

# Operation Manual



**BSSBV-201**

## Single Beam Visible Spectrophotometer

Thank you for Choosing Biolab products. Please read the "Operating Instructions" and "Warranty" before operating this unit to assure proper operation.

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# 01 Safety

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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. This model should be operated by appropriate laboratory technicians.

# 02 General

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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 this model, avoid touching the high voltage power supply at all times.

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

# 03 Electrical

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

## 04 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 this 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

## 05 Working Principle

The spectrophotometer consists of five parts: 1) Halogen or deuterium lamps to supply the light; 2) A Mono-chromator 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 1-1) below illustrates the relationship between these parts.

Block diagram for the Spectrophotometer

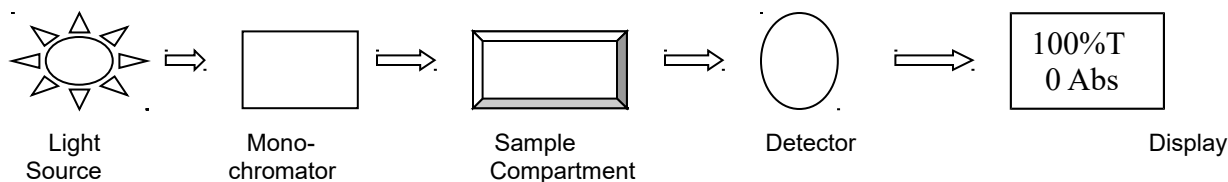


Fig1-1

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 mono-chromator 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.

## 06 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.

Description	Quantity
Spectrophotometer	1
Power Cord	1
10mm Glass Cuvette	1 Set of 4
Manual	1
Black Block	1

**NOTE: If there is any change in this package, an Accessory & Spare Parts List attached should be referred to as final.**

## 07 Specifications

Wavelength Range	320-1000nm
Spectral Bandwidth	4nm
Optical System	Single Beam, Grating 1200lines/mm
Wavelength Accuracy	±2nm
Wavelength Repeatability	1nm
Photometric Accuracy	±0.5%T
Photometric Repeatability	±0.3%T
Photometric Range	-0.097-1.999A 0-125%T
Stray Light	≤0.2%T @ 340nm
Stability	±0.002A/h @500nm
Display	Graphic LED (4 bits)
Keyboard	Membrane Keypad
Photometric Mode	T, A, C
Detector	Silicon Photodiode
Sample Compartment	Standard 10mm path length cuvette Accommodates 100mm path length cuvette with optional holder
Light Source	Tungsten lamp
Output	USB Port
Power Requirement	AC 85-250V
Dimensions (W x D x H)	420 x280 x 180 mm
Weight	8kg

## 08 Installations

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 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.



Fig.1-2

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.1-3

5. Turn on your spectrophotometer. Allow it to warm up for at least 20 minutes before taking any readings.

## 09 Introduction

Visible spectrophotometer, an analytical instrument commonly used in physic-chemical laboratories to make quantitative and qualitative analysis of specimen materials in the near ultraviolet, visible spectral range finds much scope for its service in such fields as medicine, clinical examination, biochemistry, quality control, petro-chemical industry and environmental protection.

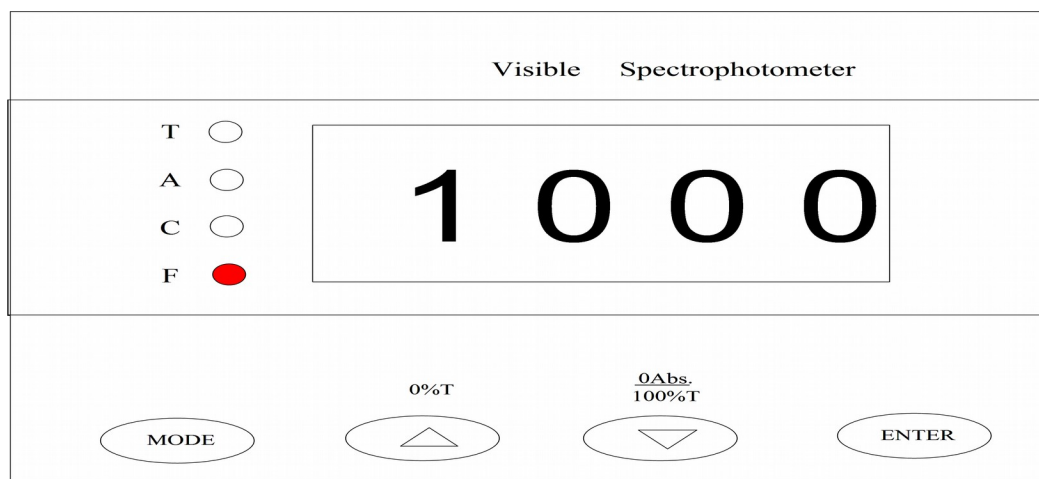


Fig. 1-4

## 10 Description of Keys and Operating Methods

The four keys on the keyboard are:

1. **MODE**
2. **△0%T**
3. **▽0Abs/100%T**
4. **ENTER**

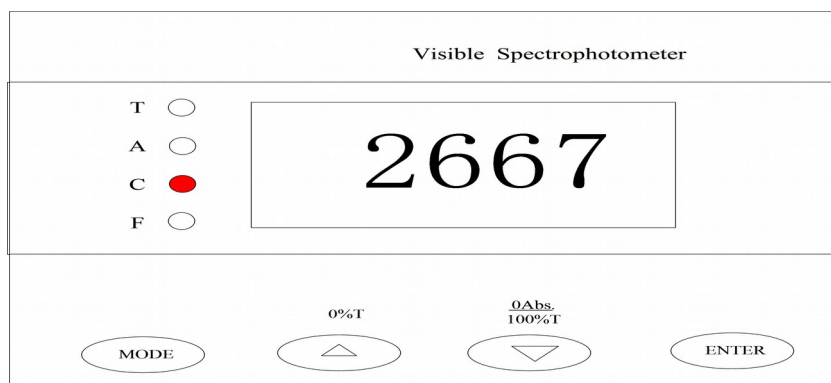
**MODE** key used to select the Transmittance, Absorbance, Concentration and Factor mode.

**ENTER** key has two functions:

- a. To be used in Parallel Port and date transmission (one –way transmission from the instrument to the Printer).
- b. When in F mode, to confirm the current F value, and then the Mode was switched to C



automatically, and the C value will be calculated ( $C = F * A$ ).



(Fig.1-5)



**0%T** key has two functions:

- To set zero. It is effective only in **T** mode. Insert the Black Block into the cuvette holder, close the sample compartment cover then pull it into the light path. Press this key, and it will show 0.0.

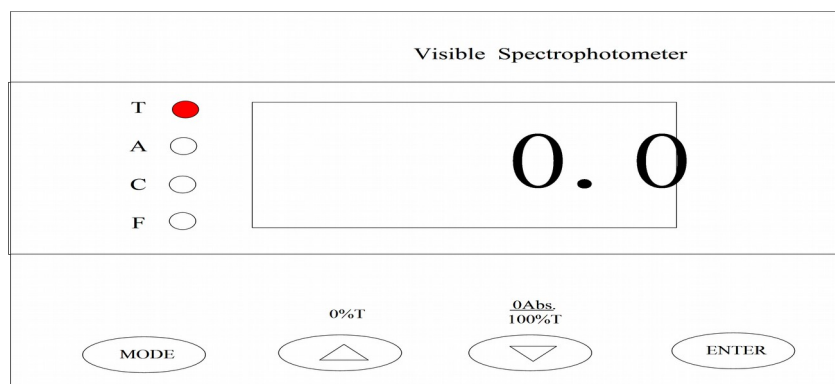
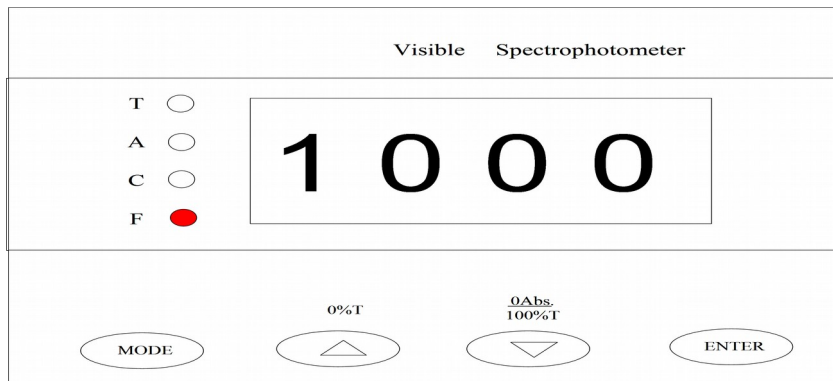


Fig.1-6

- As the ascending key. when in **F** mode, press the **0%T** key and the F value will increase by 1, Holding the key will speed up the increase. The Maximum Value of F is 9999.



↑ Fig.1-7

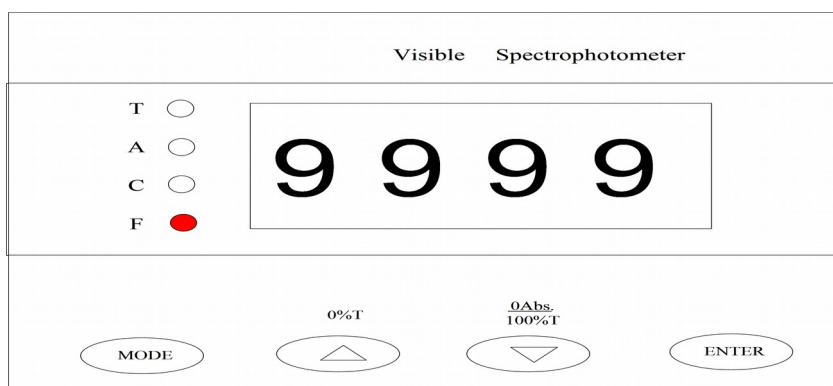
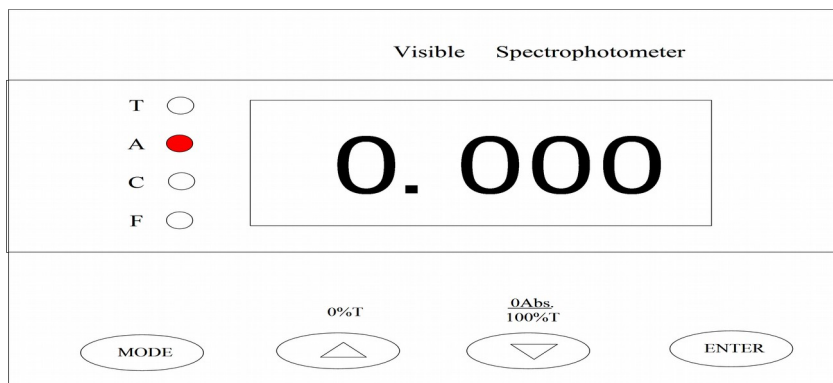


Fig.1-8

**0Abs/100%T** key has the following two functions:

- a. When in **A** or **T** mode, close the sample compartment, press the key and it will read 0.000 (Fig.1-9) or 100.0



(Fig.1-9)

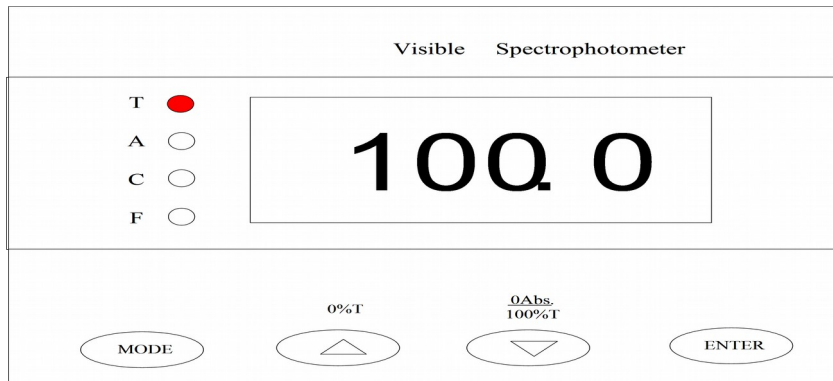



Fig.1-10 

- b. To be used as the descending key (effective only in F mode). Press this key and the F value will decrease by 1 (Fig.1-11 & Fig.1-12). A long press will speed up the decrease. The Minimum Value of F is 1.

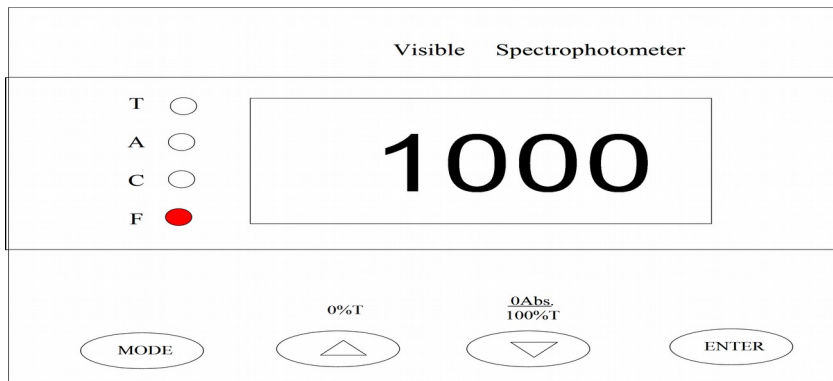



Fig.1-11 

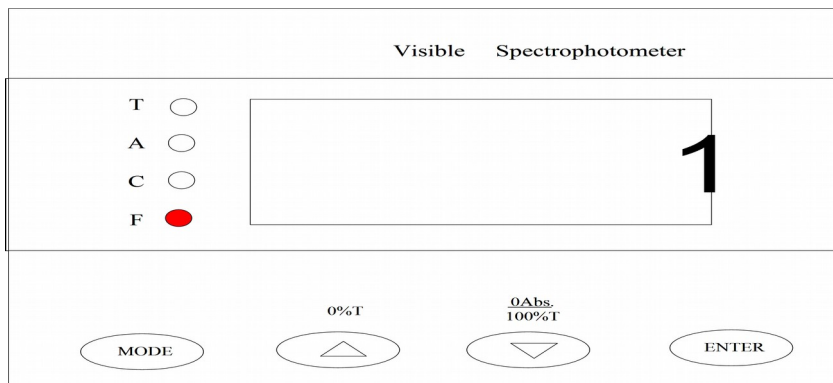
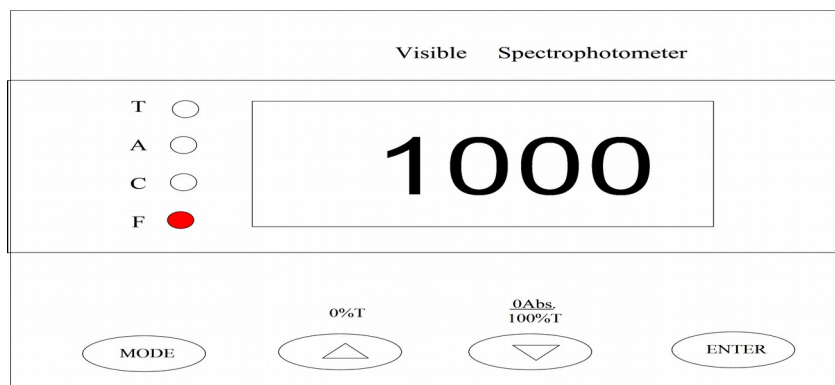


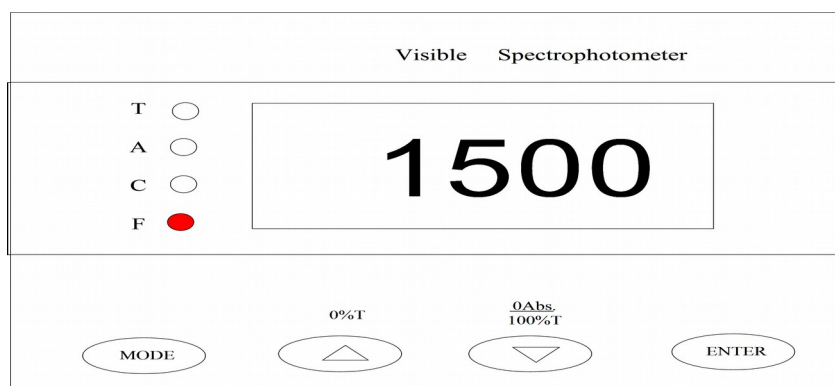
Fig.1-12 

**Example :****Let the F value be 1500.****Method I**

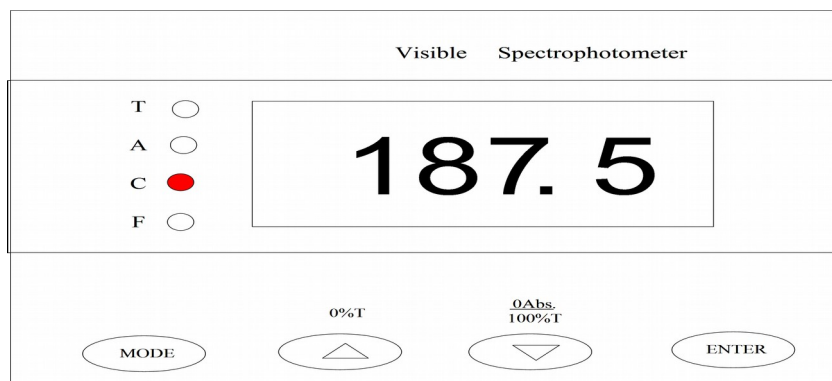
- a. Press **MODE** to set it at F mode. (Fig.1-13)

**Fig.1-13**

- b. If the current F value is 1000 , press the **0%T** key, until it goes up to 1500. (Fig.1-14)

**(Fig.1-14)**

- c. Press the **ENTER** key, and the current F value shows 1500 (Fig.1-15). Then C mode automatically appears. Suppose the A value measures 0.125, then the C value reads 187.5.



(Fig.1-14)

**Method II**

- Press **MODE** key to set it at F mode .
- If the current F value is 2000 , press the **0Abs/100%T** key, till it reaches 1500. Press the **MODE** key again to go to C mode. If the A value measures 0.125, then the C value reads 187.5.

# 11 Operation Procedures

- Plug the instrument into a grounded outlet
- Turn the instrument on. Allow the instrument to warm up for at least 20 minutes.
- Set to desired wavelength with the **Wavelength Knob**, press the **MODE** key to select T/A/C/F.
- If you want to know T value, press **MODE** key to change to "T" mode, fill one of matched cuvettes with Blank Solution.
- Insert the Black Block into the first cuvette holder, close the sample compartment cover, set 0.0%T by pressing the **0%T** key until display reads "0.0".
- Pull the holder to make the Black Block not in the light path, set 100%T by pressing the **0Abs/100%T** key until display reads 100.0.
- Insert the sample solution to be measured into the cuvette holder. Close the sample compartment cover. Then pull the sample to be measured into the light path, read results directly on the digital display.

## 12 Maintenance

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1. To ensure the steady operation of the instrument, it is recommended to use an AC voltage stabilized power source.
2. After operation, turn off the power and cut off the power supply.
3. Put a dusk cover with some desiccants over the instrument when it is not in use to keep it clean and dry.
4. After months of operation or after it is moved, the instrument should be checked for its wavelength accuracy.

## 13 Calibration and Trouble-shooting

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After a long time of use, the instrument needs calibrating or repairing, as its performance index may have changed, here are some tips.

### **1. Replacement of tungsten-halogen lamp:**

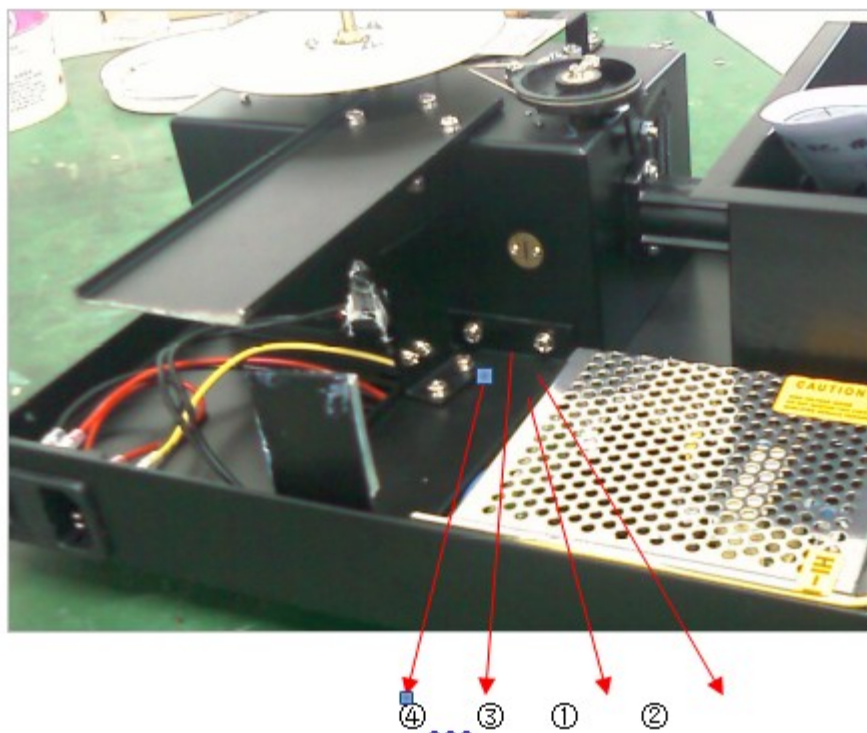
- 1) Turn off and unplug the instrument.
- 2) Remove the four screws on the sides of the spectrophotometer.



**Fig. 2-1**

- 3) Remove the **Cuvette Holder Control Knob** by unscrewing the rod counterclockwise.
- 4) Remove the WL. Setting Knob. (Fig.2-1)
  - a) Use a Flat Head Screw Driver to pick the cover out from the knob.
  - b) Use a Spanner or Sleeve to loosen the screw in the knob, then remove the knob.
- 5) Remove the cover of the instrument very carefully and place it in the back of the instrument.

**BE SURE NOT TO PULL PANEL WIRING LOOSE!**



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

CAUTION:

- a) Do not handle the lamp with bare fingers. Use tissue or cloth when handling lamp.
- b) There's no difference in polarity of the two legs of Tungsten-halogen lamp.

7) Set the wavelength of the instrument at 500nm, Switch on the power, move the lamp up and down and from side to side, until its focus falls exactly on the entrance slit. Observe the reading in T mode without adjusting the  $\nabla/0\text{Abs}/100\%T$  key, Readjust the lamp to make the reading at its maximum. If it can not focus on the center of the entrance slit, you have to adjust the four screws in Fig.2-2. No.3 & 4 for the height of the light beam while No.1 & 2 for the horizontal adjustment.

8) Switch the instrument off, tighten the two screws. Reinstall the instrument cover. Be sure to prevent all wires from being pinched in the process.

9) Reinstall the four screws. Reposition the Cuvette Holder Control Knob and the Wavelength Setting Knob.



## 2. Calibration of wavelength accuracy

This spectrophotometer is checked for its wavelength accuracy by a point-to-point method against the two characteristic absorption peaks of a didymium filter---529nm and 808nm. In case the point-to-point measurement shows a wavelength different from the peak wavelength of the didymium filter (maximum permissible error is  $\pm 2\text{nm}$ ), remove the wavelength knob, loosen the three positioning screws on the wavelength dial (Fig.2-3), adjust the dial pointer to the characteristic absorption peak wavelength value, and tighten the screws.

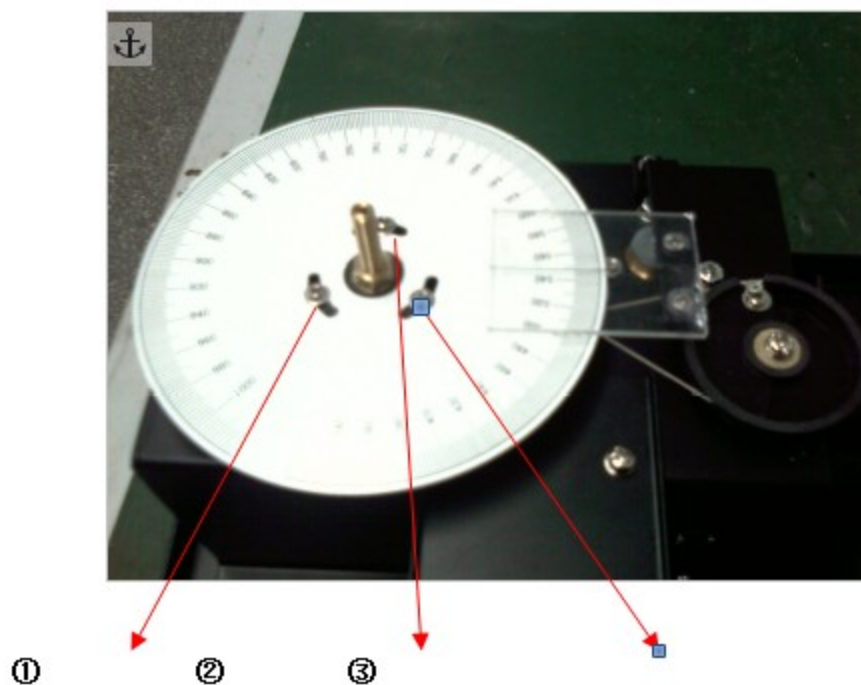


Fig.2-3

### 3. Troubleshooting

Troubles	Causes	Remedies
1. No functioning after power on.	1.Power supply not connected 2.Power fuse melted 3.Loose contact of power switch.	1.Check power line. 2.Replace fuse. 3.Replace power switch.
2.Unstable display	1.Insufficient warm-up time 2.Excessive vibration, strong air current near light source or strong external light. 3.Unstable voltage. 4.Poor grounding.	1.Ensure 20 mins warm-up time. 2.Improve working conditions 3.Use a Voltage Stabilizer. 4.Check ground connection.
3.Unable to set zero	1.black block in the light path 2.Amplifier failure.	1.Remove the block. 2.Repair amplifier.
4.Unable to set 100%T	1.Tungsten-halogen lamp not lit. 2.Inaccurate light path. 3.Amplifier failure.	1.Check or repair lamp power circuit. 2.Readjust light path. 3.Repair or replace amplifier.
5.Concentration incorrectly calculated	1.Display board out of order.	1.Repair or replace display board.



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