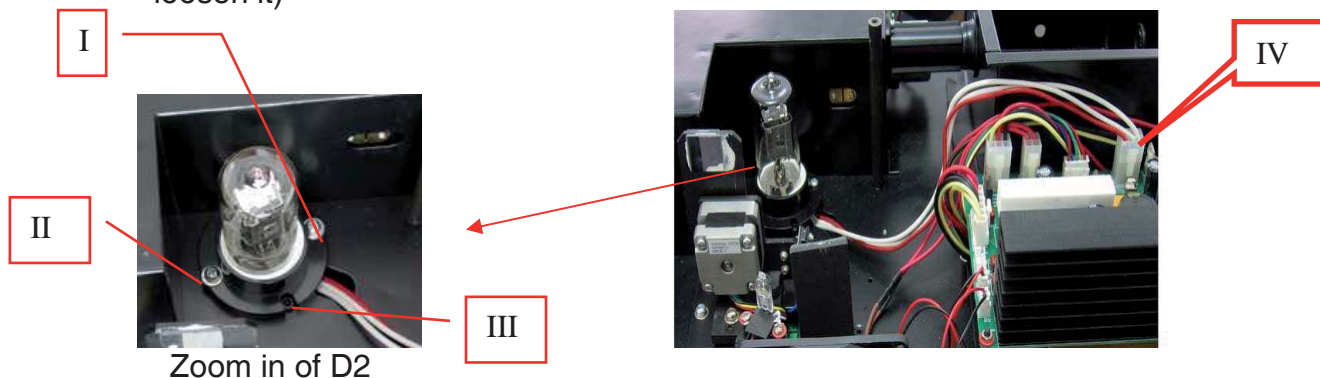


Fig.4-3

8. Replace a new pre-aligned lamp provided by or an authorized Service

- Provider. Be sure the socket of the lamp flange matches with the positioning bolt. Then tighten the two screws.
9. Reconnect the wire connector (make sure the wire connection orientation is the same as **step 6.**)
 10. Turn on the instrument. After self-testing, select 300 nm and press **【ZERO】**. Check to make sure that the light beam is focused on the entrance slit of the monochromator. Since the lamp is pre-aligned, there will be minimum, if any, adjustment required.
 11. Switch the instrument off, re-cover the lamp chamber and tighten the two screws.
 12. Reinstall the instrument cover by positioning the front of the cover first and then sliding the back of the cover over the backside grill plate. Be sure to prevent all wires from being pinched in the process.
 13. Reinstall the four screws and the **Cuvette Holder Control Knob**.

2. Battery Replacement

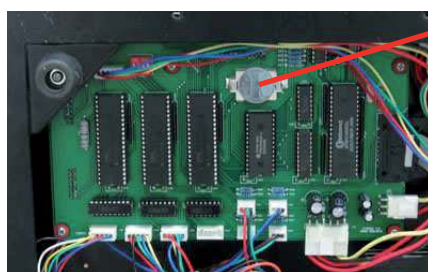
UV-1100 and 12 Series can save many data in the RAM, so a battery must be used in the mainboard. When the battery is disabled, you'll have to replace it as the following indication.

- 1) Turn off and unplug the instrument (**VERY IMPORTANT: HIGH VOLTAGE**).
- 2) Unscrew the 13 white screws from the bottom board and remove the board. (Fig.4-4)



Fig.4-4 Bottom

- 3) Pick out the old battery and replace a new one. (Fig.4-6)



Batter

Fig. 4-5 Main Board

- 4) Recover the bottom board and tighten the 13 screws.

3. Trouble-shooting

PROBLEM	Possible Cause	Solution
Instrument Inoperative after switch power on	Power cord not connected to outlet	Plug instrument in
	Dead Power outlet	Change to a different outlet
	Wrong voltage setting	Switch to your local voltage or call an authorized service engineer
	Internal fuse blown or defective electronic component	Call an authorized service engineer
Instrument cannot set 100%T (0.000A)	Light beam blocked: Holder misaligned	Check sample holder
	Lamp is old or defective	Replace lamp
	Lamp is off alignment	Refer to lamp replacement instructions in this manual
	Defective electronic component	Call an authorized service engineer
Instrument drift and noise	No sufficient warm up time	warm up at least 20 minutes
	Use glass cuvette in Ultra-violet range	Change to quartz cuvette
	Significant temperature change Lamp not adjusted properly	Check lamp if has been properly installed. Refer to lamp replacement instructions in this manual
	Lamp old or defective	Replace with a new lamp
	Unstable power supply	equip a manostat to make the voltage stable
	Defective or dirty detector or defective electronic component	Call an authorized service engineer
Incorrect readings obtained	Insufficient sample volume	Fill cuvette with more samples
	Wrong wavelength setting Failed to blank (0A/100%T)	Check analytical procedure and wavelength setting. Get dark current and calibrate wavelength in utility menu.
	Stray sample preparation vapors.	Prepare sample away from instrument. Use proper ventilation
	Bubbles or particles in solution	Check sample preparation and analytical procedure
	Instrument out of electronic calibration	Call an authorized service engineer