



S1205 & S2100+ SERIES  
SPECTROPHOTOMETER  
USER'S MANUAL

V 1.0

*United Products & Instruments, Inc.  
182-E Ridge Road  
Dayton, NJ 08810  
732-274-1155 FAX 732-274-1151*

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## **General information**

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 the 2100UV+, 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.

## **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 S1205 and S2100+Series (S2100+ and S2100UV+included) should be operated by appropriate laboratory technicians.

## **Electrical**

Before switching on the apparatus, make sure it is set to the voltage of the local power supply. 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 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

## Performance

To ensure that the instrument is working within its specification, especially when making measurements of an important nature, carry out performance checks with particular reference to wavelength and absorbance accuracy. Performance checks are detailed in this manual.

## Radio Interference

For compliance with the EMC standards referred to in the EC Declaration of Conformity, it is necessary that only shielded cables are used when connecting the instrument to computers and accessories.

## Introduction

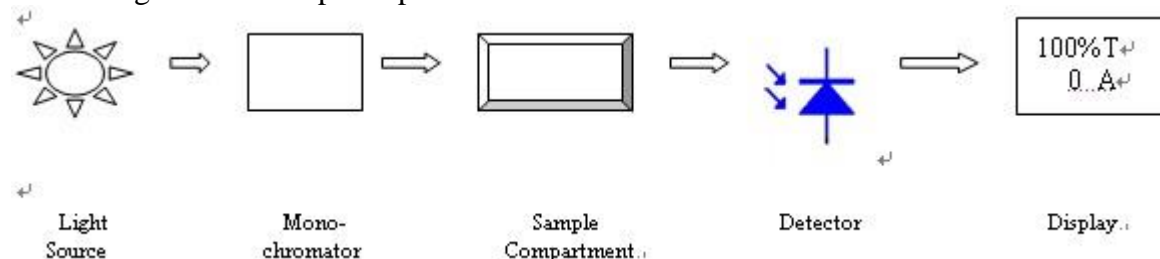
The UNICO S1205 and S2100+series are single beam, general purpose instruments designed to meet the needs of the Conventional Laboratory, They are ideal for various applications, such as: Clinical Chemistry, Biochemistry, Petrochemistry, Environmental Protection, Food and Beverage Labs, Water and Waste Water Labs and other fields of quality control and research.

Both S1205 and S2100+ Series features a digital display of photometric result, easy operation and wavelength range of 325nm to 1000nm for S1205 and model S2100+(200-1000nm for S2100UV+), these instruments are ideal for measurements in the visible wavelength region of the electromagnetic spectrum (ultraviolet and visible for the S2100UV+).

## Working Principle

The spectrophotometer consists of five parts: 1) Halogen and deuterium (for S2100UV+ only) lamp 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 below illustrates the relationship between these parts.

Block diagram for the Spectrophotometer



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.

Both S1205 and S2100+ Series incorporate an RS-232C and/or USB bi-directional port for connecting to a PC for using the UNICO Application Software.

### 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

Unless otherwise specially ordered the spectrophotometer package should include the following items.

Description:	Quantity
Spectrophotometer.....	1
Power Cord.....	1
Cuvettes, Glass .....	Set of 2
Cuvettes, Quartz(S2100UV+ only).....	Set of 2
Dust Cover.....	1
Manual.....	1
Built in Printer (Optional).....	1

### Specifications for S1205

	<b>Model S1205</b>	
Wavelength Range	325-1000nm	
Spectral Bandpass	5nm	
Wavelength Accuracy	$\pm 2$ nm	
Wavelength Repeatability	$\pm 1$ nm	
Stray Radiant Energy	<0.3 @ 340 and 400nm	

Photometric Range	0 to 125%T -0.3 to 2.5 Abs -9999 to 9999	
Photometric Accuracy	± 0.004@0.5A	
Data output	RS232 and Built in Printer(Optional)	
Power Requirements	80-240Vac, 50-60 Hz	
Dimensions	420W x 340D x 180H (mm)	
Light Source	Tungsten Halogen	
Weight	8.5kg	
Shipping Weight	19 lbs	
Shipping dimension	20 x 16 x 11 inches	

### Specifications for S2100+ Series

	Model S2100+	Model S2100UV+
Wavelength Range	325-1000nm	200-1000nm
Spectral Bandpass	4nm	4nm
Wavelength Accuracy	± 2 nm	±2 nm
Wavelength Repeatability	± 1nm	±1nm
Stray Radiant Energy	<0.3 @ 340 and 400nm	<0.3 @ 220 and 340nm
Photometric Range	0 to 125%T -0.3 to 2.5 Abs -9999 to 9999	0 to 125%T 0.3 to 2.5 Abs -9999 to 9999
Photometric Accuracy	± 0.004@0.5A	± 0.004@0.5A
Data output	RS232 and Built in Printer(Optional)	RS232 and Built in Printer(Optional)
Power Requirements	80-240Vac, 50-60 Hz	110V/60Hz or 220V/50Hz Switchable
Dimensions	505W x 430D x 200H (mm)	505W x 430D x 200H (mm)
Light Source	Tungsten Halogen	Tungsten Halogen/Deuterium
Weight	12.5kg	13.5kg
Shipping Weight	36 lbs	40 lbs
Shipping dimension	26 x 21 x 15 inches	26 x 21 x 15 inches

### **Installation:**

1. After carefully unpacking the contents, check the materials with the packing list to ensure that you have received everything in good condition.
2. Place the instrument 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. For S2100UV+ select either 220V or 110V on the voltage selector switch to match your local mains voltage supply.

5. Turn on the instrument and allow it to warm up for 15 minutes before taking any readings.

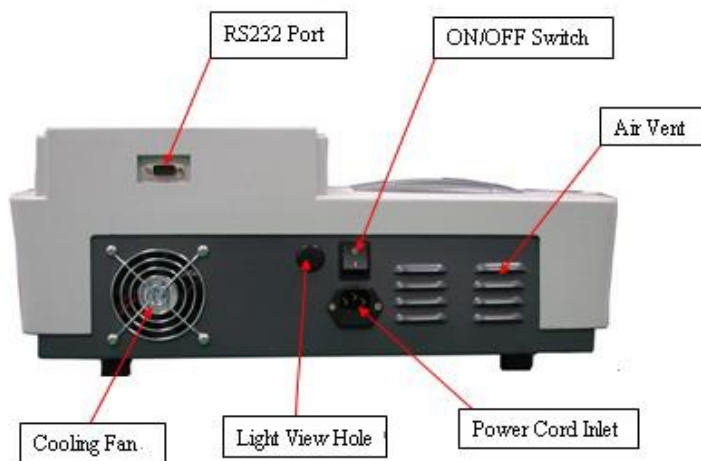


Fig.1 Back View of S2100+ and S2100UV+



Fig.2 Back View of S1205

## Operational Panel

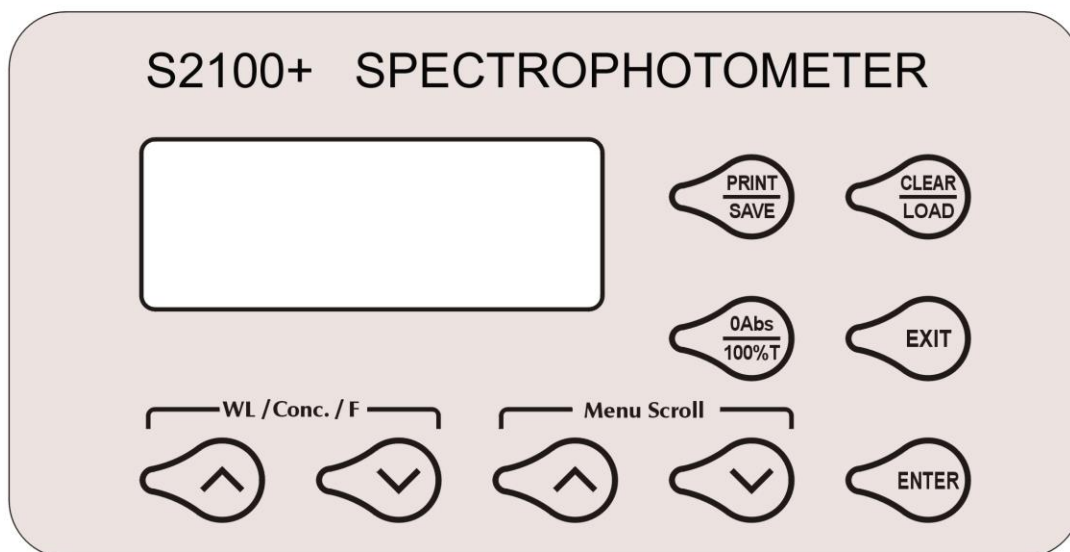


Fig 3 S2100+ Panel shown

### Description of Key Functions

- 【CLEAR/LOAD】** Clear number or character when editing in Quantitative Mode;  
Load saved data or saved curve ;
- 【PRINT/SAVE】** Print data; Save data or curve;
- 【0Abs/100%T】** Set 0Abs and 100%T;
- 【EXIT】** Return to previous screen;
- 【ENTER】** Confirm the inputted data or selected item; Go to next setup or screen;

WL/Conc./F

- 【^】 , 【v】** Set Wavelength; Enter Standard solution value or Enter Known Factor value;

Menu Scroll

- 【^】 , 【v】** Browse the items in the menu

## Operation Instruction:

Prepare the spectrophotometer



Turn on the spectrophotometer by pressing the Power Switch (IO). The screen displays sequentially as Fig 4 and 5. Press EXIT to skip 15 minutes warm up. After 15 minutes warm up the main menu displays as Fig 7. (S2100UV+ locates lamp and set filter before the main menu displays)

```
UNICO Spectro
Vis 1205
Ver.2.0 Jan.,2008
```

Fig 4

```
UNICO Spectro
Vis 1205
Warm up. 15m remaind
Press EXIT to skip
```

Fig 5

**Note:** Specific model number displays in Fig.4 and Fig. 5. (Model Vis 1205 shown in this illustration)

```
MAIN MENU 11:30:18
* BASIC MODE
  QUANTITATIVE
  UTILITY
  PC LINK
  End of list
```

Fig 6

**Note:** a.If the saved wavelength has been out of order,`WL calibrating` will be implemented and then go into **Main Menu**.  
b.It is strongly recommended that taking dark current following the steps below after warmup:

1. Select **UTILITY** in Fig. 6 and then select **Dark Current** in Fig. 7

```
UTILITY 11:37:38
WL Calibration
* Dark Current
  Edit Clock
```

Fig. 7

2. Dark Current will be taken shown as Fig 8.1 and be saved shown as Fig 8.2 after pressing **EXIT**

```
Dark Current
00031 00067 00155
00310 00640 01298
02603 05301 00031
```

Fig 8.1

```
Saving ,Wait Please!
00031 00067 00155
00310 00640 01298
02603 05301 00031
```

Fig 8.2

Tech Notes: It is always a good practice to reset the dark current periodically. It is especially important if the instrument is hanging on for a long time or the environment is not stable.

### **BASIC MODE — %T/Abs Measure**

1. In Fig 6, scroll \* to **BASIC MODE** and then press **ENTER** to Select basic T/Abs mode as showed in Fig 9. If the readouts are not 100.0%T and 0.000A, you may press **0Abs/100%T** to blank.

```
BASIC MODE
100.0%T  0.000A

546nm
```

Fig 9 BASIC MODE

2. Select the desired wavelength by pressing the appropriate key. At any time that the wavelength is changed, blank will automatically be implemented as showed in Fig 10.1, Fig 10.2 and 10.3

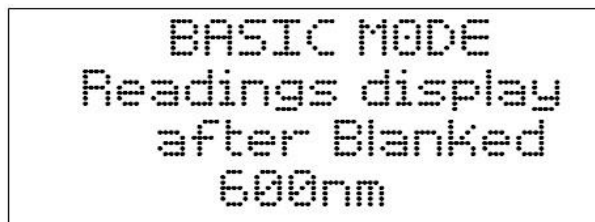


Fig 10.1 Select wavelength using **【^】** , **【v】**

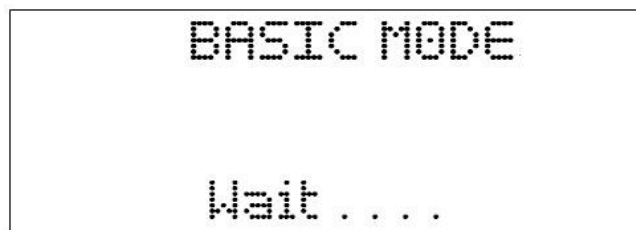


Fig 10.2 Press Enter to set the new wavelength



Fig 10.3 Blank automatically

**Note:** Press WL/Conc./F **【^】** **【v】** to change wavelength at 1nm and 5nm interval,  
Press Menu Scroll **【^】** **【v】** to change wavelength at 50nm interval.

3. Make a blank reference solution by filling a clean cuvette with distilled or de-ionized water or other specified solvent. Wipe the cuvette with tissue to remove the fingerprints and droplets of liquid.
4. Fit the blank cuvette into the 4-cell holder and place the cuvette in the slot nearest you. Push the rod so that the cuvette is in the light path. Close the lid.
5. Set 0.000A or 100%T by pressing 0A/100%T button.
6. Remove the blank cuvette if you are testing more than 3 samples. Set it aside in the case that you may need to reset 0A/100%T later (i.e. change wavelength).
7. Rinse a second cuvette (or more) with a small amount of sample solution to be tested. Fill the cuvette and wipe it.
8. Put the sample cuvette(s) in the sample compartment. Close the lid.

9. Read the % Transmittance and Absorbance from the LCD readout window. If you are reading more than one cuvette, be sure to carefully move the cuvette holder to the next position by pulling on the sample holder rod until the holder “click” into place. Be sure to make note of the readout (or print) for each sample. Remove the sample cuvette(s).

**Operational Note:**

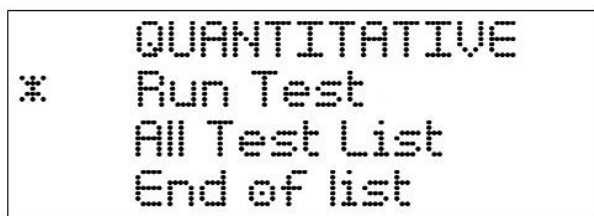
1. If you are reading 3 or less samples, then place the reference cuvette in the position nearest you, and the samples in the next available position. This will shorten the time to read samples and minimize the sample handling (opening and closing the sample compartment lid, etc.)
  2. To save or print the readings please press **PRINT/SAVE** and follow the instruction on line 4 of screen.
10. If you are to test the same sample at other wavelengths, repeat steps 2 to 9 for each wavelength.
  11. For each new sample you analyze, repeat steps 3 to 9.

## Quantitative Test

### Run Test using pre-defined Method

Test method (curve) must be defined and established before quantitative tests can be run. This instrument has open platform for you to establish your own test methods (curves). Such established method will be saved as defined test in “All Test List”. Refer to “Define/Establish Test Method” section in this chapter. Follow the procedures below to run quantitative test

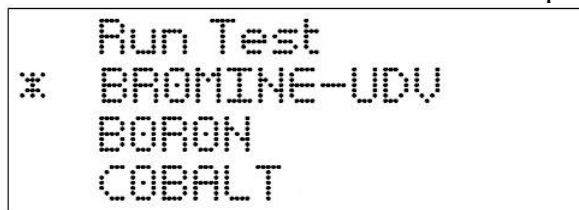
1. At main menu (Fig. 6) scroll \* to **Quantitative** and then press **ENTER** to Select Quantitative test mode as showed in Fig 11.



```
QUANTITATIVE
* Run Test
  All Test List
  End of list
```

Fig 11

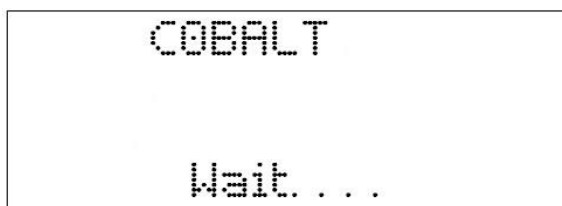
2. Select **Run Test**. Place reference in the sample holder and make sure it is the optical path (working position). Scroll \* to the left of the desired test and then press **ENTER** to confirm.



```
Run Test
* BROMINE-UDV
  BORON
  COBALT
```

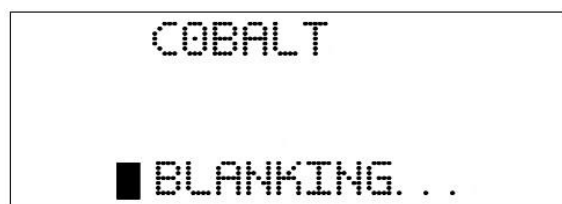
Fig 12

The instruments will automatically set to the proper wavelength as defined and blank the reference as displayed in Fig 12.1, Fig 12.2 and Fig 12.3. (Press **0Abs/100%T** button to re-blank).



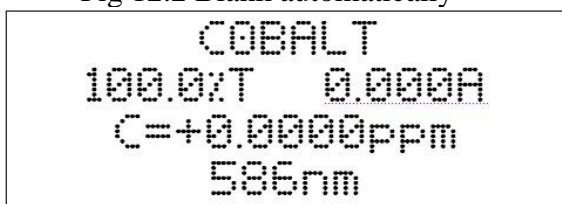
COBALT  
Wait. . . .

Fig 12.1 goto preset wavelength



COBALT  
■ BLANKING. . .

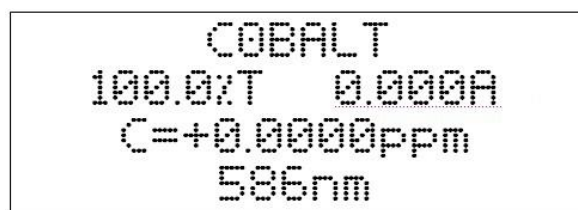
Fig 12.2 Blank automatically



COBALT  
100.0%T 0.0000A  
C=+0.00000ppm  
586nm

Fig 12.3 After Blanking

3. Insert the sample cuvette into the lightpath (working position) and sample test result is displayed.



COBALT  
100.0%T 0.0000A  
C=+0.00000ppm  
586nm

Fig 13 Test result readings

4. Press PRINT/SAVE and follow the instruction to print or save the test results.

**Note:** Run Test folder shows the pre-loaded tests ready for immediate test run. If the desired test is defined and saved in “All Test List” but not yet loaded in “Run Test”, you need to load the test method to “Run Test” before you can run the quantitative tests using such method.

### Load Test (method) to Run Test

1. Select “All Test List at Quantitative menu.

2. Selects the test method in “All Test List” to be loaded to Run Test.
3. Press LOAD button to “copy and forward” the test method to Run Test.
4. Exit from All Test List and enter to Run Test to check and make sure the selected test method is listed.

### Remove Test (method) from Run Test

1. At “Run Test” screen scrolling \* to the left of the test method you want to remove from the Run Test folder.
2. Press CLEAR/LOAD to remove it.  
(Note: The test method is still saved in All Test List and can be reloaded as needed).

### Define/Establish Test Method

Test method (curve) must be defined and established before quantitative tests can be run. This instrument has open platform for you to establish your own test methods (curves). Such established method will be saved as defined test in “All Test List”.

This section describes how to define/establish a test method in All Test List

1. At Quantitative menu select All Test List as shown Fig 14.

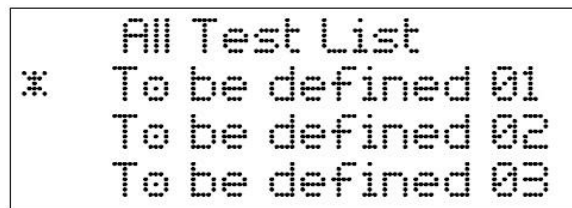


Fig 14

Up to 200 defined tests can be saved in All Test List.

**Note:** You can't run any test from All Test List. Only run test in **Run Test** menu.

### Define/Establish Test (method)

The 200 un-defined tests are originally named “To be defined 001 to 200”. You can choose to rename any of the un-defined locations and define your test in one of the following two ways:

- Define Test by Known Factor
- Define Test by know Standards

### Define a test by Known Factors

If you know the Factor value you can select “**By Known Factors**” to define the test method:

1. At Quantitative menu scroll \* to the left of desired location for saving the test method. Press **ENTER** to confirm. (In this case we choose “To be defined 02” to be defined)

```

Define Test
* By Known Factors
  By Standard
  End of list

```

Fig 15

2. Select “By Know Factors” by pressing ENTER button (Fig.15). Follow the screen step by step to enter data (Fig. 16).
3. Set wavelength by pressing **WL/Conc./F** **【Λ】** , **【V】** . Press Enter to confirm wavelength selection (581nm in this example case). The screen returns to previous menu and the \* move to “Conc. Unit” automatically.
4. Select concentration unit by pressing **Menu Scroll** **【Λ】** , **【V】** . Press Enter to confirm Conc. Unit selection. The screen returns to previous menu and the \* move to “Fit Method” automatically.

```

By Known Factors
* Wavelength
  Conc. Unit
  Fit Method

Input Factors
Name Curve
Save Curve
Dis.&Print Curve
End of list

```

Fig 16

5. Select fitness method by pressing **Menu Scroll** **【Λ】** , **【V】** . Two methods are available:

1st order linear:                      Concentration = Intercept+ Slope\*Absorbance;  
 1<sup>st</sup> order linear through zero: Concentration = Slope\*Absorbance;

Press Enter to confirm fitness method selection. The screen returns to previous menu and the \* move to “Input Factors” automatically.

6. Press **ENTER** to enter the screen displayed as in Fig 17

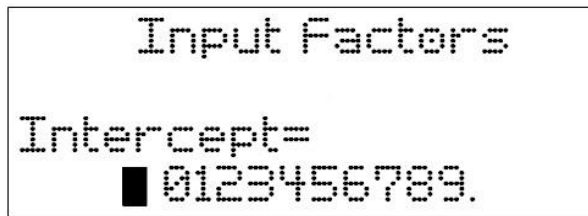


Fig 17

Suppose 1<sup>st</sup> order linear fitness method is selected and intercept value is 1.058 and the slope is 2.588.

7. **Enter Intercept and Slope value:**
- 7.1 To select a numerical number move the flashing cursor to that number; The **Menu Scroll** **【^】** scroll cursor to left; The **Menu Scroll** **【v】** scroll cursor to right;
- 7.2 Press **WL/Conc./F** **【^】** to confirm and enter the number to “intercept” line.

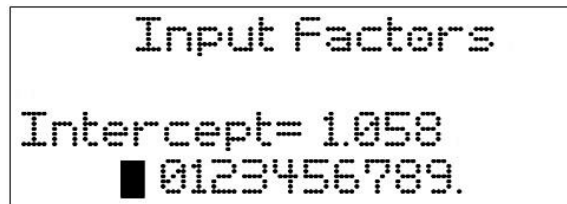


Fig 18

- 7.3 Use **CLEAR/LOAD** to delete/erase any incorrect entry.
- 7.4 Press **WL/Conc./F** **【v】** to alter the polarity of the number.
- 7.4 Check and make sure the intercept value is correct. Then press **ENTER** to confirm and move to the next screen as displayed in Fig 19.

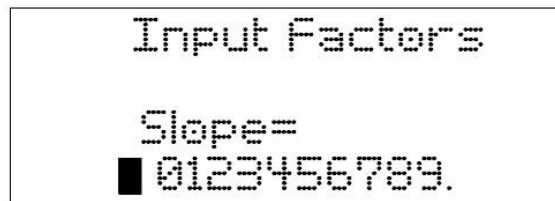


Fig 19

Enter the slope value in the same way as the intercept value is entered. The Slope value in this example is 2.588. Press **ENTER** to confirm and the screen will return to previous menu and the \* move to “Name Curve” automatically (Fig. 20).

**Note:** If “1<sup>st</sup> order liner through 0” is selected, there is no need to enter intercept.

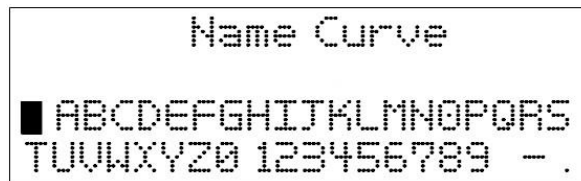


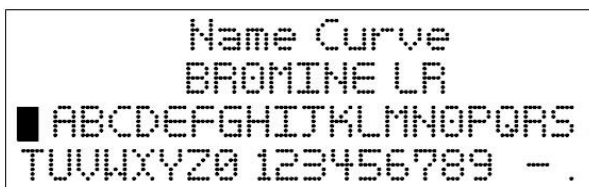
Fig 20



## 8. Name the Curve

The name character entry is the same way as the entry of intercept and slope.

- 8.1 To select a number or character move the flashing cursor to that number or character; The **Menu Scroll** **【^】** scroll cursor to left; The **Menu Scroll** **【v】** scroll cursor to right;
- 8.2 Press **WL/Conc./F** **【^】** to confirm. The number or character will be displayed below name curve.
- 8.3 Use **CLEAR/LOAD** to delete/erase any incorrect entry.
- 8.3 Check and make sure the name is correct. (“BROMINE LR” in this case is shown in Fig. 21).



```

Name Curve
BROMINE LR
█ ABCDEFGHIJKLMNOPQRS
TUUVWXYZ0 123456789 - .

```

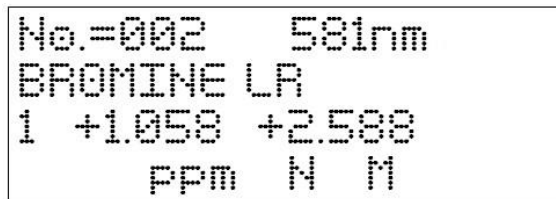
Fig 21

- 8.4 Then press **ENTER** to confirm the name (BROMINE LR in this case) and the display will automatically return to previous menu with the \* at “Save Curve”.

9. Save the Curve defined: with the \* at “Save Curve” press **ENTER** to save the define curve. Then the \* moves to “Dis & Print Curve” automatically.
10. Display and Print-out Defined Test (Curve parameter): with the \* at “Dis & Print Curve” Press **ENTER** to display and print (if printer is connected) the defined test parameter.

The data and parameters include (Shown as Fig 22):

Defined test sequence number in All Test List. (No.=002 in this example case);  
The wavelength used for the defined test (581nm in this example case);  
The defined test name (BROMINE LR in this example case);  
Fitness method for the defined test (“1” represents “1st order linear”, “0” represents “1st order linear through zero”);  
Intercept value (1.058 in this case);  
Slope number (2.588 in this case) and  
Concentration unit (ppm in this case).



```

No.=002    581nm
BROMINE LR
1 +1.058 +2.588
      ppm  N  M

```

Fig 22

**Note:** N and M are not part of parameter and have no real meaning and effect to the test.

The establishment of the defined test is complete and saved in the instruments. Now you may make final check on all the parameters. Press EXIT to return to **All Test List** menu. The “To be defined 002” has been replaced with “BROMINE LR” as shown in Fig 23.

```

All Test List
*   To be defined 01
    BROMINE LR
    To be defined 03
  
```

Fig 23

### Define a Test by Known Standards

If you have standards with known concentration values you can establish and define test curve by following the instructions in this section.

1. At Quantitative menu scroll \* to the left of desired location for saving the test method. Press **ENTER** to confirm.

```

All Test List
*   To be defined 01
    To be defined 02
    To be defined 03
  
```

2. Select “By Standard” by pressing ENTER button. Follow the screen step by step to enter data and parameters.

```

By Standard
*   Wavelength
    Conc. Unit
    No.of STDS.
    No.of Replics.
    Fit Method
    Measure Standard
    Name Curve
    Save Curve
    Dis.&Print Curve
    End of list
  
```

3. **Set wavelength** by pressing **WL/Conc./F** **【Λ】** , **【V】** . Press Enter to confirm wavelength selection. The screen returns to previous menu and the \* move to “Conc. Unit” automatically.

4. Select **concentration unit** by pressing **Menu Scroll** **【^】** , **【v】** . Press Enter to confirm Conc. Unit selection. The screen returns to previous menu and the \* move to “No. of STDS” automatically.
5. Select number of standards which will be used for establishing the test curve. Up to 8 standards can be used.
  - 5.1 To select a numerical number move the flashing cursor to that number; The **Menu Scroll** **【^】** scroll cursor to left; The **Menu Scroll** **【v】** scroll cursor to right;
  - 5.2 Press **WL/Conc./F** **【^】** to confirm and enter the number.
  - 5.3 Use **CLEAR/LOAD** to delete/erase any incorrect entry.
  - 5.4 Check and make sure the number is correct. Then press **ENTER** to confirm and the \*moves to the next screen “No. of Replics” automatically.
6. If you have more than one solution of the same standard concentration value you can measure all of them and use the averaged value for curve establishment. Enter the number of replics in the same way as the number of standards is entered. If only one standard solution for each concentration value is used just enter 1. Each standard solution will be measured and the averaged value will be used for calculation. Press **ENTER** to confirm and the \*moves to the next screen “Fit Method” automatically.
7. Select fitness method by pressing **Menu Scroll** **【^】** , **【v】** . Two methods are available:

1st order linear:                      Concentration = Intercept+ Slope\*Absorbance;  
 1<sup>st</sup> order linear through zero: Concentration = Slope\*Absorbance;

Press Enter to confirm fitness method selection. The screen returns to previous menu and the \* move to “Measure Standard” automatically.

8. Measure standard solutions:
  - 8.1 Press ENTER at “Measure Standard” The following screen will pop up (Fig 25).

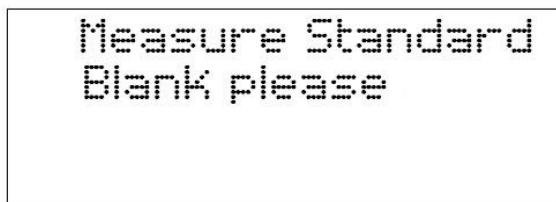


Fig 25

- 8.2 Place the cuvette with reference solution in the cuvette holder, press **【0Abs/100%T】** to blank. After blank is complete it is ready for standard solution measurement starting from STD. No.1

```
Measure Standard
      Blanked
STD.No.1=
█ 0123456789.
```

Fig 26

- 8.3 Place standard No. 1 in the cuvette holder and make sure it is in the optical path (working position). Enter the known concentration value. Refer to Intercept value entry for data entry procedures. Check and make sure the value entered matches the value of the standard No.1 (it is usually labeled on the standard).
- 8.4 Press **ENTER** to measure the standard No.1. The Absorbance of the standard solution No.1 will be measured and displayed (Fig 27). Since this is the first measurement the absorbance is marked "A1"

```
Measure Standard
      Blanked
STD.No.1= 0.1877A1
█ 0123456789.
```

Fig 27

If the "No. of Replics" is "3", then place the second solution of STD No.1 in the cuvette holder. Pressing **ENTER** will measure the second solution of STD No.1 and the second measurement value will be displayed at STD No.1= 0.18775A2. Repeat the same procedures to measure the third solution of STD No.1 and screen will display STD. No.1=0.1876A3. This finishes the measurement of the three solutions of standard No. 1.

Press **ENTER** again to average the measured absorbance values and the screen then displays its averaged value: 0.1876A (0.1877A1+0.1875A2+0.1876A3)/3. This averaged absorbance value will be used for calculation.

- 8.5 Place standard solution No.2 into the cuvette holder in the optical path. Repeat step 8.3 to 8.4 to measure standard No.2. Repeat the same procedures for all the standards in sequence.
- 8.6 After all the standards are measured press **ENTER** to create the curve (as shown in Fig.28) and the screen return to the first with \* at "Name Curve".

```
Measure Standard

Press ENTER to
Create Curve
```

Fig. 28

- 9. Name Curve and Save Curve: Refer to “Name Curve and Save Curve” in “By Factor” chapter (page 17).
- 10. Display and Print Curve Parameters: Refer to “Dis & Print Curve” in By Known Factors chapter (page 18 ).

## UTILITY

```
MAIN MENU 11:30:18
* BASIC MODE
  QUANTITATIVE
  UTILITY
  PC LINK
  End of list
```

In **MAIN MENU**(Fig. 6), move \* down to the left of **UTILITY** and press **ENTER** to go into **UTILITY** menu as shown in Fig. 29.

```
UTILITY 17:38:28
* WL Calibration
  Dark Current
  Edit Clock

  System Baseline
  Turn on/off D2
  Reset Defaults
  Memory Manager
  WL Correction
  End of list
```

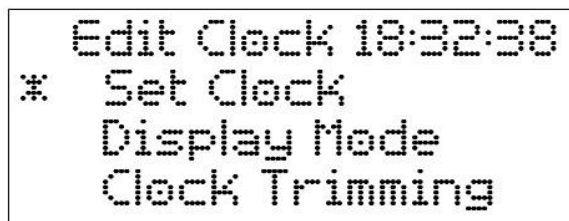
Fig 29

There are eight functions in **UTILITY**.

**WLCalibration:** the instrument will implement a self-check and calibration procedure. It includes filter positioning, lamp positioning, and wavelength calibrating, dark current resetting;

**Dark Current:** measure and refresh instrument dark current. It is designed for eliminating the error from electronic drifting. It is recommended that you refresh and save the Dark Current after the 15 minutes warm up and periodically.

**Edit Clock:** There are three functions as shown in Fig. 30

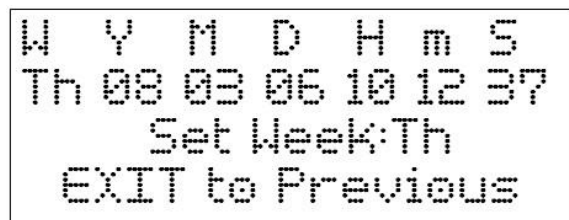


```
Edit Clock 18:32:38
* Set Clock
  Display Mode
  Clock Trimming
```

Fig 30

### 1. Set Clock

Select **Set Clock** in Fig. 30. Press **ENTER** to cycle through W (Week), Y(Year), M( Month), D(Day), H(Hour), M(Minute), S(Second). Press **WL/Conc./F** **【^】** **【v】** to change. Press **ENTER** to confirm. Press **EXIT** to return to Edit Clock screen (Fig 30).

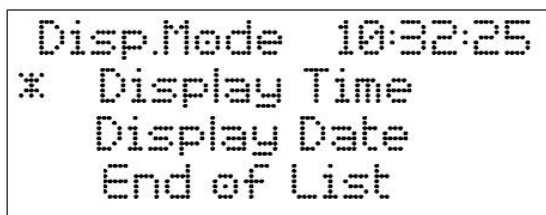


```
W Y M D H m S
Th 08 03 06 10 12 37
  Set Week:Th
  EXIT to Previous
```

Fig 31

### 2. Display of Date or Time

The instrument screen can either display date or time (hour:min:sec). Select **Display Mode** in Fig. 30. Press **Menu Scroll** **【^】** **【v】** to select Display Time or Display Date(Fig.32). Press **ENTER** to confirm. Press **EXIT** to return to Edit Clock screen.



```
Disp.Mode 10:32:25
* Display Time
  Display Date
  End of List
```

Fig 32

### 3. Clock Trimming

This function is only useful when the clock is not running accurately. Set the off-set level (clock trimming) to adjust the clock. There are 64 levels of adjustments:

Slow Levels		Fast Levels	
Slowest			Fastest
32-----16-----0		0-----16-----32	

Table 1

Select **Clock Trimming** (Fig. 30), press **WL/Conc./F** **【^】** **【v】** to set the adjustment level (Fig.33). Press **ENTER** to confirm. Press **EXIT** return to Set Clock menu (Fig. 30).

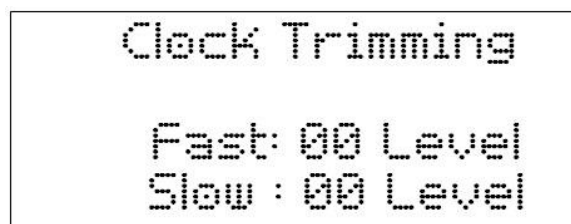


Fig 33

**System Baseline:** It is used for determining the appropriate energy level across the whole wavelength range. Fig 34 shows establishing system baseline in progress.

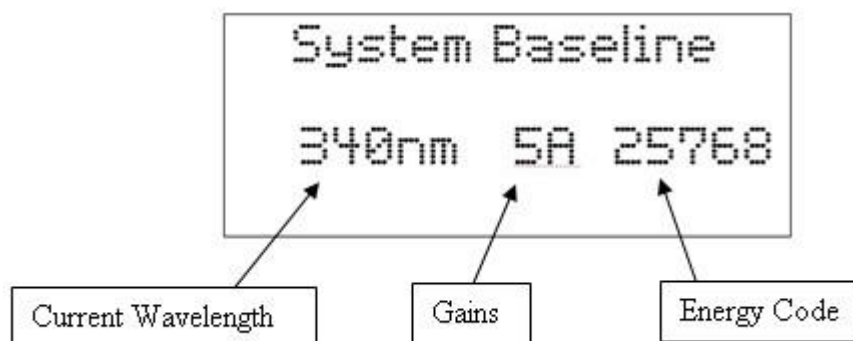


Fig 34

**Deuterium lamp(D2) on/off:** Turn on or off Deuterium lamp. It is advisable to turn off deuterium lamp if wavelength 200 to 340 are not going to be use for a while..

**Reset Defaults:** Reserved for future application;

**Memory Manager:** It has three functions as shown in Fig 35.

```
Memory Manager
* Load Saved data
Clear User Tests
Clear Data Memory
```

Fig 35

#### A. Load Saved data

Select **Load Saved data** in Fig 35. The saved data will all be listed as Fig.36.

```
Saved data list
* COBALT      003
BORON        002
XT/Abs Test  001
```

Fig 36

With \* next to the saved data interested (COBALT in this case), press **ENTER**, you can print the data (if printer installed) and display it on screen, or you can send the data to computer (Fig. 37).

```
Saved data list
* Print & Display
Send to PC
End of list
```

Fig 37

#### B. Clear User Tests

Select **Clear User Tests** in Fig. 35, all established and saved tests/curves will be deleted.

**Warning:** All saved test curves will be deleted PERMANENTLY!!!

#### C. Clear Data Memory

Select **Clear Data Memory** in Fig 35; all saved tests data will be deleted.

**Warning:** All saved data will be deleted PERMANENTLY!!!

**Wavelength Correction:** If wavelength is found to be not accurate. Use this function to make the proper wavelength correction. Select **WL Correction** (Fig 38).



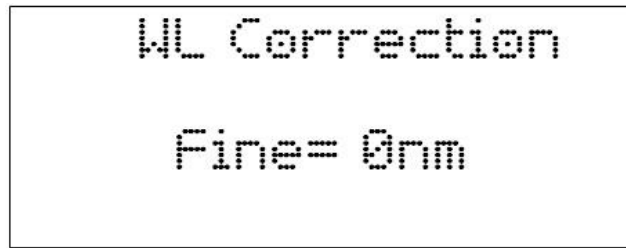


Fig 38

Press **WL/Conc./F** **【^】** **【v】** to get the wavelength off-set number.  
Press **ENTER** to confirm.  
Press **EXIT** to return to previous menu.

**Note:** The correction will be saved in memory and will not get lost after power off.

## **PC LINK**

S2100+ and S2100UV+ are designed to be operated by Computer with UNICO application software. In Fig. 7, move \* to the left of PC LINK and press **ENTER**; the following screen is displayed (Fig 39).

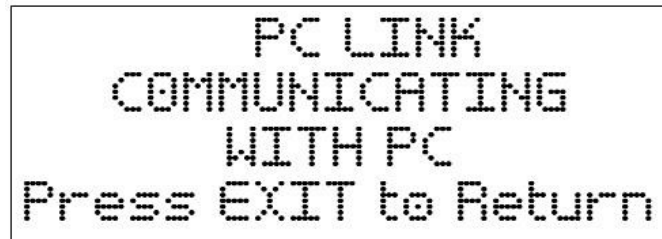


Fig 39

When the communication between the instrument and the computer is established the computer is in control (as shown in Fig. 40). Please details of the PC software please refer to UNICO application software manual.

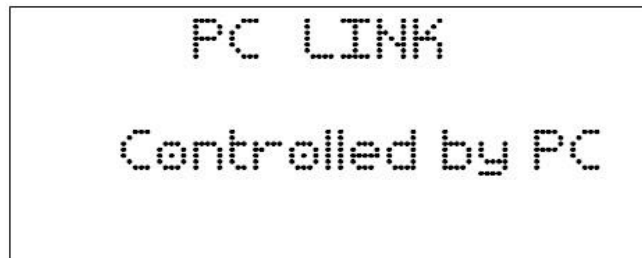


Fig 40

## **Wavelength Calibration:**

Normally the S2100+ and 2100UV+ Series spectrophotometer retains its wavelength calibration indefinitely. However if the instrument receives a severe shock or is abused, use the following methods to check wavelength calibration. Please note that this test requires the UNICO Didymium filter, p/n 2100-116, or the Holmium Oxide filter, p/n 2100-115.

In the filter method, the didymium filter has two distinct absorbance peaks at 529nm and 807nm. The Holmium filter has a distinct peak at 361nm. When the instrument is calibrated properly you will find minimum Transmittance (maximum Absorbance) at the range  $\pm 2$ nm from these peaks. Note that the specific Transmittance values are not important as you are only looking for the wavelength where the minimum transmittance (maximum Absorbance) occurs.

**Holmium Oxide Filter Method:**

1. Turn instrument on and allow it to warm up for 15 minutes.
2. Select the BASIC MODE.
  1. Set the wavelength to 350nm.
  2. Make sure the cuvette holder is empty in the sample compartment. Close the sample compartment lid.
  3. Set zero Absorbance by pressing the 0A/100%T. The reading should then be 0.000A. If not, press 0Abs/100%T again.
  4. Remove the cuvette holder and insert the Holmium filter into it. Place it in the sample compartment and close the lid.
  5. Record the Absorbance reading on the LCD display.
  6. Advance the wavelength setting by 1nm and repeat steps 2 to 5.
  7. Repeat step 6 until the wavelength setting reaches 370nm.
  8. Look for the maximum absorbance reading obtained, and this should be found between 359 and 363nm.

**Didymium Filter Method:**

1. Set the Wavelength to 800 nm.
2. Make sure the cuvette holder is empty in the sample compartment. Close the sample compartment lid.
3. Set zero Abs by pressing the 0A/100%T. The reading should then be 0.000A. If not, press 0Abs/100%T again.
4. Remove the cuvette holder and insert the Didymium filter into it. Place it in the sample

compartment and close the lid.

5. Record the Absorbance reading on the LCD display.
6. Advance the wavelength setting by 1nm and repeat steps 2 to 5.
7. Repeat step 6 until the wavelength setting reaches 815nm.
8. Look for the maximum absorbance reading obtained, and this should be found between 805 and 809nm.
9. If a “middle” wavelength check is desired, set the wavelength to 522nm (optional)
10. Make sure the cuvette holder is empty in the sample compartment. Close the sample lid.
11. Set zero Abs by pressing the 0A/100%T key. The reading should then be 0.000A .If not, press 0Abs/100%T again
12. Remove the cuvette holder and insert the Didymium filter into it. Place it in the sample compartment and close the lid.
13. Record the absorbance reading on the LCD display.
14. Advance the wavelength setting by 1nm and repeat steps 10 to 13.
15. Repeat step 14 until the wavelength setting reaches 536nm. Again, look for the maximum absorbance reading. It should be between 527 and 531nm.

### **Absorbance Accuracy Checks**

Specification:  $\pm 0.004A$  at 0.5A.

The absorbance accuracy should be checked against a set of neutral density filters accurately calibrated to the NIST standards. Contact your UNICO representative for more information (800-588-9776).

An alternative method using potassium dichromate is described below. Due to the many factors that might affect the results (i.e. temperature, bandpass, weighing and diluting errors), this method is less accurate and should only be used as a guide.

Reference: Johnson E A

Potassium Dichromate as an absorbance standard

PSG Bulletin 1967, No. 17, page 505

1. Make up N/100 sulfuric acid as the solvent and use part of it to make a solution containing 120 +0.5mg/litre of potassium dichromate.
2. Wash out a square cuvette with solvent, and fill with solvent.
3. Put the cuvette into the sample compartment and close the lid.
4. Select **BASIC MODE** and Set the wavelength to 350nm.
5. Set the reading to 0.000A using the 0Abs/100%T key.
6. Empty the cell. Wash out with dichromate solution, and fill with dichromate solution.
7. Put the cuvette into the sample compartment and close the lid.

8. Read the absorbance of the standard from the LCD display. The value should be Calibrated Value  $\pm 0.004A$ . Refer to the notes above when interpreting the result.

Note:It is recommended that you refresh the **Dark Current** (refer to Page21) before check.

## Stray Light Check

Specification: Less than 0.3%T at 340nm by ASTM E 387

A good indication as to whether the stray light level is within specification may be obtained as follows:

1. Set the wavelength to 340nm.
2. Select BASIC MODE With the sample compartment empty, close the lid and press the 0A/100%T key to set the LCD display to 100.0%.
3. Prepare a solution containing 50gm/L of sodium nitrite ( $\text{NaNO}_2$ ) in distilled water and fill a square cuvette with this solution.
4. Place the cuvette in the sample compartment. Close the lid. The display should read <0.3%T.

Note:It is recommended that you refresh the **Dark Current** (refer to Page21) before check.

## Trouble Shooting:

PROBLEM	Possible	Solution
<b>Instrument Inoperative</b>	Power cord not connected to outlet	<i>Plug instrument in.</i>
	Dead Power outlet	<i>Change to a different outlet</i>
	Internal fuse blown or defective electronic component	<i>Call an authorized service engineer.</i>
	Improper power setting	<i>Set to the main power</i>
<b>Instrument cannot set 100%T (0.000A)</b>	Light beam blocked	<i>Check sample holder. See if holder is properly positioned and nothing is blocking light path.</i>
	Lamp is misaligned.	<i>Check to see if light is positioned properly on entrance slit to monochromator. Call Technical Service for details (800-588-9776).</i>
	Defective electronic component.	<i>Call an authorized service engineer.</i>
<b>Incorrect Transmittance to Absorbance correlation</b>	Bubbles or particles in solution.	<i>Check sample preparation and analytical procedure.</i>
	Defective electronic component.	<i>Call an authorized service engineer.</i>
<b>LCD Digital Display does not change regardless of sample concentration</b>	Concentration reading “frozen”.	<i>Sample Solution too Dark , dilute it and Restart measurement procedure.</i>
	Wrong wavelength setting.	<i>Check sample procedure and wavelength setting.</i>
	Insufficient sample volume.	<i>Fill cuvette with more sample.</i>
	Stray sample preparation vapors.	<i>Prepare the sample away from the instrument. Use proper ventilation.</i>
	Bubbles or particles in solution.	<i>Check sample preparation and analytical procedure.</i>

	Defective electronic component or loose wiring.	<i>Call an authorized service engineer.</i>
<b>Instrument drift and noise</b>	Lamp not adjusted properly.(misalignment)	<i>Check lamp has been properly installed or has moved during transit.</i>
	Lamp old or defective.	<i>Replace with a new lamp.</i>
	Defective or dirty detector or defective electronic component.	<i>Call an authorized service engineer.</i>
<b>Incorrect readings obtained</b>	Insufficient sample volume	<i>Fill cuvette with more sample.</i>
	Wrong wavelength setting.	<i>Check analytical procedure and wavelength setting. Check wavelength accuracy according to procedure in this manual.</i>
	Stray sample preparation vapors.	<i>Prepare sample away from instrument. Use proper ventilation.</i>
	Bubbles or particles in solution.	<i>Check sample preparation and analytical procedure.</i>
	Instrument out of electronic calibration.	<i>Call an authorized service engineer.</i>

### **Error Codes Definitions:**

The Error Codes are the classification for errors detected automatically by the instrument. Each code represents different errors that occur during the self-calibration or during operation. The Error Codes are displayed on the wavelength display and are defined as follows:

<b>Error Code</b>	<b>Definition (function)</b>	<b>Causes/Solutions</b>
-------------------	------------------------------	-------------------------

<b>Error 1</b>	Instrument unable to initialize and/or locate the lamp (S2100UV+only).	<ul style="list-style-type: none"> <li>• Check power supply to see if proper voltage is selected.</li> <li>• Open cover of instrument and check the connector J3 between CPU board and Lamp-change-over motor .</li> <li>• Lamp-change-over motor or lamp initialization switch malfunctioning, Check the connector J8 on CPU board.</li> <li>• Call authorized service engineer</li> </ul>
<b>Error 2</b>	Instrument unable to initialize and/or locate the filter	<ul style="list-style-type: none"> <li>• Open cover of instrument and check the connector J2 between CPU board and Filter-driven motor.</li> <li>• Filter-driven motor malfunctioning , Check the connector J4 on CPU board.</li> <li>• Call authorized service engineer</li> </ul>
<b>Error 3</b>	Monochromator unable to locate starting position	<ul style="list-style-type: none"> <li>• Monochromator contact switch or grating-driven motor (WL motor) is malfunctioning</li> <li>• Open cover of instrument and check the connector J11(S2100+Series) or J3(S1205) between CPU board and grating-driven motor.</li> <li>• Check the connector J5 on CPU board</li> <li>• Call authorized service engineer.</li> </ul>
<b>Error 4</b>	Instrument unable to locate “0” order light	<ul style="list-style-type: none"> <li>• Check sample holder. See if holder is properly positioned and nothing is blocking light path.</li> <li>• Check to see if light is positioned properly on entrance slit to monochromator.</li> <li>• Check tungsten-halogen lamp. Replace lamp if necessary.</li> <li>• Call authorized service engineer.</li> </ul>
<b>Error 5</b>	Instrument is unable to set 0A/100%T. “Energy Low!” display.	<ul style="list-style-type: none"> <li>• Check sample compartment and remove cuvette or any object blocking light path.</li> <li>• Place the 4-cell sample holder in the proper position.</li> <li>• See the lamps is ON or OFF via the small hole in the rear of the instrumen.if OFF,call authorized service engineer.</li> <li>• Contact an authorized service engineer.</li> </ul>