INSTRUCTION MANUAL

FOR

MODEL U-5100 RATIO BEAM SPECTROPHOTOMETER

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Be sure to read through and understand the following points with regard to this manual.

1. Information contained in this document is subject to change without notice for improvement.
2.
3. Hitachi High-Tech Science Corporation assumes no liability for any direct, indirect, or consequential damages arising from use not described in this manual.
Utmost care must be exercised when using the instrument.
4. This document does not provide any warranty or permission for industrial properties or any rights to grant license lawfully and without infringement.

PREFACE

We thank you for purchasing the Model U-5100 Ratio Beam Spectrophotometer.

This instrument is designed for measuring the absorbance and transmittance of a sample.
Note that samples that may have been infected with bacteria or viruses are not applicable to the instrument

This instrument is intended for use by persons having a basic knowledge of chemical analysis procedures.
Keep in mind that improper use of analytical instruments, chemicals or samples would result not only in wrong analytical data but also in consequences adverse to safety.
Note that it is allowed only for persons having a basic knowledge of chemical analysis procedures to use this instrument.

Please read this instrument manual carefully before attempting operation and acquaint yourself with this instrument for its correct use.

ABOUT THIS MANUAL

This instruction manual has been prepared for the user of Model U-5100 Ratio Beam Spectrophotometer. The operating procedures and maintenance/inspection instructions for the instrument are contained in this manual.

First of all, be sure to read "IMPORTANT" and "SAFETY SUMMARY" at the beginning of this manual.

The contents of "**IMPORTANT**" and "**SAFETY SUMMARY**" described hereafter apply to the accessories of this instrument also.

IMPORTANT

Precautions on CE Conformity Marking

In consideration of use in the European countries, this instrument bears the CE mark indicating the conformity to the requirements mentioned below.

1. Electromagnetic Compatibility Requirement

This instrument is designed to satisfy the European Norm EN61326-1 (2006) for the CE conformity marking through conformity to the EMC Directive 2004/108/EC.

This instrument is classified as Class A of EN61326-1. So, this instrument must not be used in domestic establishments nor in establishments directly connected to a low voltage power supply network which supplies buildings used for domestic purpose.

And this instrument is also designed to comply with table 1 "Basic immunity test requirements" in the above European Norms. If the instrument is used near an intense electromagnetic source, however, interfering noise may be given to the instrument to cause an adverse effect on its performance or functionality.

2. Safety Requirement

This instrument is also designed to satisfy the European Norm EN61010-1 (2010) for the CE conformity marking through conformity to the LVD Directive 2006/95/EC.
This instrument is requested to be used in a suitable environment and grounded appropriately.

Information for Users on WEEE (only for EU Countries)

This symbol is in compliance with the Waste Electrical and Electronic Equipment directive 2002/96/EC (WEEE).
This symbol on the product indicates the requirement NOT to dispose of the equipment as unsorted municipal waste, but use the return and collection systems available.

Information on Disposal for Users

1. In the European Union

If you need to discard this product or discard user serviceable parts:
Please contact your local sales representative or distributor who will inform you of the recycle of the product.
You might be charged for the costs arising from take-back and recycling.

2. In other Countries outside the EU

If you wish to discard this product, please contact your local authorities and ask for the correct method of disposal.

Instruction Manual for U-5100

Cautions

The following is a statement of notice about EMC for Korea.
A 급 기기 (업무용 방송통신기자재)
이 기기는 업무용(A 급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며,
가정외의 지역에서 사용하는 것을 목적으로 합니다. (O)

Warranty on Product

This product, inclusive of its accessories, is warranted to be free from defects in material or workmanship under normal use within the product specifications indicated in this manual and under conditions given below.
This warranty is void if the instrument is not used according to the instruction manual.

(1) Scope of Warranty

Any parts that prove to be defective in design or workmanship during the warranty period will be repaired, adjusted or replaced without charge. A substitute part may be used for repair, or replacement with an equivalent product may be made instead of repair. Such system components as a personal computer and printer to be updated frequently for improvement may not be available in original versions at the time of replacement.
The manufacturer assumes no liability for any damage to data or application software due to any possible fault or failure of this instrument.

(2) Warranty Period

One year from the date of initial installation
(In case a separate warranty document has been issued, the warranty period indicated in it takes precedence over the above period)

(3) Limitations and Exclusions on Warranty

Note that the following cases are excluded from the scope of this warranty, i.e., these cases are beyond the coverage of free-of-charge repair even during the warranty period indicated above.

(a) Failure due to operation at a place not meeting the installation requirements specified by the manufacturer.

(b) Failure due to power supply voltage/frequency other than specified by the manufacturer or due to abnormality in power supply.

(c) Corrosion or deterioration of the piping due to impurities contained in gas, compressed air or cooling water supplied by the user.

(d) Corrosion of the electric circuits or deterioration of the optical elements due to highly corrosive atmospheric gas.

(e) Failure due to use of software, hardware or spare parts not supplied by the manufacturer.

(f) Failure due to use not described in the manual or improper repair not approved by the manufacturer.

(g) Failure due to maintenance or repair by other than service engineer qualified by the manufacturer.

(h) Failure due to relocation or transport conducted not under the supervision of the manufacturer after the initial installation of the instrument.

(i) Failure due to disassembly, modification or relocation not approved by the manufacturer.

(j) Failure due to acts of God, including fire, earthquake, storm, flood, lightning, social disturbance, riot, crime, insurrection, terrorism, war (declared or undeclared), radioactive pollution, contamination with harmful substances, etc.

(k) Failure of the hardware, or damage to the system software, application software or data due to computer virus infection.

(l) After disposal of this instrument, after its resale without prior approval from the manufacturer, consumable parts, and failure of any part that have reached the end of its service life.

(m) Failure due to a life-limited part that has exceeded the end of its useful lifetime.

(4) Disclaimer of Warranty

THE MANUFACTURER MAKES NO WARRANTIES, EITHER EXPRESS OR IMPLIED, EXCEPT AS PROVIDED HEREIN, INCLUDING WITHOUT LIMITATION THEREOF, WARRANTIES AS TO MARKETABILITY, MERCHANTABILITY, FOR A PARTICULAR PURPOSE OR USE, OR AGAINST INFRINGEMENT OF ANY PATENT. IN NO EVENT SHALL THE MANUFACTURER BE LIABLE FOR ANY DIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY NATURE, OR LOSSES OR EXPENSES RESULTING FROM ANY DEFECTIVE PRODUCT OR THE USE OF ANY PRODUCT.
NO ORAL OR WRITTEN INFORMATION OR ADVICE GIVEN BY THE MANUFACTURER, ITS DEALERS, DISTRIBUTORS, AGENTS OR EMPLOYEES SHALL CREATE A WARRANTY OR IN ANY WAY INCREASE THE SCOPE OF THIS WARRANTY.

Service Life of This Instrument

This instrument has a useful service life of seven years after the date of its initial use (installation), which is estimated under the condition that periodic maintenance, checkup, replacement of life-limited parts, and repair of worn parts are carried out as specified in the present instruction manual.

(In use of the instrument under standard operating conditions (8 h/day, 20 days/month))

For using the instrument beyond the useful service life, it shall be checked for safety by Hitachi High-Technologies Corporation sales representative or service office of Hitachi High-Technologies Corporation sales representative. (This safety check will be available on a chargeable basis.)

If use of the instrument is continued without receiving the safety check, the instrument might become faulty and cause a danger. Note that replacement may be recommended as a result of the safety check.

Installation, Relocation and After-sale Technical Service

(1) Installation and Relocation

(a) Installation at delivery shall not be carried out by the user. It shall be carried out by our sales representative or the engineers who have been trained and qualified for this purpose by us in order to use the instrument safely and accurately.

(b) Before installation, the user shall make preparations for satisfying the installation requirements in accordance with this instruction manual.

(c) If relocation becomes necessary after initial installation (delivery), please contact the dealer from whom you purchased the instrument or our sales representative.

(2) After-sales Service

(a) For after-sales service, contact our sales representative or service office of our sales representative.

(b) For service after the warranty period, consult our sales representative or service office of our sales representative with regard to a maintenance and inspection service contract. (Service will be available on a chargeable basis.)

(c) The maintenance and consumables of the instrument can be supplied within the useful service life of the instrument (7 years). Even after the period of useful service life, the parts and units can be supplied (within 10 years after the date of initial use) so far as they are obtainable. However, this measure will not lead to an extension of the 7-year useful service life which is assured by the manufacturer.
And, if a part or unit is unavailable due to the discontinuance of its manufacture, a substitute part or unit may be supplied, for which we request your understanding.

(d) It may be impossible to supply the main unit components other than the maintenance parts and consumables due to the discontinuance of main-unit manufacture, etc. If the instrument becomes faulty, it might be irreparable due to lack of such components. In this case, the user is requested to stop operation and replace the instrument with a new one.

Technical Seminars and Training Courses for Users

We offer technical seminars and training courses at either our or user's facilities to ensure proper and safe operation of the analytical instrument to its full performance. For further information, contact our sales representative. (Applicants will be charged.)

Other Precautions

1. Handling of Chemicals and Samples

(1) The user is responsible for following relevant legal standards and regulations in handling, storage and disposal of chemicals and samples used in analytical operations with this instrument.

(2) Reagents, standard solutions and accuracy-control samples shall be handled, stored and discarded as instructed by the respective suppliers.

(3) Samples that may have been infected with bacteria or viruses are not applicable to the instrument.)

2. Trademark Acknowledgments

SAFETY SUMMARY

General Safety Guidelines

Before using Model U-5100 Ratio Beam Spectrophotometer, be sure to read the following safety instructions carefully.

The hazard warnings which appear on the warning labels on the product or in the manual have one of the following alert headings consisting of a safety alert symbol and signal word DANGER, WARNING or CAUTION.

	:	Safety alert symbol used for calling attention to a potential hazard which could cause personal injury. To avoid possible injury or death, observe all the safety messages following this symbol.
DANGER	:	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
WARNING	:	Indicates a potentially hazardous situation which, if not avoided, can result in death or serious injury.
CAUTION	:	Indicates a hazardous situation which, if not avoided, can result in minor or moderate injury.
NOTICE	:	Indicates a hazardous situation which, if not avoided, can result in damage to property.

In addition to the above, the following signal word is used to indicate instructions for ensuring proper use of the product.

NOTE:	Indicates an instruction for ensuring correct use of the product and accurate analysis therewith.

SAFETY SUMMARY

Common Safety Precautions

Prior to Use

- Before using the instrument, be sure to read this instruction manual carefully to attain a full understanding of its operations.
- Keep the instruction manual handy nearby so it can be referred to whenever needed.
- Be sure to observe the procedures specified in the manual.
- Be sure to understand and follow all the safety instructions given in the manual.
- Be sure to observe all the hazard warnings attached to the instrument or provided in the manual. Failure to do so could result in personal injury or damage to the instrument.
- Be sure to follow all the methods of use instructed in the manual for proper application of the product.
- Absolutely avoid modifying the product, using non-specified parts, or removing safety devices as it could be hazardous.
- Do not perform any operation or action other than described in the manual.
  On occurrence of any trouble in the instrument, notify your nearest Hitachi High-Technologies Corporation sales representative or service office of Hitachi High-Technologies Corporation sales representative.
- When using chemicals for the instrument, be sure to provide proper ventilation of the room. Inadequate ventilation could endanger human health.
- Keep in mind that the hazard warnings in the manuals or on the product cannot cover every possible case, as it is impossible to predict and evaluate all circumstances beforehand. Always be alert and use your common sense.

SAFETY SUMMARY

Common Safety Precautions (Continued)

- Wear appropriate protective equipment when using chemicals. In the case of accidental contact with the skin and ingestion, refer to the product safety data sheet to take first-aid action and seek medical care.

In Use

- If an abnormality such as unusual noise, odor, fuming or gas leakage occurs during operation of the instrument, immediately disconnect power to the instrument, and take proper safety measures as required. Then, notify your nearest Hitachi High-Technologies Corporation sales representative or service office of Hitachi High-Technologies Corporation sales representative.

Installation, Maintenance, and Relocation

- At the time of delivery, installation of the instrument shall be carried out by or under supervision of qualified service personnel of the manufacturer or its authorized service agent for ensuring safety and high accuracy in operation of the instrument. It is not permitted for the user to carry out installation.

- After completion of installation, check that all the standard parts are equipped. If the instrument is made active with any one of the standard parts not equipped, a failure could occur to result in a hazardous condition.
  If any item is missing or damaged or if you have any question, notify the installation personnel at site or your nearest Hitachi High-Technologies Corporation sales representative or service office of Hitachi High-Technologies Corporation sales representative.

SAFETY SUMMARY

Common Safety Precautions (Continued)

- The maintenance and checkup procedures to be taken by the user are only those described in the manual. When taking the maintenance and checkup procedures described in the manual, attain a clear understanding of them.
  Do not perform other maintenance and checkup procedures to avoid jeopardizing safety and causing troubles in the instrument.

- After installation, do not relocate the instrument. If the instrument is relocated, vibration or impact to be applied during relocation could cause a malfunction in the optical components that have been adjusted precisely.

- If any warning/caution label has become illegible due to deterioration with age or it has been damaged due to any cause, notify your nearest Hitachi High-Technologies Corporation sales representative or service office of Hitachi High-Technologies Corporation sales representative for replacement with a new one.

- The parts having a useful lifetime indicated in this manual must be replaced periodically as specified. If the instrument is operated though the replacement of life-limited parts has already been required, the instrument might become faulty due to part deterioration, etc., causing leak, fuming, combustion or the like trouble on safety.
  For other than the replacement procedures instructed in this manual, contact your nearest Hitachi High-Technologies Corporation sales representative or service office of Hitachi High-Technologies Corporation sales representative.

- For reducing a risk of trouble occurrence due to physical deterioration, it is requested to carry out the safety check (available on a chargeable basis) or replacement with a new one when the instrument has reached the end of its useful service life.

SAFETY SUMMARY

Safety Instructions in This Manual

Shown below are the safety instructions contained in this manual and their relevant sections in it.

DANGER Indications

The indication " DANGER" does not apply to this instrument.

WARNING Indications

Electric Shock due to Contact with Dangerous Voltage

- In contact with power supply voltage, you may receive an electric shock to cause fatal or serious injury.
  Before connecting the power cord, make sure that the POWER switch of the spectrophotometer main unit is turned off. Absolutely avoid modifying the product.

(Sections 1.5)

Electric Shock due to Improper Grounding

- To prevent an electric shock hazard, provide proper grounding connection.

(Sections 1.7)

Electric Shock due to Contact with Inside of Instrument

- If you touch the internal electric parts of the instrument, you may receive an electric shock. To prevent this, refer inspection of the internal parts to qualified service personnel.

(Sections 6.6)

SAFETY SUMMARY

CAUTION Indications

Injury due to Gazing Directly at Xe Flash Lamp When Lit

- The Xe flash lamp radiates strong ultraviolet rays. Avoid gazing at it directly when lit. For looking at the lamp, be sure to wear goggles equipped with a function for cutting off ultraviolet rays.

(Sections 5.2)

Fatigue due to Long-Hour Operation

- If you keep working with the display monitor and keyboard for long hours, your eyes and body will be fatigued to jeopardize your health. When working with the display monitor for a long time, take a break for 10 to 15 minutes per hour for the health of your eyes and body.

(Chapter 3)

Heavy Instrument

- This instrument weight as much as 15 kg. When carrying this instrument, exercise care not to incur injury by dropping it accidentally. Be sure to hold the right and left parts of the instrument securely when moving it.

(Sections 1.1)

SAFETY SUMMARY

NOTICE

Disposal of Waste Solution

Be sure to collect waste solution and treat it for proper disposal in accordance with the relevant laws and regulations regarding water pollution control and sewage treatment.
Improper treatment of waste solution may result in environmental pollution, and could also lead to a penalty.

Accuracy and Precision of Measured Values

Carry out periodic inspection and check whether the system is operating normally. If necessary, conduct measurement on a control sample.

Burst of a Lithium Battery

This spectrophotometer uses a lithium battery to backup the data in the memory. A lithium battery may burst should it be handled improperly. Be sure not to charge and dissolve it, or throw it to the fire under any circumstance. It should be handled totally separate from ordinary wastes.
When the lithium battery needs to be replaced (for example, when an error message RAM NG is displayed frequently on the screen), contact the dealer from whom you bought the spectrophotometer or the nearest service department.
Please entrust the replacement to a service agent who finished the technical training provided by our company.
(Replacement is charged after the warranty period of the spectrophotometer.

SAFETY SUMMARY

NOTICE (Continued)

Electrical Checkups

- Make sure that power supply to the spectrophotometer is 100 V AC, 1 kVA or more (50 or 60 Hz). Voltage fluctuation or noise entering the power line may have an adverse effect on the spectrophotometer main unit and cause a malfunction as well.

- Be sure to prepare a grounding wire together with power cables and confirm that the wire has a ground resistance of 100 Ω or less (Class D grounding construction in Electric Facility Technical Standards). Insufficient grounding may make the instrument susceptible to noise from the exterior and cause a stray voltage to appear in the main unit, which would be hazardous to personnel.

CONTENTS

1. INSTALLATION (REFERENCE INFORMATION FOR USER)

This instrument shall be installed by service personnel qualified by Hitachi-Technologies Corporation. The following description is included as reference information on instrument configuration, etc. for the user.

1.1 Unpacking

Unpack the shipping crate, carefully take out the spectrophotometer and place it on a sturdy table or desk. Take utmost care when taking out the instrument.

CAUTION

Caution on Carrying Heavy Instrument

This instrument weighs about 13 kg. There is a danger of personal injury if you accidentally drop it. When carrying the instrument, carefully handle it and securely hold it at both sides.

Fig. 1-1 Model U-5100 Ratio Beam Spectrophotometer

1.2 Installation Conditions

Before installation, check the following conditions.

1.2.1 Power Supply

Power voltage	:	100, 115, 220, 230 or 240 V Voltage variation shall be within ±10% of the rated voltage.
Frequency	:	50 or 60 Hz Frequency variation shall be within ±0.5 Hz of the rated frequency.
Power capacity	:	100 VA or more
Ground line	:	Grounding resistance 100 Ω or less.

1.2.2 Installation Space

Floor area: 400 mm (W) × 470 mm (D) or more
Provide a space of at least 200 mm at the front and rear of the main unit.
(Select a level installation position capable of withstanding a load of 30 kg and at a height of 300 mm or more above floor level.)

1.3 Environmental Conditions

1.3.1 Operating Temperature

15 to 35 °C
For measurement under the most stable conditions, it is recommended to install the instrument in a room which is air-conditioned at 20 to 25 °C.

1.3.2 Operating Humidity

25 to 80%
No condensation is allowed.
At 30 °C or higher, keep a humidity of 70% or less.

1.3.3 Atmospheric Gas

(1) Acidic, alkaline and other gases which may corrode metals significantly shall not be contained in the atmosphere.

(2) Gaseous organic solvents (particularly benzene and thinner) which may dissolve paint.

1.3.4 Other General Precautions

(1) The instrument should not be exposed to direct sunlight (which may deteriorate the optical performance or discolor the housing. Avoid a position near a window.)

(2) Sensible vibration or shock should not be applied to the instrument (otherwise the fine adjustment or mechanism might get out of order).

(3) There should be no heat source such as a gas burner, electric heater and oven near the instrument to prevent the main unit cover being heated (to 70 °C or higher).

(4) The instrument should not be located near a device producing a strong electric field (electric welding machine, high-frequency electric furnace or pole transformer for example).

(5) The installation site should be free from excessive dust (which may deteriorate optical performance).

(6) The instrument should be free from abrupt variation in power voltage (which constitutes a noise source).

(7) Avoid frequently turning on/off the electric motor not provided with a noise suppressor (of a stirrer, vibrator, etc.) on the power line connected with the spectrophotometer main unit.

NOTICE: The optical system in the spectrophotometer is very delicate. And the control unit incorporates parts constructing a high-density electronic circuit which functions as a computer.
So careful consideration should be given to the above items.

1.4 Check of Contents

After unpacking, check the contents against the packing list. If any part is missing or damaged, or if you have a question, contact the dealer from whom you purchased the instrument.

1.5 Check of Power Voltage and Fuse

WARNING

Electric Shock due to Dangerous Voltage

An electric shock due to power voltage could result in death or serious injury. Before connecting the power cord, make sure that the power switch of the spectrophotometer main unit is turned off.
Also, absolutely avoid disassembling or modifying the instrument.

Check that the power line voltage to be applied meets the operating voltage requirement of the spectrophotometer which is indicated near its power connector.

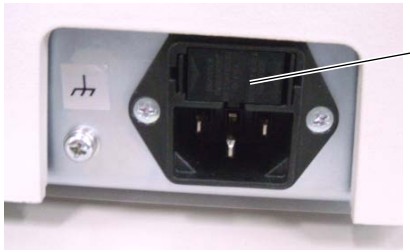


Fig. 1-2 Power Connector Section at Instrument Rear

Referring to section 6.6, check if a fuse having the capacity indicated in Table 1-1 is used.

Table 1-1 Fuse Capacity and Part No.

Fuse Capacity	Part No.
2 A (time lag)	J821396

1.6 Connection of Cords

Connect the cords referring to Fig. 1-3 or Fig.1-4.

WARNING

Electric Shock due to Dangerous Voltage

An electric shock due to power voltage could result in death or serious injury. Before connecting the power cord, make sure that the power switch of the spectrophotometer main unit is turned off.

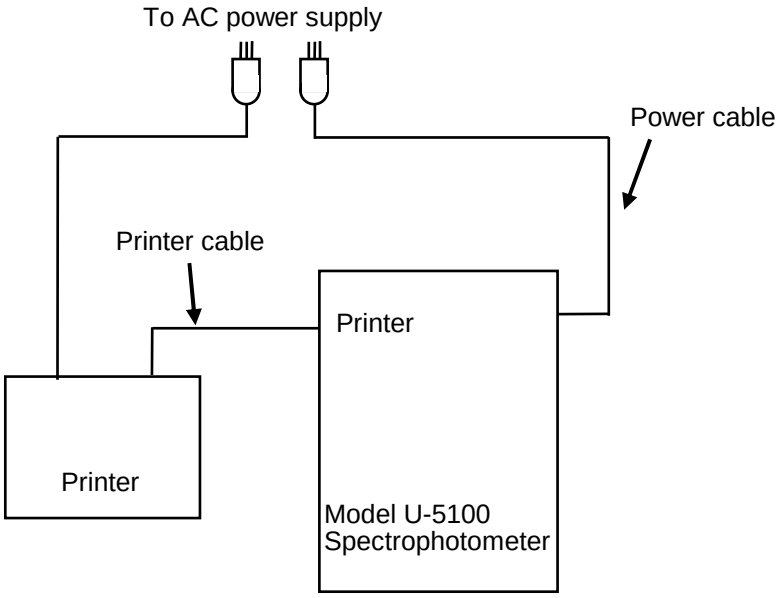


Fig. 1-3 Connection of Cords (for independent operation of instrument)

NOTE: Separately prepare a printer having <1> and <2> given below.

<1> Centronics cable

<2> Any of the following printer languages (commands)

Printer Language (command)
DPU
ESC/P V.2
PCL3

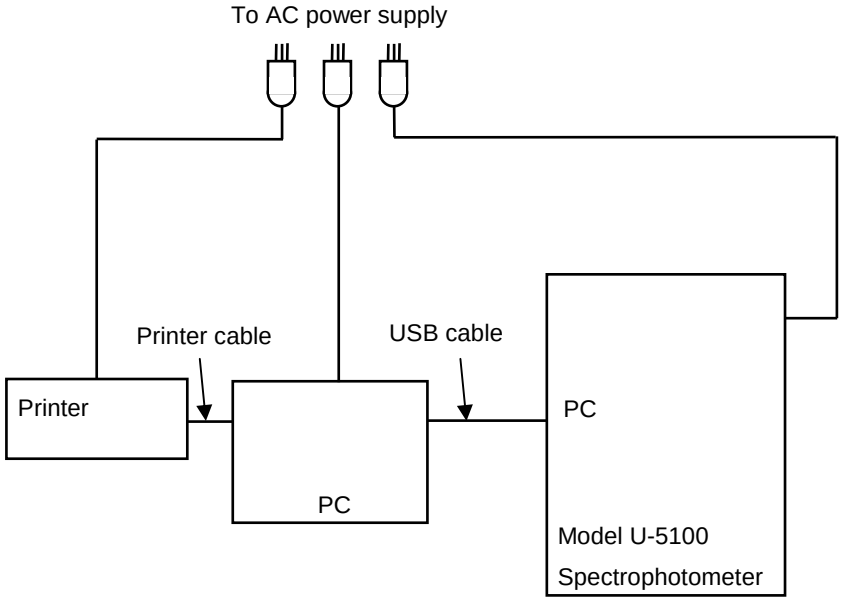


Fig. 1-4 Connection of Cords (for PC operation)

1.7 Connection of Power Cord and Ground Wire

(1) Securely plug the power cord into the connector of the main unit.

(2) When using a plug adapter or table tap, securely connect its ground wire to the ground terminal.

⚠ WARNING

Improper grounding may result in an electric shock hazard. Be sure to provide proper grounding connection.

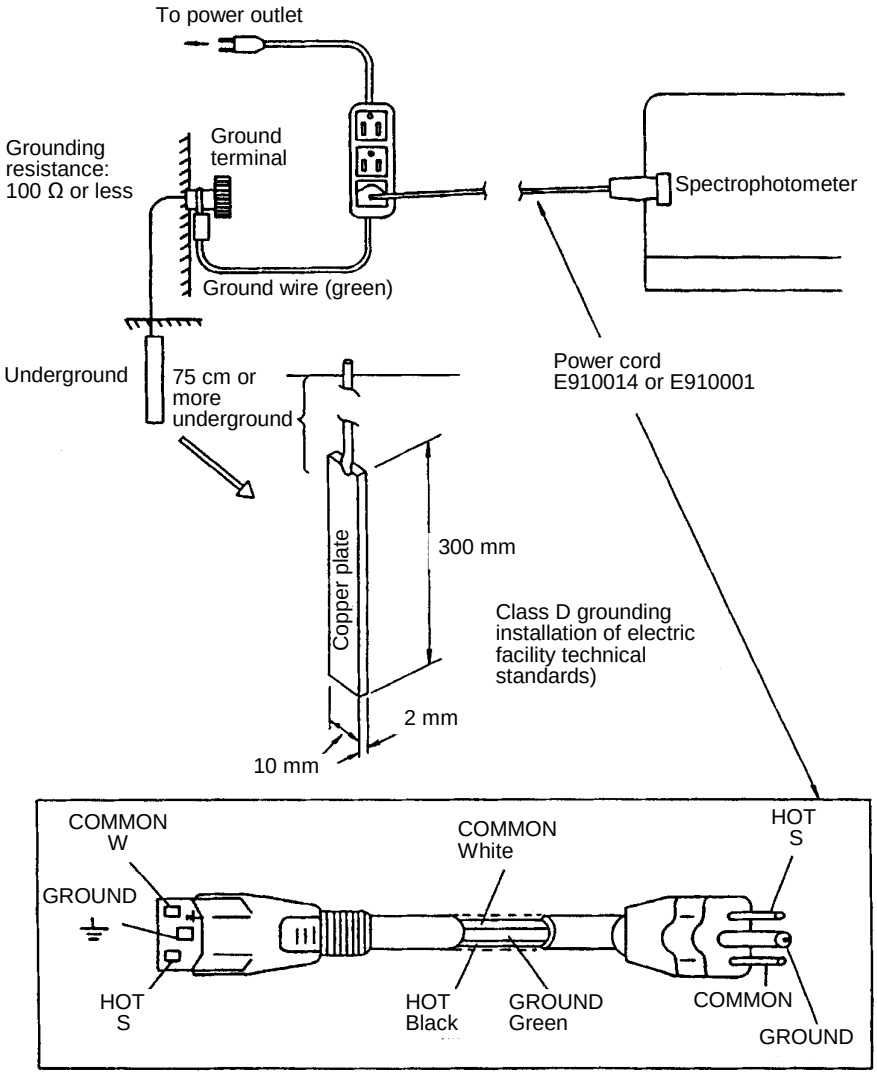


Fig. 1-5 Grounding Connection

2. FUNCTIONS AND BASIC OPERATION

2.1 Features of Model U-5100

This instrument is capable of quantitatively determining a liquid sample and measuring the absorbance, transmittance, absorption spectrum, transmission spectrum and absorbance/transmittance change with time.
With this instrument, the light source is turned on only during measurement. The instrument can thus save a larger amount of electric power than the spectrophotometer with a continuous light source. Also, the instrument is standard-equipped with the automatically turning 6-cell measurement function, thus permitting quantitative analysis through simple operation.

2.2 Name and Function of Each Part

2.2.1 Names and Functions of Parts of Spectrophotometer Main Unit

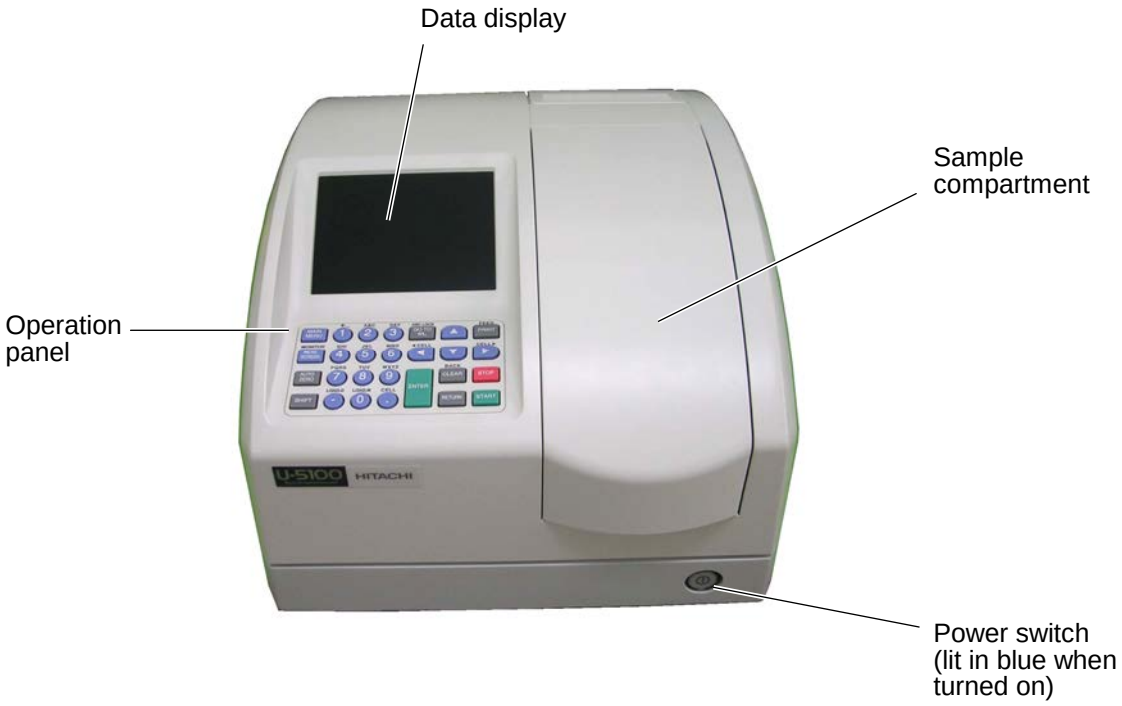


Fig. 2-1 External View of Model U-5100 Ratio Beam Spectrophotometer

<1> Operation panel : By using the keys on this panel, you can operate the spectrophotometer.
<2> Data display : While watching this display panel, operate the spectrophotometer and check data.
<3> Sample compartment : In this compartment, set a sample to be measured.
<4> Power switch : Used to turn on/off the power supply.

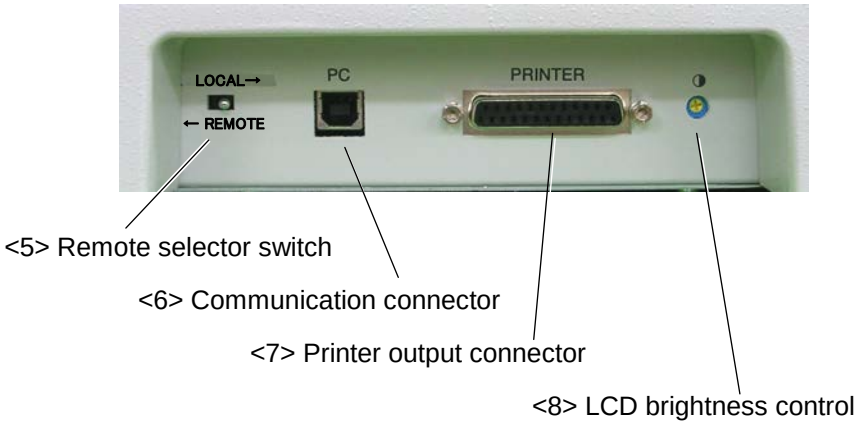


Fig. 2-2 Left Side View of Spectrophotometer

<5> LOCAL/REMOTE selector switch : Set this switch to the LOCAL side.
<6> Communication connector (PC) : USB connector used for communication with a personal computer.
<7> Printer output connector : Connect the printer cable to this connector.
<8> LCD brightness control : Used to adjust the LCD brightness.

Fig. 2-3 Rear View of Spectrophotometer

<9> Light source cover : Opened/closed only when mounting the pen-shaped low-pressure mercury lamp (optionally available). For how to mount the pen-shaped low-pressure mercury lamp, refer to its instruction manual.

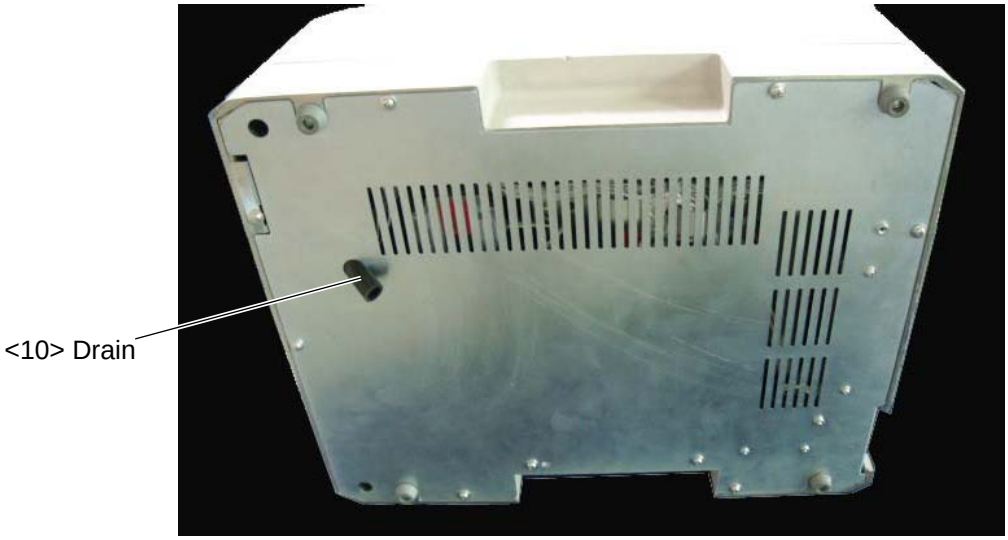


Fig. 2-4 Bottom View of Spectrophotometer

<10>Drain : Tube for draining liquid accidentally spilt in the sample compartment. The spilt liquid is discharged to the bottom of the instrument through this drain. If you accidentally spill liquid in the sample compartment, then carry out cleaning according to section 6.2.

2.2.2 Inside View of Sample Compartment

An inside view of the sample compartment plus the 6-cell Turret and drain are described below.

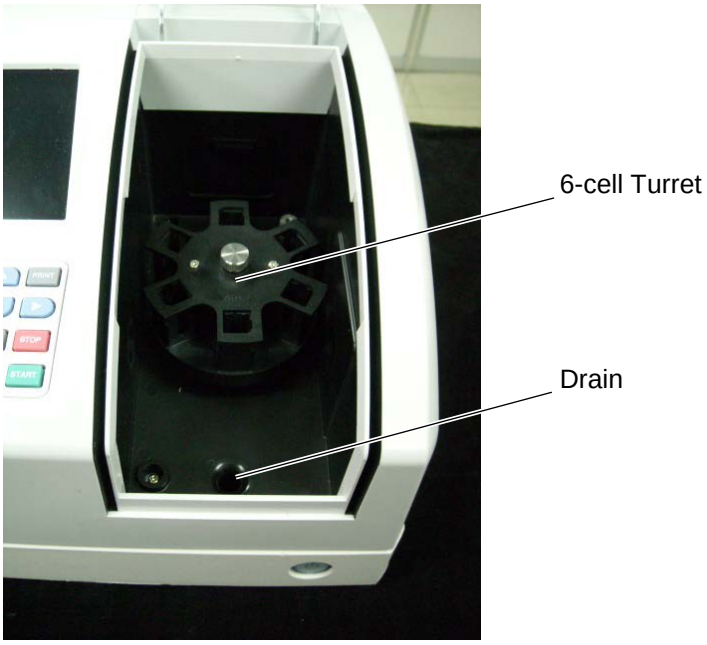


Fig. 2-5 Inside of Sample Compartment

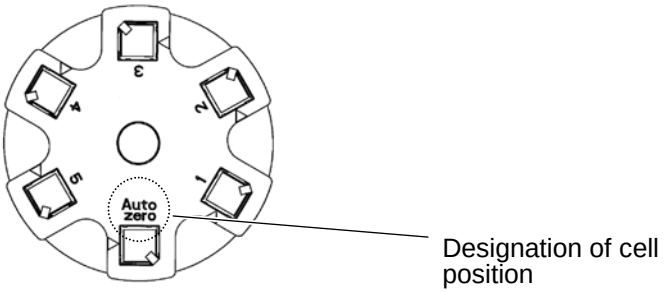


Fig. 2-6 Top View of 6-cell Turret

6-cell Turret:
Set cells in the 6-cell holder for measurement. This cell turret can accommodate 6 cells. The cell position inscribed with Autozero is used only for auto zero. Normally, auto zero is executed with the cell at this position (hereafter referred to as cell A). The cell positions inscribed with 1 to 5 are used for sample measurement (hereafter referred to as cell 1, cell 2, ... and cell 5).

Drain:
Tube for draining liquid accidentally spilt in the sample compartment. The spilt liquid is discharged to the bottom of the instrument through this drain. If you accidentally spill liquid in the sample compartment, then carry out cleaning according to section 6.2.

2.3 Startup and Shutdown of Instrument

2.3.1 Startup of Instrument

1. Power on the Instrument.

   (1) Check that the power switch lamp on the front of the instrument is extinguished.

   (2) Check that the LOCAL/REMOTE selector switch on the left side of the instrument is set at the LOCAL side.

   (3) Check that the power cable is connected between the instrument and power outlet.

   (4) Check that no sample is set in the sample compartment. If any sample is set, take it out of the sample compartment.

   (5) Close the cover of the sample compartment.

   (6) Press the power switch on the front of the instrument.

2. Display of Initialization Screen

   (1) The initialization screen (Fig. 2-7) appears on the display panel of the instrument.

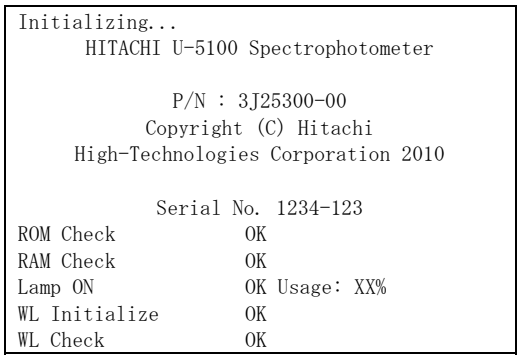


Fig. 2-7 Initialization Frame

(2) Self-diagnosis and automatic adjustment are carried out. The items to be checked are listed below.
For each item, “OK” is indicated if its function is normal and “NG” if abnormal. If “NG” is indicated for ROM Check, RAM Check, Lamp ON, WL Initialize or WL Check, the system will stop. In this case, refer to “b. Troubleshooting” in section 6.8. If “NG” is indicated for RAM Check or Lamp ON, the system control can be advanced by pressing the [CLEAR] key.
Upon normal completion of initialization, the Main Menu screen will appear.

- ROM Check : ROM check
- RAM Check : RAM check
- Lamp ON : The system checks if the lamp is turned on.
- Lamp Usage : For the lamp, the status of use is indicated in percentage. A value of 100% is a standard for service life. When 100% is exceeded, Lamp Usage is displayed. If 100% is exceeded, then execute performance check with reference to section 5.1 and make sure that the performance is within the scope of the specifications.
  If outside the scope of specifications, contact the dealer from whom you purchased the instrument or your nearest maintenance service office.
- WL Initialize : Check of wavelength drive system
- WL Check : Wavelength calibration at 484.6 nm

3. Display of Main Menu Screen

The Main Menu screen (Fig. 2-8) appears. From this screen, you can proceed to each measurement item or instrument setup item.
After starting the instrument, 2-hour warming-up is necessary for the measurement requiring an instrument stability equivalent to the specified baseline stability level (0.0007 Abs/h) (for time scan or measurement in which auto zero is not executed for a long time).

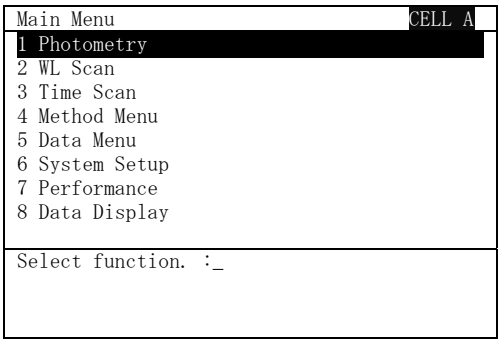


Fig. 2-8 Main Menu Screen

2.3.2 Shutdown of Instrument

1. Termination of Measurement

   (1) Check that the power switch lamp on the front of the instrument is lit.

   (2) When measurement is in progress, wait until it is terminated or press the [STOP] key. When monitor display is provided, press the [RETURN] key.

   (3) Save or print out data if desired. For details of save and print operations, refer to Section 3.

2. Power off the Instrument.

   Press the power switch on the front of the instrument to turn off power. Check that the power switch lamp is extinguished.

NOTICE:	Avoid turning off the power switch immediately after performing data save operation. Otherwise data might not be saved. Wait for at least 5 seconds or so after the save operation.

2.4 Basic Operation

2.4.1 Operation Panel

Figure 2-9 shows the operation panel of the instrument.
The function of each key is explained in Table 2-1, and key operation in combination with the [SHIFT] key in Table 2-2.

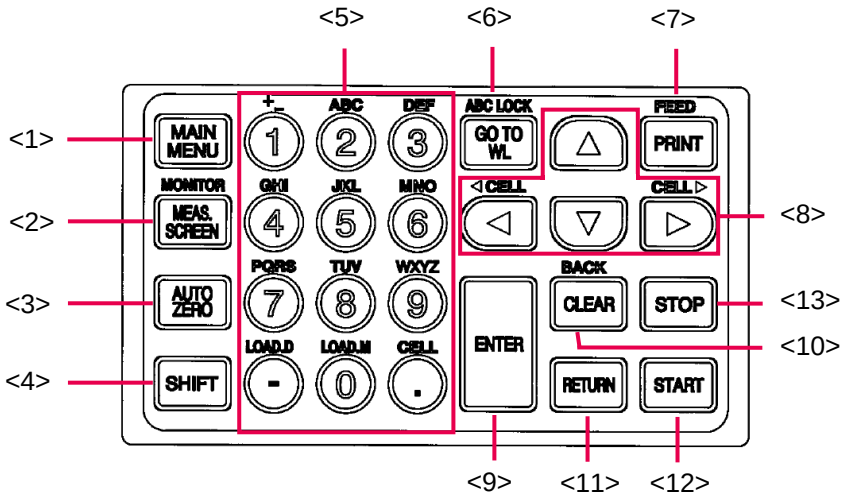


Fig. 2-9 Operation Panel

Table 2-1 Independent Key Operation (The bold-faced characters are entered in sequence each time the relevant key is pressed.)

	Key	Description
<1>	MAIN MENU	Displays the Main Menu screen.
<2>	MEAS.SCREEN	Determines the current measuring conditions and changes the currently displayed screen to the measurement screen.
<3>	AUTO ZERO	Adjusts the photometric value to 0 Abs in ABS mode and to 100%T in %T mode. (*1)
<4>	SHIFT	By holding down this key and pressing another one, you can execute a different command.
<5>	1	Enters 1. On the character input screen, the following characters are entered. Alphabet input : **+**, _, **/**, **:**, *****, **(**, **)**, **;**, **1** Numeric input : 1
	2	Enters 2. On the character input screen, the following characters are entered. Alphabet input : **a**, **b**, **c**, **A**, **B**, **C**, **2** Numeric input : 2
	3	Enters 3. On the character input screen, the following characters are entered. Alphabet input : **d**, **e**, **f**, **D**, **E**, **F**, **3** Numeric input : 3

(cont'd)

	Key	Description
<5>	4	Enters 4. On the character input screen, the following characters are entered. Alphabet input : **g**, **h**, **i**, **G**, **H**, **I**, **4** Numeric input : 4
	5	Enters 5. On the character input screen, the following characters are entered. Alphabet input : **j**, **k**, **l**, **J**, **K**, **L**, **5** Numeric input : 5
	6	Enters 6. On the character input screen, the following characters are entered. Alphabet input : **m**, **n**, **o**, **M**, **N**, **O**, **6** Numeric input : 6
	7	Enters 7. On the character input screen, the following characters are entered. Alphabet input : **p**, **q**, **r**, **s**, **P**, **Q**, **R**, **S**, **7** Numeric input : 7
	8	Enters 8. On the character input screen, the following characters are entered. Alphabet input: **t**, **u**, **v**, **T**, **U**, **V**, **8** Numeric input: 8
	9	Enters 9. On the character input screen, the following characters are entered. Alphabet input : **w**, **x**, **y**, **z**, **W**, **X**, **Y**, **Z**, **9** Numeric input : 9
	—	Enters "-"(hyphen).
	0	Enters 0.
	.	Enters "." (period).

<6>	GO TO WL	Used for shifting the wavelength. Upon pressing this key, the guidance given below appears. You can shift the wavelength by entering a wavelength in a range of 190.0 to 1100.0 (in steps of 0.1 nm).
		`Input value. :_`
		`WL(nm) [190.0 - 1100.0nm]`

<7>	PRINT	Used for printing out data. Pressing this key after measurement prints out a report. When it is pressed with the monitor screen displayed, the current wavelength and photometric value are printed out. If pressed with the data read by the cursor displayed, the cursor data is printed out.
<8>	►	Used for moving the cursor to the right on the Meas. PARAM. setting screen. Also used for moving to the next page when ◄ ► is indicated in the lower part of the screen.
	◄	Used for moving the cursor to the left on the Meas. PARAM. setting screen. Also used for moving to the previous page when ◄ ► is indicated in the lower part of the screen.
	▲	Used for moving up the cursor.
	▼	Used for moving down the cursor.
<9>	ENTER	Used for determining the entered character/numerical value or the set item.
<10>	CLEAR	Used for erasing the entered character or numerical value.
<11>	RETURN	Used for returning to the previous screen.
<12>	START	Used for starting measurement, proceeding to the next measurement or advancing to the next measurement screen.
<13>	STOP	Used for stopping measurement.

(*1) About AUTOZERO:
Please be sure to execute AUTOZERO on each measurement screen. The guidance is displayed on the AUTOZERO execution screen after the screen was transited to the measurement screen. Please set the sample for AUTOZERO when you execute AUTOZERO. The behavior of AUTOZERO is different in the measurement mode and each screen.
Please refer to appendix d. for its details.

Table 2-2 Key Operation in Combination with SHIFT Key (The bold-faced characters are entered in sequence each time the relevant key is pressed.)

Key	Description
[SHIFT] + MEAS.SCREEN	Allows you to change the currently displayed screen to the monitor screen.
[SHIFT] + 1	On the character input screen, the following characters are entered. Alphabet input : 1 Numeric input : **+**, _, **/**, **:**, *****, **(**, **)**, **;**, **1**
[SHIFT] + 2	On the character input screen, the following characters are entered. Alphabet input : 2 Numeric input : **a**, **b**, **c**, **A**, **B**, **C**, **2**
[SHIFT] + 3	On the character input screen, the following characters are entered. Alphabet input : 3 Numeric input : **d**, **e**, **f**, **D**, **E**, **F**, **3**
[SHIFT] + 4	On the character input screen, the following characters are entered. Alphabet input : 4 Numeric input : **g**, **h**, **i**, **G**, **H**, **I**, **4**
[SHIFT] + 5	On the character input screen, the following characters are entered. Alphabet input : 5 Numeric input : **j**, **k**, **l**, **J**, **K**, **L**, **5**
[SHIFT] + 6	On the character input screen, the following characters are entered. Alphabet input : 6 Numeric input : **m**, **n**, **o**, **M**, **N**, **O**, **6**
[SHIFT] + 7	On the character input screen, the following characters are entered. Alphabet input : 7 Numeric input : **p**, **q**, **r**, **s**, **P**, **Q**, **R**, **S**, **7**
[SHIFT] + 8	On the character input screen, the following characters are entered. Alphabet input : 8 Numeric input : **t**, **u**, **v**, **T**, **U**, **V**, **8**
[SHIFT] + 9	On the character input screen, the following characters are entered. Alphabet input : 9 Numeric input : **w**, **x**, **y**, **z**, **W**, **X**, **Y**, **Z**, **9**
[SHIFT] + -	Displays the data loading screen.
[SHIFT] + 0	Displays the method loading screen.

[SHIFT] + .	Displays the 6-cell move screen. The guidance given below will appear.
	By entering a cell number, it is possible to move to the target cell position directly.
	`Input value. :_`
	`Cell No.[0 - 5, 0:for Autozero]`

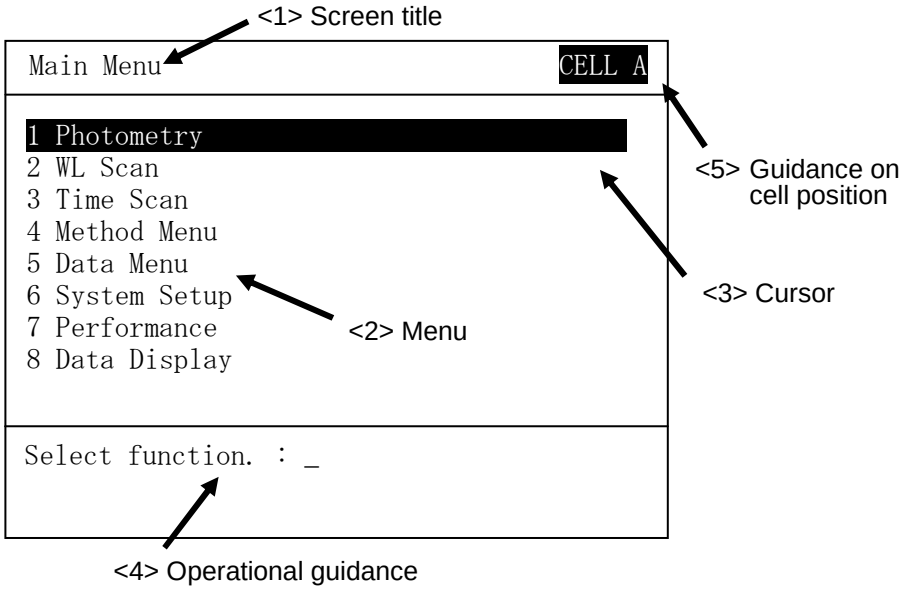
[SHIFT] + GO TO WL	Changes over between alphabet input and numeric input on the character input screen.
[SHIFT] + PRINT	Feeds the printer paper. Note that this key operation is invalid when the printer for PCL3 commands is used.
[SHIFT] + ►	Turns the 6-cell turret counterclockwise.
[SHIFT] + ◄	Turns the 6-cell turret clockwise.
[SHIFT] + CLEAR	Clears a character before the cursor to move it back one position.

2.4.2 Basic Operation of Screen

Explained here is the gateway to operation or the Main Menu screen. For the menu items and setting items displayed on the monitor, you can proceed with operation by use of the [◄], [►], [▲] and [▼] keys, numeric keys and [ENTER] key on the operation panel.

a. Main Menu Screen and Basic Operation

Start the instrument referring to section 2.3.1. The Main Menu screen will appear.



<1> Screen title : Title of the currently displayed screen.
<2> Menu : Selectable menu items are indicated.
<3> Cursor : Indicates the currently selected item. The cursor can be moved up and down by pressing the [▲] and [▼] keys. Move the cursor to the aimed-at item and press the [ENTER] key, and you can access to its details.

<4> Operational guidance : Guidance on operation is given for the menu item selected by the cursor. This guidance differs depending on the screen active at the time. In the subsequent process, carry out operation according to the guidance. On the Main Menu screen, “Select function.: _” is indicated. By entering the number preceding each menu item, you can proceed to internal setting.

<5> Guidance on cell position : Indicates the current measurement position when the 6-cell turret is mounted. If any other accessory than the 6-cell turret, such as a single cell holder, rectangular long path cell holder or auto sipper (optionally available), is used, indication varies with the accessory. For details, refer to Tables 2-3 and 2-4.

Table 2-3 Guidance on Cell Position in Use of 6-cell Turret

Guidance on Cell Position	Status of 6-cell Turret
CELL A	Indicated when “Autozero” on the 6-cell turret is at the measurement position.
CELL 1	Indicated when “1” on the 6-cell turret is at the measurement position.
CELL 2	Indicated when “2” on the 6-cell turret is at the measurement position.
CELL 3	Indicated when “3” on the 6-cell turret is at the measurement position.
CELL 4	Indicated when “4” on the 6-cell turret is at the measurement position.
CELL 5	Indicated when “5” on the 6-cell turret is at the measurement position.
CELL *	Indicated when the 6-cell turret is turning.
CELL -	Indicated when the cell position on the 6-cell turret is not yet pinpointed.

Table 2-4 Guidance on Cell Position in Use of Accessory

Guidance on Cell Position	In-use Accessory Indicated
CELL S	Single cell holder (optionally available) Rectangular long path cell holder (optionally available)
SIPPER	Auto sipper (optionally available)

To display the Main Menu screen from another screen, press the [MAIN MENU] key.

b. Measuring Condition Setting Screen

Described below is the basic operation of the measuring condition setting screen when “Photometry” has been selected on the Main Menu screen.

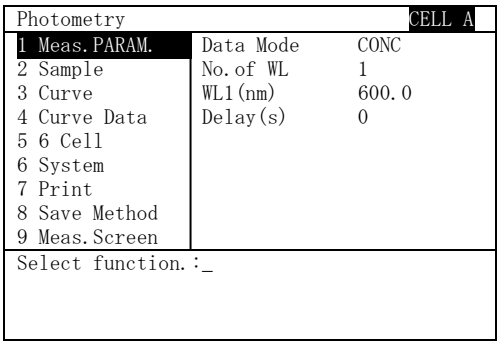


Fig. 2-10 Measuring Condition Setting Screen

Two methods are available for the setting of measuring conditions. Select either of them from the perspective of your ease of use, or use them in combination.

1. Use of [◄], [►], [▲] and [▼] keys
   Each item on the screen can be selected with the [◄], [►], [▲] and [▼] keys. For setting “3 Curve” for example, move the cursor to “3 Curve” with the [▲] or [▼] keys and press the [►] key to enable setting of each item in “3 Curve”. Set the conditions according to the guidance. The cursor can be moved to the left with the [◄] key.

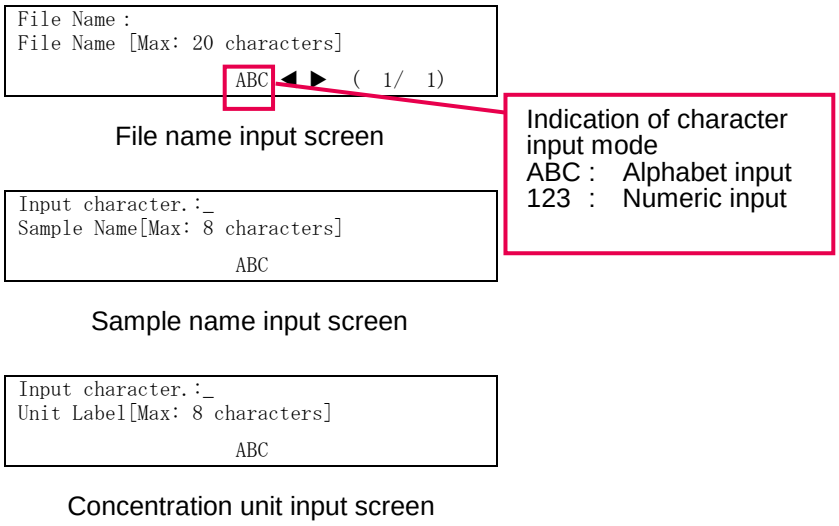
2. Use of numeric keys and [ENTER] key
   Enter the number preceding the desired menu item and press the [ENTER] key. For setting “3 Curve” for example, enter <3> and press the [ENTER] key. Then, set each item according to the operational guidance and press the [ENTER]. To move the cursor to the left, press the [RETURN] key.

2.4.3 How to Input Characters

Explained below is how to input characters. Character input is done when entering the file name, sample name and concentration unit.

a. Character Input Screen

Character input is done when entering the file name, sample name and concentration unit. On each input screen, the guidance shown in Fig. 2-11 appears. For the file name, you can input up to 20 characters, and up to 8 characters for the sample name and concentration unit.



File name input screen

Sample name input screen

Concentration unit input screen

Fig. 2-11 Character Input Screen

b. Alphabet Input and Numeric Input

Alphabet input mode and numeric input mode are available for character input. In alphabet input mode, “ABC” is indicated in the lower part of the screen, and “123” is indicated in numeric mode. Alphabet input mode is initially set on the character input screen. To change over between alphabet input and numeric input, hold down the [SHIFT] key and press the [GO TO WL] key.
In alphabet input mode, you can enter a numeric character in numeric mode by holding down the [SHIFT] key and pressing the numeric (1 to 9) key. In numeric input mode, you can enter a character in alphabet input mode.
<Example>
When you hold down the [SHIFT] key and press the <5> key in alphabet input mode, “5” is entered.
When you hold down the [SHIFT] key and press the <5> key in numeric input mode, “j” is entered.

c. Character Transition in Alphabet Input Mode

In alphabet input mode, the character entered is changed over as follows by pressing the key repeatedly:
Small letters of alphabet assigned to each key → Capital letters of alphabet → numeric on each key
<Example>
With the <3> key, the character is repeatedly changed over in the order of d → e → f → D → E → F → 3. (For the other keys, refer to Table 2-1.)

d. Other Operations

For erasing one character, press the [CLEAR] key.
By pressing the [►] key, you can enter the same alphabetical character repeatedly or place a space.
To determine the entered character(s), press the [ENTER] key.

2.4.4 How to Set Cell

This section explains about the cell, including cell selection, sample volume required for measurement and how to set a cell to the 6-cell turret.

a. About Cell

Please use the cell that shows in Table 2-5 for the measurement.

Table 2-5 Type of Cell

Cell Name	P/N	Measurable Sample Volume
10 mm quartz cell (optionally available)	123-1004	1.7 to 3.5 mL
10 mm glass cell (optionally available)	123-1010	1.7 to 3.5 mL

NOTE: There is a possibility that accurate measurements are not obtained according to the cell when using excluding the cell described in Table 2-5 and measuring it.

b. Setting of Cell

The cell has transparent and frosted faces. It should be held by the frosted faces. If held by the transparent faces, its measurement face will be contaminated with fingerprints, thus causing an error in measurement.

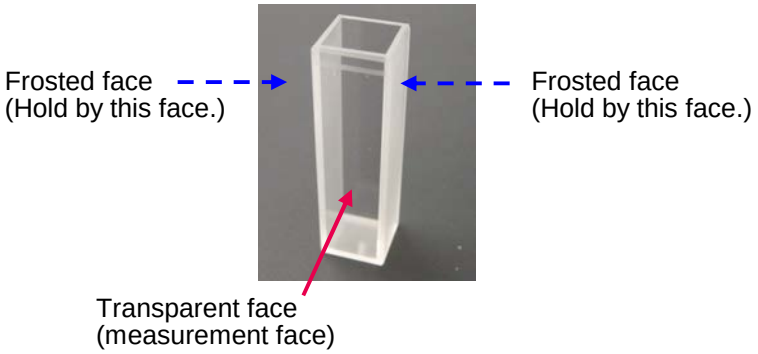


Fig. 2-12 10 mm Cell

For measurement, set the cell so that the beam passes through its transparent face. Figure 2-13 shows the external view of the 6-cell turret. It turns for measurement of each cell. It is therefore necessary to set the cell in different directions according to the cell position.
Triangular marks are put on the 6-cell turret to indicate the incident direction of beam. So set each cell so that its transparent face is matched with the triangular mark.

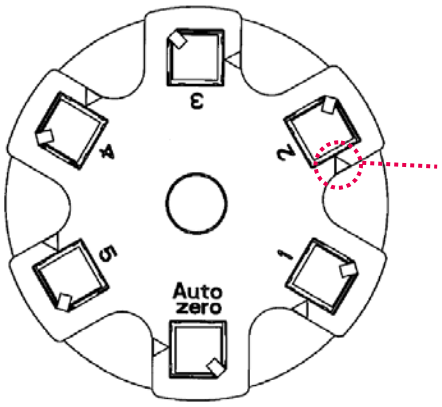


Fig. 2-13 External View of 6-cell Turret

c. Other Cells

In addition to the above-mentioned cell, you can use a micro cell (sample volume: 340 to 600 µL) by utilizing the optionally available single cell holder and micro cell mask.
In addition to the above-mentioned cell, you can use a 1.5 µL Trace sample cell (sample volume: 1.5 to 4.0 µL), 12 µL Trace sample cell (sample volume: 12 to 40 µL) and 50 µL Trace sample cell (sample volume: 50 to 90 µL) by utilizing the optionally available single cell holder and mask for trace sample cell.
You can also use a cell whose optical path length is 100 mm (sample volume: 17 to 35 mL) by utilizing the optionally available rectangular long path cell holder.
For details of these options, refer to section 4.6.

2.4.5 Demounting and Remounting of 6-cell Turret

The 6-cell turret is demounted when installing any accessory or cleaning the sample compartment. Described below are the procedures for demounting and remounting the holder.

a. Procedure for Demounting 6-cell Turret

(1) Loosen the hand screw at the center of the 6-cell turret until being turned freely.

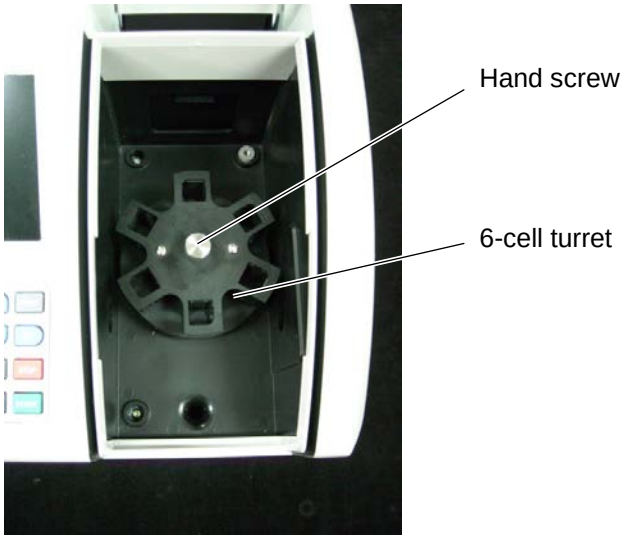


Fig. 2-14 Preparation for Demounting of 6-cell Turret

(2) Hold the 6-cell turret by the top and vertically pull it out of the sample compartment.

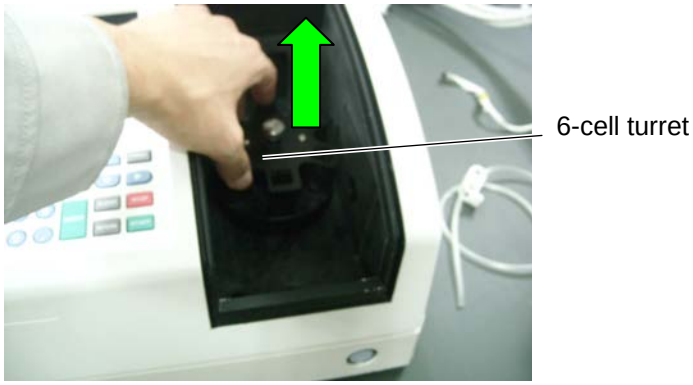


Fig. 2-15 Demounting of 6-cell Turret

(3) Put the demounted 6-cell turret in a case which can protects against dust and keep it in a safe place.

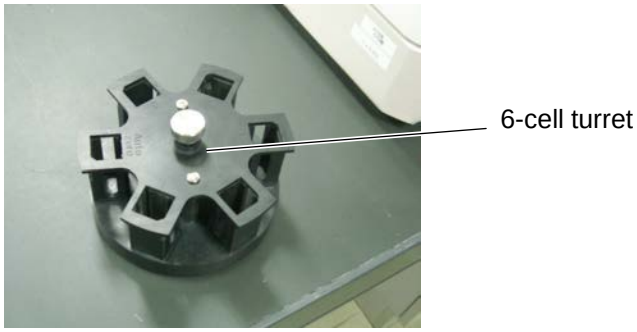


Fig. 2-16 Demounted 6-cell Turret

b. Procedure for Remounting 6-cell Holder

Given below is the procedure for remounting the 6-cell turret demounted.

(1) Open the sample compartment. Check the 6-cell turret driving shaft in the sample compartment. The shaft has a notched portion (concave portion). Let us refer to this portion as A.

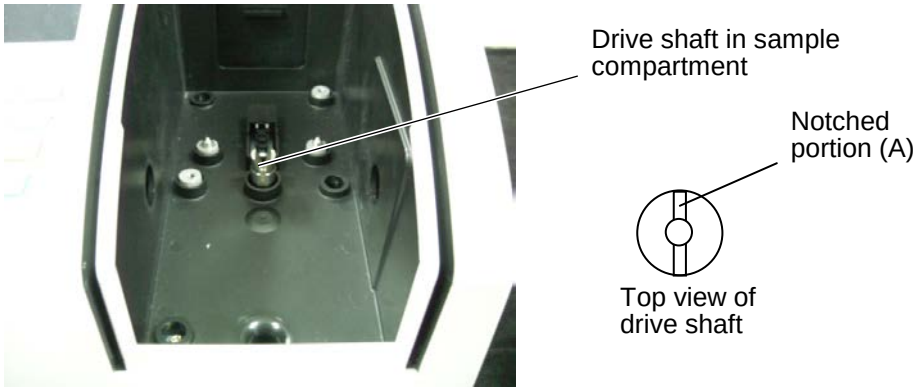


Fig. 2-17 Drive Shaft in Sample Compartment

(2) Check the screw cramp section on the back side of the 6-cell turret to be remounted. The screw cramp section includes a portion for alignment (convex portion). Let us refer to this portion as B. Align the 6-cell turret by turning it so that the convex portion for alignment fits into the notched portion of the drive shaft in the sample compartment. Then, fit the 6-cell turret to the drive shaft.

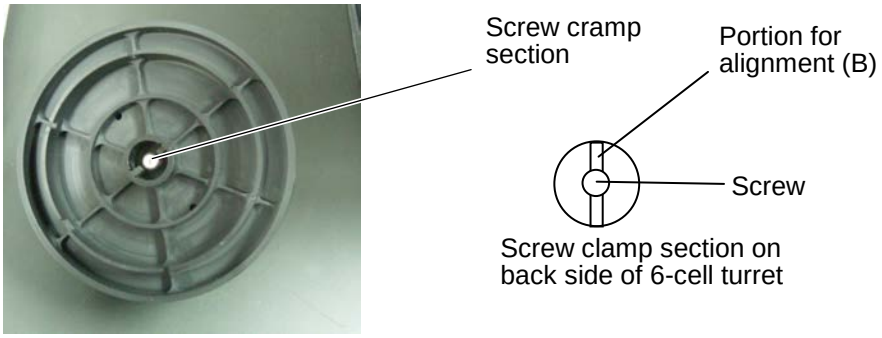


Fig. 2-18 Back Side View of 6-cell Turret

(3) Fix the 6-cell turret by tightening the hand screw at the center. The 6-cell turret has now been remounted.

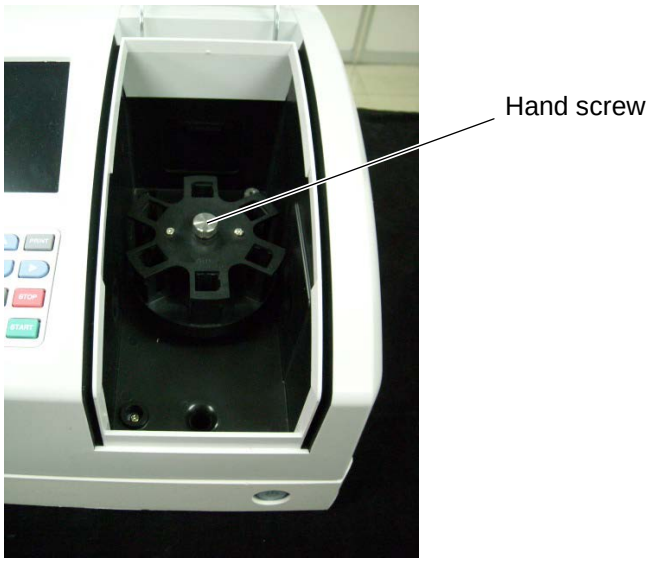


Fig. 2-19 Fixing of 6-cell Turret

2.4.6 Cautions on Operation

Pay attention to the following points during operation and measurement.

NOTICE:	For sample measurement, securely close the sample compartment cover. Also, avoid opening the sample compartment cover during measurement. Otherwise abnormal measured values may be obtained.

NOTICE:	The main unit has a function of saving the measured data or measuring conditions. However, the saved data may be erased if the lithium battery for memory backup dies or deteriorates. It is recommended to keep the backup copy of valuable data on paper, etc. without fail.

2.5 Basic Setting

2.5.1 Setting of Current Date and Time

Set the current date and time. The date and time set here are used for the date and time of analysis, printing, etc.

1. Startup of Instrument

   Start the instrument according to section 2.3.1.

2. Main Menu Screen

   The Main Menu screen (Fig. 2-20) appears. To select “System Setup”, press the <6> key (System Setup) and then [ENTER] key. Or select “System Setup” with the [▲] or [▼] key and press the [ENTER] key.

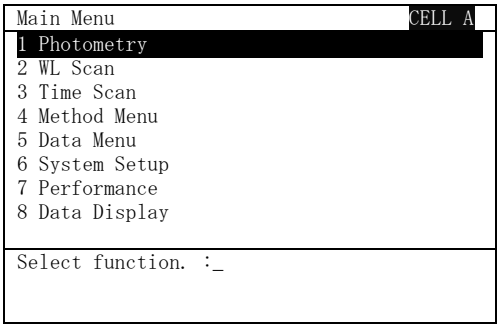


Fig. 2-20 Main Menu Screen

3. System Setup Screen

   The System Setup screen (Fig. 2-21) appears. To select “Date and Time”, press the <3> key (Date and Time) and then [ENTER] key. Or select “Date and Time” with the [▲] or [▼] key and press the [ENTER] key.

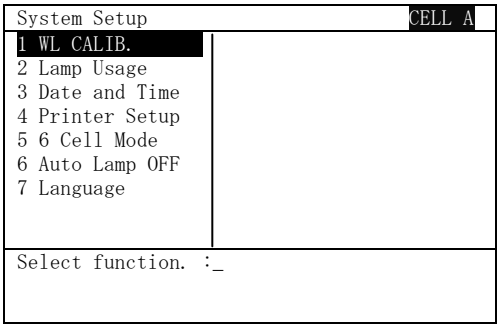


Fig. 2-21 System Setup Screen

4. Setting of Date and Time

(1) The Date and Time setting screen (Fig. 2-22) appears. Select each item indicated and make your entry. For details, refer to Table 2-6.

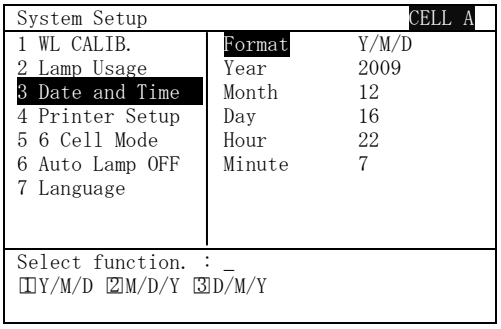


Fig. 2-22 Date and Time Setting Screen

Table 2-6 Date and Time Setting Parameters

Setting Item	Description
Format	Select a display format for the date. [1] Y/M/D: Displays the date in year/month/day format. [2] M/D/Y: Displays the date in month/day/year format. [3] D/M/Y: Displays the data in day/month/year format.
Year	Enter the current year. Settable in a range of 2008 to 2099.
Month	Enter the current month. Input range: 1 to 12
Day	Enter the current day. Input range: 1 to 31
Hour	Enter the current hour. Input range: 0 to 23
Minute	Enter the current minute. Input range: 0 to 59

(2) After completion of setting, return to the Main Menu screen with the [RETURN] key.

2.5.2 Setting of Printer

Select a type of language for the connected printer.

1. Startup of Instrument

   Start the instrument according to section 2.3.1.

2. Main Menu Screen

   The Main Menu screen (Fig. 2-23) appears. To select “System Setup”, press the <6> key (System Setup) and then [ENTER] key. Or select “System Setup” with the [▲] or [▼] key and press the [ENTER] key.

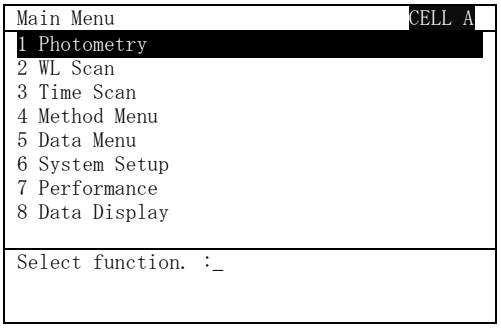


Fig. 2-23 Main Menu Screen

3. System Setup Screen

   The System Setup screen (Fig. 2-24) appears. To select “Printer Setup”, press the <4> key (Printer Setup) and then [ENTER] key. Or select “Printer Setup” with the [▲] or [▼] key and press the [ENTER] key.

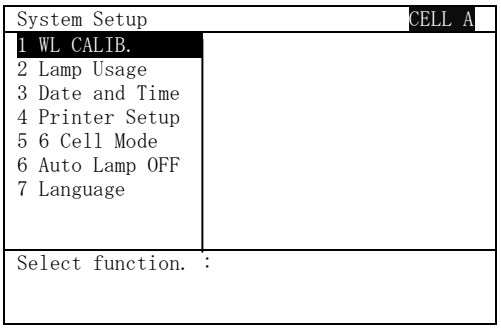


Fig. 2-24 System Setup Screen

4. Setting of Printer

(1) The printer setup screen (Fig. 2-25) appears. Select the item indicated and make your entry. For details, refer to Table 2-7.

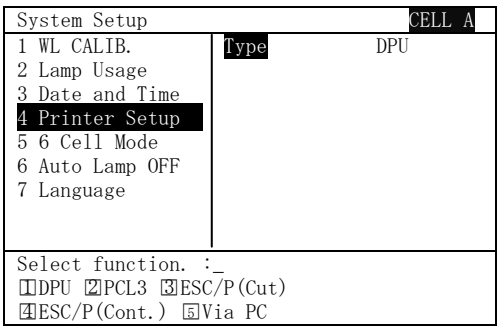


Fig. 2-25 Printer Setup Screen

Table 2-7 Printer Setup Parameter

Setting Item	Description
Type	Select the type of printer language. [1] DPU : Selected when the printer having DPU commands is connected. [2] PCL3 : Selected when the printer having PCL/3 commands is connected. [3] ESC/P (Cut) : Selected when connecting the printer having ESC/P V2 commands and using cut sheets. [4] ESC/P (Cont.) : Selected when connecting the printer having ESC/P V2 commands and using continuous forms. [5] Via PC : When External output program (Part No.3J2-0290) is used, it selects it. If the type of language is unknown, contact the dealer from whom you purchased the instrument or your nearest maintenance service office. Note: When the language selects 中文 by switching, the printer can use only DPU. When the language selects Deutsch by switching, printer can not use via PC.

(2) After completion of setting, return the Main Menu screen with the [RETURN] key.

2.5.3 Setting of Auto Lamp OFF Time

This instrument has a function of automatically turning off the lamp after a certain period of time to prevent the lamp staying on unnecessarily for a long time in use of the enlarged display screen (monitor). You can set this lamp OFF time.
For measurement with the enlarged display screen, refer to section 3.4.

1. Startup of Instrument

   Start the instrument according to section 2.3.1.

2. Main Menu Screen

   The Main Menu screen (Fig. 2-26) appears. To select “System Setup”, press the <6> key (System Setup) and then [ENTER] key. Or select “System Setup” with the [▲] or [▼] key and press the [ENTER] key.

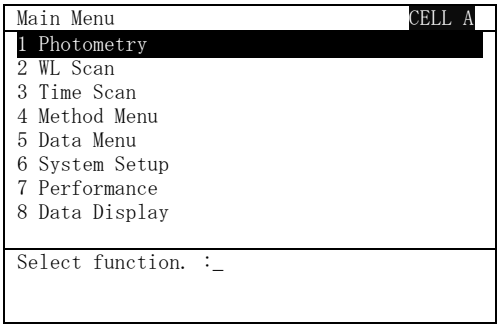


Fig. 2-26 Main Menu Screen

3. System Setup Screen

   The System Setup screen (Fig. 2-27) appears. To select “Auto Lamp OFF”, press the <6> key (Auto Lamp OFF) and then [ENTER] key. Or select “Auto Lamp OFF” with the [▲] or [▼] key and press the [ENTER] key.

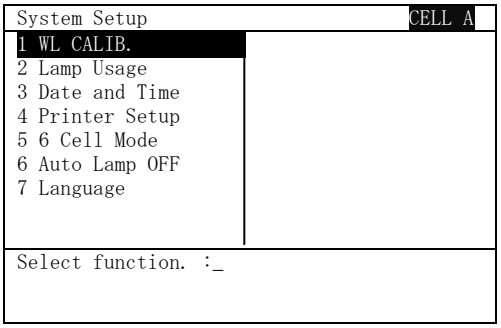


Fig. 2-27 System Setup Screen

4. Setting of Auto Lamp OFF Time

(1) The auto lamp OFF time setting screen (Fig. 2-28) appears. Set the time for automatically turning off the lamp when the enlarged display screen is active. For details, refer to Table 2-8.

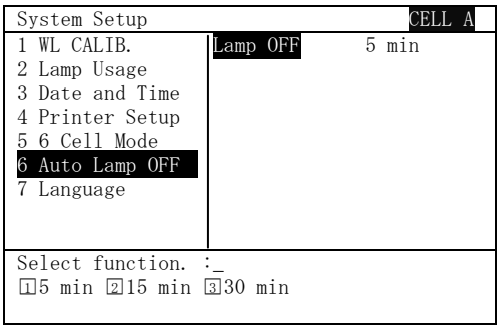


Fig. 2-28 Auto Lamp OFF Time Setting Screen

Table 2-8 Auto Lamp OFF Setting Parameter

Setting Item	Description
Lamp OFF	You can set the time for automatically turning off the lamp when the enlarged display screen (monitor) is active. It is recommended to select [1] 5 min unless the enlarged display screen is frequently used for measurement. [1] 5 min [2] 15 min [3] 30 min

(2) After completion of setting, return to the Main Menu screen with the [RETURN] key.

2.5.4 Setting of 6 Cell Mode

You can specify whether to control the 6-cell turret.
The setting needs to be changed for measurement with the optionally available single cell holder or rectangular long path cell holder in place of the 6-cell turret, or for measurement with the 6-cell turret in place of the single cell holder or rectangular long path cell holder.

Table 2-9 Setting of 6 Cell Mode

Cell Holder	6 Cell Mode
6-cell turret	ON
Single cell holder (optionally available)	OFF
Rectangular long path cell holder (optionally available)	OFF

1. Startup of Instrument

   Start the instrument according to section 2.3.1.

2. Main Menu Screen

   The Main Menu screen (Fig. 2-29) appears. To select “System Setup”, press the <6> key (System Setup) and then [ENTER] key. Or select “System Setup” with the [▲] or [▼] key and press the [ENTER] key.

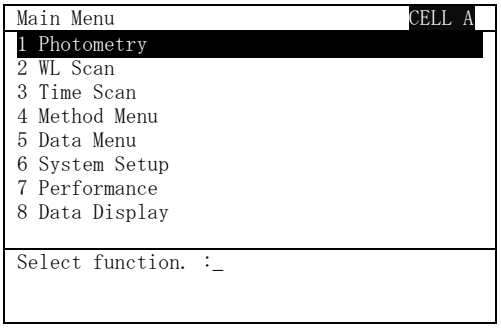


Fig. 2-29 Main Menu Screen

3. System Setup Screen

The System Setup screen (Fig. 2-30) appears. To select “6 Cell Mode”, press the <5> key (6 Cell Mode) and then [ENTER] key. Or select “6 Cell Mode” with the [▲] or [▼] key and press the [ENTER] key.

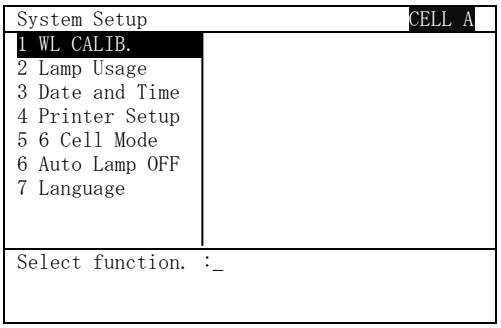


Fig. 2-30 System Setup Screen

4. Setting of 6-cell Mode

(1) The 6-cell mode setting screen (Fig. 2-31) appears. Select the item indicated and make your entry. For details, refer to Table 2-10.

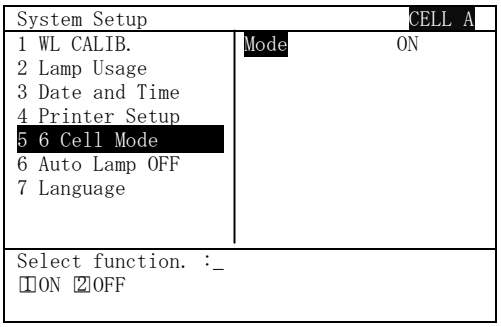


Fig. 2-31 6-Cell Mode Setting Screen

Table 2-10 6 Cell Mode Setting Item

Setting Item	Description
Mode	Select whether to validate control of the 6-cell turret. [1] ON : Selected for use of the 6-cell turret. [2] OFF : Selected for use of the optionally available single cell holder or rectangular long path cell holder.

(2) After completion of setting, return to the Main Menu screen with the [RETURN] key.

NOTE: 6 Cell Mode ON/OFF setting can be changed upon reading the measuring conditions from the Method Menu (for details, refer to section 4.2.1), executing auto start (for details, refer to section 4.5) or reading data from the Data Menu (for details, refer to section 4.1.1).

2.5.5 Selection of Language

You can select a language on the data display in the following procedure.

1. Startup of Instrument

   Start the instrument according to section 2.3.1.

2. Main Menu Screen

   The Main Menu screen (Fig. 2-32) appears. To select “System Setup”, press the <6> key (System Setup) and then [ENTER] key. Or select “System Setup” with the [▲] or [▼] key and press the [ENTER] key.

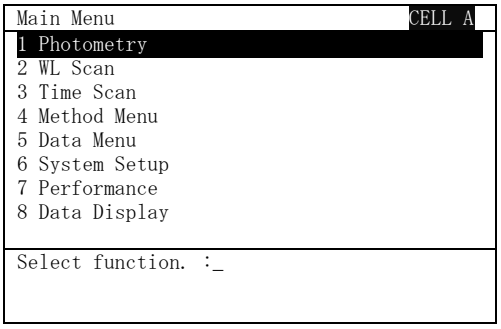


Fig. 2-32 Main Menu Screen

3. System Setup Screen

   The System Setup screen (Fig. 2-33) appears. To select “Language”, press the <7> key (Language) and then [ENTER] key. Or select “Language” with the [▲] or [▼] key and press the [ENTER] key.

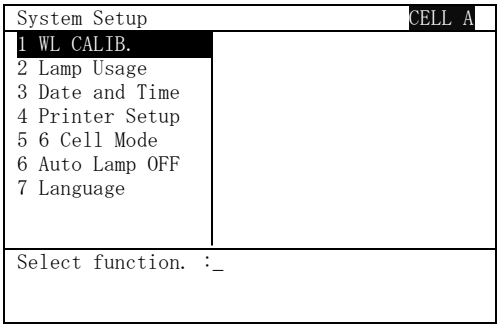


Fig. 2-33 System Setup Screen

4. Selection of Language

(1) The language selection screen (Fig. 2-34) appears. Select the item indicated and make your entry. For details, refer to Table 2-11.

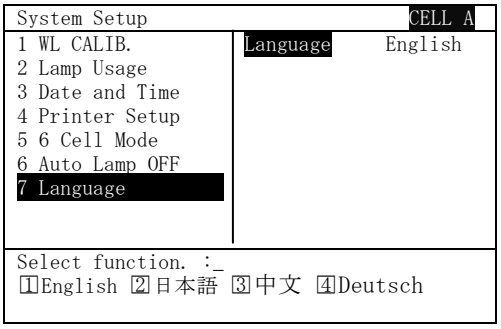
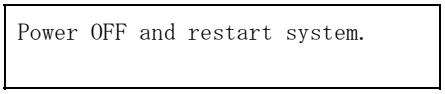


Fig. 2-34 Language Selection Screen

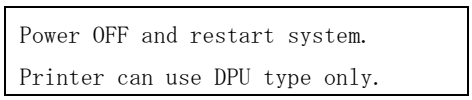
Table 2-11 Language Setting Item

Setting Item	Description
Language	Select a language to be displayed by the instrument. [1] English : Sets English display. [2] 日本語 : Sets Japanese display. [3] 中文 : Sets Chinese display. [4] Deutsch : Sets German display.

(2) After completion of setting, a guide message “Power OFF and restart system.” is indicated. Power off the instrument and then restart it. Its language will be changed.



Note: When 中文 is selected, “Printer can use DPU type only.” is displayed. The printer can use only DPU.



3. FIRST MEASUREMENT

3.1 What this Product can Do

Determination of Solution Concentration:
This product can measure the absorbance of a solution and determine the concentration from the measured value.

Automatic continuous measurement → section 3.2.1.
Sample-by-sample measurement → section 3.3.1.

Measurement of Absorbance/Transmittance:
This product can measure the absorbance and transmittance of a solution at a maximum of 6 wavelengths.

Automatic continuous measurement → section 3.2.2.
Sample-by-sample measurement → section 3.3.2.

Estimation of DNA Purity:
This product can measure the sample absorbance (at 230 nm, 260 nm, 280 nm and 320 nm) and calculate the absorbance ratio (A260/A280 or A260/A230) for DNA purity check.

Automatic continuous measurement → section 3.2.3.
Sample-by-sample measurement → section 3.3.3.

Measurement of Spectrum:
This product can measure the absorption spectrum or transmission spectrum of a sample.

Measurement after automatic baseline Correction → section 3.2.4.
Sample-by-sample measurement → section 3.3.4.

Measurement of Time Scan:
This product can measure the absorbance or transmittance of a sample at a specified wavelength. → section 3.3.5.

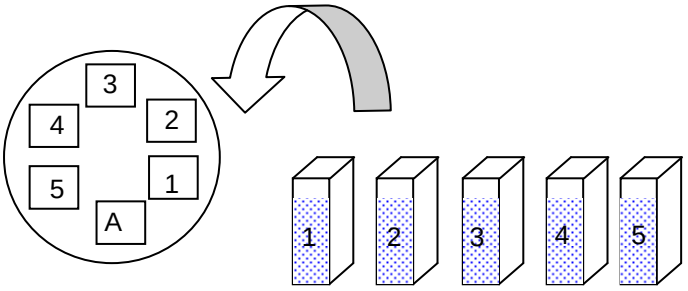
⚠ CAUTION

Fatigue due to Long-hour Operation

Operating the instrument while watching the display in the same posture for long hours will cause fatigue of the eyes and body. When working with the display for a long time, take a break for 10 to 15 minutes every hour to relax your eyes and body.

3.2 Automatic Continuous Measurement (6-cell auto mode)

Up to 6 samples can be measured automatically (auto zero sample is contained; spectrum measurement is excluded.). Automatic absorbance zero correction or baseline correction is possible by using the position of cell A.



Determination of Solution Concentration → section 3.2.1.
Generation of calibration curve and determination of unknown sample concentration → section 3.2.1
Determination of unknown sample concentration by entered calibration curve factor → section 3.2.1.
Determination of unknown sample concentration from saved calibration curve → section 4.1.4.
Measurement of Absorbance/Transmittance → section 3.2.2.
Measurement of DNA Purity → section 3.2.3.
Measurement of Spectrum → section 3.2.4.

3.2.1 Determining Concentration of Solution

This instrument is used for generating a calibration curve and determining the concentration of an unknown sample, and for entering a calibration curve factor and determining the concentration of an unknown sample.

Guide: When auto start is specified, the system automatically sets up the conditions and advances to the measurement screen phase of sequence after the power switch is turned on. For how to specify auto start, refer to section 4.5.

1. Startup of This Product

   Start this product. (For the starting procedure, refer to section 2.3.)

2. Setting of Measuring Conditions

   (1) Press the [MAIN MENU] key. The Main Menu screen (Fig. 3-1) will appear. To set each condition for quantitative calculation, press the <1> key (Photometry) and then [ENTER] key. Or select “Photometry” with the [▲] or [▼] key and press the [ENTER] key.

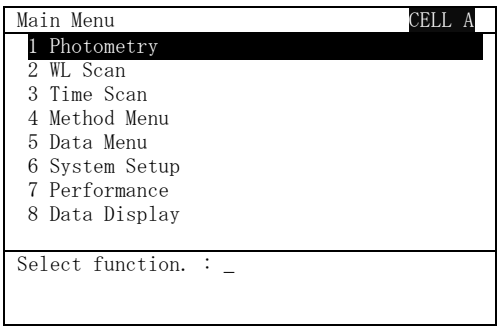


Fig. 3-1 Main Menu Screen

   (2) The Photometry screen (Fig. 3-2) appears. To set the measuring conditions, press the <1> key (Meas. PARAM.) and then [ENTER] key. Or select “Meas. PARAM.” with the [▲] or [▼] key and press the [ENTER] key or [►] key.

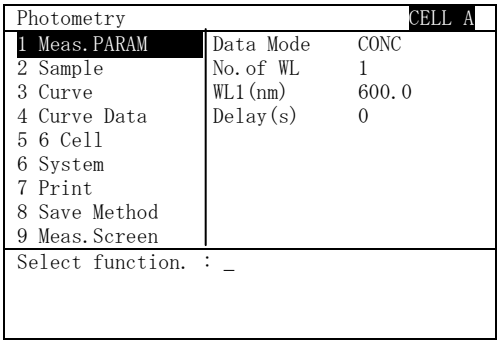


Fig. 3-2 Photometry Screen

(3) The measuring condition (Meas. PARAM.) screen (Fig. 3-3) appears. To select concentration measurement (CONC) in Data Mode, press the <1> key (CONC) and then [ENTER] key. After that, with the [▲] or [▼] key, set the number of wavelengths (No. of WL), wavelength (WL) and initial delay (Delay). For details of each parameter, refer to Table 3-1 and Explanation 3-1.

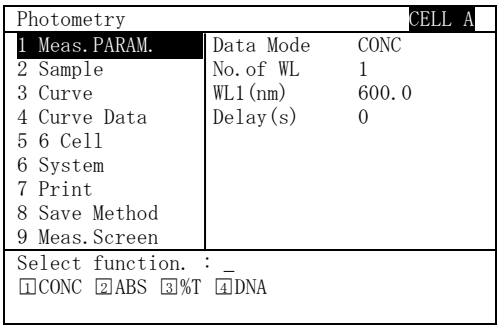
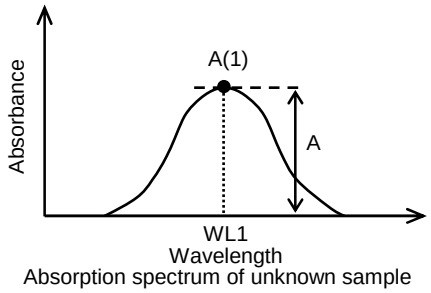
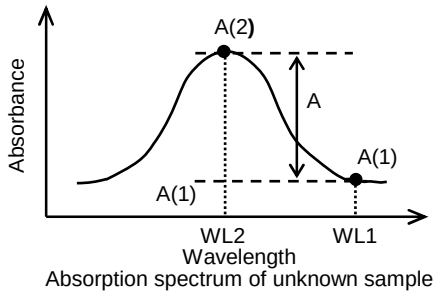
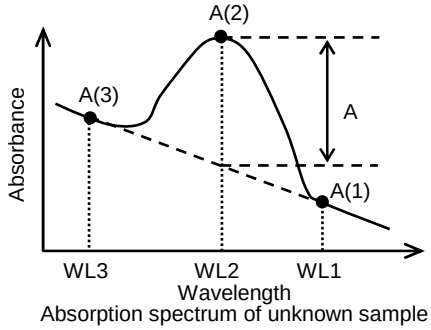


Fig. 3-3 Measuring Condition (Meas. PARAM.) Screen

Table 3-1 "Meas. PARAM." Setting Parameters

Setting Item	Description
Data Mode	For measuring the concentration of a solution, select [1] CONC. [1] CONC [2] ABS : Used for measuring the absorbance. (For details, refer to section 3.2.2.) [3] %T : Used for measuring the transmittance. (For details, refer to section 3.2.2.) [4] DNA : Used for estimating the purity of DNA. (For details, refer to section 3.2.3.)
No. of WL	Set the number of wavelengths to be used for measurement. Normally specify "1". When subtracting background absorption, specify "2" or "3". (→ For details of setting, refer to Explanation 3-1.)
WL1 (nm) to WL3 (nm)	Enter a wavelength to be used for measurement. This parameter is settable in a range of 190.0 to 1100.0 nm in steps of 0.1 nm. When "1" is set for No. of WL: Enter a wavelength to be used for measurement for WL1. When "2" is set for No. of WL: For WL1, enter a wavelength at which background absorption is obtained. For WL2, enter a wavelength at which absorption deriving from the target substance for quantitative determination is obtained. In so doing, it is required that WL1 > WL2. When "3" is set for No. of WL: For WL1 and WL3, enter a wavelength at which background absorption is obtained. For WL3, enter a wavelength at which absorption deriving from the target substance for quantitative determination is obtained. In so doing, it is required that WL1 > WL2 > WL3.
Delay (s)	After the [START] key is pressed, the system waits for the time period set here and then starts measurement. This parameter is settable in a range of 0 to 9999 sec in steps of 1 sec. Set this parameter when you want to start measurement after a specified time period, including when measuring a sample after its temperature reaches the room temperature or to start measurement after completion of reaction. Enter "0" if the delay time need not be set.

Explanation 3-1 Setting of Number of Wavelengths

Number of Wavelengths	Description
1	Most generally used. Specify a wavelength for WL1. A calibration curve is generated from obtained absorbance A and the concentration of an unknown sample is determined. $A = A(1)$  Absorption spectrum of unknown sample
2	Effective when the background is flat. For WL2, specify a wavelength at which absorption deriving from the target substance for quantitative determination is obtained and for WL1, specify a wavelength at which background absorption is obtained. Absorbance A is calculated by the equation given below replacing the obtained absorbance values with A(2) and A(1). A calibration curve is generated from the value thus calculated and the concentration of an unknown sample is determined. $A = A(2) - A(1)$  Absorption spectrum of unknown sample
3	Effective When a sample is turbid or the background is not flat. Absorbance A is calculated by the equation given below replacing the absorbance values at 3 wavelengths with A(1), A(2) and A(3). A calibration curve is generated from the value thus calculated and the concentration of an unknown sample is determined. $A = A(2) - \dfrac{(WL1 - WL2) \times A(3) + (WL2 - WL3) \times A(1)}{WL1 - WL3}$ (where, $WL1 > WL2 > WL3$)  Absorption spectrum of unknown sample

(4) After completion of setting, return to the Photometry screen by pressing the [RETURN] key or [◄] key.

3. Setting of Sample Conditions

(1) To set the sample conditions, press the <2> key (Sample) and then [ENTER] key. Or select “Sample” with the [▲] or [▼] key and press the [ENTER] key or [►] key.

(2) The sample condition (Sample) screen (Fig. 3-4) appears.

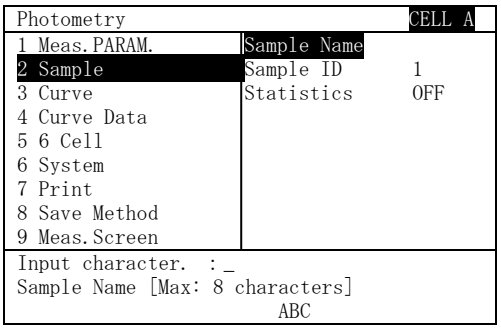


Fig. 3-4 Sample Condition (Sample) Screen

(3) To enter/select the sample conditions, press the [ENTER] key. Or select each item with the [▲] or [▼] key and make your setting. For details of each parameter, refer to Table 3-2.

(4) After setting the sample name (Sample Name), sample number (Sample ID), statistical calculation (Statistics) and number of calculations (No. of Calc), return to the Photometry screen by pressing the [RETURN] key or [◄] key.

Table 3-2 "Sample" Setting Parameters

Setting Item	Description
Sample Name	Up to 8 characters can be entered for the sample name. The sample name entered here is printed in the sample name field on the report. For the character input procedure, refer to section 2.4.3.
Sample ID	Set the first number to be assigned for sample numbering. This parameter is settable in a range of 1 to 9999. If "9999" is specified for Sample ID, the samples are numbered 9999 $\rightarrow$ 1 $\rightarrow$ 2 ....
Statistics	Specify whether to perform statistical calculation. 1) ON : Statistical calculation is carried out. 2) OFF : Statistical calculation is not carried out. In statistical calculation, the mean value (MEAN), standard deviation (SD) and relative standard deviation (RSD) are calculated according to the equations given below for the quantitative values of samples. This calculation is carried out for every number of calculations (N) set by the following parameter. [Mean value] $MEAN = \frac{\sum_{i=1}^{N} X_i}{N}$ (N = Number of calculations) [Standard deviation] $SD = \sqrt{\left(\sum_{i=1}^{N} {X_i}^2\right) - \left(\sum_{i=1}^{N} X_i\right)^2 \Big/ N \over N-1}$ (N = Number of calculations) [Relative standard deviation] $RSD = \frac{SD}{MEAN} \times 100$
No. of Calc	This parameter is indicated when ON is specified for Statistics. Set the number of samples for statistical calculation. The number is settable in a range of 2 to 100. If "3" is set for No. of Calc, statistical calculation is carried out for every 3 samples.

4. Setting of Calibration Curve Conditions

(1) To set the calibration curve conditions, press the <3> key (Curve) and then [ENTER] key. Or select “Curve” with the [▲] or [▼] key and press the [ENTER] key or [►] key.

(2) The calibration curve condition (Curve) screen (Fig. 3-5) appears.

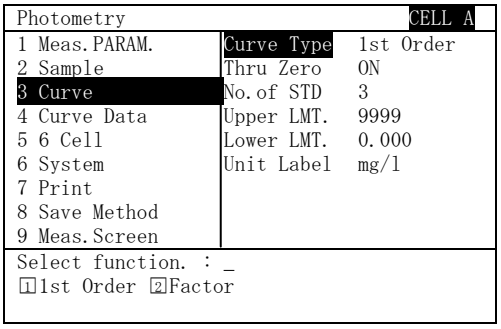


Fig. 3-5 Calibration Curve Condition (Curve) Screen

(3) To enter/select the calibration curve conditions, press the [ENTER] key. Or select each item by pressing the [▲] or [▼] key and make your setting. For details of each parameter, refer to Table 3-3.

(4) After setting the calibration curve type (Curve Type), through-zero function (Through Zero), upper concentration limit (Upper LMT.), lower concentration limit (Lower LMT.) and concentration unit (Unit Label), return to the Photometry screen by pressing the [RETURN] key or [◄] key.

Table 3-3 "Curve" Setting Parameters

Setting Item	Description
Curve Type	Select a method for calculating the concentration of an unknown sample from the following two. 1) 1st Order : Standards (standard solutions) are measured, regression analysis (least-squares method) is made based on the relationship between the standard concentrations and obtained absorbance to generate a calibration curve. The concentration of an unknown sample is determined from the calibration curve thus obtained. [Calculation formula] For the calculation formula for the calibration curve factor, refer to Explanation 3-2. 2) Factor : The slope and intercept of a calibration curve are entered and the concentration of an unknown sample is determined based on its factor. This method is used for determining the concentration according to the literature or calibration curve data measured with other instrument, or for calculating the concentration by using the molar absorption coefficient or ratio absorbance to multiply the absorbance by factor. [Calculation formula] • When ABS = f(CONC) is selected for Curve (calibration curve formula) on System screen $Y = A1 \cdot X + A0$ $X = (Y - A0) / A1$ • When CONC = f(ABS) is selected for Curve (calibration curve formula) on System screen $X = A1 \cdot Y + A0$ where, X : Quantitative value of unknown sample Y : Absorbance of unknown sample (measurement result) $A0, A1$: Input values
Thru Zero	Select generation of a calibration curve which is forced through the origin (concentration 0, absorbance 0) or generation of a calibration curve which is not forced through the origin. 1) ON : A calibration curve which is forced through the origin is generated. 2) OFF : A calibration curve which is not forced through the origin is generated.

(cont'd)

Setting Item	Description
Thru Zero	When ON is selected, regression analysis is made taking the intercept of the calibration curve as zero. When OFF is selected, regression analysis is made with the intercept of the calibration curve. For calculation of the regression formula, refer to Explanation 3-2. For details of usage, refer to Explanation 3-3 and Explanation 3-4.
No. of STD	Set the number of standards (standard solutions) to be measured in a range of 1 to 20. Note that "1" is settable only when ON is selected for Thru Zero.
Upper LMT.	If the result of quantitative determination is larger than the set value, "HI" is printed at the side of the result. This indication is used for readily checking if the result is within the normal concentration range. This parameter is settable in a range of 0 to 9999.
Lower LMT.	If the result of quantitative determination is smaller than the set value, "LO" is printed at the side of the result. This indication is used for readily checking if the result is within the normal concentration range. This parameter is settable in a range of 0 to 9999.
Unit Label	Up to 8 characters can be entered for the unit of concentration. (mg/L, %, mol/L and ppm for example) For the character input procedure, refer to section 2.4.3.

Explanation 3-2 How to Calculate Regression Formula

Calibration Curve Formula (system condition)	Thru Zero ON	Thru Zero OFF
Abs = f(Conc.)	Regression formula: $Y = A1 \cdot X$ $A1 = \frac{\sum X_n Y_n}{\sum X_n^{\,2}}$	Regression formula: $Y = A1 \cdot X + A0$ $A0 = \frac{\left(\sum X_n^{\,2}\right)\left(\sum Y_n\right) - \left(\sum X_n\right)\left(\sum X_n Y_n\right)}{n\left(\sum X_n^{\,2}\right) - \left(\sum X_n\right)^2}$ $A1 = \frac{n\left(\sum X_n Y_n\right) - \left(\sum X_n\right)\left(\sum Y_n\right)}{n\left(\sum X_n^{\,2}\right) - \left(\sum X_n\right)^2}$
Conc. = f(Abs)	Regression formula: $X = A1 \cdot Y$ $A1 = \frac{\sum Y_n X_n}{\sum Y_n^{\,2}}$	Regression formula: $X = A1 \cdot Y + A0$ $A0 = \frac{\left(\sum Y_n^{\,2}\right)\left(\sum X_n\right) - \left(\sum Y_n\right)\left(\sum Y_n X_n\right)}{n\left(\sum Y_n^{\,2}\right) - \left(\sum Y_n\right)^2}$ $A1 = \frac{n\left(\sum Y_n X_n\right) - \left(\sum Y_n\right)\left(\sum X_n\right)}{n\left(\sum Y_n^{\,2}\right) - \left(\sum Y_n\right)^2}$

X : Standard concentration
Y : Obtained standard absorbance
n : Number of standards

5. Setting of Calibration Curve Data

(1) To set the calibration curve data, press the <4> key (Curve Data) and then [ENTER] key. Or select "Curve Data" with the [▲] or [▼] key and press the [ENTER] key or [►] key.

[When Curve - Curve Type: 1st Order is selected]

(2) The calibration curve data (Curve Data) screen (Curve Type: 1st Order) (Fig. 3-6) appears.

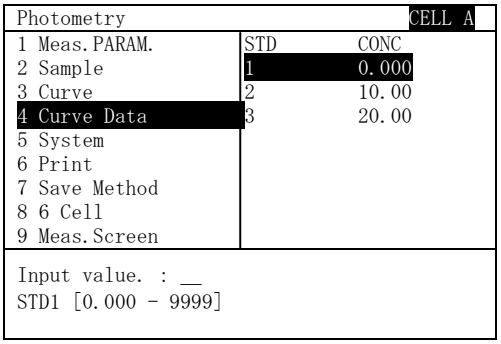


Fig. 3-6 Calibration Curve Data (Curve Data) Screen (Curve Type: 1st Order)

(3) Enter the concentration of each standard (standard solution). After that, press the [ENTER] key.
You can enter the concentration of each standard by using the [▲] or [▼] key. Here, key in the concentration values according to the number of standards entered on the calibration curve condition (Curve) screen. The concentration can be entered in a range of 0.000 to 9999.

[When Curve - Curve Type: Factor is selected]

(2)' The calibration curve data (Curve Data) screen (Curve Type: Factor) (Fig. 3-7) appears.

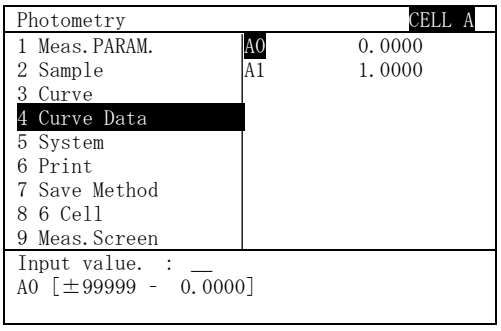
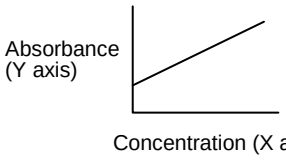
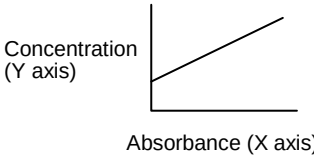


Fig. 3-7 Calibration Curve Data (Curve Data) Screen (Curve Type: Factor)

(3)' Enter calibration curve factors. After that, press the [ENTER] key. You can enter each factor by using the [▲] or [▼] key. The factor can be entered in 5 significant digits in a range of 0.0000 to ±99999.
For how to set the calibration curve factors, refer to Table 3-4.

Table 3-4 How to Set Calibration Curve Factors

	[Normal Usage] **Calibration Curve Formula (system condition):** **ABS = f(CONC)**	**Calibration Curve Formula (system condition):** **CONC = f(ABS)**
Calculation formula	Absorbance = A1 × Concentration + A0 Concentration = (Absorbance - A0)/A1	Concentration = A1 × Absorbance + A0
Use of literature value or calibration curve data measured with other instrument	 Enter A1: Slope value and A0: Y-intercept value with the absorbance on the Y axis and the concentration on the X axis.	 Enter A1: Slope value and A0: Y-intercept value with the concentration on the Y axis and the absorbance on the X axis.
Use of molar absorption coefficients	When the molar absorption coefficient is ε ($M^{-1}cm^{-1}$), the optical path length of cell is L (cm) and the concentration is C (μM), Absorbance = εCL/1000. For determining concentration C, enter A1: εL/1000 and A0: 0.	When the molar absorption coefficient is ε ($M^{-1}cm^{-1}$), the optical path length of cell is L (cm) and the concentration is C (μM), Absorbance = εCL/1000. For determining concentration C, enter A1: 1000/εL and A0: 0.
Use of ratio absorbance	When the molar absorption coefficient is $E^{1\%}_{1cm}$, the optical path length of cell is L (cm) and the concentration is C (mg/L), Absorbance = $E^{1\%}_{1cm}$CL/10000. For determining concentration C, enter A1: $E^{1\%}_{1cm}$L/10000 and A0: 0.	When the molar absorption coefficient is $E^{1\%}_{1cm}$, the optical path length of cell is L (cm) and the concentration is C (mg/L), Absorbance = $E^{1\%}_{1cm}$CL/10000. For determining concentration C, enter A1: 10000/$E^{1\%}_{1cm}$L and A0: 0.

(4) After setting each standard concentration or calibration curve factors, return to the Photometry screen by pressing the [RETURN] key or [◄] key.

6. Setting of 6-cell Conditions

> **NOTE**: "6 Cell Mode" is not indicated if OFF is specified for Mode on the 6-cell mode setting screen for use of the single cell holder or rectangular long path cell holder. (For details, refer to section 2.5.4.) When the auto sipper is connected, "Sipper" is indicated in place of "6 Cell Mode".

(1) To set the 6-cell conditions, press the <5> key (6 Cell) and then [ENTER] key. Or select "6 Cell" with the [▲] or [▼] key and press the [ENTER] key or [►] key.

(2) The 6-cell condition (6 Cell) screen (Fig. 3-8) appears (Curve Type: 1st Order).

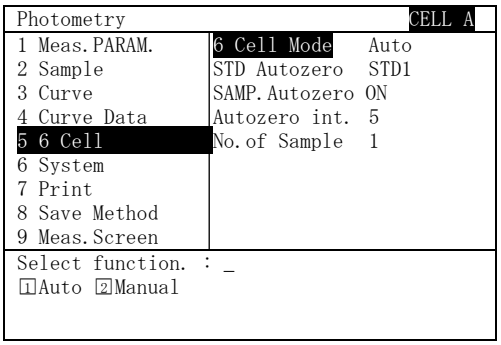


Fig. 3-8 6-cell Condition (6 Cell) Screen

(3) To set each item on the 6-cell condition (6 Cell) screen, press the [ENTER] key. Or select each item with the [▲] or [▼] key and make your setting according to the guidance. For details of each parameter, refer to Table 3-5.

(4) After selection/input of the 6-cell mode (6 Cell Mode), calibration curve auto zero (STD Autozero), sample auto zero (SAMP. Autozero), auto zero interval (Autozero int.) and number of samples (No. of Sample), return to the Photometry screen by pressing the [RETURN] key or [◀] key.

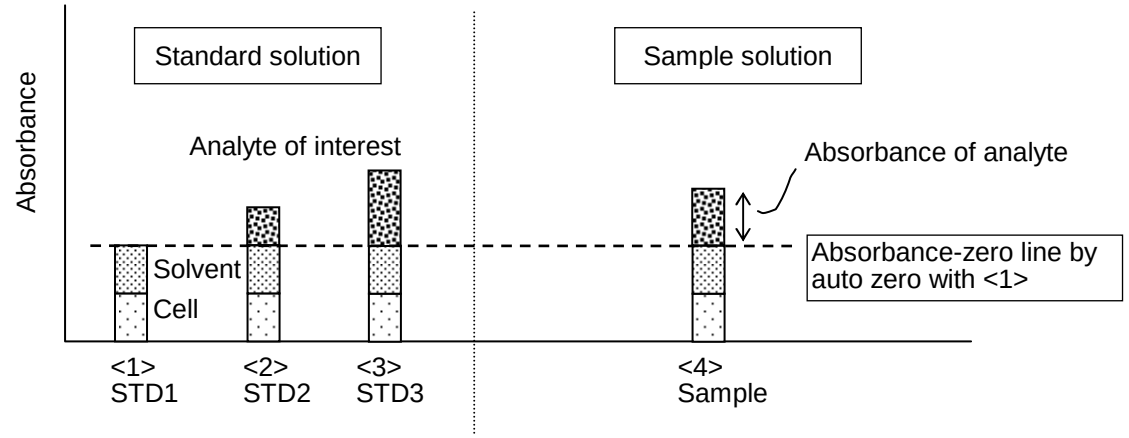
Table 3-5 "6 Cell" Setting Parameters

Setting Item	Description
6 Cell Mode	Specify a 6-cell operation mode for measurement. 1) Auto In this mode, a sample is set at each position of the 6-cell turret beforehand and the holder is automatically turned to automatically perform from auto zero to standard/sample measurement. It is recommended to use this mode if you have 6 cells and there are many samples to be measured. 2) Manual In this mode, standard/sample measurement is carried out by using one position (cell 1 to 5 selectable) of the 6-cell turret. To eliminate the influence of instrument drift (baseline fluctuation) during measurement, auto zero can easily be executed by setting a solution for auto zero to cell A. In normal usage, set a standard or sample solution to cell 1. (For details of the manual mode, refer to section 2.5.4.)

(cont'd)

Setting Item	Description
Curve Autozero (indicated only when 1st Order is selected for Curve Type)	Select a sample to be used for auto zero (operation for adjusting the absorbance to zero) in standard measurement between STD1 and Blank. 1) STD1 Selected when the auto zero sample in standard measurement is a standard solution whose concentration is 0 (STD1). In standard measurement, auto zero is automatically performed with STD1. With STD1 selected, the absorbance is adjusted to 0 with a solution whose concentration is 0. It is therefore recommended to specify 1) ON for Thru Zero in Table 3-3. 2) Blank Selected when the auto zero sample in standard measurement is other than a standard solution whose concentration is 0 (blank). In standard measurement, auto zero is automatically performed with this blank solution. Normally, select 2) OFF set for Thru Zero in Table 3-3. * For details of setting, refer to Explanation 3-3 and Explanation 3-4.
SAMP. Autozero	You can select a sample for auto zero in sample measurement or specify avoidance of automatic execution of auto zero. 1) ON Selected when the auto zero sample in sample measurement is the same as the one in standard measurement. Auto zero is automatically carried out. 2) Sample Blank Selected when the auto zero sample in sample measurement is a sample blank. Auto zero is automatically carried out with the sample blank. Used for calculating the quantitative value by subtracting the sample blank absorbance from the sample absorbance. 3) OFF Auto zero is not carried out automatically in sample measurement. You can carry out auto zero manually. * For details of setting, refer to Explanation 3-3 and Explanation 3-4.
Autozero int.	1) 5 Auto zero is automatically carried out for every 5 measurements. 2) 1 Auto zero is automatically carried out for each sample.
No. of Sample	Set the number of samples to be measured. The number is settable in a range of 1 to 150.

Explanation 3-3 How to Set 6-cell Measurement Parameters without Coloring Reagent

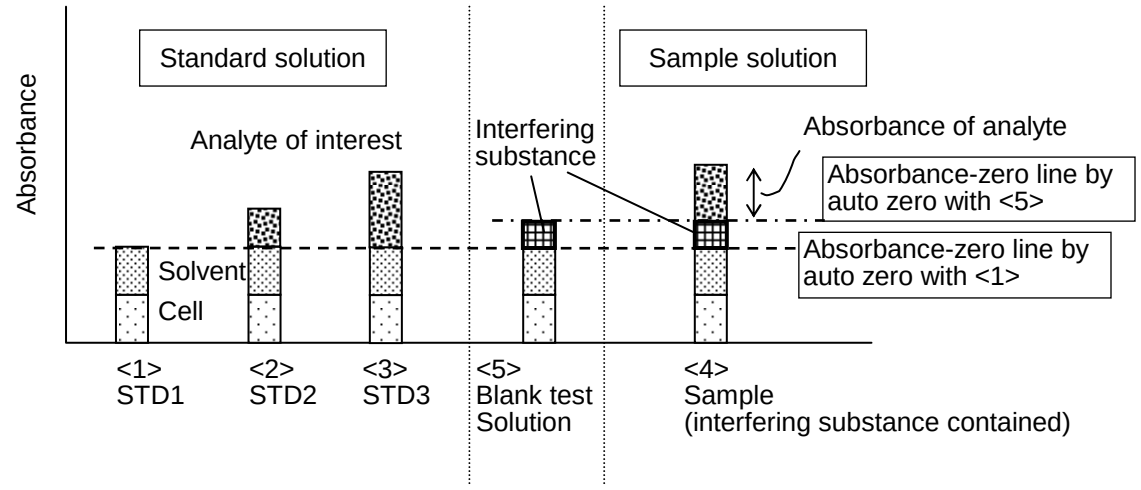


Elements causing absorbance without using coloring reagent (not containing interfering substance)

A measured absorbance value is given as a total of absorptions due to various elements (cell, solvent, coloring reagent, analyte of interest, interfering substance). In other words, this value does not simply stand for an absorption due to the analyte alone.

For generating a calibration curve according to concentration levels 0, 1 and 2, solutions of concentration levels 0, 1 and 2 are prepared for STD1, STD2 and STD3, respectively (see <1> to <3> in the above figure). These STD's have absorptions due to cell, solvent and analyte. However, the absorbance required for actual quantitation is the one deriving from the analyte. Therefore, absorptions due to cell and solvent need to be subtracted (by auto zero operation). In this case, auto zero is carried out with STD 1 and the absorbance values of STD1 to STD3 are measured, thereby generating a calibration curve.

And, for sample quantitation, the concentration of the sample is determined using the absorbance after exclusion of cell and solvent. When the absorption other than those due to cell and solvent derives from the analyte alone, the determined concentration equals the concentration of the analyte as illustrated at <4> in the above figure. For quantitation of this sample with 6 Cell Mode set to Auto, the STD Autozero, SAMP. Autozero and Thru Zero are set to STD1, ON or OFF and ON, respectively. (Refer to the measurement parameters in "A" of the following table.)



Elements causing absorbance without using coloring reagent (containing interfering substance)

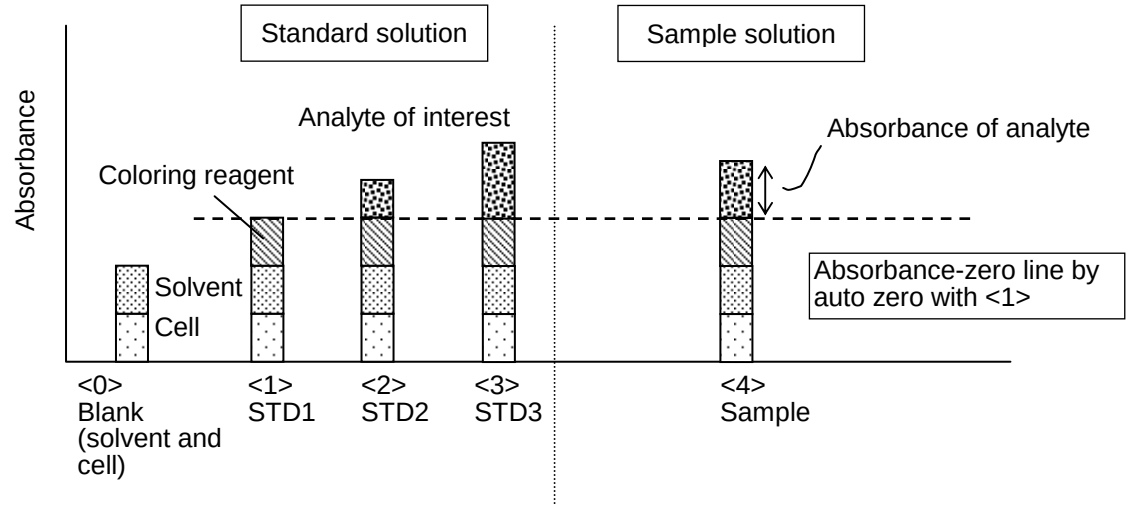
(cont'd)

In the case where a sample contains an interfering substance such as turbid or disturbing component as illustrated at <6> in the above figure, the absorbance due to the interfering substance will be added to the quantitative value of the analyte.
In this case, it is necessary to carry out a blank test (the same preparatory operation as for samples by use of pure water or the like) and subtract the measured absorbance of the blank test solution by auto-zero operation at the time of sample measurement or subtract the quantitative value of the blank test solution from that of the sample in order to subtract the absorbance of the interfering substance from that of the sample. For quantitation of the sample with 6 Cell Mode set to Auto and subtraction by auto zero, the STD Autozero, SAMP. Autozero and Thru Zero are set to STD1, SAMP. BLK and ON, respectively. (Refer to the measurement parameters in "B" of the following table.)

Setting of Each Measurement Parameter without Coloring Reagent

Application	**A: Usual Method (in case of sample <4>)**		**B: Correction with Blank Test Solution (in case of sample <6>)**
	Common Usage		**For Subtracting Absorbance of Blank Test Solution**
STD Autozero	STD1		STD1
SAMP. Autozero	ON	OFF	Sample Blank
Thru Zero	ON		ON

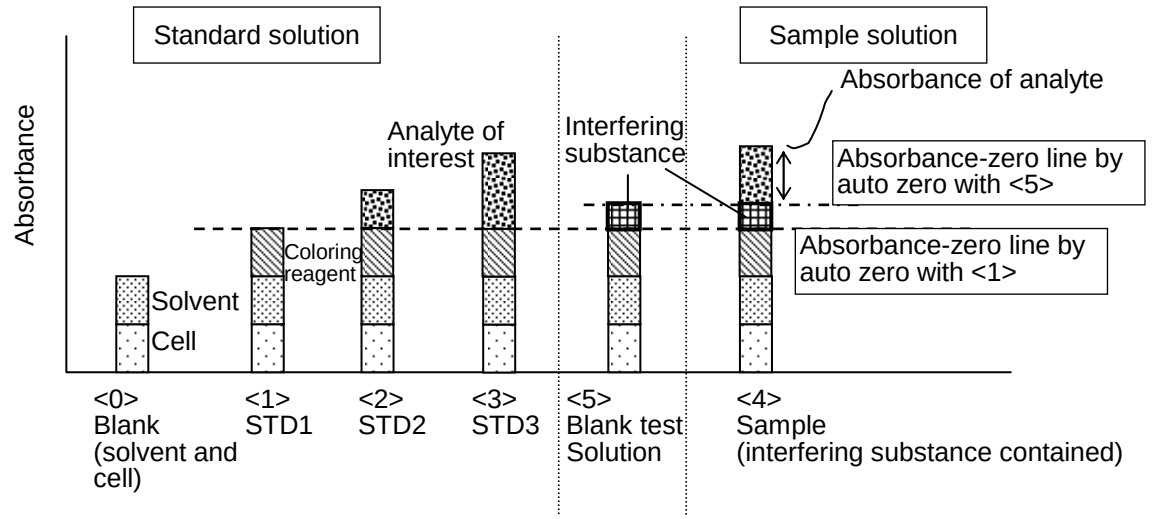
Explanation 3-4 How to Set 6-cell Measurement Parameters with Coloring Reagent



Elements causing absorbance with coloring reagent (not containing interfering substance)

When using a coloring reagent, the absorption of a sample solution includes that of this reagent besides those of cell and solvent. For subtracting the absorbance due to the coloring reagent as well, auto zero is carried out with the solution at <1> in the above figure.

For sample quantitation, the concentration of the sample is determined using the absorbance after exclusion of cell, solvent and coloring reagent. When the absorption other than those due to cell, solvent and coloring reagent derives from the analyte alone, the determined concentration equals the concentration of the analyte as illustrated at <4> in the above figure. For quantitation of this sample with 6 Cell Mode set to Auto, the STD Autozero, SAMP. Autozero and Thru Zero are set to STD1, ON or OFF and ON, respectively. (Refer to the measurement parameters in “D” of the following table.)
Also, when the absorbance of the solution at <1> in the above figure is unstable with time, the solution is not suited for auto zero operation. Therefore, it is recommended to carry out auto zero with the blank (sample). In this case, STD Autozero, SAMP. Autozero and Thru Zero are set to Blank, ON or OFF and ON, respectively. (Refer to the measurement parameters in “E” of the following table.)



(cont'd)

In the case where a sample contains an interfering substance such as turbid or disturbing component as illustrated at <6> in the above figure, the absorbance due to the interfering substance will be added to the quantitative value of the analyte. In this case, it is necessary to carry out a blank test (the same preparatory operation as for samples by use of pure water or the like) and subtract the measured absorbance of the blank test solution by auto-zero operation at the time of sample measurement or subtract the quantitative value of the blank test solution from that of the sample in order to subtract the absorbance of the interfering substance from that of the sample. For quantitation of the sample with 6 Cell Mode set to Auto and subtraction by auto zero, the STD Autozero, SAMP. Autozero and Thru Zero are set to STD1, Sample Blank and ON, respectively. (Refer to the measurement parameters in "F" of the following table.)

Setting of Each Measurement Parameter with Coloring Reagent

Application	**D: Usual Method (in case of sample <4>)**		**E: Auto Zero with Blank (in case of sample <4>)**		**F: Correction with Blank Test Solution (in case of sample <6>)**
	Common Usage (auto zero with STD1)		**When STD1 Absorbance is Unstable with Time (auto zero with blank)**		**For Subtracting Absorbance of Blank Test Solution**
STD Autozero	STD1		Blank		STD1
SAMP. Autozero	ON	OFF	ON	OFF	Sample Blank
Thru Zero	ON		OFF		ON

7. Setting of System Conditions

(1) To set the system conditions, press the <6> key (System) and then [ENTER] key. Or select “System” with the [▲] or [▼] key and press the [ENTER] key or [►] key.

(2) The system condition (System) screen (Fig. 3-9) appears. Set the condition for the calibration curve regression formula according to the guidance.
For detail, refer to Table 3-6.

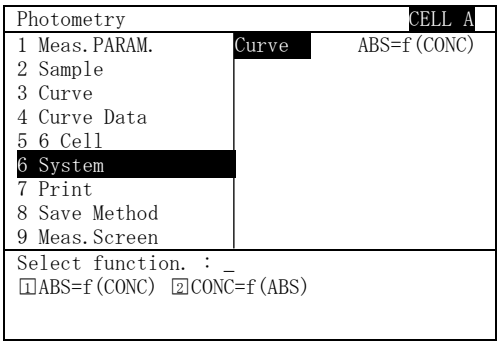


Fig. 3-9 System Condition (System) Screen

Table 3-6 “System” Setting Parameter

Setting Item	Description
Curve	Select a format for the calibration curve formula between the following two. 1) ABS = f(CONC) The calibration curve formula is expressed in the format of (Absorbance = A1 × Concentration + A0). This format is normally used. 2) CONC = f(ABS) The calibration curve formula is expressed in the format of (Concentration = A1 × Absorbance + A0). This format is used only when the reference calibration curve is expressed in the format of CONC = f(ABS), or when Factor is selected for Curve Type and the value obtained by adding a numerical value to the absorbance multiplied by factor is taken as a concentration.

(3) After setting the calibration curve factor (Factor), return to the Photometry screen by pressing the [RETURN] key or [◄] key.

8. Setting of Printing Conditions

> **GUIDE**: Specify print items if determined beforehand. You can also specify print items after completion of measurement. If you do not want to set the printing conditions here, proceed to step 9.

(1) To set the printing conditions, press the <7> key (Print) and then [ENTER] key. Or select “Print” with the [▲] or [▼] key and press the [ENTER] key or [►] key.

(2) The printing condition (Print) screen (Fig. 3-10) appears.

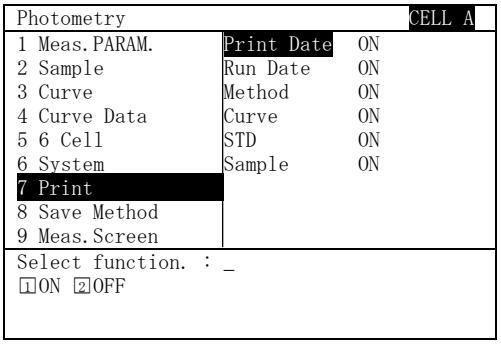


Fig. 3-10 Printing Condition (Print) Screen

(3) To select the printing conditions, press the [ENTER] key. Or select each item with the [▲] or [▼] key and make your setting according to the guidance.
For details of each parameter, refer to Table 3-7.

(4) After specifying whether to print out the printing date (Print Date), analysis date (Run Date), conditions (Method), calibration curve (Curve), standard data (STD) and sample data (Sample), return to the Photometry screen by pressing the [RETURN] key or [◄] key.

Table 3-7 “Print” Setting Parameters

Setting Item	Description	Location in Fig. 3-11
Print Date	[1] ON : Printing date is printed. [2] OFF : Printing date is not printed.	<1>
Run Date	[1] ON : Analysis date is printed. [2] OFF : Analysis date is not printed.	<2>
Method	[1] ON : Measuring conditions are printed. [2] OFF : Measuring conditions are not printed.	<3>
Curve	[1] ON : Calibration curve is printed. [2] OFF : Calibration curve is not printed.	<4>
STD	[1] ON : Results of standard measurement are printed. [2] OFF : Results of standard measurement are not printed.	<5>
Sample	[1] ON : Results of sample measurement are printed. [2] OFF : Results of sample measurement are not printed.	<6>

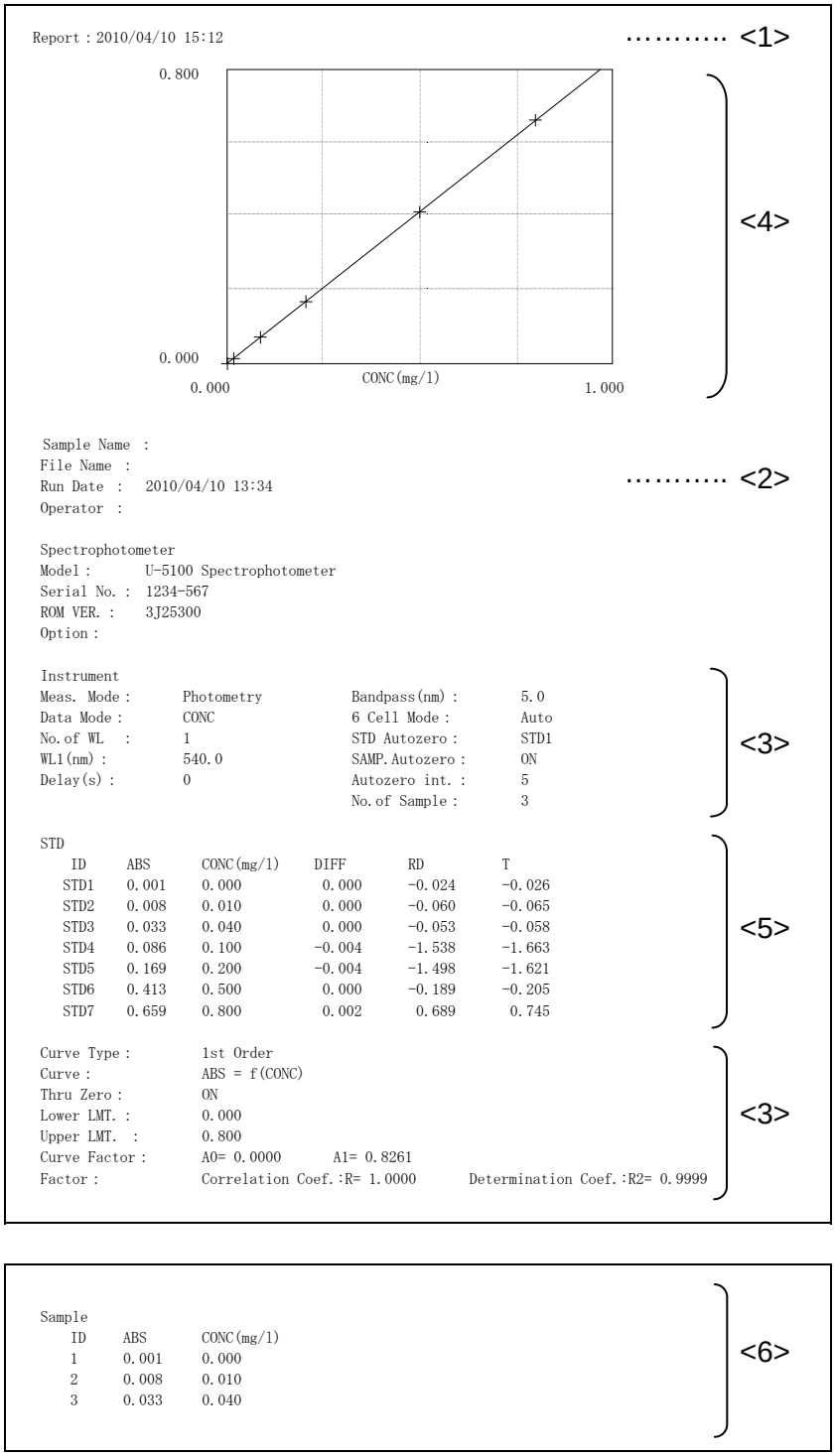


Fig. 3-11 Example of Printout in Photometry Mode

Setting of measuring conditions has now been completed.
For saving the set conditions, proceed to step 9. If they need not be saved, then proceed to step 10.

9. Saving of Measuring Conditions

> **GUIDE**: When the set measuring conditions need not be saved, proceed to step 10.

(1) To save the set measuring conditions, press the <8> key (Save Method) and then [ENTER] key. Or select "Save Method" with the [▲] or [▼] key and press the [ENTER] key or [►] key.

(2) The measuring condition saving (Save Method) screen (Fig. 3-12) appears.

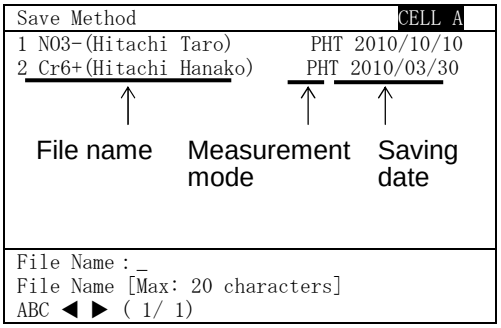


Fig. 3-12 Measuring Condition Saving (Save Method) Screen (with saved data)

(3) When other measuring conditions are saved in advance, a list of saved measuring conditions appears on the main menu. At this time, the file name, measurement mode (PHT: Photometry, WLS: Wavelength Scan, TMS: Time Scan) and saving date are indicated.

(4) For the measuring conditions to be saved, enter a file name within 20 characters and press the [ENTER] key.

NOTE:

- If a file of the same name as entered already exists in the same measurement mode, the following guidance appears.

  ```
  Already exists. Overwrite it? : ___
  [1]Yes  [2]No
  ```

  For overwriting, press the <1> key (Yes). To avoid overwriting, press the <2> key (No) and rename the file to be saved.
- A total of 50 method files can be saved for all measurement modes.
- If 50 files are already registered, the following message appears.

  ```
  No.of files is full.
  ```

  In this case, delete files referring to section 4.2.2 and retry saving.
- The method for which auto start (for details, refer to section 4.5) is set is preceded by "*".

(5) Return to the Photometry screen by pressing the [RETURN] key.

10. Measurement of Standard Solutions

GUIDE: When 2) Factor is selected for Curve Type in step 4, standard solution measurement is not carried out. So proceed to step 11.

(1) To determine the measuring conditions set in the preceding steps, press the <9> key (Meas. Screen) and then [ENTER] key. Or press the [MEAS. SCREEN] key.

(2) The standard setting screen (Fig. 3-13) appears.

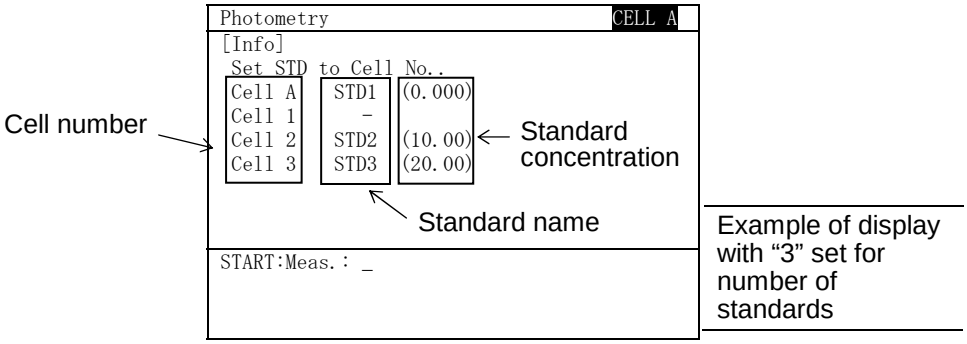


Fig. 3-13 Standard Setting Screen

On the screen, displayed from the left are the cell number, standard name and standard concentration. Set the corresponding standard to each cell. If “-” (hyphen) is indicated for the standard name, avoid setting a standard in the relevant cell. When STD1 is set for “STD Autozero”, set the cells as shown in Table 3-8. The instrument measures standards in the sequence shown in Table 3-9. When Blank is set for “STD Autozero”, set the cells as shown in Table 3-10. The instrument measures standards in the sequence shown in Table 3-11. Measurement is carried out for every 5 standards until the number set in “No. of STD” is reached.

Table 3-8 How to Set Cells with STD Selected for STD Autozero

	Cell A	Cell 1	Cell 2	Cell 3	Cell 4	Cell 5
1st round	STD1	Not set	STD2	STD3	STD4	STD5
2nd round	STD1	STD6	STD7	STD8	STD9	STD10
3rd round	STD1	STD11	STD12	STD13	STD14	STD15
4th round	STD1	STD16	STD17	STD18	STD19	STD20

Table 3-9 Auto Zero Interval and Operation of Instrument (1)

Sequence of Operation		Cell Position	Operation
Auto Zero Interval: 5	**Auto Zero Interval: 1**		
Setting of standards (1st round)			
1	1	Cell A	Auto zero
2	2	Cell A	STD1 measurement
—	3	Cell A	Auto zero
3	4	Cell 2	STD2 measurement
—	5	Cell A	Auto zero
4	6	Cell 3	STD3 measurement
—	7	Cell A	Auto zero
5	8	Cell 4	STD4 measurement
—	9	Cell A	Auto zero
6	10	Cell 5	STD5 measurement
Setting of standards (2nd round)			
7	11	Cell A	Auto zero
8	12	Cell 1	STD6 measurement
—	13	Cell A	Auto zero
9	14	Cell 2	STD7 measurement
Repeated until the specified number of standards are all measured.			

Table 3-10 How to Set Cells with Blank Selected for STD Autozero

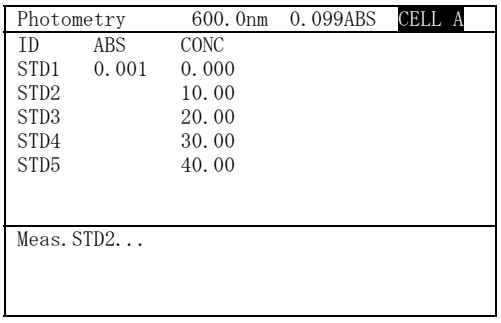
	Cell A	Cell 1	Cell 2	Cell 3	Cell 4	Cell 5
1st round	Blank	STD1	STD2	STD3	STD4	STD5
2nd round	Blank	STD6	STD7	STD8	STD9	STD10
3rd round	Blank	STD11	STD12	STD13	STD14	STD15
4th round	Blank	STD16	STD17	STD18	STD19	STD20

Table 3-11 Auto Zero Interval and Operation of Instrument (2)

Sequence of Operation		Cell Position	Operation
Auto Zero Interval: 5	**Auto Zero Interval: 1**		
Setting of standards (1st round)			
1	1	Cell A	Auto zero
2	2	Cell 1	STD1 measurement
—	3	Cell A	Auto zero
3	4	Cell 2	STD2 measurement
—	5	Cell A	Auto zero
4	6	Cell 3	STD3 measurement
—	7	Cell A	Auto zero
5	8	Cell 4	STD4 measurement
—	9	Cell A	Auto zero
6	10	Cell 5	STD5 measurement
Setting of standards (2nd round)			
7	11	Cell A	Auto zero
8	12	Cell 1	STD6 measurement
—	13	Cell A	Auto zero
9	14	Cell 2	STD7 measurement
Repeated until the specified number of standards are all measured.			

(3) Upon completion of setting, press the [START] key. Measurement will then start.

(4) During measurement, the screen shown in Fig. 3-14 is displayed.



Example of display with “5” set for number of standards

Fig. 3-14 Screen Displayed during STD2 Measurement

GUIDE: To stop measurement, press the [STOP] key.
To restart measurement, press the [START] key.

(5) When “6” or more is specified for “No. of STD”, the results obtained from measurement of STD1 to STD5 are indicated as shown in Fig. 3-15. This screen also appears after completion of 2nd/3rd-round measurement. Pressing the [START] key displays the next standard setting screen. Pressing the <1> key (Curve Confirmation) or <2> key (Remeasure) allows the processing or remeasurement shown in Table 3-12.

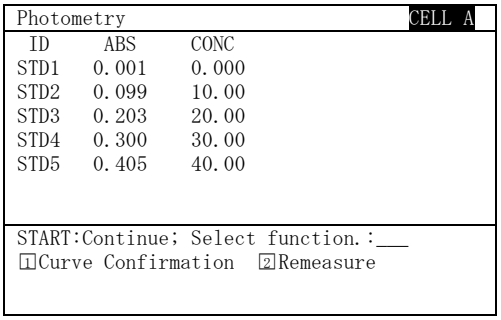
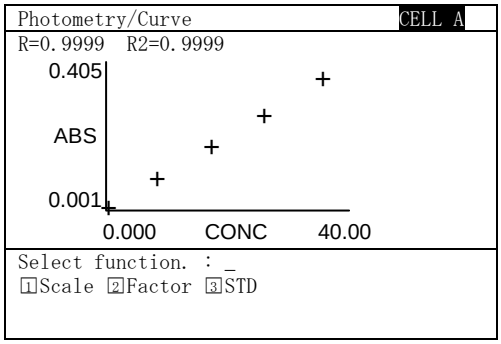


Fig. 3-15 Example of Display after 1st-round Standard Measurement

Table 3-12 Guidance during Standard Measurement

Setting Item	Description
[1] Curve Confirmation	You can generate a calibration curve with the standards measured before now and confirm it.  [1] Scale : Allows you to change the scale of calibration curve. [2] Factor : Indicates the factor, correlation coefficient and determination coefficient of calibration curve. [3] STD : Indicates the result of standard solution measurement.
[2] Remeasure	You can remeasure the last-measured standard.

(6) When the specified number of standards have all been measured, the screen shown in Fig. 3-16 appears. When you select the <1> key (Sample Meas.), the system terminates standard measurement and proceeds to sample measurement. Selecting the <2> key (Curve), <3> key (Save) and <4> key (Print) allows the processings shown in Table 3-13.

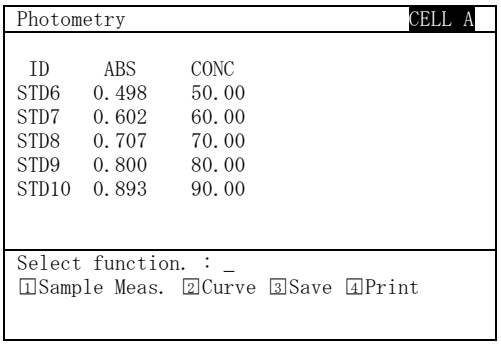
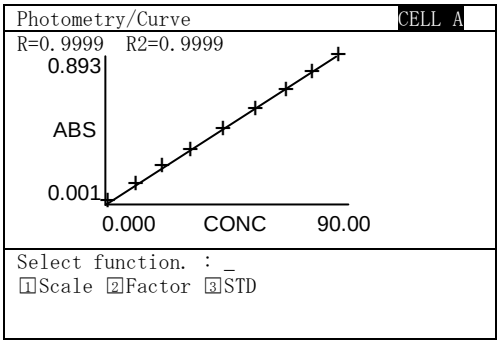
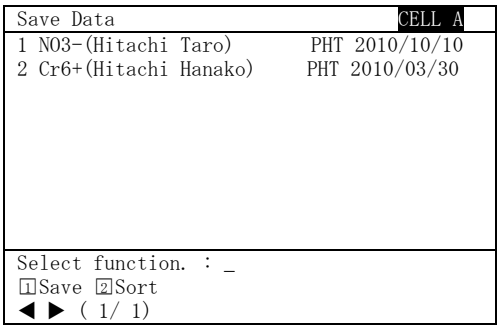
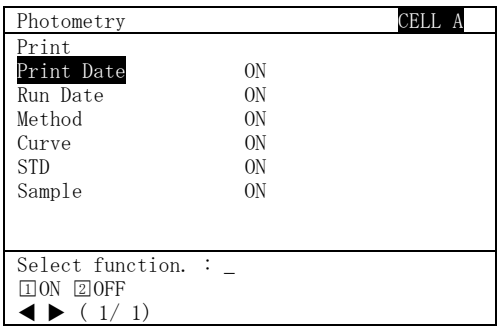


Fig. 3-16 Guidance after Standard Measurement (No. of STD: 10)

Table 3-13 Guidance after Standard Measurement

Setting Item	Description
[1] Sample Meas.	The system proceeds to sample measurement.
[2] Curve	You can generate a calibration curve with the measured standards and confirm it. When this function is selected, the following screen appears. 

(cont'd)

Setting Item	Description
[2] Curve	[1] Scale : Allows you to change the scale of calibration curve. [2] Factor : Indicates the factor, correlation coefficient and determination coefficient of calibration curve. [3] STD : Indicates the result of standard solution measurement. Also allows remeasurement of a standard solution, deletion of standard data unnecessary for generation of a calibration curve or retrieval of deleted data.
[3] Save	You can save the measured standard data. When this function is selected, the following screen appears.  [1] Save : Allows you to save the result data under a new file name. [2] Sort : Allows you to rearrange the presently saved data in the order of file names or dates.
[4] Print	You can select items to be printed. When this function is selected, the screen given below appears. For each item, specify whether to print out (ON or OFF). 

11. Measurement of Sample Solutions

(1) The sample setting screen (Fig. 3-17) appears.

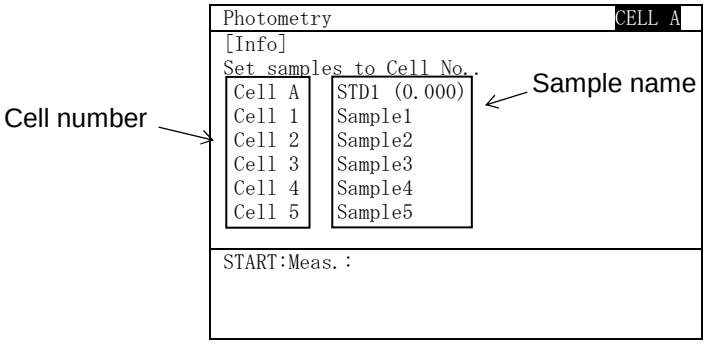
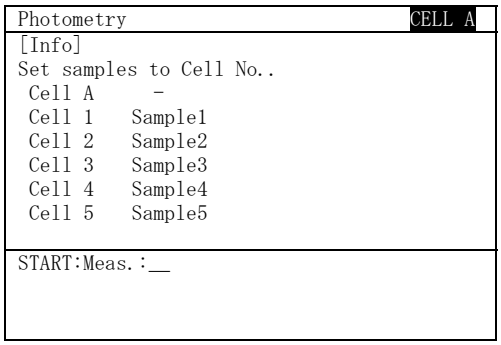


Fig. 3-17 Sample Setting Screen

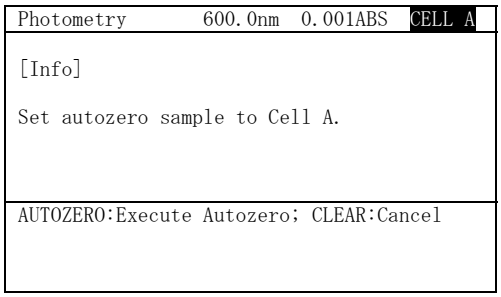
On the screen, displayed from the left are the cell number and sample name. Set the corresponding sample to each cell. If “-” (hyphen) is indicated for the sample name, avoid setting a sample in the relevant cell. When ON is selected for “SAMP. Autozero”, set the samples as shown in Table 3-14, as shown in Table 3-15 when Sample Blank is selected and as shown in Table 3-16 when OFF is selected.
The instrument measures samples in the sequence shown in Table 3-17.
When OFF is set for “SAMP. Autozero”, auto zero can be executed by pressing the [AUTOZERO] key when the guidance on sample setting is indicated.
For details, refer to Fig. 3-18.

<1> Press the [AUTOZERO] key when the sample setting screen is displayed.



Sample setting screen

<2> The auto zero execution screen appears. Set an auto zero sample to cell A. The lamp is lit for 30 seconds and the current measured value is indicated so that you can check if execution of auto zero is necessary.



Auto zero execution screen

<3> Press the [AUTOZERO] key. Auto zero is executed and the sample setting screen reappears.

Fig. 3-18 Manual Auto Zero with OFF Set for SAMP. Autozero

Upon completion of sample setting according to the guidance, press the [START] key. Measurement will then start. Measurement is carried out for every 5 samples. Guidance is given until the specified number of samples (No. of Sample on 6 Cell screen) are all measured.

GUIDE: For how to set a sample to the cell holder, refer to section 2.4.4.

Table 3-14 How to Set Cells with ON Selected for SAMP. Autozero

	Cell A*	Cell 1	Cell 2	Cell 3	Cell 4	Cell 5
1st round	STD1 or blank	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
2nd round	STD1 or blank	Sample 6	Sample 7	Sample 8	Sample 9	Sample 10
3rd round	STD1 or blank	Sample 11	Sample 12	Sample 13	Sample 14	Sample 15
4th round and subsequent	Repeated until the specified number of samples are all measured.					

* Set the solution selected in “Curve Autozero”. When Factor is selected for Curve Type, set STD1 or blank.

Table 3-15 How to Set Cells with Sample Blank Selected for SAMP. Autozero

	Cell A	Cell 1	Cell 2	Cell 3	Cell 4	Cell 5
1st round	Sample blank	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
2nd round	Sample blank	Sample 6	Sample 7	Sample 8	Sample 9	Sample 10
3rd round	Sample blank	Sample 11	Sample 12	Sample 13	Sample 14	Sample 15
4th round and subsequent	Repeated until the specified number of samples are all measured.					

Table 3-16 How to Set Cells with OFF Selected for SAMP. Autozero

	Cell A*	Cell 1	Cell 2	Cell 3	Cell 4	Cell 5
1st round	Not set	STD1	STD2	STD3	STD4	STD5
2nd round	Not set	STD6	STD7	STD8	STD9	STD10
3rd round	Not set	STD11	STD12	STD13	STD14	STD15
4th round and subsequent	Repeated until the specified number of samples are all measured.					

* Upon completion of each round, you can execute auto zero with cell A if needed. For details, refer to Fig. 3-18.

Table 3-17 Auto Zero Interval and Operation of Instrument

SAMP. Autozero: OFF	SAMP. Autozero: ON		Cell Position	Operation
	Auto Zero Interval: 5	Auto Zero Interval: 1		
Setting of samples (1st round)				
—	1	1	Cell A	Auto zero
1	2	2	Cell 1	Sample 1 measurement
—	—	3	Cell A	Auto zero
2	3	4	Cell 2	Sample 2 measurement
—	—	5	Cell A	Auto zero
3	4	6	Cell 3	Sample 3 measurement
—	—	7	Cell A	Auto zero
4	5	8	Cell 4	Sample 4 measurement
—	—	9	Cell A	Auto zero
5	6	10	Cell 5	Sample 5 measurement
Setting of samples (2nd round)				
—	7	11	Cell A	Auto zero
6	8	12	Cell 1	Sample 6 measurement
—	—	13	Cell A	Auto zero
7	9	14	Cell 2	Sample 7 measurement
Repeated until the specified number of samples are all measured.				

(2) During measurement, the screen shown in Fig. 3-19 is displayed.

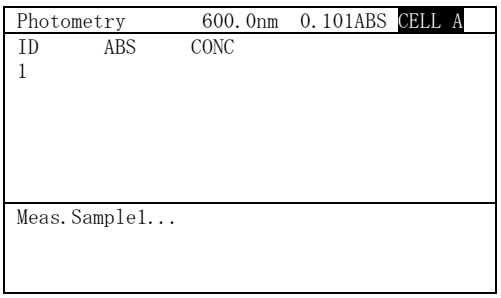


Fig. 3-19 Screen Displayed during Sample Measurement

(3) When “6” or more is specified for “No. of Sample”, the results obtained from measurement of samples 1 to 5 are indicated as shown in Fig. 3-16.
This measurement result screen also appears after completion of 2nd/3rd-round measurement.
Pressing the [START] key displays the next sample setting screen. Set the next samples according to the guidance. (For operation when the <1> key or <2> key is pressed, refer to Table 3-12.)

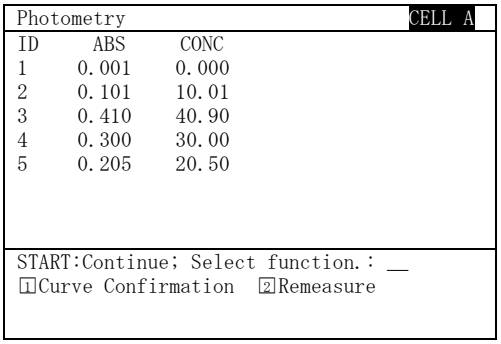


Fig. 3-20 Example of Display after 1st-round Sample Measurement

(4) When the specified number of samples have all been measured, the screen shown in Fig. 3-21 appears.
For the processing function assigned to each key, refer to Table 3-18.

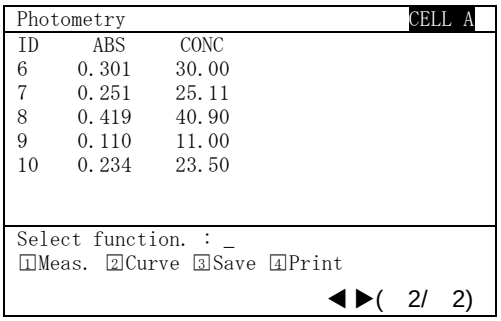
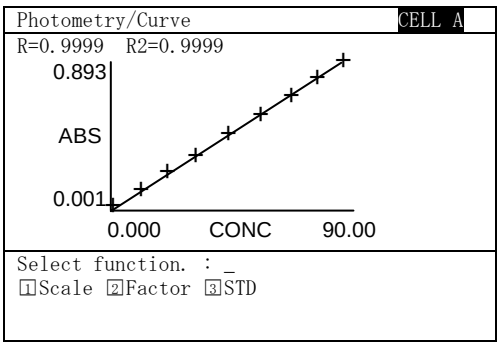
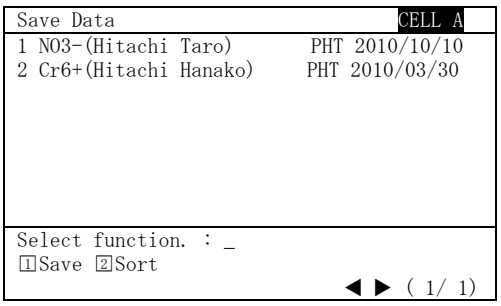


Fig. 3-21 Example of Display after Sample Measurement (number of samples: 10)

Table 3-18 Guidance after Sample Measurement

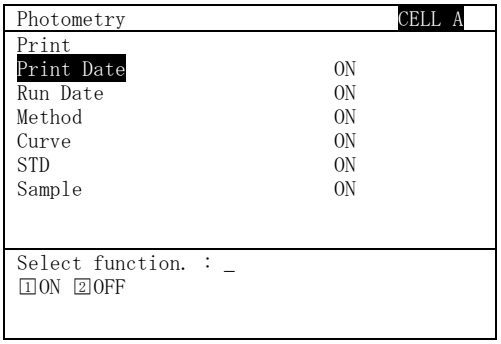
Setting Item	Description
[1] Meas.	You can make setting related to measurement. New Meas., Continue and Remeasure are selectable. [1] New Meas. : Selected when newly measuring samples with the same calibration curve. [2] Continue : Allows you to start measurement from the number following the previously measured sample. When this function is selected, the guidance given below appears. Enter the number of samples to be measured and press the [ENTER] key. Input value. : __ No.of Sample [1-140] Display with 10 samples measured [3] Remeasure : Selected when remeasuring a measured sample. When this function is selected, the guidance given below appears. Select a sample to be remeasured with the [◀] or [▶] key, set the sample to cell 1 and press the [START] key to carry out remeasurement. To execute auto zero, press the [AUTOZERO] key. Photometry CELL A ID ABS CONC 6 0.301 30.00 7 0.251 25.11 8 0.419 40.90 9 0.110 11.00 10 0.234 23.50 Set sample to Cell1(Sample10).: _ START:Meas.; AUTOZERO:Autozero ◀▶(2/ 2)

(cont'd)

Setting Item	Description
[2] Curve	You can generate a calibration curve with the measured standards and confirm it. When this function is selected, the following screen appears.  For details of this function, refer to section 4.3. [1] Scale : Allows you to change the scale of calibration curve. [2] Factor : Indicates the factor, correlation coefficient and determination coefficient of calibration curve. [3] STD : Indicate the result of standard solution measurement. Also allows remeasurement of a standard solution, deletion of a standard unnecessary for generating a calibration curve and retrieval of deleted data.
[3] Save	You can save the measured data. When this function is selected, the following screen appears.  [1] Save : Allows you to save data under a new file name. [2] Sort : Allows you to rearrange the currently saved data in the order of file names or dates.

(cont'd)

Setting Item	Description
[4] Print	You can select items to be printed. When this function is selected, the screen given below appears. For each item, select whether to print out (ON or OFF).



3.2.2 Measuring Absorbance/Transmittance

This instrument is capable of measuring the absorbance and transmittance of a solution at a maximum of 6 wavelengths.

GUIDE: When auto start is specified, the system automatically sets up the conditions and advances to the measurement screen phase of sequence after the power switch is turned on. For how to specify auto start, refer to section 4.5.

1. Startup of This Product

   Start this product. (For the starting procedure, refer to section 2.3.)

2. Setting of Measuring Conditions

   (1) Press the [MAIN MENU] key. The Main Menu screen (Fig. 3-22) will appear.

   (2) To set each condition for quantitative calculation, press the <1> key (Photometry) and then [ENTER] key. Or select “Photometry” with the [▲] or [▼] key and press the [ENTER] key.

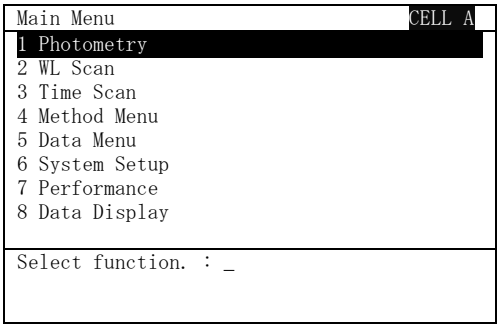


Fig. 3-22 Main Menu Screen

(3) The Photometry screen (Fig. 3-23) appears.

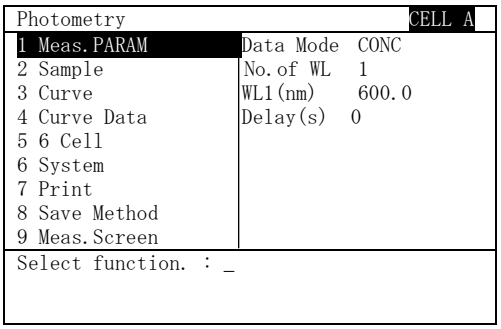


Fig. 3-23 Photometry Screen

(4) To set the measuring conditions, press the <1> key (Meas. PARAM.) and then [ENTER] key. Or select “Meas. PARAM.” with the [▲] or [▼] key and press the [ENTER] key or [►] key.

(5) The measuring condition (Meas. PARAM.) screen (Fig. 3-24) appears.

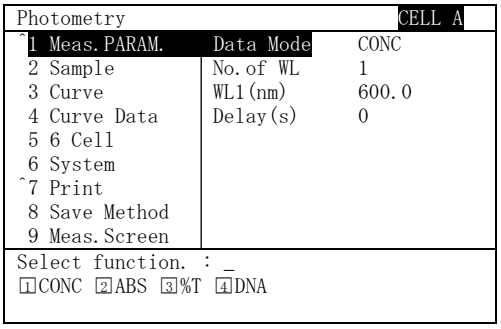


Fig. 3-24 Measuring Condition (Meas. PARAM.) Screen

(6) For Data Mode, press the <2> key (ABS) for absorbance measurement or <3> key (%T) for transmittance measurement and then press the [ENTER] key.

(7) With the [▲] or [▼] key, set the number of wavelengths (No. of WL) and wavelength (WL). For details of each parameter, refer to Table 3-19.

(8) After completion of setting, return to the Photometry screen by pressing the [RETURN] key or [◄] key.

Table 3-19 "Meas. PARAM." Setting Parameters

Setting Item	Description
Data Mode	For measuring the absorbance, select 2) ABS. For measuring the transmittance, select 3) %T. 1) CONC : Used for generating a calibration curve and determining the concentration. (For details, refer to section 3.2.1.) 2) ABS : Used for measuring the absorbance. 3) %T : Used for measuring the transmittance. 4) DNA : Used for estimating the purity of DNA. (For details, refer to section 3.2.3.)
No. of WL	Set the number of wavelengths to be used for measurement. This parameter is selectable in a range of 1 to 6.
WL1 (nm) to WL6 (nm)	Enter a wavelength to be used for measurement. This parameter is settable in a range of 190.0 to 1100.0 nm in steps of 0.1 nm.
Delay (s)	After the [START] key is pressed, the system waits for the time period set here and then starts measurement. This parameter is settable in a range of 0 to 9999 sec in steps of 1 sec. Set the parameter when you want to start measurement after a specified time period, including when measuring a sample after its temperature reaches the room temperature and when starting measurement after completion of reaction. Enter "0" if the delay time need not be set.

3. Setting of Sample Conditions

(1) To set the sample conditions, press the <2> key (Sample) and then [ENTER] key. Or select "Sample" with the [▲] or [▼] key and press the [ENTER] key or [►] key.

(2) The sample condition (Sample) screen (Fig. 3-25) appears.

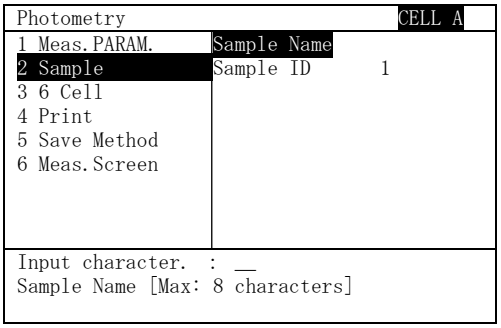


Fig. 3-25 Sample Condition (Sample) Screen

(3) To enter/select the sample conditions, press the [ENTER] key. Or select each item with the [▲] or [▼] key and make your setting. For details of each parameter, refer to Table 3-20.

(4) After setting the sample name (Sample Name) and sample number (Sample ID), return to the Photometry screen by pressing the [RETURN] key or [◀] key.

Table 3-20 "Sample" Setting Parameters

Setting Item	Description
Sample Name	Up to 8 half-size alphanumeric characters can be entered for the sample name. The sample name entered here is printed in the sample name field on the report. For the character input procedure, refer to section 2.4.3.
Sample ID	Set the first number to be assigned for sample numbering. This parameter is settable in a range of 1 to 9999. If "9999" is specified for Sample ID, the samples are numbered 9999 → 1 → 2 ....

4. Setting of 6-cell Conditions

NOTE: "6 Cell Mode" is not indicated if OFF is specified for Mode on the 6-cell mode setting screen for use of the single cell holder or rectangular long path cell holder. (For details, refer to section 2.5.4.) When the auto sipper is connected, "Sipper" is indicated in place of "6 Cell Mode".

(1) To set the 6-cell conditions, press the <3> key (6 Cell) and then [ENTER] key. Or select “6 Cell” with the [▲] or [▼] key and press the [ENTER] key or [►] key.

(2) The 6-cell condition (6 Cell) screen (Fig. 3-26) appears.

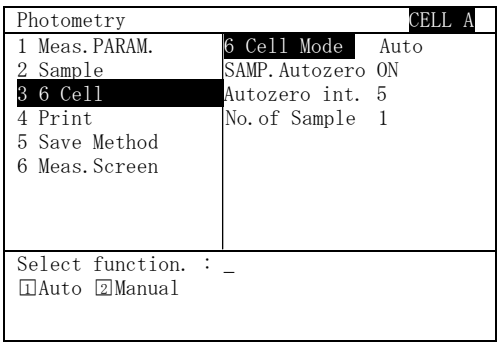


Fig. 3-26 6-cell Condition (6 Cell) Screen

(3) To set each item on the 6-cell condition (6 Cell) screen, press the [ENTER] key. Or select each item with the [▲] or [▼] key and make your setting according to the guidance. For details of each parameter, refer to Table 3-21.

(4) After selecting/entering the 6-cell mode (6 Cell Mode), sample auto zero (SAMP. Autozero), auto zero interval (Autozero int.) and number of samples (No. of Sample), return to the Photometry screen by pressing the [RETURN] key or [◄] key. Setting of measuring conditions has now been completed. For saving the set conditions, proceed to step 6. If they need not be saved, then proceed to step 7.

Table 3-21 "6 Cell" Setting Parameters

Setting Item	Description
6 Cell Mode	Specify a 6-cell operation mode for measurement. 1) Auto In this mode, a sample is set at each position of the 6-cell turret beforehand and the holder is automatically turned to automatically perform from auto zero to standard/sample measurement. It is recommended to use this mode if you have 6 cells and there are many samples to be measured. 2) Manual In this mode, standard/sample measurement is carried out by using one position (cell 1 to 5 selectable) of the 6-cell turret. To eliminate the influence of instrument drift (baseline fluctuation) during measurement, auto zero can easily be executed by setting a solution for auto zero to cell A. In normal usage, set a standard or sample solution to cell 1. (For details of the Manual mode, refer to section 3.3.2.)
SAMP. Autozero	You can select an auto zero sample in sample measurement or specify avoidance of automatic execution of auto zero. 1) ON Auto zero is automatically carried out in sample measurement. The auto zero interval is set in Autozero int. 2) OFF Auto zero is not carried out automatically in sample measurement. You can carry out auto zero manually.
Autozero int.	1) 5 Auto zero is automatically carried out for every 5 measurements. 2) 1 Auto zero is automatically carried out for each sample.
No. of Sample	Set the number of samples to be measured. This parameter is settable in a range of 1 to 150.

5. Setting of Printing Conditions

> **GUIDE**: Specify print items if determined beforehand. You can also specify print items after completion of measurement. If you do not want to set the printing conditions here, proceed to step 6.

(1) To set the printing conditions, press the <4> key (Print) and then [ENTER] key. Or select “Print” with the [▲] or [▼] key and press the [ENTER] key or [►] key.

(2) The printing condition (Print) screen (Fig. 3-27) appears.

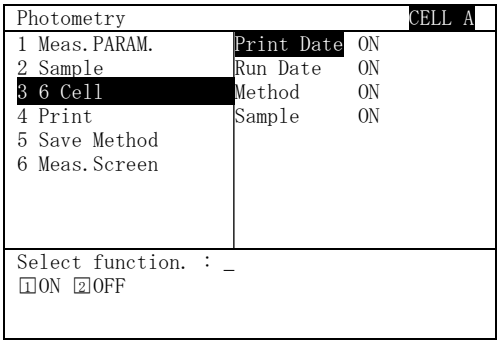


Fig. 3-27 Printing Condition (Print) Screen

(3) To select the printing conditions, press the [ENTER] key. Or select each item with the [▲] or [▼] key and make your setting according to the guidance. For details of each parameter, refer to Table 3-22.

(4) After specifying whether to print out the printing date (Print Date), analysis date (Run Date), conditions (Method) and sample data (Sample), return to the Photometry screen by pressing the [RETURN] key or [◄] key.

Table 3-22 "Print" Setting Parameters

Setting Item	Description	Location in Fig. 3-28
Print Date	[1] ON : Printing date is printed. [2] OFF : Printing date is not printed.	<1>
Run Date	[1] ON : Analysis date is printed. [2] OFF : Analysis date is not printed.	<2>
Method	[1] ON : Measuring conditions are printed. [2] OFF : Measuring conditions are not printed.	<3>
Sample	[1] ON : Results of sample measurement are printed. [2] OFF : Results of sample measurement are not printed.	<4>

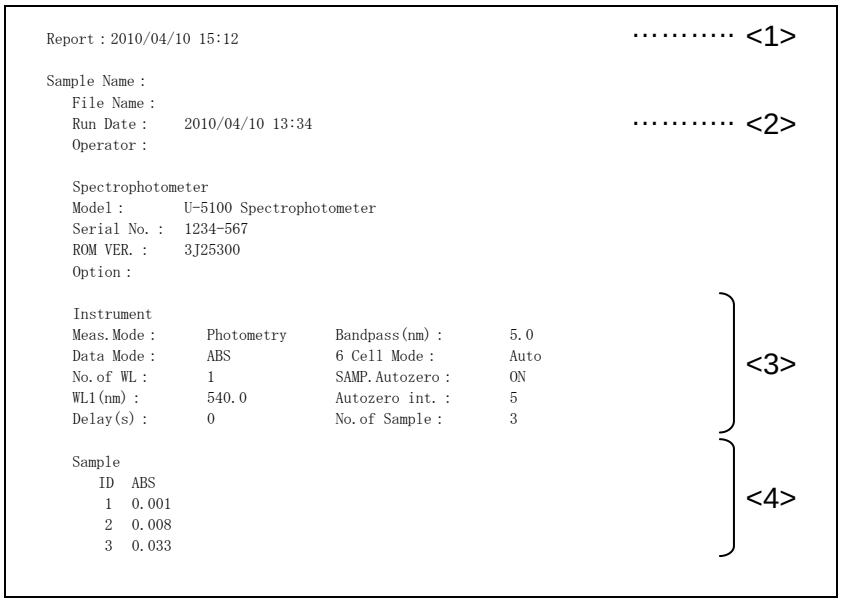


Fig. 3-28 Example of Printout in Absorbance/Transmittance Measurement

6. Saving of Measuring Conditions

> **GUIDE**: When the set measuring conditions need not be saved, proceed to step 7.

(1) To save the set measuring conditions, press the <5> key (Save Method) and then [ENTER] key. Or select “Save Method” with the [▲] or [▼] key and press the [ENTER] key or [►] key.

(2) The measuring condition saving (Save Method) screen (Fig. 3-29) appears.

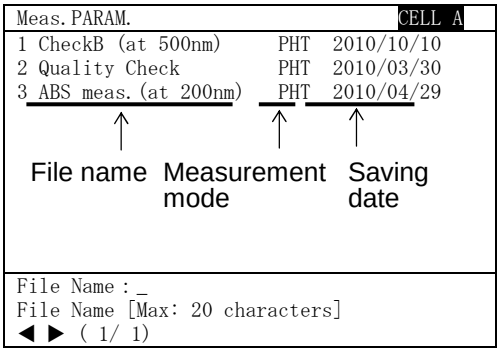


Fig. 3-29 Measuring Condition Saving (Save Method) Screen

(3) When other measuring conditions are saved in advance, a list of saved measuring conditions appears on the main menu. At this time, the file name, measurement mode (PHT: Photometry, WLS: Wavelength Scan, TMS: Time Scan) and saving date are indicated.

(4) For the measuring conditions to be saved, enter a file name within 20 characters and press the [ENTER] key.

NOTE:

- If a file of the same name as entered already exists in the same measurement mode, the following guidance appears.

  ```
  Already exists. Overwrite it? :_
  [1]Yes [2]No
  ```

  For overwriting, press the <1> key (Yes). To avoid overwriting, press the <2> key (No) and rename the file to be saved.

- A total of 50 method files can be saved for all measurement modes.
- If 50 files are already registered, the following message appears.

  ```
  No.of files is full.
  ```

  In this case, delete files referring to section 4.2.2 and retry saving.

- The method for which auto start (for details, refer to section 4.5) is set is preceded by “*”.

(5) Return to the Photometry screen by pressing the [RETURN] key.

7. Measurement of Samples

(1) To determine the measuring conditions set in the preceding steps, press the <6> key (Meas. Screen) and then [ENTER] key. Or press the [MEAS. SCREEN] key. The sample setting screen (Fig. 3-30) appears.

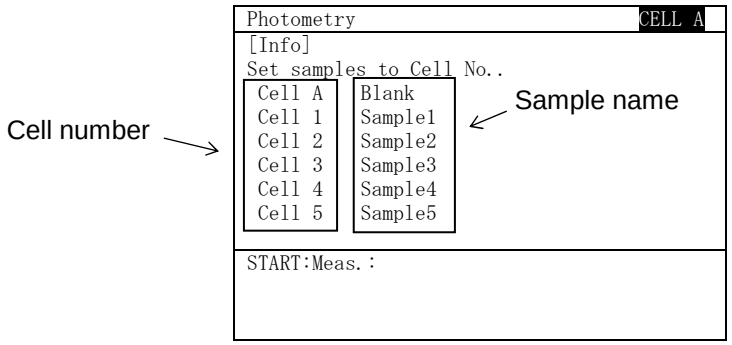
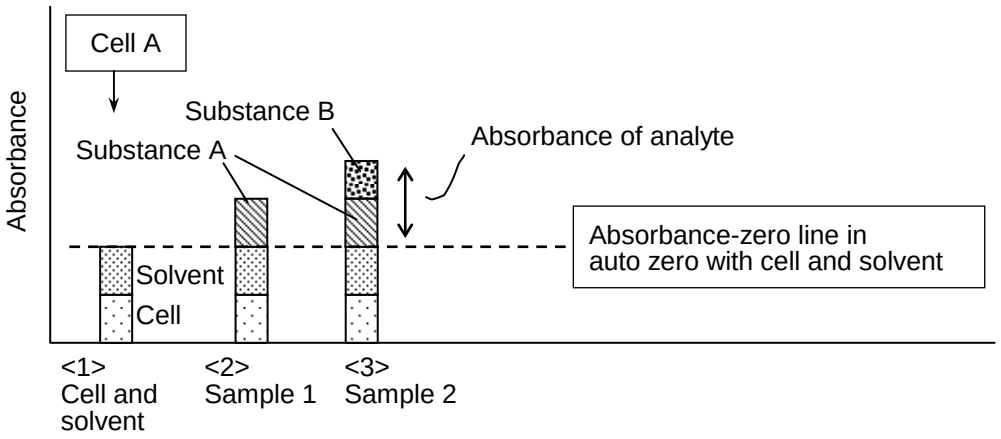


Fig. 3-30 Sample Setting Screen

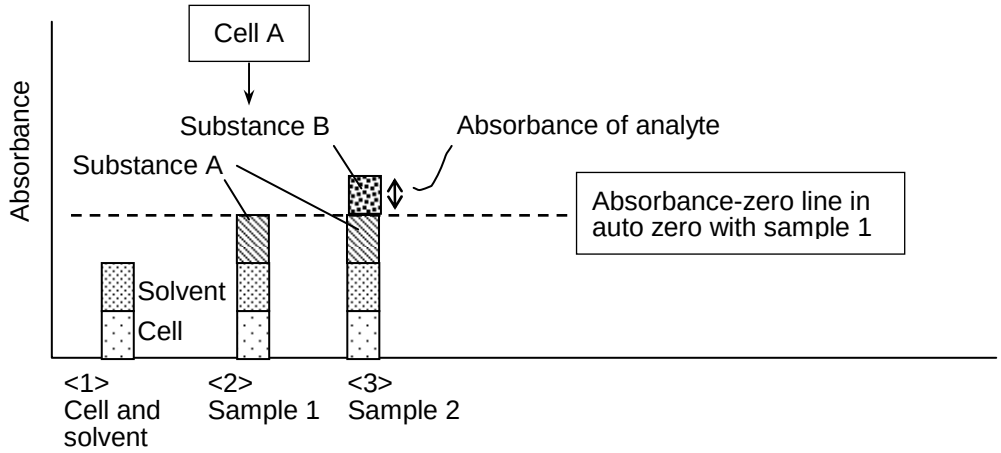
On the screen, displayed from the left are the cell number and sample name. Set the corresponding sample to each cell. If you do not know what sample should be set to cell A (blank), refer to Explanation 3-5 in absorbance measurement and Explanation 3-6 in transmittance measurement.

Explanation 3-5 Method of Auto Zero in Absorbance Measurement



Auto Zero for Measuring Absorbance Except for Cell and Solvent

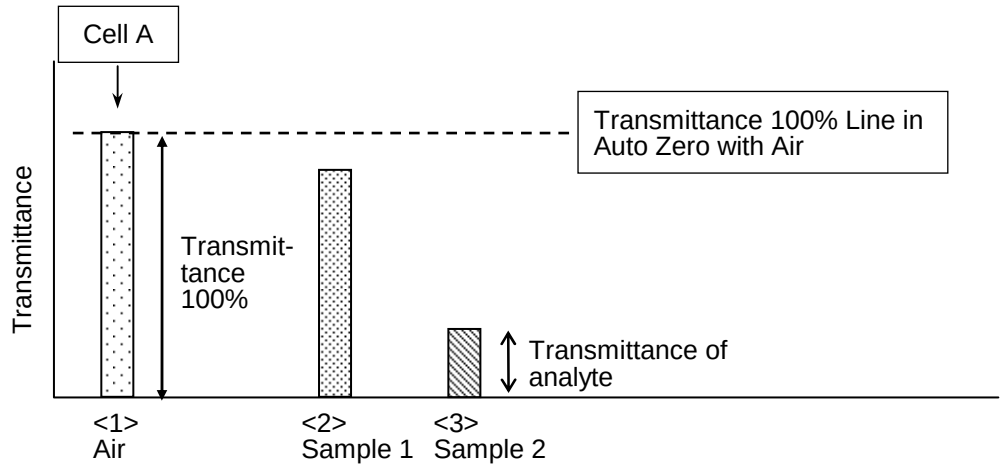
A measured absorbance is given as a total absorbance of various elements (such as cell, solvent, substances contained in sample). Therefore, the analyst must extract necessary absorbance from the total absorbance.
Assume the following have been prepared; a solvent contained in cell <1> and 2 sample solutions; sample solution 1 containing substance A in cell <2> and sample solution 2 containing substances A and B in cell <3>. Reference should be made to the above figure ([Auto Zero for Measuring Absorbance except for Cell and Solvent]). We see that the absorbance of the solution in cell <2> derives from the cell, solvent and substance A, and that of the solution in cell <3> derives from the cell, solvent and substances A and B. For targeting the absorbance except for cell and solvent, auto zero is carried out with the cell containing a solvent alone. As a result, the absorbance of only the substance A is measurable with <2> and a sum of the absorbance values due to substances A and B is measurable with <3>.



Auto Zero for Measuring Absorbance of Substance B

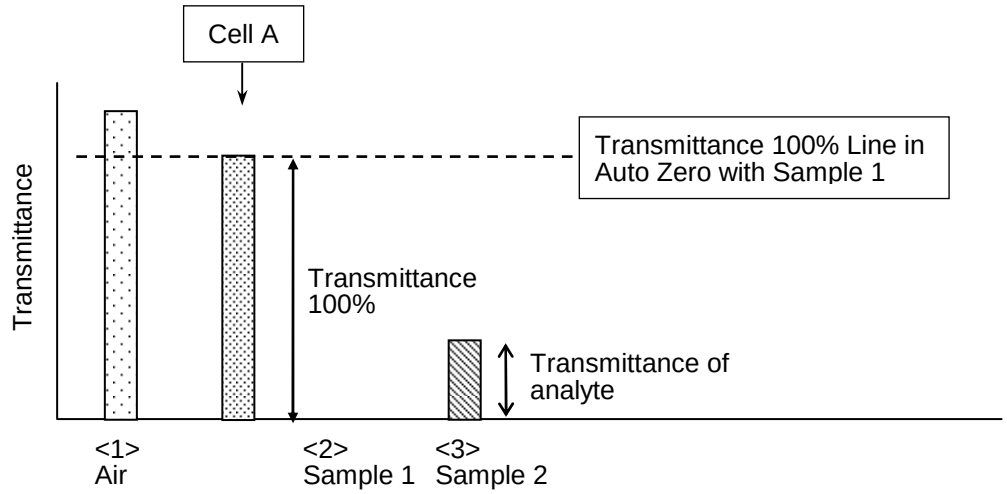
For measuring the absorbance of only the substance B, auto zero operation is carried out with sample 1 in cell <2>. By this operation, the absorbance of only the substance B in cell <3> can be measured. [Refer to “Auto Zero for Measuring Absorbance of Substance B” in the above figure.]
For extracting the absorbance of an analyte of interest, the absorbance due to elements other than the analyte can be subtracted by performing auto zero operation with a solution having a composition which does not contain the analyte. The solution subjected to the auto zero operation is called a “blank” in absorbance/transmittance measurement. You should select an optimum blank in consideration of its role explained here.

Explanation 3-6 Method of Auto Zero in Transmittance Measurement



Auto Zero with Transmittance of Air Set at 100%

In transmittance measurement, it is important what condition is to be defined as transmittance 100%. For measuring the transmittance of a sample with the transmittance in air assumed to be 100%, auto zero operation is carried out with nothing contained in cell A except for air. Refer to the above figure ("Auto Zero with Transmittance of Air Set at 100%"). Then, by measuring samples 1 and 2, their transmittance values with respect to that of air will be obtainable.



Auto Zero with Transmittance of Cell and Solvent Set at 100%

For transmittance measurement on assumption that the transmittance of sample 1 is 100%, auto zero operation is carried out with this sample contained in cell A. By this method, the transmittance of sample 2 will be obtainable with respect to that of sample 1. The sample subjected to the auto zero operation is called a "blank" in absorbance/transmittance measurement. You should select an optimum blank in consideration of its role explained here.

If "-" (hyphen) is indicated for the sample name, avoid setting a sample in the relevant cell. When ON is selected for "SAMP. Autozero", set samples as shown in Table 3-23, and as shown in Table 3-24 when OFF is selected. The instrument measures samples in the sequence shown in Table 3-25.

Table 3-23 How to Set Cells with ON Selected for SAMP. Autozero

	Cell A*	Cell 1	Cell 2	Cell 3	Cell 4	Cell 5
1st round	Blank	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
2nd round	Blank	Sample 6	Sample 7	Sample 8	Sample 9	Sample 10
3rd round	Blank	Sample 11	Sample 12	Sample 13	Sample 14	Sample 15
4th round and subsequent	Repeated until the specified number of samples are all measured.					

Table 3-24 How to Set Cells with OFF Selected for SAMP. Autozero

	Cell A*	Cell 1	Cell 2	Cell 3	Cell 4	Cell 5
1st round	Not set	STD1	STD2	STD3	STD4	STD5
2nd round	Not set	STD6	STD7	STD8	STD9	STD10
3rd round	Not set	STD11	STD12	STD13	STD14	STD15
4th round and subsequent	Repeated until the specified number of samples are all measured.					

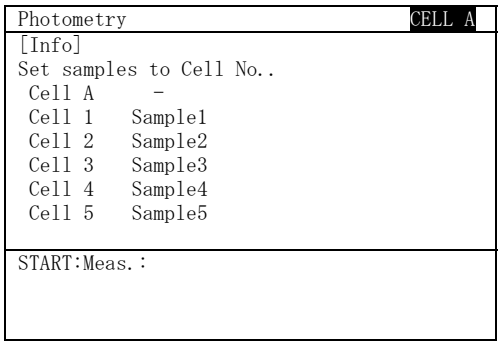
* Upon completion of each round, you can execute auto zero with cell A if needed. For details, refer to Fig. 3-31.

Table 3-25 Auto Zero Interval and Operation of Instrument

SAMP. Autozero: OFF	SAMP. Autozero: ON		Cell Position	Operation
	Auto Zero Interval: 5	Auto Zero Interval: 1		
Setting of samples (1st round)				
—	1	1	Cell A	Auto zero
1	2	2	Cell 1	Sample 1 measurement
—	—	3	Cell A	Auto zero
2	3	4	Cell 2	Sample 2 measurement
—	—	5	Cell A	Auto zero
3	4	6	Cell 3	Sample 3 measurement
—	—	7	Cell A	Auto zero
4	5	8	Cell 4	Sample 4 measurement
—	—	9	Cell A	Auto zero
5	6	10	Cell 5	Sample 5 measurement
Setting of samples (2nd round)				
—	7	11	Cell A	Auto zero
6	8	12	Cell 1	Sample 6 measurement
—	—	13	Cell A	Auto zero
7	9	14	Cell 2	Sample 7 measurement
Repeated until the specified number of samples are all measured.				

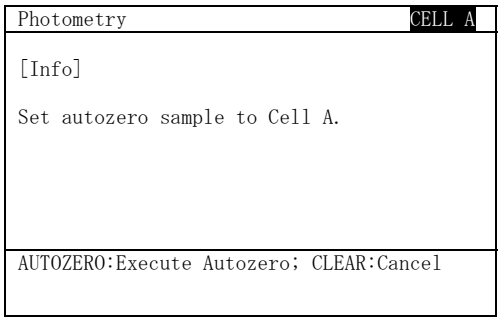
When OFF is set for “SAMP. Autozero”, auto zero can be executed by pressing the [AUTOZERO] key when the guidance on sample setting is indicated.
For details, refer to Fig. 3-31.

(1) Press the [AUTOZERO] key when the sample setting screen is displayed.



Sample setting screen

(2) The auto zero execution screen appears. Set an auto zero sample to cell A.



Auto zero execution screen

(3) Auto zero is executed and the sample setting screen reappears.

Fig. 3-31 Manual Auto Zero with OFF set for SAMP. Autozero

Upon completion of sample setting according to the guidance, press the [START] key. Measurement will then start. Measurement is carried out for every 5 samples. Guidance is given until the specified number of samples are all measured.

GUIDE: For how to set a sample to the cell holder, refer to section 2.4.4.

(2) During measurement, the screen shown in Fig. 3-32 is displayed.

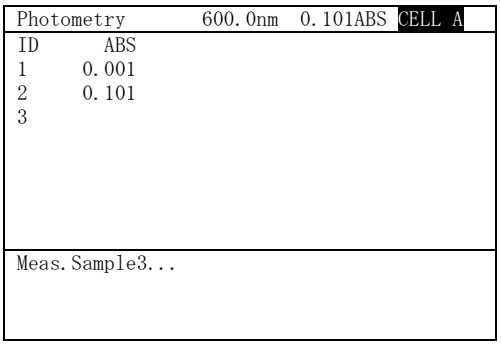


Fig. 3-32 Screen Displayed during Sample Measurement

(3) When “6” or more is specified for “No. of Sample”, the results obtained from measurement of samples 1 to 5 are indicated as shown in Fig. 3-33.
This measurement result screen also appears after completion of 2nd/3rd-round measurement.
Pressing the [START] key displays the next sample setting screen. Set the next samples according to the guidance. (Pressing the <1> key (Remeasure) allows remeasurement of the previous sample.)

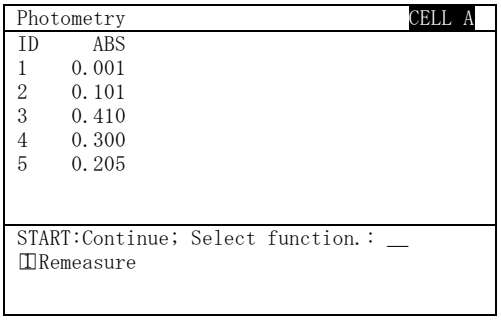


Fig. 3-33 Example of Display after 1st-round Sample Measurement

(4) When the specified number of samples have all been measured, the screen shown in Fig. 3-34 appears.
For the processing function assigned to each key, refer to Table 3-26.

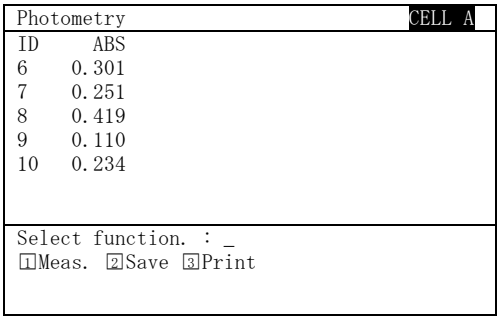
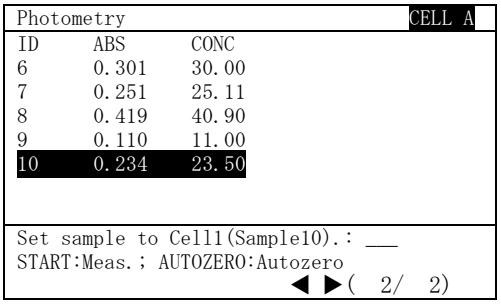
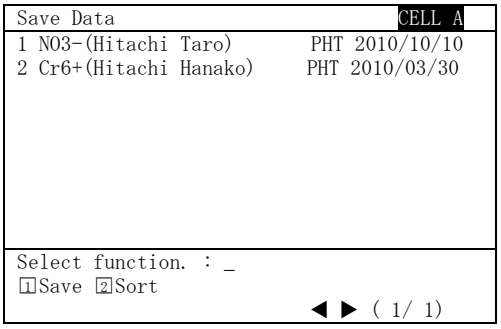
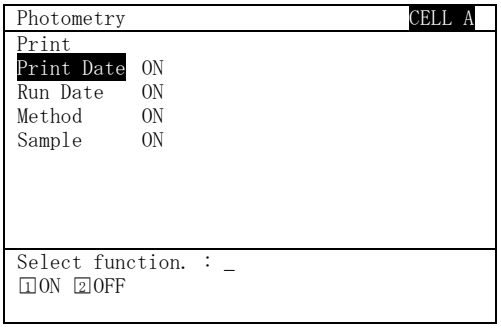


Fig. 3-34 Example of Display after Sample Measurement (number of samples: 10)

Table 3-26 Guidance after Sample Measurement

Setting Item	Description
Meas.	You can make setting related to measurement. "New Meas.", "Continue" and "Remeasure" are selectable. [1] New Meas. : Selected when newly measuring samples with the same calibration curve. [2] Continue : Allows you to start measurement from the number following the previously measured sample. When this function is selected, the guidance given below appears. Enter the number of samples to be measured and press the [ENTER] key. Input value. : __ No.of Sample [1-140] Display with 10 samples measured [3] Remeasure : Selected when remeasuring a measured sample. When this function is selected, the guidance given below appears. Select a sample to be remeasured with the [▲] or [▼] key, set the sample to cell 1 and press the [START] key to carry out remeasurement. To execute auto zero, press the [AUTOZERO] key.

(cont'd)

Setting Item	Description
Meas.	
Save	You can save the measured data. When this function is selected, the following screen appears.  [1] Save : Allows you to save data under a new file name. [2] Sort : Allows you to rearrange the currently saved data in the order of file names or dates.
Print	You can select items to be printed. When this function is selected, the screen given below appears. For each item, select whether to print out (ON or OFF). 

3.2.3 Measuring DNA Sample (measurement through ratio calculation)

This instrument is capable of measuring the absorbance (at 230 nm, 260 nm, 280 nm and 320 nm) of a DNA sample and calculating the absorbance ratio (A260/A280 and A260/A230) for check of the DNA purity. The instrument is also used for measuring the absorbance at 2 wavelengths and calculating the absorbance ratio or absorbance difference between the values thus obtained.

GUIDE: When auto start is specified, the system automatically sets up the conditions and advances to the measurement screen phase of sequence after the power switch is turned on. For how to specify auto start, refer to section 4.5.

1. Startup of This Product

   Start this product. (For the starting procedure, refer to section 2.3.)

2. Setting of Measuring Conditions

   (1) Press the [MAIN MENU] key. The Main Menu screen (Fig. 3-35) will appear.

   (2) To set each measuring condition, press the <1> key (Photometry) and then [ENTER] key. Or select “Photometry” with the [▲] or [▼] key and press the [ENTER] key.

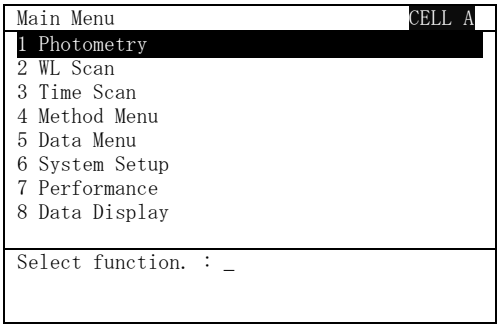


Fig. 3-35 Main Menu Screen

(3) The Photometry screen (Fig. 3-36) appears.

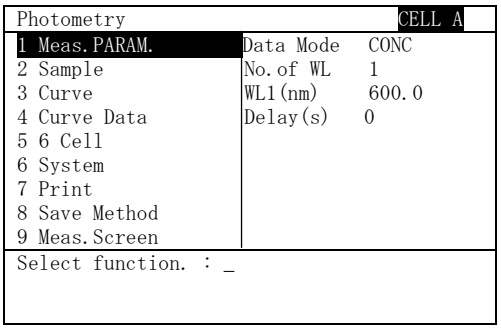


Fig. 3-36 Photometry Screen

(4) To set the measuring conditions, press the <1> key (Meas. PARAM.) and then [ENTER] key. Or select "Meas. PARAM." with the [▲] or [▼] key and press the [ENTER] key or [►] key.

(5) The measuring condition (Meas. PARAM.) screen (Fig. 3-37) appears.

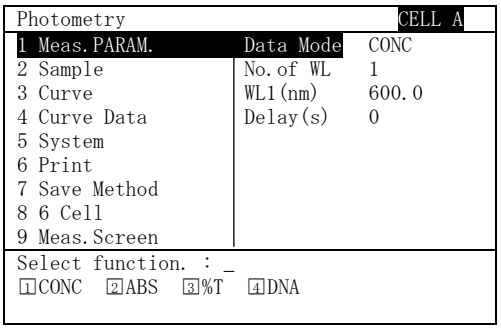


Fig. 3-37 Measuring Condition (Meas. PARAM.) Screen

(6) For Data Mode, press the <4> key (DNA) and then [ENTER] key to select DNA measurement.

(7) With the [▲] or [▼] key, set the number of pairs of wavelengths (WL pair No.), background correction (Bkgd. CORR.), wavelength (WL), correction wavelength (CORR. WL) and initial delay time (Delay). For details of each parameter, refer to Table 3-27.

(8) After completion of setting, return to the Photometry screen by pressing the [RETURN] key or [◄] key.

Table 3-27 "Meas. PARAM." Setting Parameters

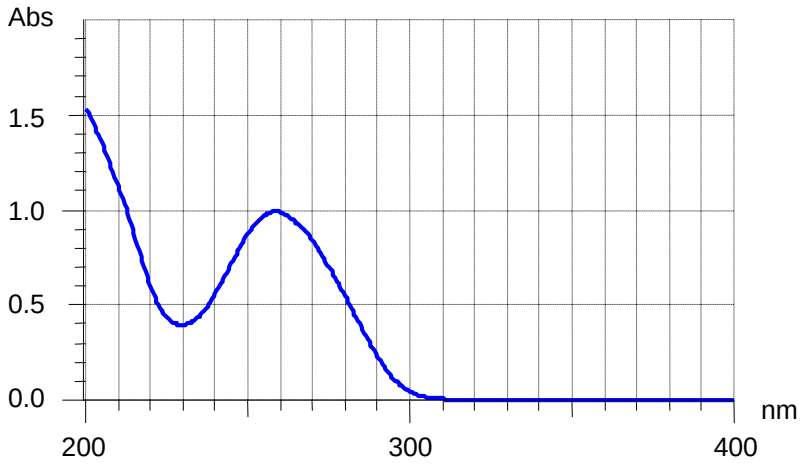
Setting Item	Description
Data Mode	For estimating the purity of DNA, select 4) DNA. [1] CONC : Used for generating a calibration curve and determining the concentration. (For details, refer to section 3.2.1.) [2] ABS : Used for measuring the absorbance. (For details, refer to section 3.2.2.) [3] %T : Used for measuring the transmittance. (For details, refer to section 3.2.2.) [4] DNA : Used for estimating the purity of DNA.
WL pair No.	Set up the number of pairs of wavelengths to be used for measurement. Select whether to perform ratio calculation for one pair of wavelengths or two pairs of wavelengths. [1] WL pair No. 1 : Selected for ratio calculation for one pair (either A260/A280 (absorbance ratio between 260 nm and 280 nm) or A260/A230). [2] WL pair No. 2 : Selected for ratio calculation for two pairs (both A260/A280 and A260/A230). For DNA measurement, refer to Explanation 3-7.
Bkgd. CORR.	Specify whether to perform background correction. [1] ON : Selected when subtracting background absorption. [2] OFF: Selected when not subtracting background absorption. For details of this function, refer to Explanation 3-8.
WL1 (nm) to WL4 (nm)	Enter a wavelength to be used for measurement. This parameter is settable in a range of 190.0 to 1100.0 nm in steps of 0.1 nm. The following calculations are performed using the absorbance values at the set wavelengths. [WL pair No.: 1, Bkgd. CORR.: OFF] Absorbance ratio = ABS (WL1)/ABS (WL2) Absorbance difference = ABS (WL1) - ABS (WL2) [WL pair No.: 1, Bkgd. CORR.: ON] Absorbance ratio = (ABS (WL1) - ABS (CORR. WL))/(ABS (WL2) - Data (CORR. WL)) Absorbance difference = ABS (WL1) - ABS (WL2) [WL pair No.: 2, Bkgd. CORR.: OFF] Absorbance ratio (WL: 1, 2) = ABS (WL1)/ABS (WL2) Absorbance ratio (WL: 3, 4) = ABS (WL3) - ABS (WL4) [WL pair No.: 2, Bkgd. CORR.: ON] Absorbance ratio (WL: 1, 2) = (ABS (WL1) - ABS (CORR. WL))/(ABS (WL2) - ABS (CORR. WL)) Absorption ratio (WL: 3, 4) = (ABS (WL3) - ABS (CORR. WL))/(ABS (WL4) - ABS (CORR. WL))
CORR. WL	Set a wavelength to be used for background correction. This parameter is indicated only when ON is selected for Bkgd. CORR. The parameter is settable in a range of 190.0 nm to 1100.0 in steps of 0.1 nm.

(cont'd)

Setting Item	Description
Delay (s)	After the [START] key is pressed, the system waits for the time period set here and then starts measurement. This parameter is settable in a range of 0 to 9999 sec in steps of 1 sec. Set the parameter when you want to start measurement after a specified time period, including when measuring a sample after its temperature reaches the room temperature. Enter "0" if the delay time need not be set.

Explanation 3-7 Set Wavelengths in DNA Measurement

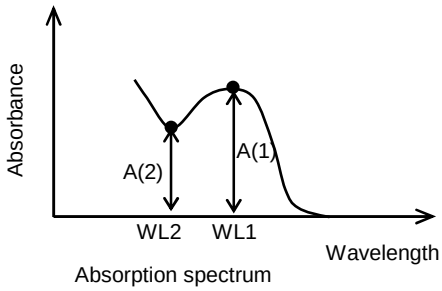
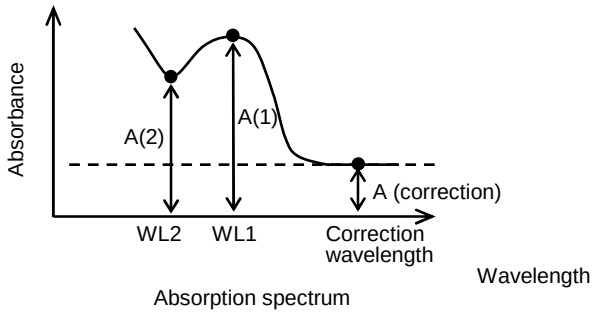
On the absorption spectrum of an aqueous nucleic acid solution, absorption has the minimum point near 230 nm and the maximum point near 260 nm. The wavelength of maximum absorption varies with the base content and sequence in the nucleic acid. It is known that the ratio of A260/A230 is approximately 1.8 with DNA and 2.0 with RNA.
Also, because the coexisting protein have a maximum absorption point at 280 nm, sample purity can be estimated by taking the ratio of A260/A280. When the ratio is smaller than 1.8 in the case of DNA, protein may be coexistent. Conversely, it is known that the ratio becomes larger under the coexistence of RNA.



Absorption spectrum of salmon testis DNA

Excerpt from BUNSEKI KAGAKU BINRAN, 5th revised edition by The Japan Society of Analytical Chemistry (page 400)

Explanation 3-8 Background Correction

Bkgd.CORR	Setting method
OFF	Background correction is avoided. Absorbance ratio will be calculated using the obtained absorbance values. Absorbance ratio = A(1)/A(2)  Absorption spectrum
ON	The background will be corrected. This is effective when the background level is even along the wavelength axis. The absorbance at the set correction wavelength will be subtracted from those at the measuring wavelengths. Calculation is carried out according to the following equation. Absorbance ratio = (A(1) - A(correction))(A(2) - A(correction))  Absorption spectrum

3. Setting of Sample Conditions

(1) To set the sample conditions, press the <2> key (Sample) and then [ENTER] key. Or select “Sample” with the [▲] or [▼] key and press the [ENTER] key or [►] key.

(2) The sample condition (Sample) screen (Fig. 3-38) appears.

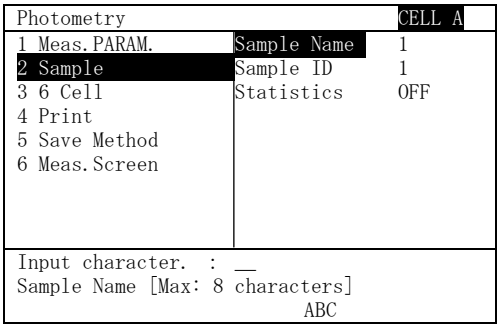


Fig. 3-38 Sample Condition (Sample) Screen

(3) To enter/select the sample conditions, press the [ENTER] key. Or select each item with the [▲] or [▼] key and make your setting. For details of each parameter, refer to Table 3-28.

(4) After setting the sample name (Sample Name), sample number (Sample ID) and statistical calculation (Statistics), return to the Photometry screen by pressing the [RETURN] key or [◄] key.

Table 3-28 "Sample" Setting Parameters

Setting Item	Description
Sample Name	Up to 8 half-size alphanumeric characters can be entered for the sample name. The sample name entered here is printed in the sample name field on the report. For the character input procedure, refer to section 2.4.3.
Sample ID	Set the first number to be assigned for sample numbering. This parameter is settable in a range of 1 to 9999. If "9999" is specified for Sample ID, the samples are numbered 9999 → 1 → 2 ....
Statistics	For the sample absorbance ratio and absorbance difference, the mean value (MEAN), standard deviation (SD) and relative standard deviation (RSD) are calculated according to the equations given below. This calculation is carried out for every number of calculations (N). The number of calculations is set in the following setting item. [Mean value] $MEAN = \frac{\sum_{i=1}^{N} X_i}{N}$ (N = Number of calculations) [Standard deviation] $SD = \sqrt{\frac{\left(\sum_{i=1}^{N} X_i^{\,2}\right) - \left(\sum_{i=1}^{N} X_i\right)^2 \Big/ N}{N-1}}$ (N = Number of calculations) [Relative standard deviation] $RSD = \frac{SD}{MEAN} \times 100$
No. of Calc	Set the number of samples for statistical calculation. This parameter is indicated when ON is set for Statistics. It is settable in a range of 2 to 100. When "3" is set, statistical calculation is carried out for every 3 samples.

4. Setting of 6-cell Conditions

NOTE: "6 Cell Mode" is not indicated if OFF is specified for Mode on the 6-cell mode setting screen for use of the single cell holder or rectangular long path cell holder. (For details, refer to section 2.5.4.) When the auto sipper is connected, "Sipper" is indicated in place of "6 Cell Mode".

(1) To set the 6-cell conditions, press the <3> key (6 Cell) and then [ENTER] key. Or select "6 Cell" with the [▲] or [▼] key and press the [ENTER] key or [►] key.

(2) The 6-cell condition (6 Cell) screen (Fig. 3-39) appears.

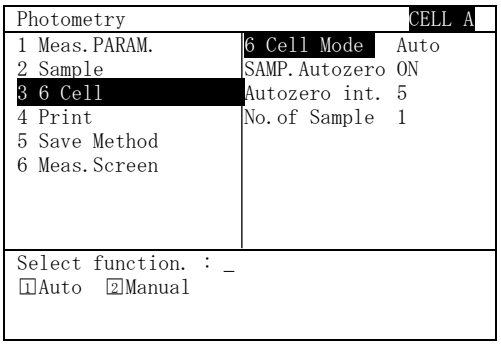


Fig. 3-39 6-cell Condition (6 Cell) Screen

(3) To set each item on the 6-cell condition (6 Cell) screen, press the [ENTER] key. Or select each item with the [▲] or [▼] key and make your setting according to the guidance. For details of each parameter, refer to Table 3-29.

(4) After selecting/entering the 6-cell mode (6 Cell Mode), sample auto zero (SAMP. Autozero), auto zero interval (Autozero int.) and number of samples (No. of Sample), return to the Photometry screen by pressing the [RETURN] key or [◄] key.

Table 3-29 "6 Cell" Setting Parameters

Setting Item	Description
6 Cell Mode	Specify a 6-cell operation mode for measurement. [1] Auto In this mode, a sample is set at each position of the 6-cell turret beforehand and the holder is automatically turned to automatically perform from auto zero to standard/sample measurement. It is recommended to use this mode if you have 6 cells and there are many samples to be measured. [2] Manual In this mode, standard/sample measurement is carried out by using one position (cell 1 to 5 selectable) of the 6-cell turret. To eliminate the influence of instrument drift (baseline fluctuation) during measurement, auto zero can easily be executed by setting a solution for auto zero to cell A. In normal usage, set a standard or sample solution to cell 1. (For details of the Manual mode, refer to section 3.3.3.)
SAMP. Autozero	You can select an auto zero sample in sample measurement or specify avoidance of automatic execution of auto zero. [1] ON Auto zero is automatically carried out in sample measurement. The auto zero interval is set in Autozero int. [2] OFF Auto zero is not carried out automatically in sample measurement. You can carry out auto zero manually.
Autozero int.	[1] 5 Auto zero is automatically carried out for every 5 measurements. [2] 1 Auto zero is automatically carried out for each sample.
No. of Sample	Set the number of samples to be measured. This parameter is settable in a range of 1 to 150.

5. Setting of Printing Conditions

> **GUIDE**: Specify print items if determined beforehand. You can also specify print items after completion of measurement. If you do not want to set the printing conditions here, proceed to step 6.

(1) To set the printing conditions, press the <4> key (Print) and then [ENTER] key. Or select “Print” with the [▲] or [▼] key and press the [ENTER] key or [►] key.

(2) The printing condition (Print) screen (Fig. 3-40) appears.

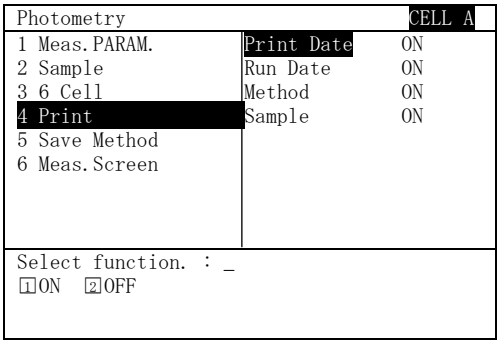


Fig. 3-40 Printing Condition (Print) Screen

(3) To select the printing conditions, press the [ENTER] key. Or select each item with the [▲] or [▼] key and make your setting according to the guidance.
For details of each parameter, refer to Table 3-30.

(4) After specifying whether to print out the printing date (Print Date), analysis date (Run Date), conditions (Method) and sample data (Sample), return to the Photometry screen by pressing the [RETURN] key or [◄] key.

Table 3-30 "Print" Setting Parameters

Setting Item	Description	Location in Fig. 3-41
Print Date	[1] ON : Printing date is printed. [2] OFF : Printing date is not printed.	<1>
Run Date	[1] ON : Analysis date is printed. [2] OFF : Analysis date is not printed.	<2>
Method	[1] ON : Measuring conditions are printed. [2] OFF : Measuring conditions are not printed.	<3>
Sample	[1] ON : Results of sample measurement are printed. [2] OFF : Results of sample measurement are not printed.	<4>

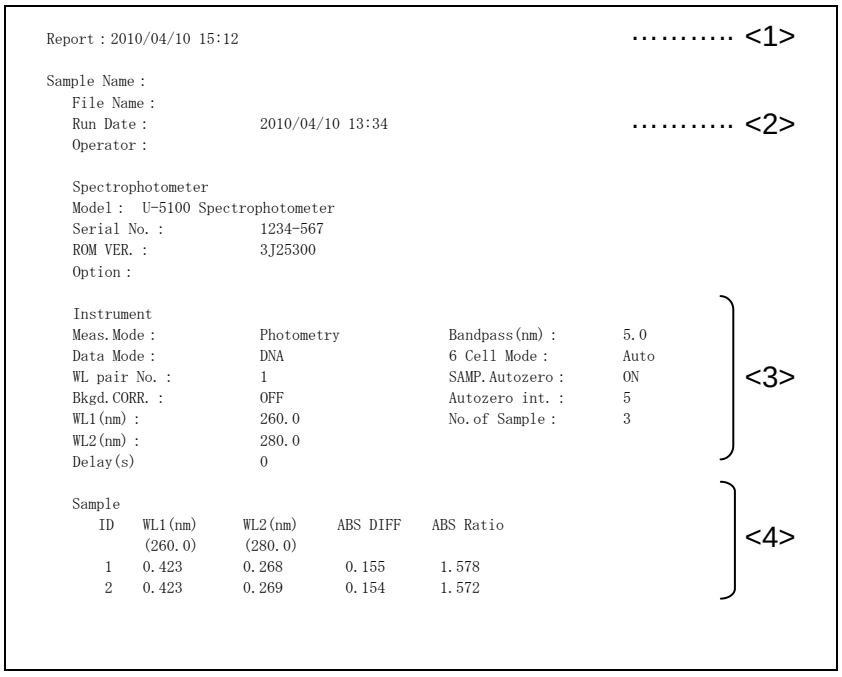


Fig. 3-41 Example of Printout in DNA Measurement

(5) Setting of measuring conditions has now been completed. For saving the set conditions, proceed to step 6. If they need not be saved, then proceed to step 7.

6. Saving of measuring conditions

> **GUIDE**: When the set measuring conditions need not be saved, proceed to step 7.

(1) To save the set measuring conditions, press the <5> key (Save Method) and then [ENTER] key. Or select “Save Method” with the [▲] or [▼] key and press the [ENTER] key or [►] key.

(2) The measuring condition saving (Save Method) screen (Fig. 3-42) appears.

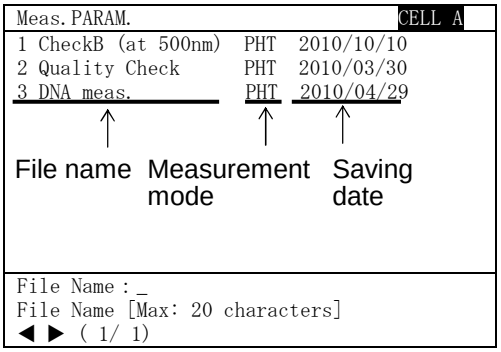


Fig. 3-42 Measuring Condition Saving (Save Method) Screen

(3) When other measuring conditions are saved in advance, a list of saved measuring conditions appears on the main menu. At this time, the file name, measurement mode (PHT: Photometry, WLS: Wavelength Scan, TMS: Time Scan) and saving date are indicated.

(4) For the measuring conditions to be saved, enter a file name within 20 characters and press the [ENTER] key.

NOTE:

- If a file of the same name as entered already exists in the same measurement mode, the following guidance appears.

  ```
  Already exists. Overwrite it? :_
  [1]Yes  [2]No
  ```

  For overwriting, press the <1> key (Yes). To avoid overwriting, press the <2> key (No) and rename the file to be saved.
- A total of 50 method files can be saved for all measurement modes.
- If 50 files are already registered, the following message appears.

  ```
  No.of files is full.
  ```

  In this case, delete files referring to section 4.2.2 and retry saving.
- The method for which auto start (for details, refer to section 4.5) is set is preceded by "*".

(5) Return to the Photometry screen by pressing the [RETURN] key.

7. Measurement of Samples

(1) To determine the measuring conditions set in the preceding steps, press the <6> key (Meas. Screen) and then [ENTER] key. Or press the [MEAS. SCREEN] key. The sample setting screen (Fig. 3-43) appears.

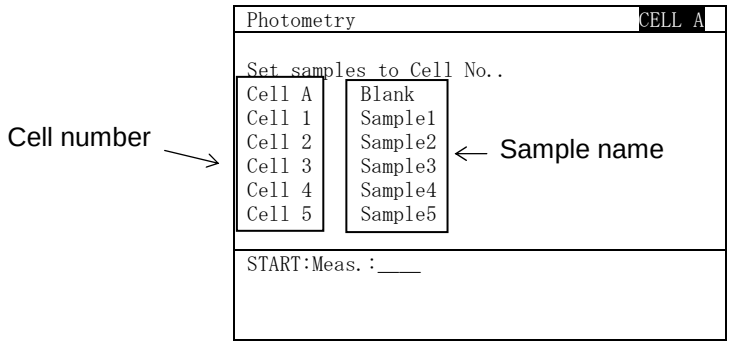


Fig. 3-43 Sample Setting Screen

On the screen, displayed from the left are the cell number and sample name. Set the corresponding sample to each cell. If "-" (hyphen) is indicated for the sample name, avoid setting a sample in the relevant cell. When ON is selected for "SAMP. Autozero", set samples as shown in Table 3-31, and as shown in Table 3-32 when OFF is selected. The instrument measures samples in the sequence shown in Table 3-33.

Table 3-31 How to Set Cells with ON Selected for SAMP. Autozero

	Cell A*	Cell 1	Cell 2	Cell 3	Cell 4	Cell 5
1st round	Blank	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
2nd round	Blank	Sample 6	Sample 7	Sample 8	Sample 9	Sample 10
3rd round	Blank	Sample 11	Sample 12	Sample 13	Sample 14	Sample 15
4th round and subsequent	Repeated until the specified number of samples are all measured.					

Table 3-32 How to Set Cells with OFF Selected for SAMP. Autozero

	Cell A*	Cell 1	Cell 2	Cell 3	Cell 4	Cell 5
1st round	Not set	STD1	STD2	STD3	STD4	STD5
2nd round	Not set	STD6	STD7	STD8	STD9	STD10
3rd round	Not set	STD11	STD12	STD13	STD14	STD15
4th round and subsequent	Repeated until the specified number of samples are all measured.					

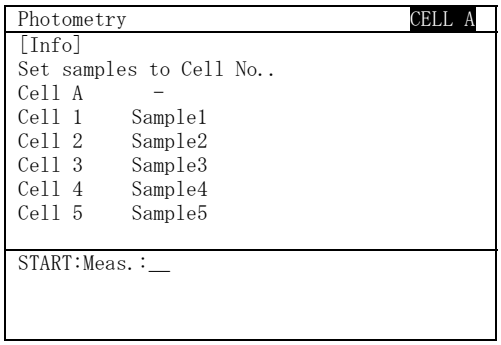
* Upon completion of each round, you can execute auto zero with cell A if needed. For details, refer to Fig. 3-44.

Table 3-33 Auto Zero Interval and Operation of Instrument

SAMP. Autozero: OFF	SAMP. Autozero: ON		Cell Position	Operation
	Auto Zero Interval: 5	Auto Zero Interval: 1		
Setting of samples (1st round)				
—	1	1	Cell A	Auto zero
1	2	2	Cell 1	Sample 1 measurement
—	—	3	Cell A	Auto zero
2	3	4	Cell 2	Sample 2 measurement
—	—	5	Cell A	Auto zero
3	4	6	Cell 3	Sample 3 measurement
—	—	7	Cell A	Auto zero
4	5	8	Cell 4	Sample 4 measurement
—	—	9	Cell A	Auto zero
5	6	10	Cell 5	Sample 5 measurement
Setting of samples (2nd round)				
—	7	11	Cell A	Auto zero
6	8	12	Cell 1	Sample 6 measurement
—	—	13	Cell A	Auto zero
7	9	14	Cell 2	Sample 7 measurement
Repeated until the specified number of samples are all measured.				

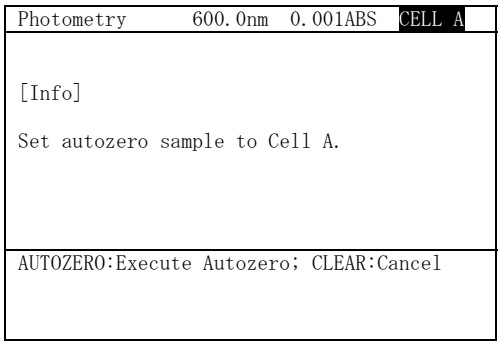
When OFF is set for “SAMP. Autozero”, auto zero can be executed by pressing the [AUTOZERO] key when the guidance on sample setting is indicated.
For details, refer to Fig. 3-44.

<1> Press the [AUTOZERO] key when the sample setting screen is displayed.



Sample setting screen

<2> The auto zero execution screen appears. Set an auto zero sample to cell A. The lamp is lit for 30 seconds and the current measured value is indicated so that you can check if execution of auto zero is necessary.



Auto zero execution screen

Fig. 3-44 Manual Auto Zero with OFF set for SAMP. Autozero

Upon completion of sample setting according to the guidance, press the [START] key. Measurement will then start. Measurement is carried out for every 5 samples. Guidance is given until the specified number of samples are all measured.

GUIDE: For how to set a sample to the cell holder, refer to section 2.4.4.

(2) During measurement, the screen shown in Fig. 3-45 is displayed.

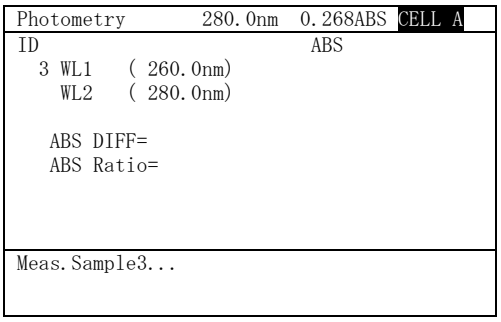


Fig. 3-45 Screen Displayed during Sample Measurement

(3) When “6” or more is specified for “No. of Sample”, the results obtained from measurement of samples 1 to 5 are indicated as shown in Fig. 3-46. This measurement result screen also appears after completion of 2nd/3rd-round measurement. Pressing the [START] key displays the next sample setting screen. Set the next samples according to the guidance. (Pressing the <1> key (Remeasure) allows remeasurement of the previous sample.)

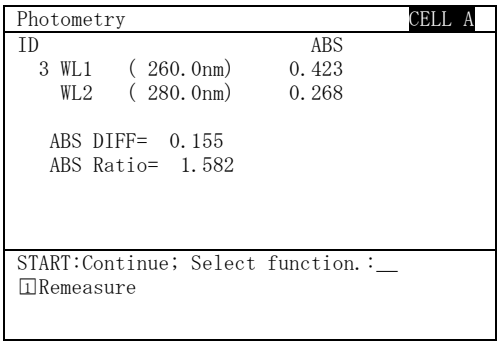


Fig. 3-46 Example of Display after 1st-round Sample Measurement

(4) When the specified number of samples have all been measured, the screen shown in Fig. 3-47 appears. For the processing function assigned to each key, refer to Table 3-34.

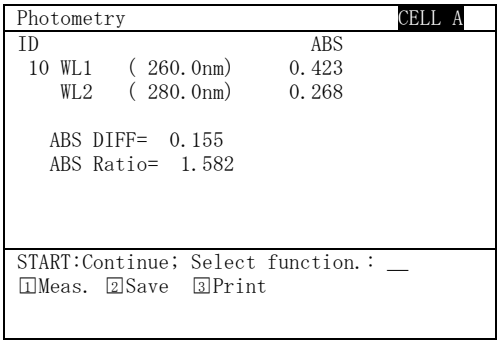
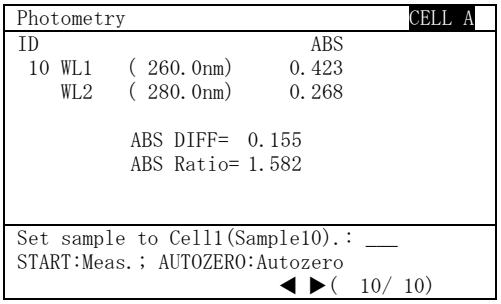
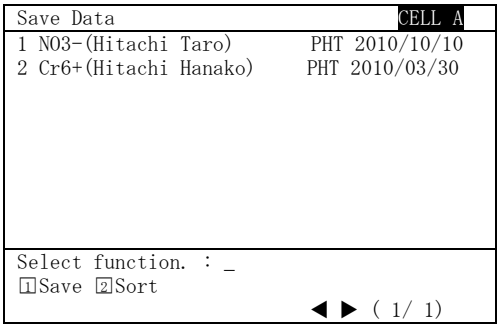
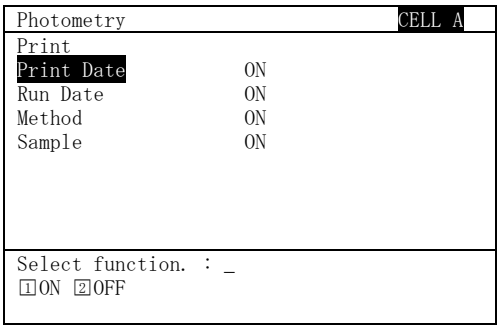


Fig. 3-47 Example of Display after Sample Measurement (number of samples: 10)

Table 3-34 Guidance after Sample Measurement

Setting Item	Description
[1] Meas.	You can make setting related to measurement. "New Meas.", "Continue" and "Remeasure" are selectable. [1] New Meas. : Selected when newly measuring samples with the same calibration curve. [2] Continue : Allows you to start measurement from the number following the previously measured sample. When this function is selected, the guidance given below appears. Enter the number of samples to be measured and press the [ENTER] key. Input value. : No.of Sample [1-140] Display with 10 samples measured [3] Remeasure : Selected when remeasuring a measured sample. When this function is selected, the guidance given below appears. Select a sample to be remeasured with the [▲] or [▼] key, set the sample to cell 1 and press the [START] key to carry out remeasurement. To execute auto zero, press the [AUTOZERO] key.

(cont'd)

Setting Item	Description
[1] Meas.	
[2] Save	You can save the measured data. When this function is selected, the following screen appears.  [1] Save : Allows you to save data under a new file name. [2] Sort : Allows you to rearrange the currently saved data in the order of file names or dates.
[3] Print	You can select items to be printed. When this function is selected, the screen given below appears. For each item, select whether to print out (ON or OFF). 

3.2.4 Measuring a Spectrum

This instrument is capable of measuring the transmission spectrum and absorption spectrum. By setting the blank to cell A, one sample can be measured after automatic execution of baseline correction.

GUIDE: When auto start is specified, the system automatically sets up the conditions and advances to the measurement screen phase of sequence after the power switch is turned on. For how to specify auto start, refer to section 4.5.

1. Startup of This Product

   Start this product. (For the starting procedure, refer to section 2.3.1.)

2. Setting of Measuring Conditions

   (1) Press the [MAIN MENU] key. The Main Menu screen (Fig. 3-48) will appear. To set each condition for wavelength scan, press the <2> key (WL Scan) and then [ENTER] key. Or select “WL Scan” with the [▲] or [▼] key and press the [ENTER] key.

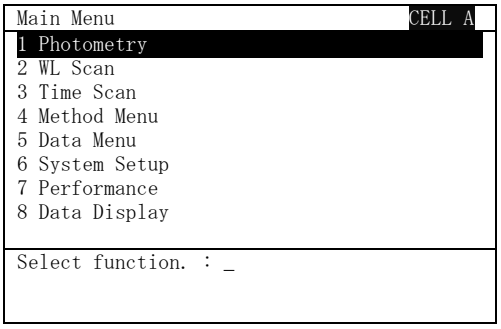


Fig. 3-48 Main Menu Screen

   (2) The WL Scan screen (Fig. 3-49) appears. To set the measuring conditions, press the <1> key (Meas. PARAM.) and then [ENTER] key. Or select “Meas. PARAM.” with the [▲] or [▼] key and press the [ENTER] key or [►] key.

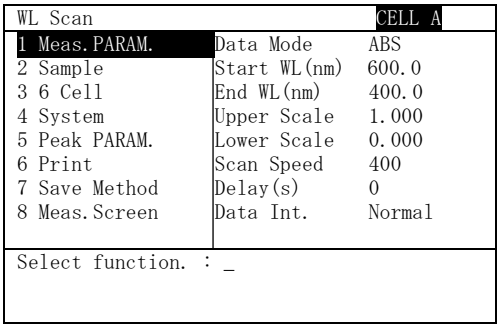


Fig. 3-49 WL Scan Screen

(3) The measuring condition (Meas. PARAM.) screen (Fig. 3-50) appears. With the [▲] or [▼] key, set the data mode (Data Mode), start wavelength (Start WL), end wavelength (End WL), scan speed (Speed), initial delay (Delay), Y-axis upper limit (Upper Scale) and Y-axis lower limit (Lower Scale) according to the guidance. For details of each parameter, refer to Table 3-35. After completion of setting, return to the WL Scan screen by pressing the [RETURN] key or [◀] key.

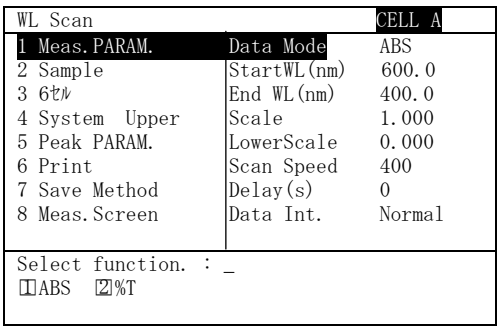


Fig. 3-50 Measuring Condition (Meas. PARAM.) Screen

Table 3-35 “Meas. PARAM.” Setting Parameters

Setting Item	Description
Data Mode	Determine the unit of scale on the Y axis. [1] ABS : Used for measuring the absorption spectrum (spectrum with absorbance on the Y axis). [2] %T : Used for measuring the transmission spectrum (spectrum with transmittance on the Y axis).
Start WL (nm)	Enter a wavelength for starting wavelength scanning. This parameter is specifiable in a range of 200.0 to 1100.0 nm in steps of 0.1 nm. Make your setting so that Start WL < End WL. Make your setting so that (End WL−Start WL)≧10.
End WL (nm)	Enter a wavelength for ending wavelength scanning. This parameter is specifiable in a range of 190.0 to 1090.0 nm in steps of 0.1 nm. Make your setting so that Start WL < End WL. Make your setting so that (End WL−Start WL)≧10
Upper Scale	Enter a Y-axis upper limit for the spectrum displayed during measurement. This parameter is specifiable in the following range. ABS : -9.999 to 9.999 %T : -999.9 to 999.9
Lower Scale	Enter a Y-axis lower limit for the spectrum displayed during measurement. This parameter is specifiable in the following range. ABS : -9.999 to 9.999 %T : -999.9 to 999.9
Scan Speed	Set up a wavelength scanning speed. The following 7 speeds are selectable. [1] 40 [2] 100 [3] 200 [4] 400 [5] 800 [6] 1200 [7] 2400 The data interval varies with the scan speed. For this interval, a small value is set at low speed and a large value at high speed. For details, refer to the description of “Data Int.”
Delay (s)	After the [START] key is pressed, the system waits for the time period set here and then starts measurement. This parameter is settable in a range of 0 to 9999 sec in steps of 1 sec. Set the parameter when you want to start measurement after a specified time period, including when measuring a sample after its temperature reaches the room temperature and when starting measurement after completion of reaction. Enter “0” if the delay time need not be set.

(cont'd)

<table>
<tr><th>Setting Item</th><th>Description</th></tr>
<tr><td>Data Int.</td><td>
Set up a data interval. "Normal" and "Fine" are selectable.
[1] Normal : Usually selected.
[2] Fine : Permits measurement at short data intervals as compared with Normal. However, noise is more likely to be generated on a spectrum, because the data acquisition time per point is shorter than when Normal is selected. The actual data interval differs depending on the scan speed and measuring wavelength range. Whichever is longer is made effective. In case of scanning at 400 nm/min in a range of 600 to 400 nm for example, the data interval is set to 2 nm when Normal is selected, and to 1 nm when Fine is selected.

Scan speed and data interval
<table>
<tr><th rowspan="2">Scan Speed (nm/min)</th><th colspan="2">Data Sampling Interval (nm)</th></tr>
<tr><th>Normal</th><th>Fine</th></tr>
<tr><td>40</td><td>0.2</td><td>0.1</td></tr>
<tr><td>100</td><td>0.5</td><td>0.2</td></tr>
<tr><td>200</td><td>1</td><td>0.5</td></tr>
<tr><td>400</td><td>2</td><td>1</td></tr>
<tr><td>800</td><td>3</td><td>2</td></tr>
<tr><td>1200</td><td>5</td><td>3</td></tr>
<tr><td>2400</td><td>5</td><td>5</td></tr>
</table>
Data interval according to measuring wavelength range
<table>
<tr><th>Measuring wavelength range (nm)</th><th>Data interval (nm)</th></tr>
<tr><td>$\lambda > 500$</td><td>1.0</td></tr>
<tr><td>$500 \geqq \lambda > 200$</td><td>0.5</td></tr>
<tr><td>$200 \geqq \lambda > 100$</td><td>0.2</td></tr>
<tr><td>$100 \geqq \lambda$</td><td>0.1</td></tr>
</table>
</td></tr>
</table>

3. Setting of Sample Conditions

(1) To set the sample conditions, press the <2> key (Sample) and then [ENTER] key. Or select "Sample" with the [▲] or [▼] key and press the [ENTER] key or [►] key.

(2) The sample condition (Sample) screen (Fig. 3-51) appears. Enter a sample name here. For details, refer to Table 3-36. After input, return to the WL Scan screen by pressing the [ENTER] key or [◄] key.

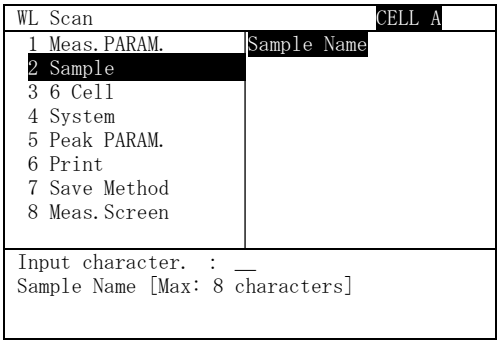


Fig. 3-51 Sample Condition (Sample) Screen

Table 3-36 Input of Sample Name

Setting Item	Description
Sample Name	Up to 8 half-size alphanumeric characters can be entered for the sample name. The sample name entered here is printed in the sample name field on the report. For the character input procedure, refer to section 2.4.3.

4. Setting of 6-cell Conditions

NOTE: "6 Cell Mode" is not indicated if OFF is specified for Mode on the 6-cell mode setting screen for use of the single cell holder or rectangular long path cell holder. (For details, refer to section 2.5.4.) When the auto sipper is connected, "Sipper" is indicated in place of "6 Cell Mode".

(1) To set the 6-cell conditions, press the <3> key (6 Cell) and then [ENTER] key. Or select "6 Cell" with the [▲] or [▼] key and press the [ENTER] key or [►] key.

(2) The 6-cell condition (6 Cell) screen (Fig. 3-52) appears. To set each item on the 6-cell condition (6 Cell) screen, press the [ENTER] key. Or select each item with the [▲] or [▼] key and make your setting according to the guidance. For details of each parameter, refer to Table 3-37.

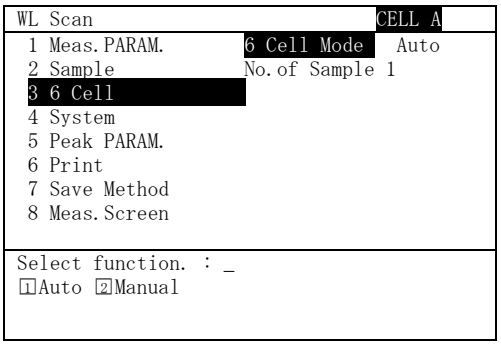


Fig. 3-52 6-cell Condition (6 Cell) Screen

Table 3-37 "6 Cell" Setting Parameters

Setting Item	Description
6 Cell Mode	Select a 6-cell operation mode for measurement from the following. [1] Auto By setting a baseline sample and unknown samples to the 6-cell turret, it is possible to automatically turn the 6-cell turret and automatically measure one sample after baseline correction. [2] Manual Baseline correction and sample measurement are performed manually. It is required to manually move the cell and execute baseline correction. (For details of the Manual mode, refer to section 3.3.4.)
No. of Sample	Set the number of samples to be measured. This parameter is settable in a range of 1 to 5.

(3) After setting each item, return to the WL Scan screen by pressing the [RETURN] key or [◄] key.

5. Setting of System Conditions

(1) To set the system conditions, press the <4> key (System) and then [ENTER] key. Or select "System" with the [▲] or [▼] key and press the [ENTER] key or [►] key.

(2) The system condition (System) setting screen (Fig. 3-53) appears. Set a response according to the guidance. For detail, refer to Table 3-38.

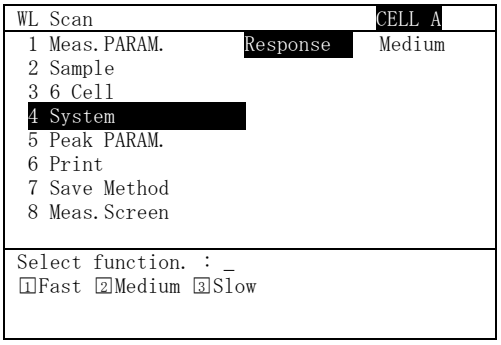


Fig. 3-53 System Condition (System) Setting Screen

Table 3-38 Response Setting Parameter

Setting Item	Description
Response	Select from the following 3 response speeds. [1] Fast : Used for high-resolution measurement with respect to the wavelength. Note that the noise level is high as compared with Medium and Slow. [2] Medium: Used for ordinary measurement. [3] Slow : Used to reduce a variation in photometric value. This response speed is unsuitable for high-resolution measurement as compared with Fast and Medium.

(3) After completion of response setting, return to the WL Scan screen by pressing the [RETURN] key or [◄] key.

6. Setting of Peak Detection Conditions

(1) To set the peak detection conditions, press the <5> key (Peak PARAM.) and then [ENTER] key.
Or select “Peak PARAM.” with the [▲] or [▼] key and press the [ENTER] or [►] key.

(2) The peak detection condition (Peak PARAM.) setting screen (Fig. 3-54) appears. Specify a threshold and sensitivity here according to the guidance. For details, refer to Table 3-39.

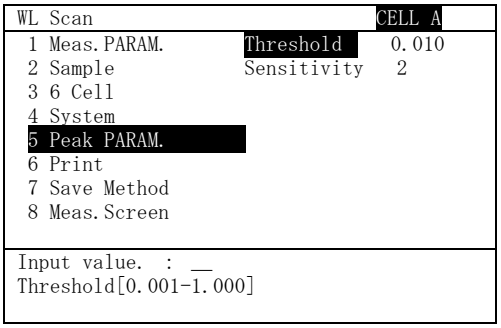
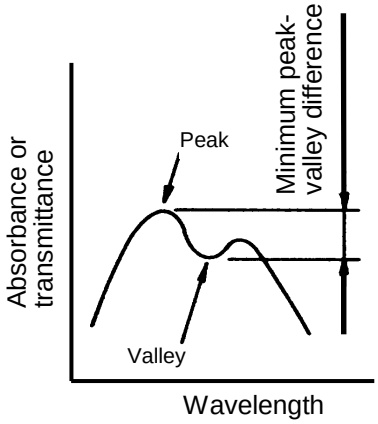


Fig. 3-54 Peak Detection Condition (Peak PARAM.) Setting Screen

Table 3-39 "Peak PARAM." Setting Parameters

Setting Item	Description
Threshold	Set up a condition for detecting a peak and valley from the measured spectrum. In peak detection, peaks including noise are detected if the threshold level is reduced. Conversely, small peaks cannot be detected if the threshold level is increased. As just described, it is a threshold level that determines the detectability in the Y-axis direction of a spectrum. If the minimum difference in photometric value between the peak and valley (peak-valley difference shown in the following figure) is larger than the threshold level, they are detected as a peak and valley. Detected peak and valley: Minimum peak-valley difference > Threshold level This parameter is specifiable in the following range. ABS : 0.001 to 1.000 %T : 0.1 to 100.0 

(cont'd)

Setting Item	Description
Sensitivity	Set up a condition for detecting a peak and valley from the measured spectrum. It is sensitivity that determines the detectability in the X-axis direction of a spectrum. For detection of a sharp peak, select sensitivity 1. For detection of a broad peak, select sensitivity 8. The following 4 levels are selectable. [1] 1 [2] 2 [3] 4 [4] 8 For details, refer to Explanation 3-9.

(3) After completion of calculation condition setting, return to the WL Scan screen by pressing the [RETURN] or [◀] key.

Explanation 3-9 Peak Detection Sensitivity

The setting of peak detection sensitivity is employed for judging whether data has increased or decreased by comparing the data at the present base point and the data after N points, based on which a peak will be detected. Explanation is given here in the case of peak detection where peak sensitivity is set at level 1 (data after 6 points to be used for comparison).

When the data after N points is larger than at the present base point, it is taken as a rise. When smaller, it is taken as a fall. Thus, data at the next base point is compared with that after N points. This sequence is repeated for rise or fall judgments. (See Fig. 1.) When a rise occurs N/2 times in succession followed by N/2-times succession of a fall, it is judged that a peak is detected. Also, when a fall occurs N/2 times in succession followed by N/2-times succession of a rise, it is judged that a valley is detected. (See Fig. 2.)

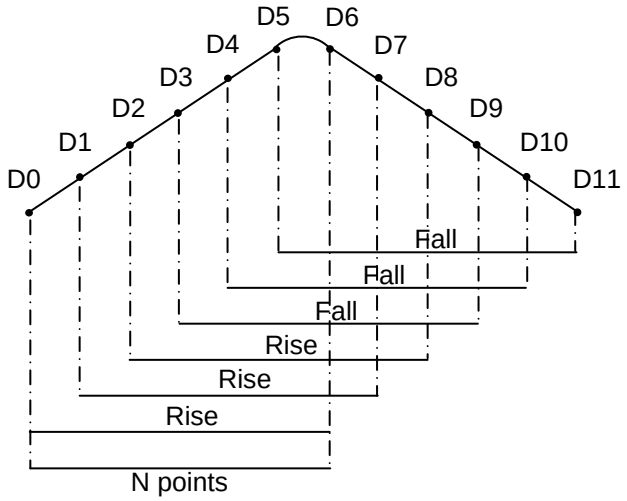


Fig. 1 Schematic Diagram of Peak

Table 1 Rule on Rise or Fall Judgment

Base-point data	D0	D1	D2	D3	D4	D5
Data after N points	D6	D7	D8	D9	D10	D11
Rise/fall judgment	Rise	Rise	Rise	Fall	Fall	Fall

Sensitivity setting assigns a concrete number to “N” which represents the number of points after the base point to be used for peak detection. Table 2 lists the relation between sensitivity level and data checking interval. At sensitivity level 1, data after 6 points is checked. At sensitivity level 8, data after 48 points is checked. Therefore, sensitivity level 1 should be selected for detecting peak/valley in a sharp spectrum, and sensitivity level 8 for detecting peak/valley in a spectrum having a moderate curve.

Table 2 Sensitivity Level and Data Checking Interval

Sensitivity Level	Interval (N points)
1	6 points
2	12 points
4	24 points
8	48 points

7. Setting of Printing Conditions

> **GUIDE**: Specify print items if determined beforehand. You can also specify print items after completion of measurement. If you do not want to set the printing conditions here, proceed to step 8.

(1) To set the printing conditions, press the <6> key (Print) and then [ENTER] key. Or select “Print” with the [▲] or [▼] key and press the [ENTER] key or [►] key.

(2) The printing condition (Print) screen (Fig. 3-55) appears. Make your setting according to the guidance. For details of each parameter, refer to Table 3-40.

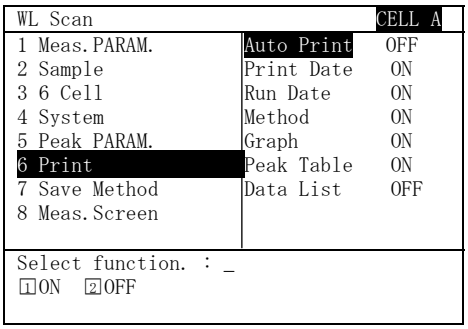


Fig. 3-55 Printing Condition (Print) Screen

(3) After completion of setting for Auto Print, Print Date, Run Date, Method, Graph, Peak Table, Data List and Int., return to the WL Scan screen by pressing the [RETURN] key or [◄] key.

Table 3-40 “Print” Setting Parameters

Setting Item	Description	Location in Fig. 3-56
Auto Print	[1] ON : Automatic printing is carried out after measurement. [2] OFF : Automatic printing is not carried out after measurement.	—
Print Date	[1] ON : Printing date is printed. [2] OFF : Printing date is not printed.	<1>
Run Date	[1] ON : Analysis date is printed. [2] OFF : Analysis date is not printed.	<2>
Method	[1] ON : Measuring conditions are printed. [2] OFF : Measuring conditions are not printed.	<3>
Graph	[1] ON : Spectrum is printed. [2] OFF : Spectrum is not printed.	<4>
Peak Table	[1] ON : Peak table is printed. [2] OFF : Peak table is not printed.	<5>
Data List	[1] OFF : Numerical data of spectrum is not printed. [2] All Data : Numerical data of spectrum is all printed. [3] Interval : Numerical data of spectrum is printed at the specified intervals.	<6>
Int.	Specify the printing interval for the data list. This parameter is indicated when “Interval” is selected for Data List. It is specifiable in a range of 0.5 to 100.0.	—

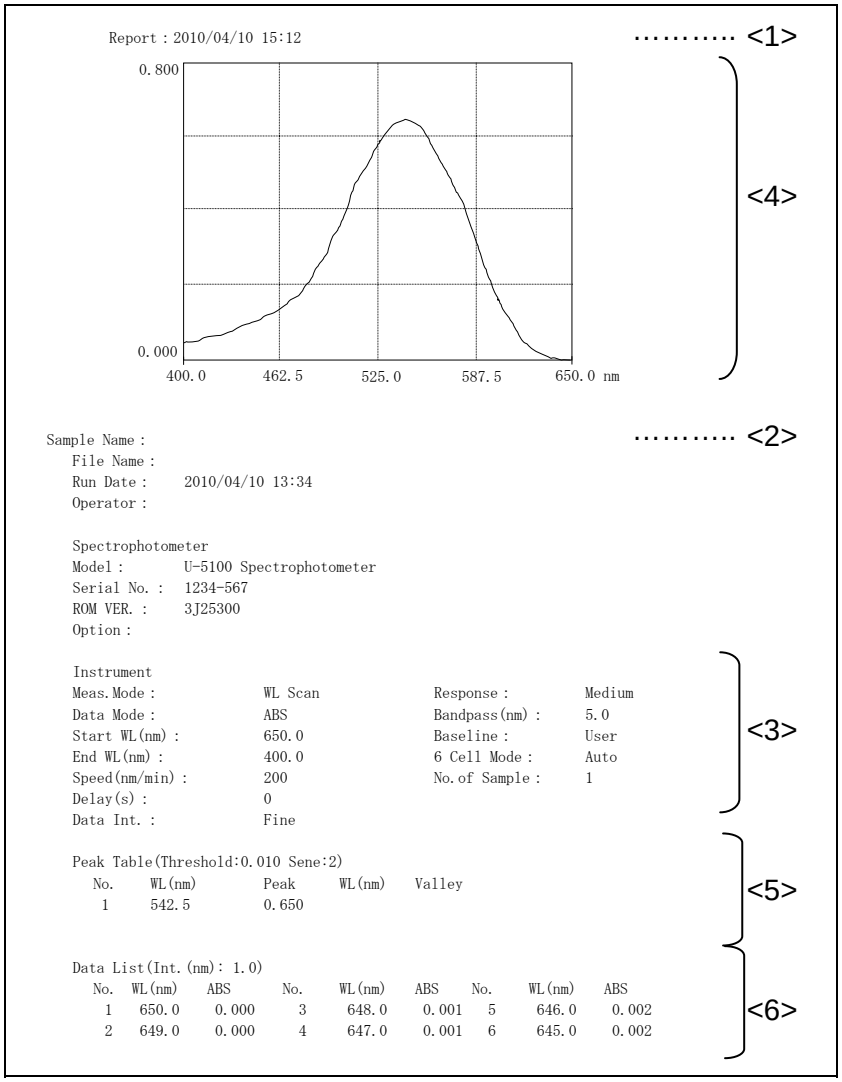


Fig. 3-56 Example of Printout in WL Scan Mode

8. Saving of Measuring Conditions

> **GUIDE**: When the set measuring conditions need not be saved, proceed to step 9.

(1) To save the set measuring conditions, press the <7> key (Save Method) and then [ENTER] key. Or select “Save Method” with the [▲] or [▼] key and press the [ENTER] key or [►] key.

(2) The measuring condition saving (Save Method) screen (Fig. 3-57) appears.

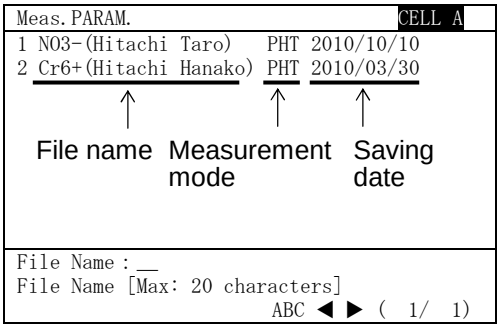


Fig. 3-57 Measuring Condition Saving (Save Method) Screen

(3) When other measuring conditions are saved in advance, a list of saved measuring conditions appears on the main menu. At this time, the file name, measurement mode (PHT: Photometry, WLS: Wavelength Scan, TMS: Time Scan) and saving date are indicated.

(4) For the measuring conditions to be saved, enter a file name within 20 characters and press the [ENTER] key.

NOTE:

- If a file of the same name as entered already exists in the same measurement mode, the following guidance appears.

  Already exists. Overwrite it? :_
  [1]Yes [2]No

  For overwriting, press the <1> key (Yes). To avoid overwriting, press the <2> key (No) and rename the file to be saved.
- A total of 50 method files can be saved for all measurement modes.
- If 50 files are already registered, the following message appears.

  No.of files is full.

  In this case, delete files referring to section 4.2.2 and retry saving.
- The method for which auto start (for details, refer to section 4.5) is set is preceded by "*".

(5) Return to the WL Scan screen by pressing the [RETURN] key.

9. Setting and Measurement of Samples

(1) To determine the measuring conditions set in the preceding steps, press the <8> key (Meas. Screen) and then [ENTER] key. Or press the [MEAS. SCREEN] key.

(2) The guidance on sample setting (Fig. 3-58) appears. On the screen, displayed from the left are the cell number and sample name. Cell A is used for baseline correction. Set a baseline correction sample (blank) to cell A. And set the corresponding samples to cells 1 to 5. Upon completion of setting, press the [START] key. After baseline correction with cell A, sample 1 will be measured.

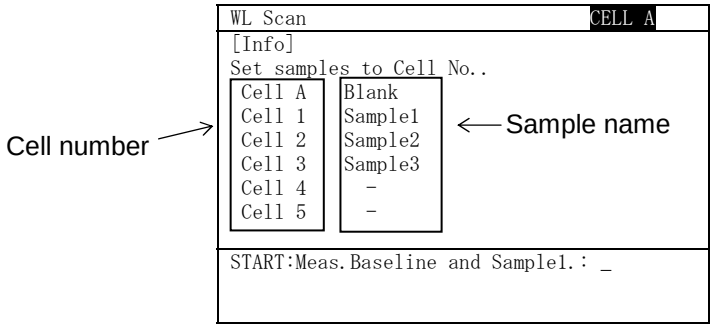


Fig. 3-58 Guidance on Sample Setting

10. Measurement of Sample Solutions

(1) Upon completion of sample 1 measurement, the guidance shown in Fig. 3-59 appears. To record data, perform the save or print operation. To save data, select the <3> key (Save). To print data, press the [PRINT] key. Pressing the <1> to <5> keys allows the processings shown in Table 3-41. For proceeding to the next measurement, press the [START] key.

NOTE: In WL Scan mode, the spectrum of each sample cannot be automatically saved. So the save or print operation is required for each sample.

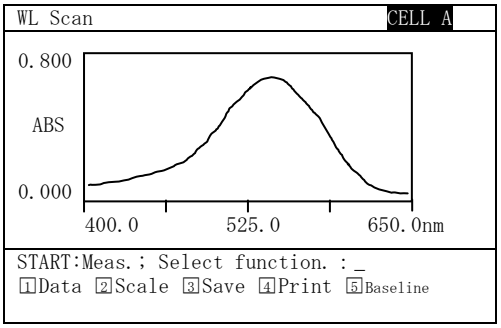
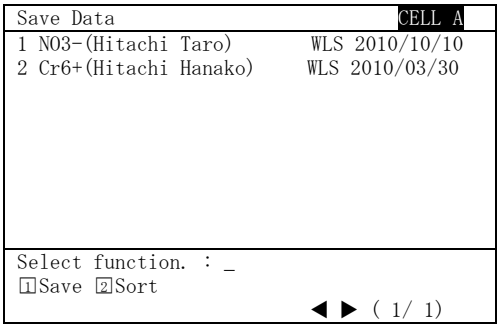
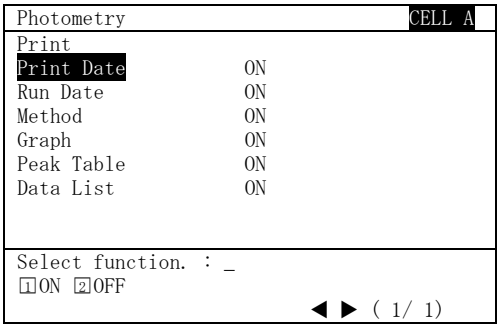
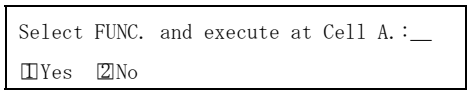


Fig. 3-59 Screen after Sample Measurement

Table 3-41 Guidance after Measurement in WL Scan Mode

Setting Item	Description
[1] Data	You can perform each data processing. When this function is selected, the following guidance appears. Select function. : _ 1Trace 2Peak 3Smoothing 4List For details of the function, refer to section 4.3. [1] Trace : Allows you to read out all the measured data on the spectrum. [2] Peak : Displays the detected peak. [3] Smoothing : Allows you to perform spectrum smoothing. [4] List : Allows you to display the measured data at the specified intervals.
[2] Scale	You can change the scale on the X axis and Y axis of spectrum. For detail of this function, refer to section 4.3.

(cont'd)

Setting Item	Description
[3] Save	You can save the measured spectrum. When this function is selected, the following screen appears.  [1] Save : Allows you to save data under a new file name. [2] Sort : Allows you to rearrange the currently saved data in the order of file names or dates.
[4] Print	You can select items to be printed. When this function is selected, the screen given below appears. For each item, select whether to print out (ON or OFF). 
[5] Baseline	You can execute baseline correction. When this function is selected, the following guidance appears.  [1] Yes : Selected to execute baseline correction. Set a sample for baseline correction to cell A and press the <1> key. [2] No : Selected to return to the previous screen without executing baseline correction.

(2) Before proceeding to the next measurement, the system displays the data deletion confirming screen (Fig. 3-60). When data has already been saved or printed, select the <1> key (Yes). If data has not yet been saved or printed, select the <2> key (No) and perform the save or print operation.

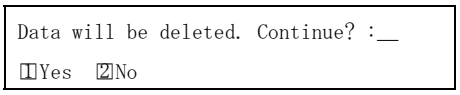


Fig. 3-60 Data Deletion Confirming Screen

(3) Pressing the [START] key starts spectrum measurement. After measurement, you can execute the same operation as in (1). By repeating this operation, it is possible to perform spectrum measurement for up to 5 samples.

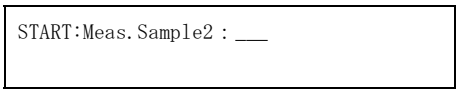
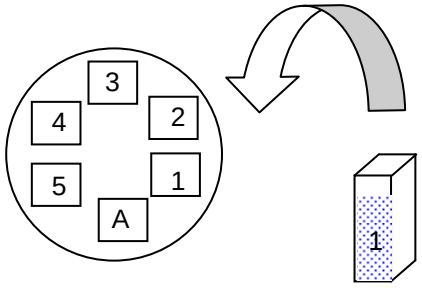


Fig. 3-61 Guidance on Measurement Start

3.3 Sample-by-sample Measurement (6-cell manual mode)

Samples are measured one by one. This mode is suitable for measurement of multiple samples with 2 cells (one for auto zero). By pressing the [Autozero] key, it is possible to correct the absorbance to zero with cell A set in advance.



Measurement of solution concentration →section3.3.1.
Generation of calibration curve and determination of unknown sample concentration →section 3.3.1.
Determination of unknown sample concentration by entered calibration curve factor →section 3.3.1.
Determination of unknown sample concentration from saved calibration curve →section 4.1.4.
Measurement of absorbance/transmittance →section 3.3.2.
Measurement of DNA →section 3.3.3.
Measurement of spectrum →section 3.3.4.
Measurement of time scan →section 3.3.5.

3.3.1 Determining Concentration of Solution

This instrument is used for generating a calibration curve and determining the concentration of an unknown sample, and for entering a calibration factor and determining the concentration.

GUIDE: When auto start is specified, the system automatically sets up the conditions and advances to the measurement screen phase of sequence after the power switch is turned on. For how to specify auto start, refer to section 4.5.

1. Startup of This Product

   Start this product. (For the starting procedure, refer to section 2.3.1.)

2. Setting of Measuring Conditions
3. Setting of Sample Conditions
4. Setting of Calibration Curve Conditions
5. Setting of Calibration Curve Data

* For steps 2 to 5, refer to section 3.2.1.

6. Setting of 6-cell Conditions

> **NOTE**: "6 Cell Mode" is not indicated if OFF is specified for Mode on the 6-cell mode setting screen for use of the single cell holder or rectangular long path cell holder. (For details, refer to section 2.5.4.) When the auto sipper is connected, "Sipper" is indicated in place of "6 Cell Mode".

(1) To set the 6-cell conditions, press the <5> key (6 Cell) and then [ENTER] key. Or select "6 Cell" with the [▲] or [▼] key and press the [ENTER] key or [►] key.

(2) The 6-cell condition (6 Cell) screen (Fig. 3-62) appears.

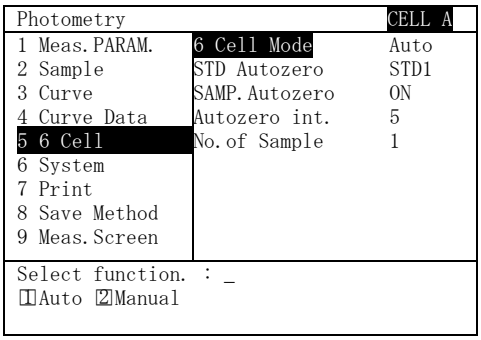


Fig. 3-62 6-cell Condition (6 Cell) Screen

(3) To set each item on the 6-cell condition (6 Cell) screen, press the [ENTER] key. Or select each item with the [▲] or [▼] key and make your setting according to the guidance. For details of each parameter, refer to Table 3-42.

Table 3-42 "6 Cell" Setting Parameter

Setting Item	Description
6 Cell Mode	Specify a 6-cell operation mode for measurement. [1] Auto In this mode, a sample is set at each position of the 6-cell turret beforehand and the holder is automatically turned to automatically perform from auto zero to standard/sample measurement. It is recommended to use this mode if you have 6 cells and there are many samples to be measured. (For details, refer to section 3.2.1.) [2] Manual In this mode, standard/sample measurement is carried out by using one position (cell 1 to 5 selectable) of the 6-cell turret. To eliminate the influence of instrument drift (baseline fluctuation) during measurement, auto zero can easily be executed by setting a solution for auto zero to cell A. In normal usage, set a standard or sample solution to cell 1.

7. Setting of System Conditions
8. Setting of Printing Conditions

* For steps 7 and 8, refer to section 3.2.1.

9. Measurement of Standard Solutions

GUIDE: When 2) Factor is selected for Curve Type in step 4, standard solution measurement is not carried out. So proceed to step 10.

(1) To determine the measuring conditions set in the preceding steps, press the <9> key (Meas. Screen) and then [ENTER] key. Or press the [MEAS. SCREEN] key.

(2) The auto zero sample setting screen (Fig. 3-63) appears. Set an auto zero sample to cell A. The lamp is lit for 30 seconds and the current measured value is indicated so that you can check if execution of auto zero is necessary. Upon completion of setting, press the [AUTOZERO] key. Auto zero will be executed at the position of cell A. When avoiding auto zero, press the [CLEAR] key to cancel auto zero.

NOTE: For the first measurement under the set conditions, be sure to execute auto zero.

For details of the auto zero sample, refer to Explanation 3-10 and Explanation 3-11.

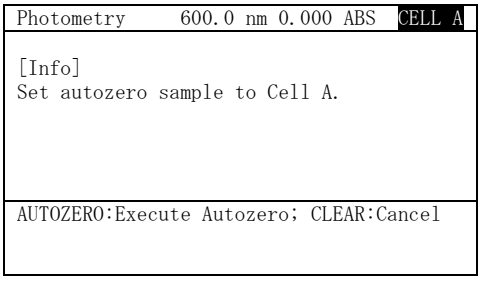
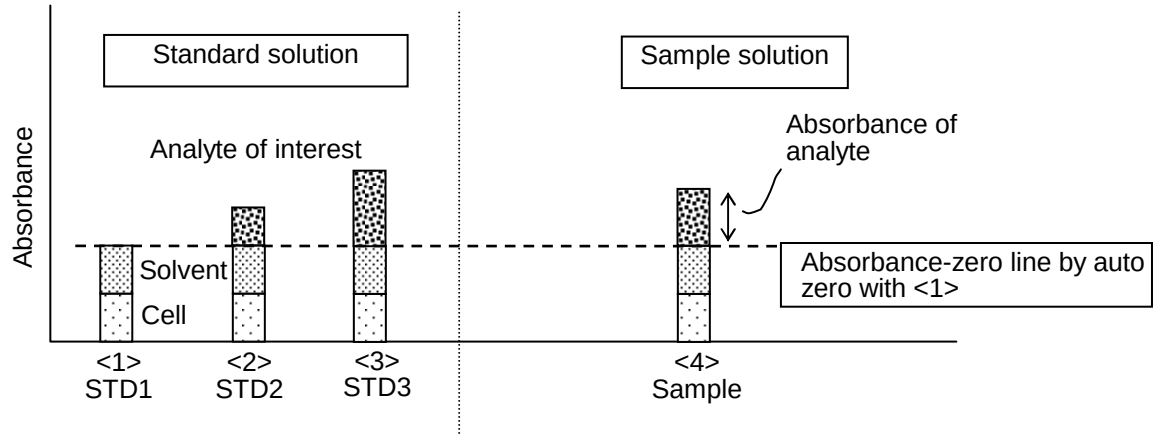


Fig. 3-63 Auto Zero Sample Setting Screen

Explanation 3-10 Auto Zero Method (without coloring reagent)

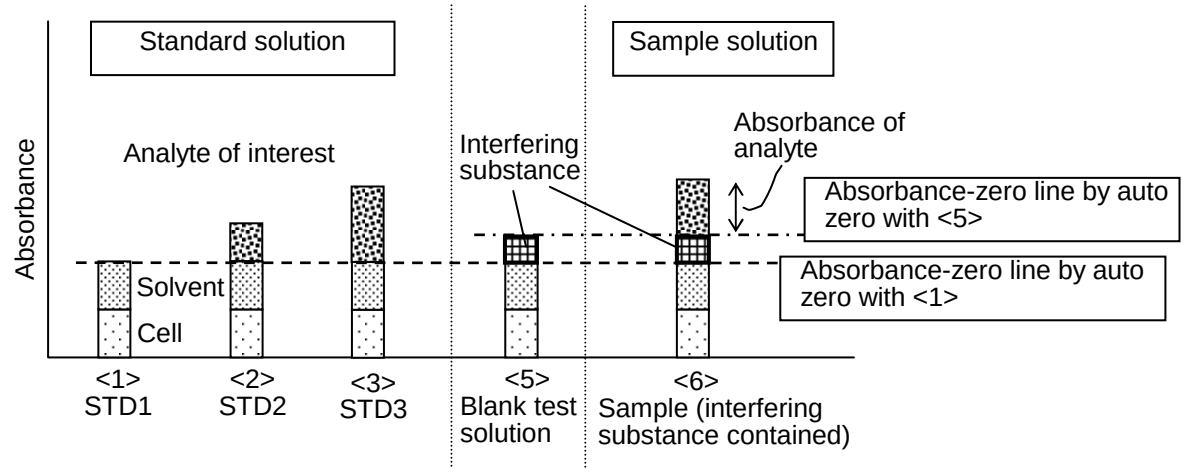


Elements causing absorbance without using coloring reagent (not containing interfering substance)

A measured absorbance value is given as a total of absorptions due to various elements (cell, solvent, coloring reagent, analyte of interest, interfering substance). In other words, this value does not simply stand for an absorption due to the analyte alone.

For generating a calibration curve according to concentration levels 0, 1 and 2, solutions of concentration levels 0, 1 and 2 are prepared for STD1, STD2 and STD3, respectively (see <1> to <3> in the above figure). These STD's have absorptions due to cell, solvent and analyte. However, the absorbance required for actual quantitation is the one deriving from the analyte. Therefore, absorptions due to cell and solvent need to be subtracted (by auto zero operation). In this case, auto zero is carried out with STD 1 and the absorbance values of STD1 to STD3 are measured, thereby generating a calibration curve.

And, for sample quantitation, the concentration of the sample is determined using the absorbance after exclusion of cell and solvent. When the absorption other than those due to cell and solvent derives from the analyte alone, the determined concentration equals the concentration of the analyte as illustrated at <4> in the above figure.

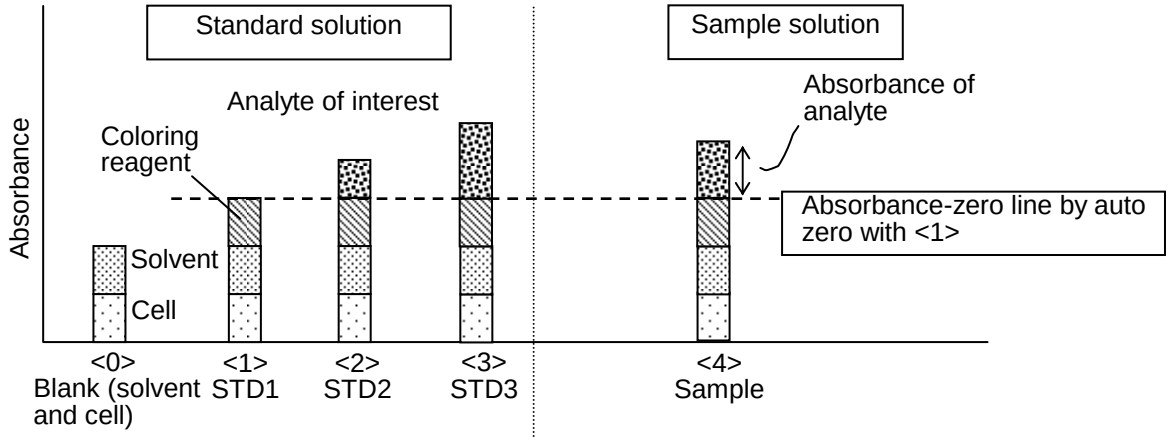


Elements causing absorbance without using coloring reagent (containing interfering substance)

In the case where a sample contains an interfering substance such as turbid or disturbing component as illustrated at <6> in the above figure, the absorbance due to the interfering substance will be added to the quantitative value of the analyte.

In this case, it is necessary to carry out a blank test (the same preparatory operation as for samples by use of pure water or the like) and subtract the measured absorbance of the blank test solution by auto-zero operation at the time of sample measurement or subtract the quantitative value of the blank test solution from that of the sample in order to subtract the absorbance of the interfering substance from that of the sample.

Explanation 3-11 Auto Zero Method (with coloring reagent)

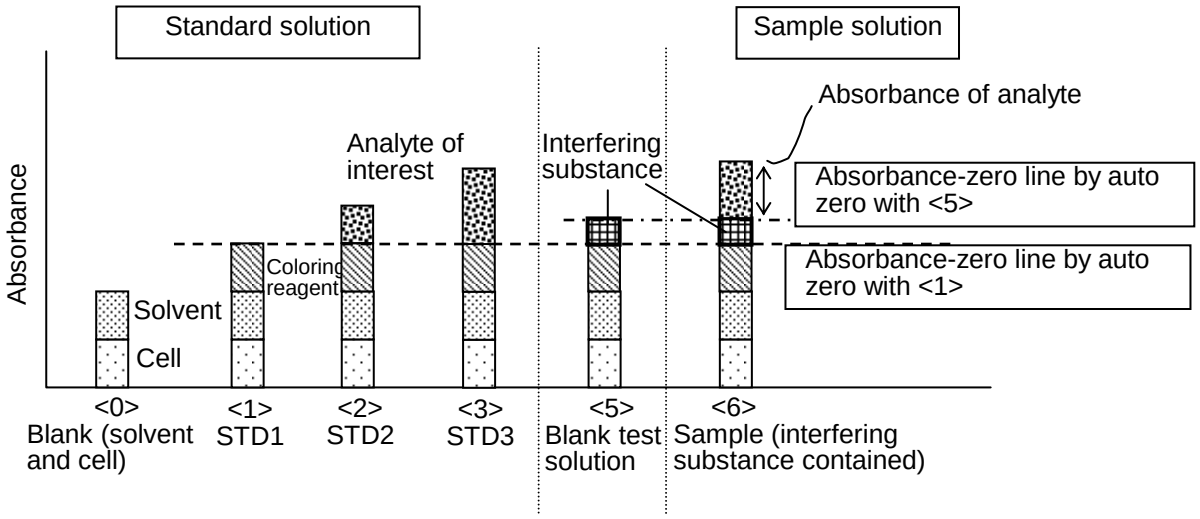


Elements causing absorbance with coloring reagent (not containing interfering substance)

When using a coloring reagent, the absorption of a sample solution includes that of this reagent besides those of cell and solvent. For subtracting the absorbance due to the coloring reagent as well, auto zero is carried out with the solution at <1> in the above figure.

For sample quantitation, the concentration of the sample is determined using the absorbance after exclusion of cell, solvent and coloring reagent. When the absorption other than those due to cell, solvent and coloring reagent derives from the analyte alone, the determined concentration equals the concentration of the analyte as illustrated at <4> in the above figure.

Also, when the absorbance of the solution at <1> in the above figure is unstable with time, the solution is not suited for auto zero operation. Therefore, it is recommended to carry out auto zero operation with the blank (solvent and cell).

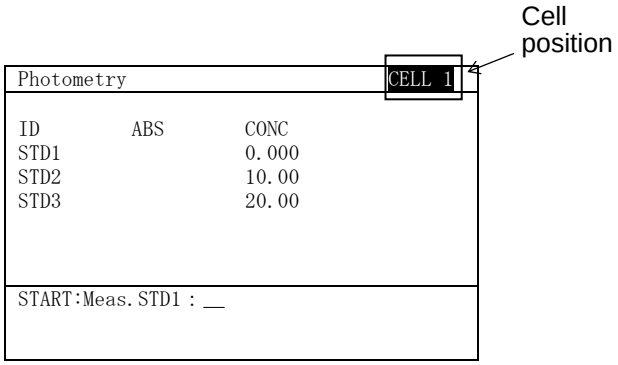


In the case where a sample contains an interfering substance such as turbid or disturbing component as illustrated at <6> in the above figure, the absorbance due to the interfering substance will be added to the quantitative value of the analyte. In this case, it is necessary to carry out a blank test (the same preparatory operation as for samples by use of pure water or the like) and subtract the measured absorbance of the blank test solution by auto-zero operation at the time of sample measurement or subtract the quantitative value of the blank test solution from that of the sample in order to subtract the absorbance of the interfering substance from that of the sample.

(3) The standard measurement screen (Fig. 3-64) appears. At this time, the cell position shifts to cell 1. For measurement at a different position, hold down the [SHIFT] key and press the [◄] or [►] to shift the cell position. Make sure that the aimed-at cell number is indicated on the screen.

NOTE: In 6-cell manual mode, the photometric value at the cell position indicated on the screen is measured. Before measurement, therefore, check if the cell position where the standard has been set coincides with the cell position indicated on the screen.

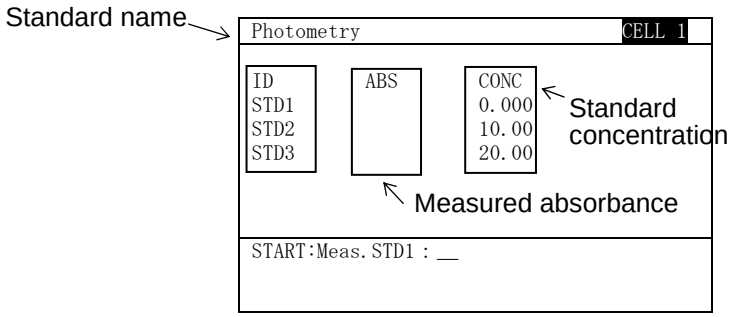
GUIDE: In 6-cell manual mode, the photometric value at the cell position indicated on the screen is measured. For carrying out auto zero frequently, it is recommended to use cell 1. Cell 1 can move to the position of cell A in a short time, thus ensuring smooth measurement. When the guidance is displayed, auto zero can be executed at the position of cell A by pressing the [AUTOZERO] key. After execution of auto zero, the system moves to the cell position before the execution. By pressing the [AUTOZERO] with the auto zero sample set to cell A and the sample set to cell 1, you can execute auto zero without taking the cell in and out.



Example of display with “3” set for number of standards

Fig. 3-64 Standard Measurement Screen

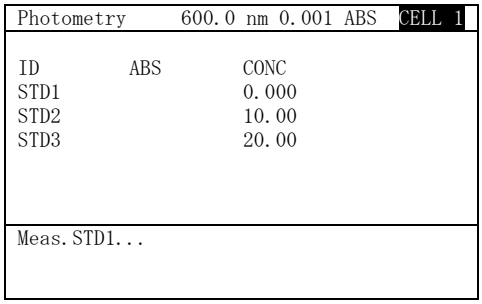
Figure 3-65 shows the standard setting screen.
On the screen, displayed from the left are the standard name, measured absorbance and standard concentration. Measurement is carried out sequentially starting from STD1, until the specified number of standards are all measured. According to the guidance, set the indicated standard to the cell position indicated on the screen (cell 1), close the sample compartment cover and press the [START] key.



Example of display with “3” set for number of standards

Fig. 3-65 Standard Setting Screen

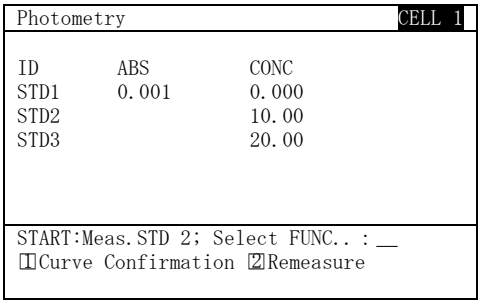
(4) During measurement, the screen shown in Fig. 3-66 is displayed.



Example of display with “3” set for number of standards

Fig. 3-66 Screen Displayed during Standard Measurement

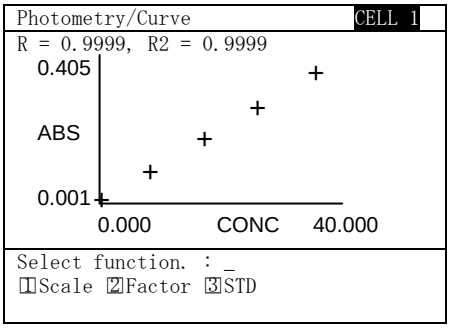
(5) Upon completion of measurement, the absorbance of STD1 is indicated on the screen (Fig. 3-67).
This screen appears after completion of measurement of each standard. Pressing the [START] key here starts measurement of the next standard (STD2).
Pressing the <1> key (Curve Confirmation) or <2> key (Remeasure) allows the processing shown in Table 3-43.



Example of display with “3” set for number of standards

Fig. 3-67 Screen after Standard Measurement

Table 3-43 Guidance during Standard Measurement

Setting Item	Description
[1] Curve Confirmation	You can generate a calibration curve with the standards measured before now and confirm it.  [1] Scale : Allows you to change the scale of calibration curve. [2] Factor : Indicates the factor, correlation coefficient and determination coefficient of calibration curve. [3] STD : Indicates the result of standard solution measurement.
[2] Remeasure	You can remeasure the last-measured standard.

(6) When the specified number of standards have all been measured, the screen shown in Fig. 3-68 appears. When the <1> key (Sample Meas.) is pressed, the system terminates standard measurement and proceeds to sample measurement. Pressing the <2> key (Curve) or <3> key (Save) allows the processing shown in Table 3-44.

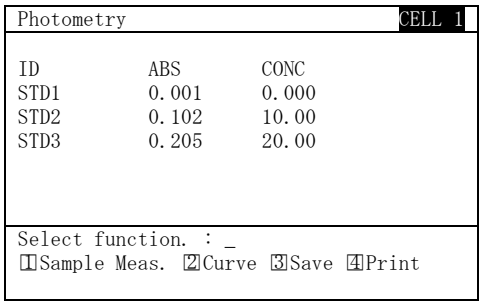
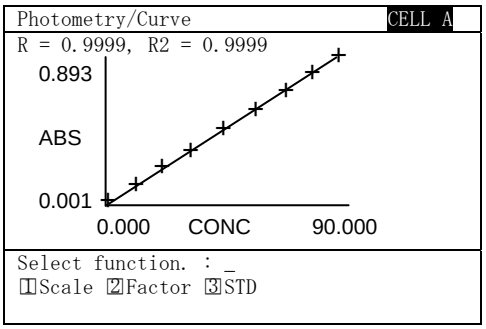
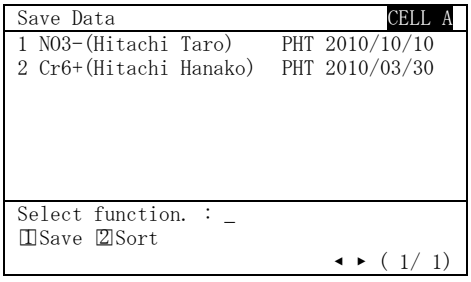


Fig. 3-68 Screen after Measurement of All Standards

Table 3-44 Guidance after Standard Measurement

Setting Item	Description
[1] Sample Meas.	The system proceeds to sample measurement.
[2] Curve	You can generate a calibration curve with the measured standards and confirm it. When this function is selected, the following screen appears.  [1] Scale : Allows you to change the scale of calibration curve. [2] Factor : Indicates the factor, correlation coefficient and determination coefficient of calibration curve. [3] STD : Indicates the result of standard solution measurement. Also allows remeasurement of a standard solution, deletion of standard data unnecessary for generation of a calibration curve or retrieval of deleted data.
[3] Save	You can save the measured standard data. When this function is selected, the following screen appears.  [1] Save : Allows you to save the result data under a new file name. [2] Sort : Allows you to rearrange the presently saved data in the order of file names or dates.

(cont'd)

Setting Item	Description
[4] Print	You can select items to be printed. When this function is selected, the screen given below appears. For each item, specify whether to print out (ON or OFF).

```
Photometry                                CELL A
Print
Print Date          ON
Run Date            ON
Method              ON
Curve               ON
STD                 ON
Sample              ON

Select function. : _
①ON ②OFF
```

10. Measurement of Sample Solutions

(1) The sample measurement screen (Fig. 3-69) appears. Set the sample indicated in the guidance area in the sample compartment. Pressing the [START] key starts measurement at the current cell position.

NOTE: In 6-cell manual mode, the photometric value at the cell position indicated on the screen is measured. Before measurement, therefore, check if the cell position where the sample has been set coincides with the cell position indicated on the screen.

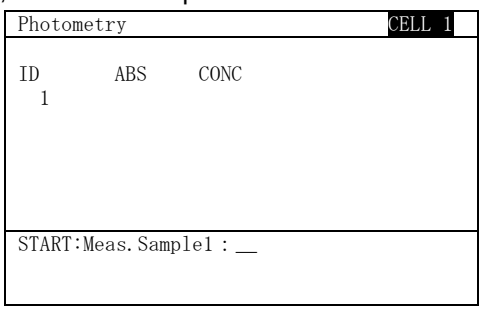
```
Photometry                                CELL 1
ID          ABS          CONC
1

START:Meas.SAMP.1; Select FUNC.. : __
①Curve Confirmation
```

Fig. 3-69 Sample Measurement Screen

Auto zero can be executed by pressing the [AUTOZERO] key when the guidance on sample setting is indicated. For details, refer to Fig. 3-70.

<1> Check that a guide message “START: Meas. SampleXX:_” is displayed. For carrying out auto zero, auto zero sample should be set to cell A.



Sample Measurement Screen

<2> Set an auto zero sample, close the cover and press the [AUTOZERO] key. The 6-cell turret will move to the position of cell A and auto zero will be executed there

<3> After execution of auto zero, the 6-cell turret moves to the position before the execution and the sample measurement screen reappears.

GUIDE: For executing auto zero frequently, set an auto zero to the position of cell A beforehand. It is now possible to move to the position of cell A and execute auto zero just by pressing the [AUTOZERO] key.

Fig. 3-70 How to Execute Auto Zero

(2) After measurement of a sample, its measured absorbance and concentration are indicated at the corresponding sample position on the screen. This screen appears after measurement of each sample. Pressing the [START] key again starts measurement of the next sample. Starting from the 1st sample, measurement can be made until the [STOP] key is pressed or up to 150 samples. Pressing the <1> key (Curve Confirmation) or <2> key (Remeasure) allows the processing shown in Table 3-43.

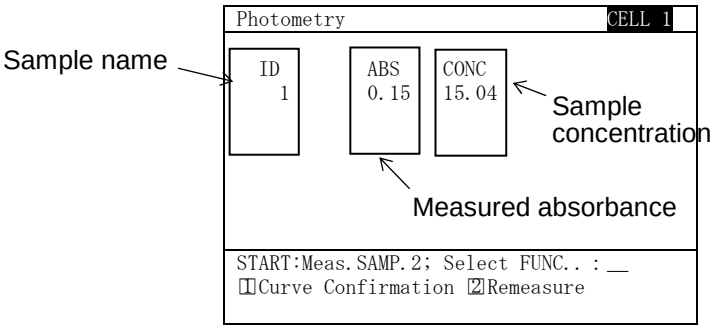
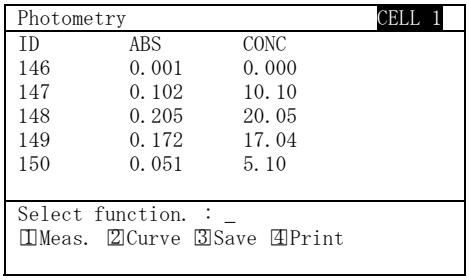


Fig. 3-71 Sample Measurement Screen

(3) When measurement is stopped by pressing the [STOP]key or 150 samples have been measured, the screen shown in Fig. 3-72 appears. For the processing function assigned to each key, refer to Table 3-45.



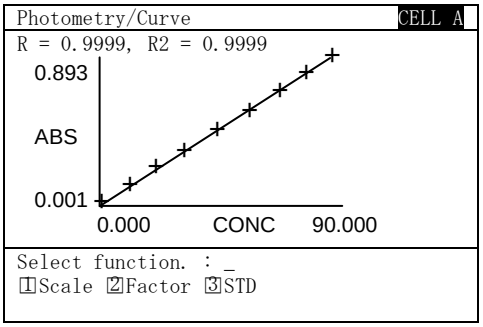
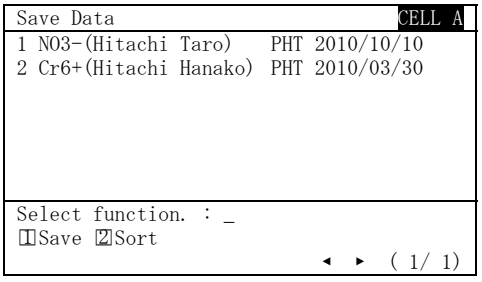
Example of display after measurement of 150 samples

Fig. 3-72 Screen after Measurement of All Samples

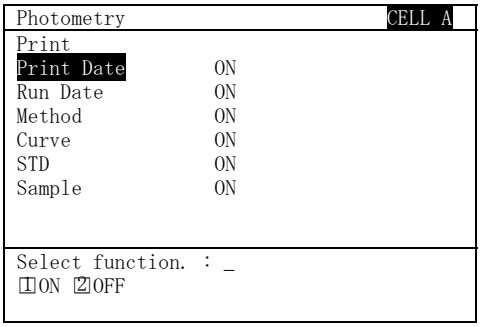
Table 3-45 Guidance after Measurement of All Samples

Setting Item	Description
[1] Meas.	You can make setting related to measurement. "New Meas.", "Continue" and "Remeasure" are selectable. [1] New Meas. : Selected when newly measuring samples with the same calibration curve. [2] Continue : Allows you to start measurement from the number following the previously measured sample. When this function is selected, the guidance given below appears. Enter the number of samples to be measured and press the [ENTER] key. Input value. : __ No.of Sample [1-140] **Display With 10 Samples Measured** [3] Remeasure : Selected when remeasuring a measured sample. When this function is selected, the guidance given below appears. Select a sample to be remeasured with the [▲] or [▼] key, set the sample to cell 1 and press the [START] key to carry out remeasurement. To execute auto zero, press the [AUTOZERO] key. Photometry CELL A ID ABS CONC 6 0.301 30.00 7 0.251 25.11 8 0.419 40.90 9 0.110 11.00 10 0.234 23.50 Set sample to Cell1(Sample10).: _ START:Meas.; AUTOZERO:Autozero ◂ ▸ (2/ 2)

(cont'd)

Setting Item	Description
[2] Curve	You can generate a calibration curve with the measured standards and confirm it. When this function is selected, the following screen appears.  For details of the function, refer to section 4.3. [1] Scale : Allows you to change the scale of calibration curve. [2] Factor : Indicates the factor, correlation coefficient and determination coefficient of calibration curve. [3] STD : Indicates the result of standard solution measurement. Also allows remeasurement of a standard solution, deletion of standard data unnecessary for generation of a calibration curve or retrieval of deleted data.
[3] Save	You can save the measured data. When this function is selected, the following screen appears.  [1] Save : Allows you to save data under a new file name. [2] Sort : Allows you to rearrange the currently saved data in the order of file names or dates.

(cont'd)

Setting Item	Description
[4] Print	You can select items to be printed. When this function is selected, the screen given below appears. For each item, select whether to print out (ON or OFF). 

3.3.2 Measuring Absorbance/Transmittance

This instrument is used for generating a calibration curve and determining the concentration of an unknown sample, and for entering a calibration factor and determining the concentration.

GUIDE: When auto start is specified, the system automatically sets up the conditions and advances to the measurement screen phase of sequence after the power switch is turned on. For how to specify auto start, refer to section 4.5.

1. Startup of This Product

   Start this product. (For the starting procedure, refer to section 2.3.1.)

2. Setting of Measuring Conditions
3. Setting of Sample Conditions

* For steps 2 and 3, refer to section 3.2.2.

4. Setting of 6-cell Conditions

NOTE: "6 Cell Mode" is not indicated if OFF is specified for Mode on the 6-cell mode setting screen for use of the single cell holder or rectangular long path cell holder. (For details, refer to section 2.5.4.) When the auto sipper is connected, "Sipper" is indicated in place of "6 Cell Mode".

(1) To set the 6-cell conditions, press the <3> key (6 Cell) and then [ENTER] key. Or select "6 Cell" with the [▲] or [▼] key and press the [ENTER] key or [►] key.

(2) The 6-cell condition (6 Cell) screen (Fig. 3-73) appears.

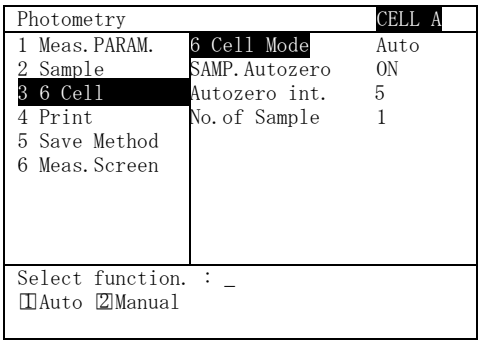


Fig. 3-73 6-cell Condition (6 Cell) Screen

(3) To set each item on the 6-cell condition (6 Cell) screen, press the [ENTER] key. Or select each item with the [▲] or [▼] key and make your setting according to the guidance. For details of each parameter, refer to Table 3-46.

After selecting “Manual” for 6 Cell Mode, return to the Photometry screen by pressing the [RETURN] key or [◄] key .

Table 3-46 “6 Cell” Setting Parameter

Setting Item	Description
6 Cell Mode	Specify a 6-cell operation mode for measurement. [1] Auto In this mode, a sample is set at each position of the 6-cell turret beforehand and the holder is automatically turned to automatically perform from auto zero to standard/sample measurement. It is recommended to use this mode if you have 6 cells and there are many samples to be measured. (For details of the Auto mode, refer to section 3.2.2.) [2] Manual In this mode, standard/sample measurement is carried out by using one position (cell 1 to 5 selectable) of the 6-cell turret. To eliminate the influence of instrument drift (baseline fluctuation) during measurement, auto zero can easily be executed by setting a solution for auto zero to cell A. In normal usage, set a standard or sample solution to cell 1.

5. Setting of Printing Conditions
6. Saving of Measuring Conditions

* For steps 5 and 6, refer to section 3.2.2. Upon completion of setting, press the <6> key (Meas. Screen) and then [ENTER] key or press the [MEAS. SCREEN] key to determine the measuring conditions.

7. Measurement of Sample Solutions

(1) The auto zero execution screen (Fig. 3-74) appears. Set an auto zero sample to cell A. Auto zero is executed by pressing the [AUTOZERO] key.

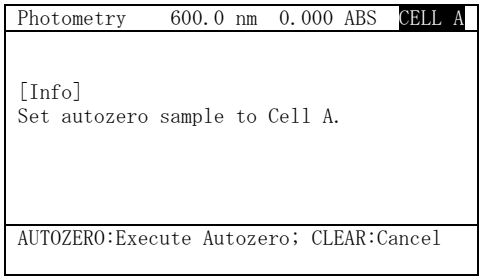


Fig. 3-74 Auto Zero Execution Screen

(2) The sample measurement screen (Fig. 3-75) appears. Set the sample indicated in the guidance area in the sample compartment. Pressing the [START] key starts measurement at the current cell position.

NOTE: In 6-cell manual mode, the photometric value at the cell position indicated on the screen is measured. Before measurement, therefore, check if the cell position where the sample has been set coincides with the cell position indicated on the screen.

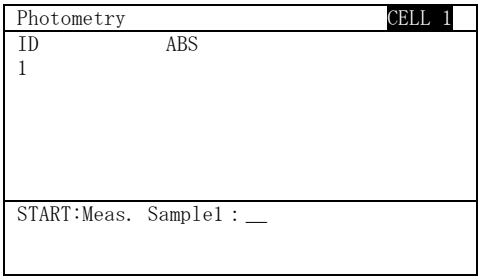
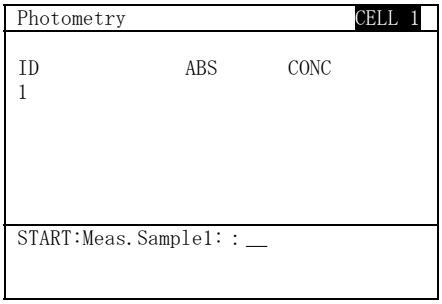


Fig. 3-75 Sample Measurement Screen

Auto zero can be executed by pressing the [AUTOZERO] key when the guidance on sample setting is indicated. For details, refer to Fig. 3-76.

<1> Check that a guide message “START: Meas. SampleXX:_” is displayed. For carrying out auto zero, auto zero sample should be set to cell A.



Sample Measurement Screen

<2> Set an auto zero sample, close the cover and press the [AUTOZERO] key. The 6-cell turret will move to the position of cell A and auto zero will be executed there

<3> After execution of auto zero, the 6-cell turret moves to the position before the execution and the sample measurement screen reappears.

GUIDE: For executing auto zero frequently, set an auto zero sample to the position of cell A beforehand. It is now possible to move to the position of cell A and execute auto zero just by pressing the [AUTOZERO] key.

Fig. 3-76 How to Execute Auto Zero

(3) After measurement of a sample, its measured absorbance is indicated at the corresponding sample position on the screen. This screen appears after measurement of each sample. Pressing the [START] key again starts measurement of the next sample. Starting from the 1st sample, measurement can be made until the [STOP] key is pressed or up to 150 samples. Pressing the <1> key (Remeasure) allows remeasurement of the last-measured sample.

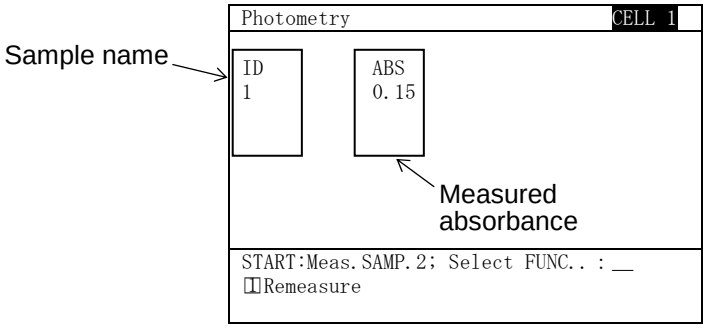
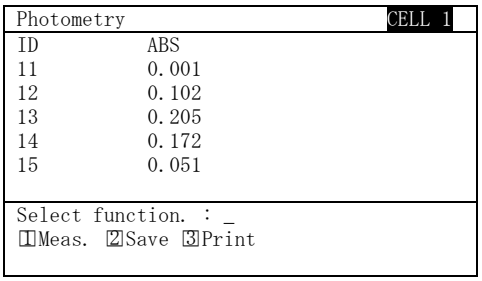


Fig. 3-77 Sample Measurement Screen

(4) When measurement is stopped by pressing the [STOP] key or 150 samples have been measured, the screen shown in Fig. 3-78 appears. For the processing function assigned to each key, refer to Table 3-47.



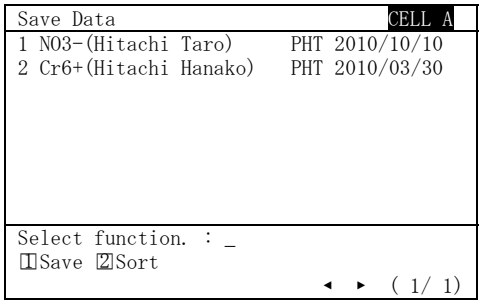
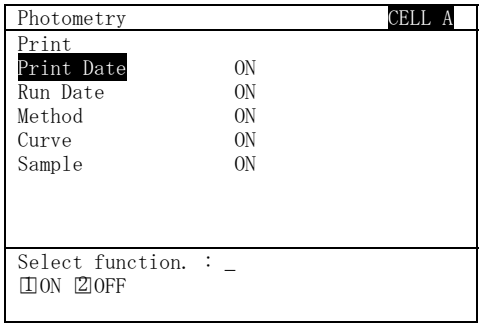
Example of display after measurement of 15 samples

Fig. 3-78 Screen after Measurement of All Samples

Table 3-47 Guidance after Measurement of All Samples

Setting Item	Description
[1] Meas.	You can make setting related to measurement. "New Meas.", "Continue" and "Remeasure" are selectable. [1] New Meas. : Selected when newly measuring samples with the same calibration curve. [2] Continue : Allows you to start measurement from the number following the previously measured sample. When this function is selected, the guidance given below appears. Enter the number of samples to be measured and press the [ENTER] key. Input value. : __ No.of Sample [1-140] **Display with 10 Samples Measured** [3] Remeasure : Selected when remeasuring a measured sample. When this function is selected, the guidance given below appears. Select a sample to be remeasured with the [▲] or [▼] key, set the sample to cell 1 and press the [START] key to carry out remeasurement. To execute auto zero, press the [AUTOZERO] key. Photometry CELL A ID ABS 6 0.301 7 0.251 8 0.419 9 0.110 10 0.234 Set sample to Cell1(Sample10).: _ START:Meas.; AUTOZERO:Autozero ◂ ▸ (2/ 2)

(cont'd)

Setting Item	Description
[2] Save	You can save the measured data. When this function is selected, the following screen appears.  [1] Save : Allows you to save data under a new file name. [2] Sort : Allows you to rearrange the currently saved data in the order of file names or dates.
[3] Print	You can select items to be printed. When this function is selected, the screen given below appears. For each item, select whether to print out (ON or OFF). 

3.3.3 Measuring DNA Sample (measurement through ratio calculation)

This instrument is capable of measuring the absorbance (at 230 nm, 260 nm, 280 nm and 320 nm) of a DNA sample and calculating the absorbance ratio (A260/A280 and A260/A230) for check of the DNA purity. The instrument is also used for measuring the absorbance at 2 wavelengths and calculating the absorbance ratio or absorbance difference between the values thus obtained.

GUIDE: When auto start is specified, the system automatically sets up the conditions and advances to the measurement screen phase of sequence after the power switch is turned on. For how to specify auto start, refer to section 4.5.

1. Startup of This Product

   Start this product. (For the starting procedure, refer to section 2.3.1.)

2. Setting of Measuring Conditions *
3. Setting of Sample Conditions *

* For steps 2 and 3, refer to section 3.2.3.

4. Setting of 6-cell Conditions

NOTE: "6 Cell Mode" is not indicated if OFF is specified for Mode on the 6-cell mode setting screen for use of the single cell holder or rectangular long path cell holder. (For details, refer to section 2.5.4.) When the auto sipper is connected, "Sipper" is indicated in place of "6 Cell Mode".

(1) To set the 6-cell conditions, press the <3> key (6 Cell) and then [ENTER] key. Or select "6 Cell" with the [▲] or [▼] key and press the [ENTER] key or [►] key.

(2) The 6-cell condition (6 Cell) screen (Fig. 3-79) appears.

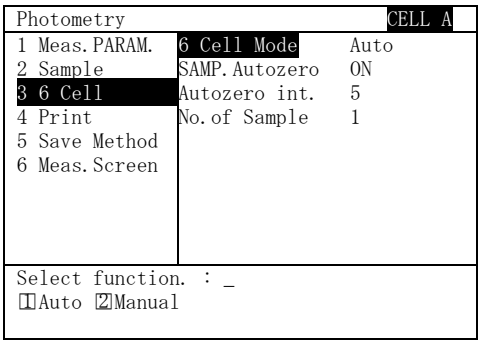


Fig. 3-79 6-cell Condition (6 Cell) Screen

(3) To set the 6-cell conditions, press the [ENTER] key. Or select each item with the [▲] or [▼] key and make your setting according to the guidance. For details of each parameter, refer to Table 3-48.

(4) After selecting “Manual” for 6 Cell Mode, return to the Photometry screen by pressing the [RETURN] key or [◄] key .

Table 3-48 “6 Cell” Setting Parameter

Setting Item	Description
6 Cell Mode	Specify a 6-cell operation mode for measurement. [1] Auto In this mode, a sample is set at each position of the 6-cell turret beforehand and the holder is automatically turned to automatically perform from auto zero to standard/sample measurement. It is recommended to use this mode if you have 6 cells and there are many samples to be measured. (For details of the Auto mode, refer to section 3.3.3.) [2] Manual In this mode, standard/sample measurement is carried out by using one position (cell 1 to 5 selectable) of the 6-cell turret. To eliminate the influence of instrument drift (baseline fluctuation) during measurement, auto zero can easily be executed by setting a solution for auto zero to cell A. In normal usage, set a standard or sample solution to cell 1.

5. Setting of Printing Conditions
6. Saving of Measuring Conditions

* For steps 5 and 6, refer to section 3.3.3.

* Upon completion of setting, press the <6> key (Meas. Screen) and then [ENTER] key or press the [MEAS. SCREEN] key to determine the measuring conditions.

7. Measurement of Sample Solutions

(1) The auto zero execution screen (Fig. 3-80) appears. Set an auto zero sample to cell A. Auto zero is executed by pressing the [AUTOZERO] key.

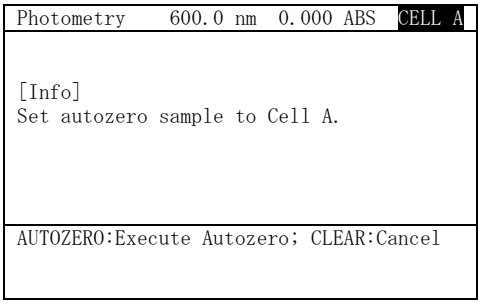


Fig. 3-80 Auto Zero Execution Screen

(2) The sample measurement screen (Fig. 3-81) appears. Set the sample indicated in the guidance area in the sample compartment. Pressing the [START] key starts measurement at the current cell position.

NOTE: In 6-cell manual mode, the photometric value at the cell position indicated on the screen is measured. Before measurement, therefore, check if the cell position where the sample has been set coincides with the cell position indicated on the screen.

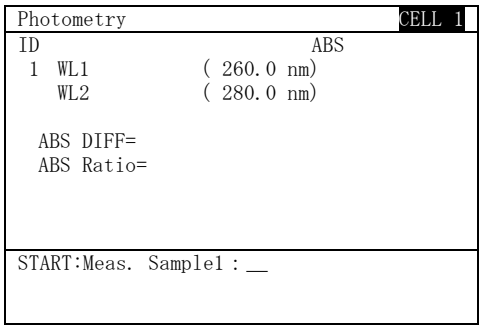
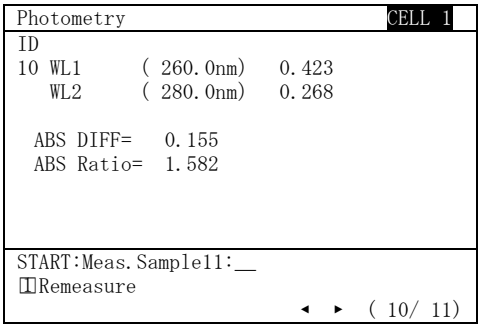


Fig. 3-81 Sample Measurement Screen

Auto zero can be executed by pressing the [AUTOZERO] key when the guidance on sample setting is indicated. For details, refer to Fig. 3-82.

<1> Check that a guide message “START: Meas. SampleXX:_” is displayed. For carrying out auto zero, auto zero sample should be set to cell A.



Sample Measurement Screen

<2> Set an auto zero sample, close the cover and press the [AUTOZERO] key. The 6-cell turret will move to the position of cell A and auto zero will be executed there

<3> After execution of auto zero, the 6-cell turret moves to the position before the execution and the sample measurement screen reappears.

HINT: For executing auto zero frequently, set an auto zero sample to the position of cell A beforehand. It is now possible to move to the position of cell A and execute auto zero just by pressing the [AUTOZERO] key.

Fig. 3-82 How to Execute Auto Zero

(3) After measurement of a sample, its absorbance is indicated on the screen. This screen appears after measurement of each sample. Pressing the [START] key again starts measurement of the next sample. Starting from the 1st sample, measurement can be made until the [STOP] key is pressed or up to 150 samples. Pressing the <1> key (Remeasure) allows remeasurement of the last-measured sample.

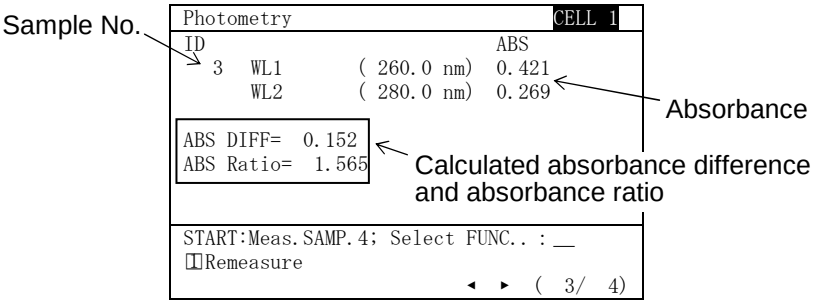
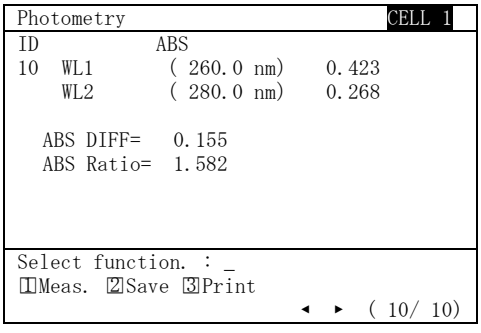


Fig. 3-83 Sample Measurement Screen

(4) When measurement is stopped by pressing the [STOP] key or 150 samples have been measured, the screen shown in Fig. 3-84 appears. For the processing function assigned to each key, refer to Table 3-49.

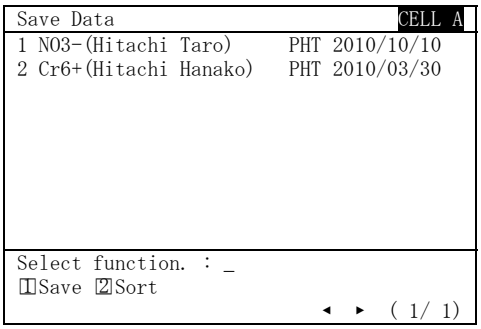
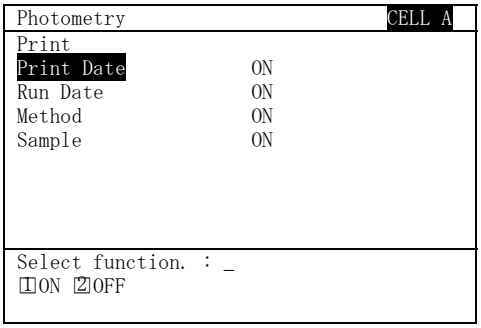


Example of display after measurement of 10 samples

Fig. 3-84 Screen after Measurement of All Samples

Table 3-49 Guidance after Measurement of All Samples

Setting Item	Description
[1] Meas.	You can make setting related to measurement. "New Meas.", "Continue" and "Remeasure" are selectable. [1] New Meas. : Selected when newly measuring samples with the same calibration curve. [2] Continue : Allows you to start measurement from the number following the previously measured sample. When this function is selected, the guidance given below appears. Enter the number of samples to be measured and press the [ENTER] key. Input value. : __ No.of Sample [1-140] **Display with 10 Samples Measured** [3] Remeasure : Selected when remeasuring a measured sample. When this function is selected, the guidance given below appears. Select a sample to be remeasured with the [◄] or [►] key, set the sample to the cell position indicated on the screen and press the [START] key to carry out remeasurement. To execute auto zero, press the [AUTOZERO] key. Photometry CELL 1 ID ABS 10 WL1 (260.0 nm) 0.423 WL2 (280.0 nm) 0.268 ABS DIFF= 0.155 ABS Ratio= 1.582 Set sample and press the START key.: ◄ ► (10/ 10)

[2] Save	You can save the measured data. When this function is selected, the following screen appears.  [1] Save : Allows you to save data under a new file name. [2] Sort : Allows you to rearrange the currently saved data in the order of file names or dates.
[3] Print	You can select items to be printed. When this function is selected, the screen given below appears. For each item, select whether to print out (ON or OFF). 

3.3.4 Measuring a Spectrum

This instrument is capable of measuring the transmission spectrum and absorption spectrum. By setting the blank to cell A, one sample can be measured after automatic execution of baseline correction.

GUIDE: When auto start is specified, the system automatically sets up the conditions and advances to the measurement screen phase of sequence after the power switch is turned on. For how to specify auto start, refer to section 4.5.

1. Startup of This Product

   Start this product. (For the starting procedure, refer to section 2.3.1.)

2. Setting of Measuring Conditions
3. Setting of Sample Conditions

* For steps 2 and 3, refer to section 3.2.4.

4. Setting of 6-cell Conditions

NOTE: "6 Cell Mode" is not indicated if OFF is specified for Mode on the 6-cell mode setting screen for use of the single cell holder or rectangular long path cell holder. (For details, refer to section 2.5.4.) When the auto sipper is connected, "Sipper" is indicated in place of "6 Cell Mode".

(1) To set the 6-cell conditions, press the <3> key (6 Cell) and then [ENTER] key. Or select "6 Cell" with the [▲] or [▼] key and press the [ENTER] key or [►] key.

(2) The 6-cell condition (6 Cell) screen (Fig. 3-85) appears. To set each item on the 6-cell condition (6 Cell) screen, press the [ENTER] key. Or use the [▲] or [▼] key. Select “Manual” for 6 Cell Mode and specify the number of samples to be measured for No. of Sample. For details of each parameter, refer to Table 3-50.

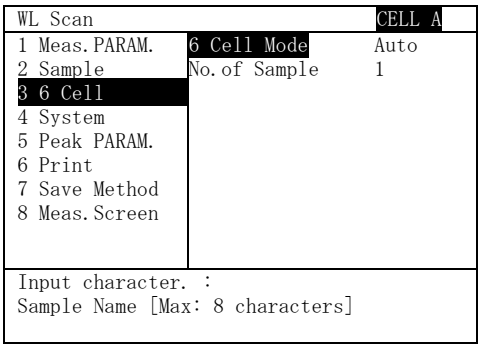


Fig. 3-85 6-cell Condition (6 Cell) Screen

Table 3-50 “6 Cell” Setting Parameter

Setting Item	Description
6 Cell Mode	Select a 6-cell operation mode for measurement from the following. [1] Auto By setting a baseline sample and unknown sample to the 6-cell turret, it is possible to automatically turn the 6-cell turret and automatically measure one sample after baseline correction. (For details of the Auto mode, refer to section 3.2.4.) [2] Manual Baseline correction and sample measurement are performed manually. It is required to manually move the cells and execute baseline correction.

5. Setting of System Conditions
6. Setting of Peak Detection Conditions
7. Setting of Printing Conditions
8. Saving of Measuring Conditions

* For steps 5 to 8, refer to section 3.2.4.

9. Baseline Correction

(1) To determine the measuring conditions set in the preceding steps, press the <8> key (Meas. Screen) and then [ENTER] key. Or press the [MEAS. SCREEN] key.

(2) The guidance on baseline correction (Fig. 3-86) appears. Set a sample for baseline correction to cell A. Upon pressing the [START] key, baseline correction is carried out. If there is a baseline saved under the same measuring conditions, you can also proceed to sample measurement without performing baseline correction with the CLEAR key.

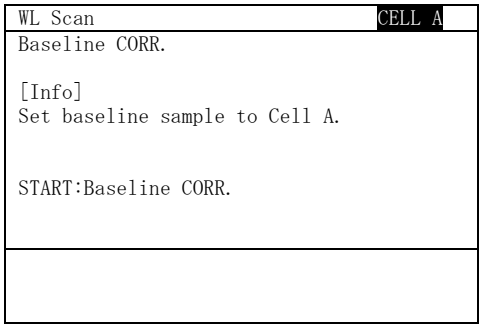


Fig. 3-86 Guidance on Baseline Correction

10. Measurement of Sample Solutions

(1) After completion of baseline correction, the sample measurement screen (Fig. 3-87) appears. Set a sample at the current cell position and press the [START] key. Measurement will then start.
For performing baseline correction, press the [RETURN] key.

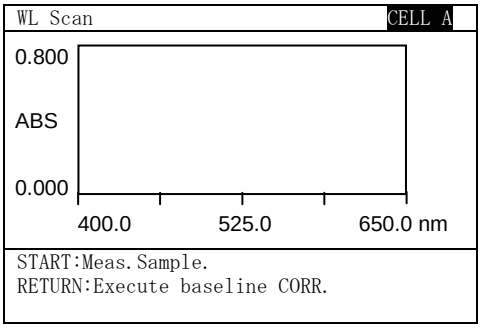


Fig. 3-87 Sample Measurement Screen

(2) After completion of measurement, the screen shown in Fig. 3-88 appears. Pressing the <1> to <5> keys allows the processings given in Table 3-51.
For proceeding to the next sample measurement, press the [START] key.

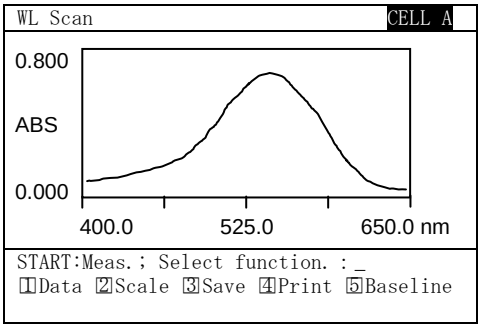


Fig. 3-88 Screen after Sample Measurement

Table 3-51 Guidance after Measurement in WL Scan Mode

Setting Item	Description
[1] Data	You can perform each data processing. When this function is selected, the following guidance appears. Select function. : _ [1]Trace [2]Peak [3]Smoothing [4]List For details of the function, refer to section 4.3. [1] Trace : Allows you to read out all the measured data on the spectrum. [2] Peak : Displays the detected peak. [3] Smoothing : Allows you to perform spectrum smoothing. [4] List : Allows you to display the measured data at the specified intervals.
[2] Scale	You can change the scale on the X axis and Y axis of spectrum. For detail of this function, refer to section 4.3.
[3] Save	You can save the measured spectrum. When this function is selected, the following screen appears. Save Data CELL A 1 NO3-(Hitachi Taro) WLS 2010/10/10 2 Cr6+(Hitachi Hanako) WLS 2010/03/30 Select function. : _ [1]Save [2]Sort ◂ ▸ (1/ 1) [1] Save : Allows you to save data under a new file name. [2] Sort : Allows you to rearrange the currently saved data in the order of file names or dates.

(cont'd)

Setting Item	Description
[4] Print	You can select items to be printed. When this function is selected, the screen given below appears. For each item, select whether to print out (ON or OFF). Photometry CELL A Print Print Date ON Run Date ON Method ON Graph ON Peak Table ON Data List ON Select function. : _ [1]ON [2]OFF ◂ ▸ (1/ 1)
[5] Baseline	You can execute baseline correction. When this function is selected, the following guidance appears. Select FUNC. and execute at Cell A.:__ [1]Yes [2]No [1] Yes : Selected to execute baseline correction. Set a sample for baseline correction to cell A and press the <1> key. [2] No : Selected to return to the previous screen without executing baseline correction.

(3) Before proceeding to the next measurement, the system displays the data deletion confirming screen (Fig. 3-89). When data has already been saved or printed, select the <1> key (Yes). To save or print data, select the <2> key (No) and perform the save or print operation.

Data will be deleted. Continue? :__
[1]Yes [2]No

Fig. 3-89 Data Deletion Confirming Screen

(4) Pressing the [START] key starts spectrum measurement for the next sample.
After measurement, you can execute the same operation as in (1).

3.3.5 Measuring Time Scan

This instrument is used for measuring the sample absorbance/transmittance change with time. You can evaluate the sample deterioration or enzyme activity based on the absorbance change thus obtained.

GUIDE: When auto start is specified, the system automatically sets up the conditions and advances to the measurement screen phase of sequence after the power switch is turned on. For how to specify auto start, refer to section 4.5.

1. Startup of This Product

   Start this product. (For the starting procedure, refer to section 2.3.1.)

2. Setting of Measuring Conditions

   (1) Press the [MAIN MENU] key. The Main Menu screen (Fig. 3-90) will appear. To set each condition for time scan, press the <3> key (Time Scan) and then [ENTER] key. Or select “Time Scan” with the [▲] or [▼] key and press the [ENTER] key.

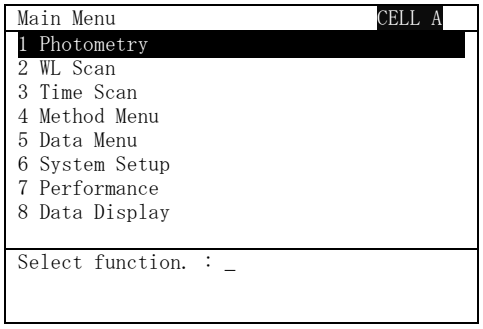


Fig. 3-90 Main Menu Screen

   (2) The Time Scan screen (Fig. 3-91) appears. To set the measuring conditions, press the <1> key (Meas. PARAM.) and then [ENTER] key. Or select “Meas. PARAM.” with the [▲] or [▼] key and press the [ENTER] key or [►] key.

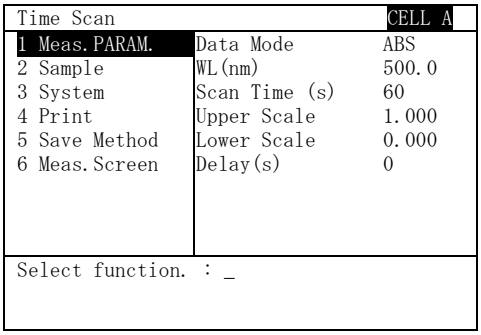


Fig. 3-91 Time Scan Screen

(3) The measuring condition (Meas. PARAM.) screen (Fig. 3-92) appears. With the [▲] or [▼] key, set the data mode (Data Mode), wavelength (WL), scan time (Scan Time), Y-axis upper limit (Upper Scale), Y-axis lower limit (Lower Scale) and initial delay (Delay).
For details of each parameter, refer to Table 3-52.

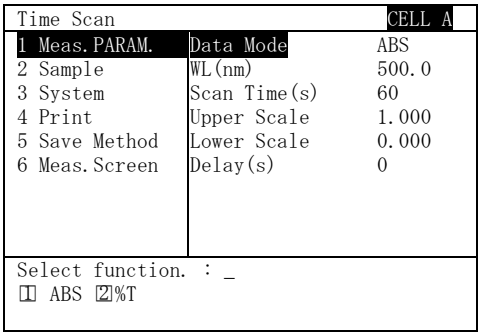


Fig. 3-92 Measuring Condition (Meas. PARAM.) Screen

Table 3-52 "Meas. PARAM." Setting Parameters

Setting Item	Description
Data Mode	Select a data mode for the Y axis. [1] ABS : Used for measuring the absorbance. [2] %T : Used for measuring the transmittance.
WL (nm)	Enter a wavelength to be used for measurement. This parameter is specifiable in a range of 190.0 to 1100.0 nm in steps of 0.1 nm.

(cont'd)

<table>
<tr><th>Setting Item</th><th>Description</th></tr>
<tr><td>Scan Time (s)</td><td>Specify a scan time.
This parameter is specifiable in a range of 60 to 99999 sec in steps of 1 sec.
The data interval differs depending on the scan time. It is set as shown in the following table.
Scan Time and Data Interval<table><tr><th>Scan time (sec)</th><th>Data Interval (sec)</th></tr><tr><td>60 ≦ Scan time < 100</td><td>1</td></tr><tr><td>100 ≦ Scan time < 200</td><td>1</td></tr><tr><td>200 ≦ Scan time < 350</td><td>1</td></tr><tr><td>350 ≦ Scan time < 1000</td><td>2</td></tr><tr><td>1000 ≦ Scan time < 2000</td><td>5</td></tr><tr><td>2000 ≦ Scan time < 5000</td><td>5</td></tr><tr><td>5000 ≦ Scan time < 10000</td><td>10</td></tr><tr><td>10000 ≦ Scan time < 99999</td><td>100</td></tr></table></td></tr>
<tr><td>Upper Scale</td><td>Enter a Y-axis upper limit for the spectrum displayed.
This parameter is specifiable in the following range.
ABS : -999.9 to 999.9
%T : -9.999 to 9.999</td></tr>
<tr><td>Lower Scale</td><td>Enter a Y-axis lower limit for the spectrum displayed.
This parameter is specifiable in the following range.
ABS : -999.9 to 999.9
%T : -9.999 to 9.999</td></tr>
<tr><td>Delay (s)</td><td>After the [START] key is pressed, the system waits for the time period set here and then starts measurement.
This parameter is settable in a range of 0 to 9999 sec in steps of 1 sec.
Set this parameter when you want to start measurement after a specified time period, including when measuring a sample after its temperature reaches the room temperature and when starting measurement after completion of reaction. Enter “0” if the delay time need not be set.</td></tr>
</table>

(4) After completion of setting, return the Time Scan screen by pressing the [RETURN] key or [◄] key.

3. Setting of Sample Conditions

(1) To set the sample conditions, press the <2> key (Sample) and then [ENTER] key. Or select “Sample” with the [▲] or [▼] key and press the [ENTER] key or [►] key.

(2) The sample condition (Sample) screen (Fig. 3-93) appears.

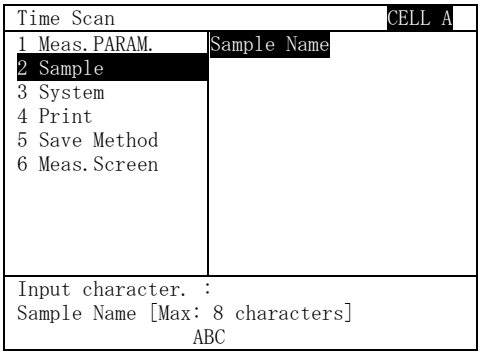


Fig. 3-93 Sample Condition (Sample) Screen

(3) To enter/select the sample conditions, press the [ENTER] key. Or select the item with the [▲] or [▼] key and make your setting. For details of the parameter, refer to Table 3-53.

(4) After entering a sample name, return to the Time Scan screen by pressing the [ENTER] key or [◄] key.

Table 3-53 “Sample” Setting Parameter

Setting Item	Description
Sample Name	Up to 8 half-size alphanumeric characters can be entered for the sample name. The sample name entered here is printed in the sample name field on the report. For the character input procedure, refer to section 2.4.3.

4. Setting of System Conditions

(1) To set the system conditions, press the <3> key (System) and then [ENTER] key. Or select “System” with the [▲] or [▼] key and press the [ENTER] key or [►] key.

(2) The system condition (System) screen (Fig. 3-94) appears.

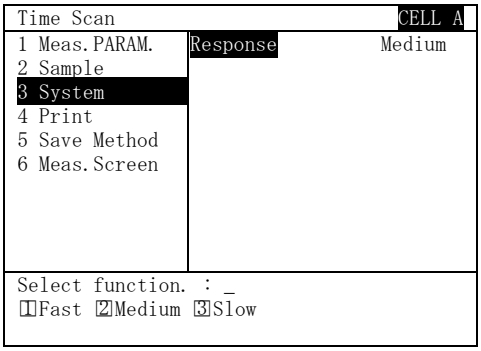


Fig. 3-94 System Condition (System) Screen

(3) Set up a response. After completion of setting, return to the Time Scan screen by pressing the [RETURN] key or [◄] key.

Setting Item	Description
Response	Select from the following 3 response speeds. [1] Fast : Used for high-resolution measurement with respect to the wavelength. Note that the noise level is high as compared with Medium and Slow. [2] Medium : Used for ordinary measurement. [3] Slow : Used to reduce a variation in photometric value. This response speed is unsuitable for sample measurement reflecting an abrupt change with time as compared with Fast and Medium.

5. Setting of Printing Conditions

> **GUIDE**: Specify print items if determined beforehand. You can also specify print items after completion of measurement. If you do not want to set the printing conditions here, proceed to step 6.

(1) To set the printing conditions, press the <4> key (Print) and then [ENTER] key. Or select “Print” with the [▲] or [▼] key and press the [ENTER] key or [►] key.

(2) The printing condition (Print) screen (Fig. 3-95) appears. To select the printing conditions, press the [ENTER] key. Or select each item with the [▲] or [▼] key and make your setting according to the guidance. For details of each parameter, refer to Table 3-55.

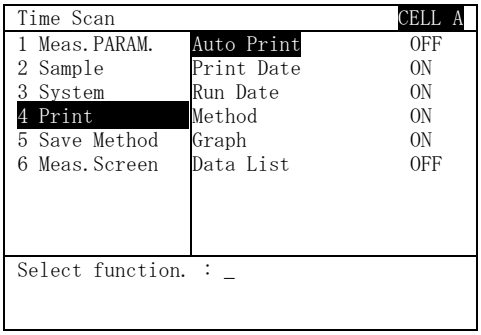


Fig. 3-95 Printing Condition (Print) Screen

(3) After making your selection (ON or OFF) for Auto Print, Print Date, Run Date, Method, Graph and Data List, return to the Time Scan screen by pressing the [RETURN] key or [◄] key.

Table 3-55 “Print” Setting Parameters

Setting Item	Description	Location in Fig. 3-98
Auto Print	[1] ON : Automatic printing is carried out after measurement. [2] OFF: Automatic printing is not carried out after measurement.	—
Print Date	[1] ON : Printing date is printed. [2] OFF: Printing date is not printed.	<1>
Run Date	[1] ON : Analysis date is printed. [2] OFF: Analysis date is not printed.	<2>
Method	[1] ON : Measuring conditions are printed. [2] OFF: Measuring conditions are not printed.	<3>
Graph	[1] ON : Graph of change with time is printed. [2] OFF: Graph of change with time is not printed.	<4>
Data List	[1] OFF : Numerical data of change with time is not printed. [2] All Data: Numerical data of change with time is all printed. [3] Interval : Numerical data of change with time is printed at the specified intervals.	<5>
Int.	Specify a printing interval for the data list. This parameter is indicated when “Interval” is selected for Data List. It is specifiable in a range of 1 to 100.	—

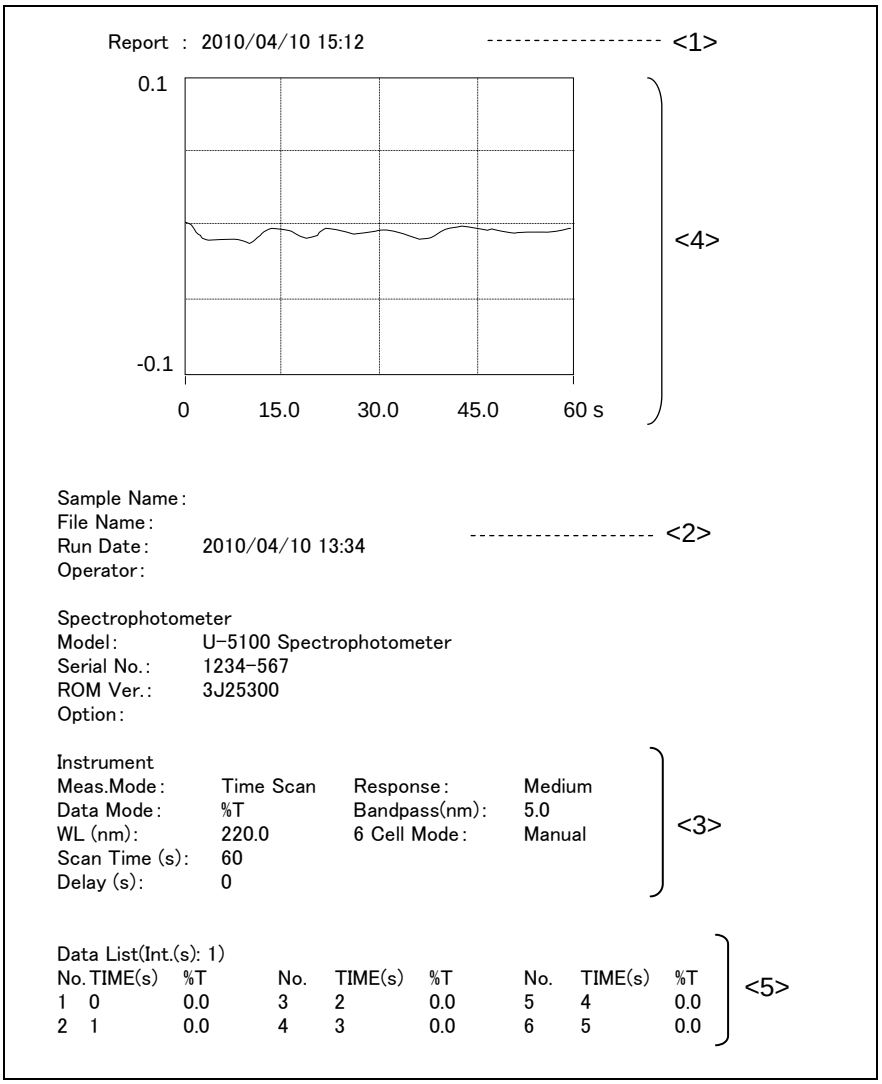


Fig. 3-96 Example of Printout in Time Scan Mode

Setting of the measuring conditions has now been completed. For saving the set conditions, proceed to step 6. If they need not be saved, proceed to step 7.

6. Saving of Measuring Conditions

> **GUIDE**: When the set measuring conditions need not be saved, proceed to step 7.

(1) To save the set measuring conditions, press the <5> key (Save Method) and then [ENTER] key. Or select "Save Method" with the [▲] or [▼] key and press the [ENTER] key or [►] key.

(2) The measuring condition saving (Save Method) screen (with saved data) (Fig. 3-97) appears.

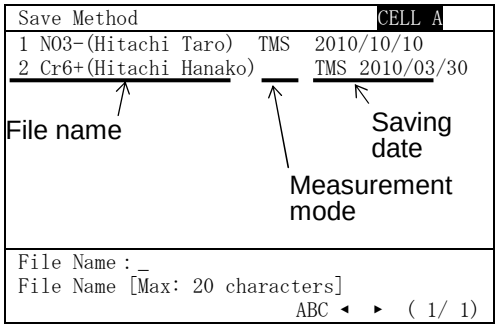


Fig. 3-97 Measuring Condition Saving (Save Method) Screen (with saved data)

(3) When other measuring conditions are saved in advance, a list of saved measuring conditions appears on the main menu. At this time, the file name, measurement mode (PHT: Photometry, WLS: Wavelength Scan, TMS: Time Scan) and saving date are indicated.

(4) For the measuring conditions to be saved, enter a file name within 20 characters and press the [ENTER] key.

NOTE:
- If a file of the same name as entered already exists in the same measurement mode, the following guidance appears.

  ```
  Already exists. Overwrite it? :__
  [1]Yes  [2]No
  ```

  For overwriting, press the <1> key (Yes).
  To avoid overwriting, press the <2> key (No) and rename the file to be saved.
- A total of 50 method files can be saved for all measurement modes.
- If 50 files are already registered, the following message appears.

  ```
  No.of files is full.
  ```

  In this case, delete files referring to section 4.2.2 and retry saving.
- The method for which auto start (for details, refer to section 4.5.) is set is preceded by "*".

(5) Return to the Time Scan screen by pressing the [RETURN] key.

7. Measurement of Sample Solutions

(1) To determine the measuring conditions set in the preceding steps, press the <6> key (Meas. Screen) and then [ENTER] key. Or press the [MEAS. SCREEN] key.

(2) The auto zero execution screen (Fig. 3-98) appears. Set an auto zero sample to cell A. Auto zero is executed by pressing the [AUTOZERO] key.
To avoid executing auto zero, press the [CLEAR] key.

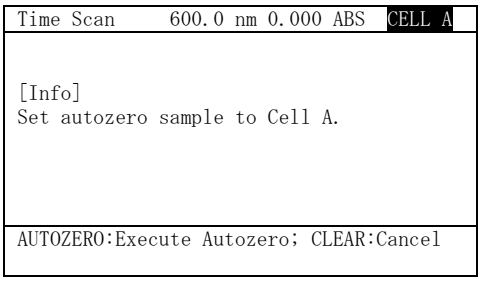


Fig. 3-98 Auto Zero Execution Screen

(3) After execution of auto zero, the sample measurement screen (Fig. 3-99) appears. Set a sample at the present cell position and press the [START] key to start measurement. For carrying out auto zero, press the [RETURN] key.

NOTE: In Time Scan mode, the photometric value at the cell position indicated on the screen is measured. Before measurement, therefore, check if the cell position where the sample has been set coincides with the cell position indicated on the screen.

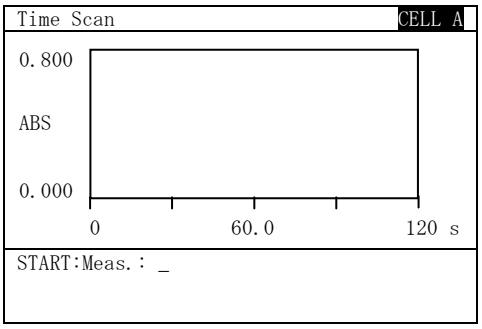


Fig. 3-99 Sample Measurement Screen

By pressing the [AUTOZERO] key when a guide message “START: Start Meas.:_” is displayed, auto zero can be executed at the position of cell A.
For details, refer to Fig. 3-100.

<1> Check that a guide message “START: Start Meas.:_” is displayed. For carrying out auto zero, auto zero sample should be set to cell A.

Sample Measurement Screen

<2> Set an auto zero sample, close the cover and press the [AUTOZERO] key. The 6-cell turret will move to the position of cell A and auto zero will be executed there

<3> After execution of auto zero, the 6-cell turret moves to the position before the execution and the sample measurement screen reappears.

GUIDE: For executing auto zero frequently, set an auto zero sample to the position of cell A beforehand. It is now possible to move to the position of cell A and execute auto zero just by pressing the [AUTOZERO] key.

Fig. 3-100 How to Execute Auto Zero

(5) After completion of measurement, the sample measurement result screen (Fig. 3-101) appears. Pressing the <1> to <4> keys allows the processings given in Table 3-56. For proceeding to the next sample measurement, press the [START] key.

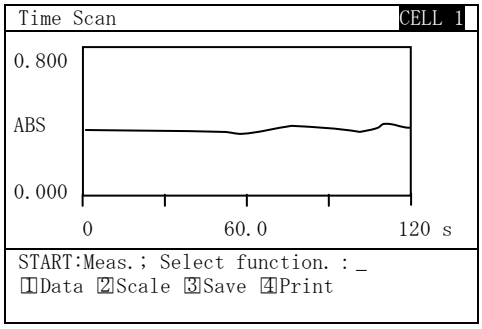
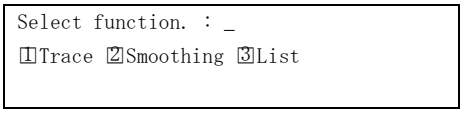
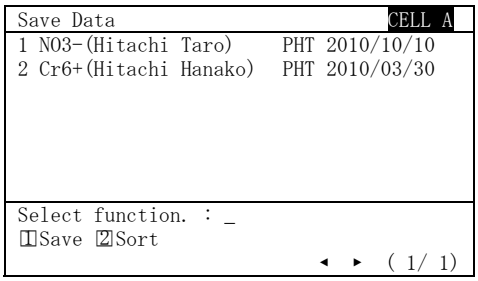
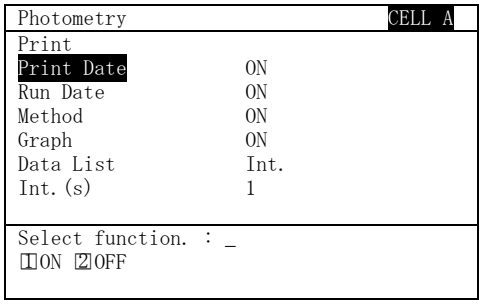


Fig. 3-101 Sample Measurement Result Wcreen

Table 3-56 Guidance after Sample Measurement

Item	Description
[1] Data	You can perform each data processing. When this function is selected, the following guidance appears.  For details of the function, refer to section 4.3. [1] Trace : Allows you to read out all the measured data on the spectrum. [2] Smoothing : Allows you to perform smoothing of the measured data. [3] List : Allows you to display the measured data at the specified intervals.
[2] Scale	You can change the scale on the X axis and Y axis of measured data. For detail of this function, refer to section 4.3.
[3] Save	You can save the measured spectrum. When this function is selected, the following screen appears.  [1] Save : Allows you to save data under a new file name. [2] Sort : Allows you to rearrange the currently saved data in the order of file names or dates.
[4] Print	You can select items to be printed. When this function is selected, the screen given below appears. For Print Date, Run Date, Method and Graph, select “ON” or “OFF”. For Data List, select from OFF, All Data and Interval. When “Interval” is selected, “Int.” is indicated. 

3.4 Measurement with Enlarged Display Screen (monitor)

This instrument displays a photometric value in enlarged size on the monitor. This function is effective in carrying out measurement while monitoring the photometric value at a wavelength. Described below is the operating procedure for measurement with this function.

GUIDE: When auto start is specified, the system automatically sets up the conditions and advances to the measurement screen phase of sequence after the power switch is turned on. For how to specify auto start, refer to section 4.5.

1. Startup of This Product

   Start this product. (For the starting procedure, refer to section 2.3.1.)

2. Display of Main Menu

   Press the [MAIN MENU] key. The Main Menu screen (Fig. 3-102) will then appear. To present the enlarged display screen, press the <8> key (Monitor) and then [ENTER] key. Or select “Monitor” with the [▲] or [▼]key and press the [ENTER] key.

GUIDE: The enlarged display screen can also be presented by pressing the [MEAS. SHIFT] key with the [SHIFT] key held down.

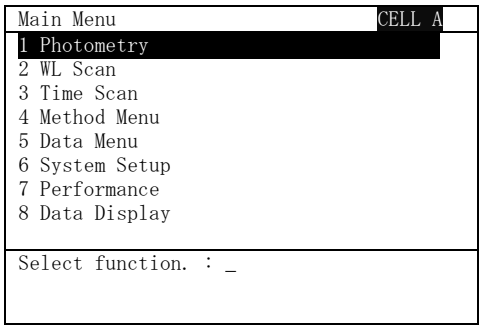


Fig. 3-102 Main Menu Screen

3. Presentation of Enlarged Display Screen (monitor)

The enlarged display screen (Fig. 3-103) appears. At this time, the lamp turns on automatically and measurement starts. In the upper part of the monitor, the current wavelength setting is displayed, and a photometric value in the lower part. This photometric value is updated at intervals of 2.5 sec. To display the absorbance, press the <1> key (ABS) and the <2> key (%T) to display the transmittance, then press the [ENTER] key.
When changing the wavelength to be used for measurement, press the [GO TO WL] key, enter a new wavelength and press the [ENTER] key.

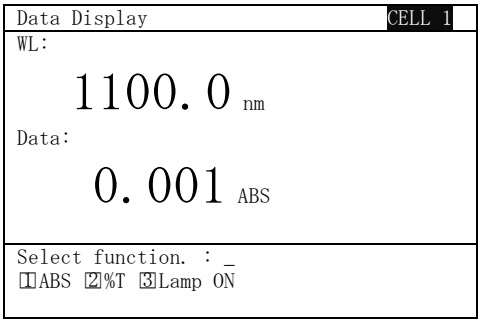


Fig. 3-103 Enlarged Display Screen

The enlarged display screen is provided with the automatic lamp off function, which serves to prevent the lamp staying on unnecessarily for a long time. After the lapse of automatic lamp off time, the lamp is automatically turned off and "------" is indicated for the photometric value as shown in Fig. 3-104. To display the photometric value again, press the <3> key (Lamp ON) and then [ENTER] key.
For the auto lamp off time (Auto Lamp OFF), "5 min" is set as default. For changing this setting, refer to section 2.5.3.

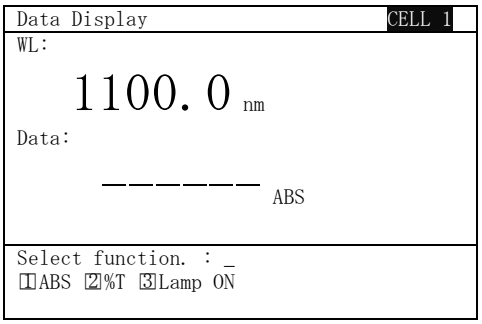


Fig. 3-104 Enlarged Display Screen with Lamp Off

4. Measurement of Sample

(1) Confirm the cell position display screen. When the 6-cell turret is connected, move to the aimed-at cell position by pressing the [◀] or [▶] key with the [SHIFT] key held down. Move to cell 1 unless otherwise specified.

(2) Press the [Autozero] key. Execute auto zero according to the guidance. When OFF is specified for 6 Cell Mode (when the single cell holder or rectangular long path cell holder is mounted), set an auto zero sample beforehand and press the [Autozero] key.

(3) When the 6-cell turret is connected, set a sample to the cell position indicated on the screen. When the single cell holder or rectangular long path cell holder is in use, set a sample to the cell holder.

(4) Read out and record the photometric value displayed on the screen.

NOTE: The photometric value displayed is updated at intervals of 2.5 sec. Read out the updated photometric value after the sample compartment becomes ready for measurement (when a sample has been set for example).

(5) When the printer is connected, print the wavelength and photometric value by pressing the [PRINT] key. However, when External Output Program(Part No.3J2-0290) is used, it is not possible to print it.

(Example of Printout)

```
500.0 nm 0.203 Abs
```

(6) After completion of measurement, return to the previous screen by pressing the [RETURN] key.

4. FOR MORE EFFICIENT OPERATION

Explained here is usage of the advanced-level functions for more efficient operations of this product. Read this section so that you can get a smoother control of the product.

4.1 Loading or Deleting the Saved Data

Described below are operation methods such as loading and deletion of the saved data.

4.1.1 Loading the Saved Data

1. Startup of This Product

   Start up this product. (For startup method, see section 2.3.1.)

2. Data Loading Procedure

   (1) Press the [MAIN MENU] key. The Main Menu screen (shown in Fig. 4-1) appears. Press the <5> key (for Data Menu) and then the [ENTER] key or press the [▲]/[▼] key to select Data Menu and then the [ENTER] key.

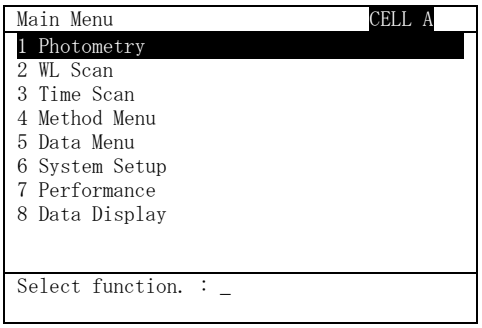


Fig. 4-1 Main Menu Screen

(2) Data Menu screen (Fig. 4-2) appears. For loading the saved data, press the <1> key (for Load/Delete Data) and then [ENTER] key or press the [▲]/[▼] key to select Load/Delete Data and then the [ENTER] key.

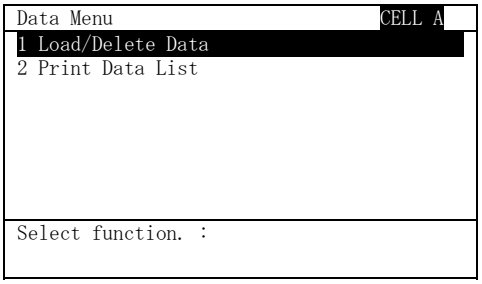


Fig. 4-2 Data Menu Screen

(3) The Load/Delete Data screen (Fig. 4-3) appears.
On this screen, the saved data files are listed.
On each row, the file name, type and date of file saving are shown from the left. "Type" denotes the type of Method in an abbreviation listed in Table 4-1. Select the data to be loaded by the [▲]/[▼] key and press the <1> key (for Load). For other keys, refer to Table 4-2.

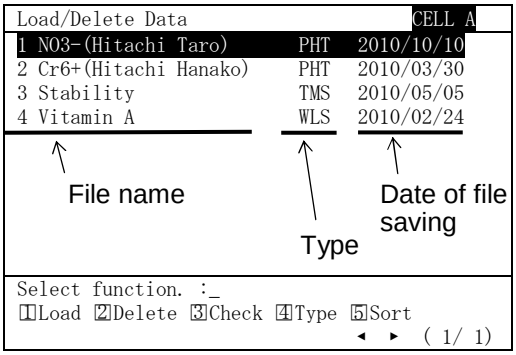


Fig. 4-3 Load/Delete Data Screen

Table 4-1 Abbreviation of Method Type

Type	Abbreviation
Photometry	PHT
Wavelength scan	WLS
Time scan	TMS

Table 4-2 Guidance for Load/Delete Data Screen

Function Key	Explanation
[1] Load	Loads the file which is now selected.
[2] Delete	Deletes the file which is now selected.
[3] Check	Enables you to check the outline of the Method in the presently selected file.
[4] Type	Enables you to select the type of the file to be displayed on the screen. Used for displaying in only one type such as photometry, wavelength scan or time scan. In default, all types are set for display.
[5] Sort	Enables you to sort the files to be displayed on the screen. Sorting is allowed in the alphabetical order of file names or in the chronological order of saved files. The alphabetical order of file names is selected by default.

(4) The data is now loaded. Then, the instrument is set in the same Method as that of the loaded data. (However, this is not applied in the case where the data using the auto sipper (separately available) is displayed during use of the 6-cell turret or that using the 6-cell turret is displayed during use of the auto sipper.) According to the guidance, data processing, re-measurement, etc. can be carried out.

NOTE: For measurement using the calibration curve and/or Method of the loaded data, the instrument parameters must always be the same between the loaded data and 6 Cell Mode or auto sipper (separately available).
If the loaded data does not agree with the 6 Cell Mode or auto sipper parameter, the following guidance will appear.

```
Data using 6 Cell will be loaded.: _
[1]Yes [2]No
```

For loading data acquired with 6-cell turret

```
Data using sipper will be loaded.: _
[1]Yes [2]No
```

For loading data acquired with auto sipper (separately available)

For loading the data, select [1] Yes, or [2] No for avoiding data loading. When such a guidance is displayed, remeasurement is allowed only after reviewing the Method.

4.1.2 Deleting the Saved Data

1. Startup of This Product

   Start up this product. (For startup method, see section 2.3.1.)

2. Data Deleting Procedure

   (1) Press the [MAIN MENU] key. The Main Menu screen (shown in Fig. 4-4) appears. Press the <5> key (for Data Menu) and then the [ENTER] key or press the [▲]/[▼] key to select Data Menu and then the [ENTER] key.

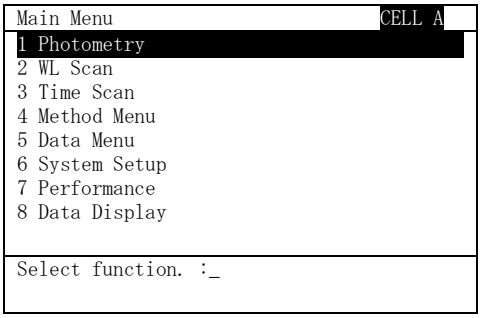


Fig. 4-4 Main Menu Screen

   (2) Data Menu screen (Fig. 4-5) appears. For displaying the saved data, press the <1> key (for Load/Delete Data) and then [ENTER] key or press the [▲]/[▼] key to select Load/Delete Data and then the [ENTER] key.

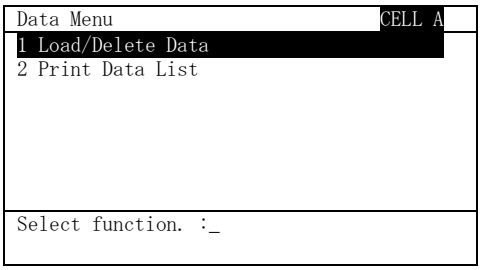


Fig. 4-5 Data Menu Screen

(3) The Load/Delete Data screen (Fig. 4-6) appears.
On this screen, the saved data files are listed.
On each row, the file name, type and date of file saving are shown from the left. "Type" denotes the type of Method in an abbreviation listed in Table 4-3. Select the data to be deleted by the [▲]/[▼] key and press the <2> key (for Delete). The guidance for confirmation of your deletion will be displayed.
When there is no problem, execute the deletion.
For other keys, refer to Table 4-4.

NOTE: Data, once deleted, cannot be recovered. Careful confirmation is required before data deletion.

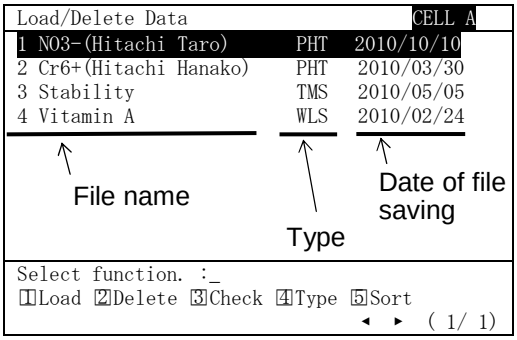


Fig. 4-6 Load/Delete Data Screen

Table 4-3 Abbreviation of Method Type

Type	Abbreviation
Photometry	PHT
Wavelength scan	WLS
Time scan	TMS

Table 4-4 Guidance for Load/Delete Data Screen

Function Key	Explanation
[1] Load	Loads the file which is now selected.
[2] Delete	Deletes the file which is now selected.
[3] Check	Enables you to check the outline of the Method in the presently selected file.
[4] Type	Enables you to select the type of the file to be displayed on the screen. Used for displaying in only one type such as photometry, wavelength scan or time scan. In default, all types are set for display.
[5] Sort	Enables you to sort the files to be displayed on the screen. Sorting is allowed in the alphabetical order of file names or in the chronological order of saved files. The alphabetical order of file names is selected by default.

4.1.3 Printing the List of Saved Data

1. Startup of This Product

   Start up this product. (For startup method, see section 2.3.1.)

2. Display of Print List Screen

   (1) Press the [MAIN MENU] key. The Main Menu screen (shown in Fig. 4-7) appears. Press the <5> key (for Data Menu) and then the [ENTER] key or press the [▲]/[▼] key to select Data Menu and then the [ENTER] key.

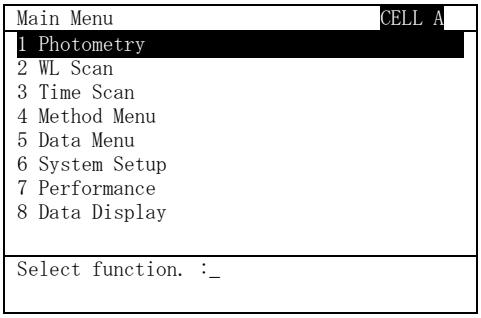


Fig. 4-7 Main Menu Screen

   (2) Data Menu screen (Fig. 4-8) appears. For printing the data list, press the <2> key (for Print List) and then [ENTER] key or press the [▲]/[▼] key to select Print List and then the [ENTER] key.

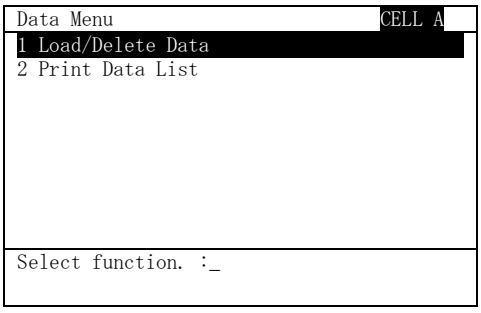


Fig. 4-8 Data Menu Screen

(3) The Print List screen (Fig. 4-9) appears. On this screen, the saved data files are listed. On each row, the file name, type and date of file saving are shown from the left. "Type" denotes the type of Method in an abbreviation listed in Table 4-5.

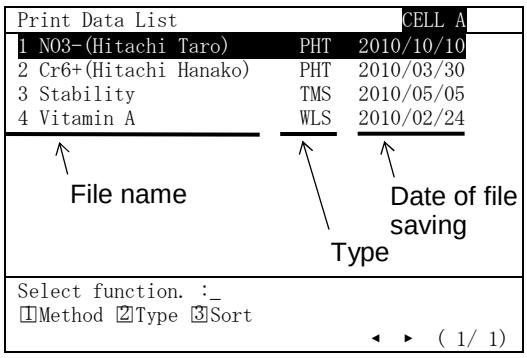


Fig. 4-9 Print Data List Screen

Table 4-5 Abbreviation of Method Type

Type	Abbreviation
Photometry	PHT
Wavelength scan	WLS
Time scan	TMS

3. Printing of Data List

For printing in only one type of Method, select the <2> key (for Type) and then PHT, WLS or TMS. For changing the display order of file names, select the <3> key (for Sort) and then "File Name" or "Data and Time." The set Method will be reflected on display. When you press the [PRINT] key, the files on display are printed in the order of display. For details of other key operations, refer to the guidance for Print List (Table 4-6). For an example of printout, see Fig. 4-10.

Table 4-6 Guidance for Print List

Function Key	Explanation
[1] Method	Enables you to confirm the outline of the Method in the presently selected file.
[2] Type	Enables you to select the type of the file to be displayed on the screen (from among All, Photometry, WL Scan and Time Scan). In default, all types are set for display. Select function.:_ 1All, 2Photometry, 3WL Scan, 4Time Scan
[3] Sort	Enables you to sort the files to be displayed on the screen. Sorting is allowed in the alphabetical order of file names (File Name) or in the chronological order of saved files (Date and Time). The alphabetical order of file names is selected by default. Select function.:_ 1File Name, 2Date and Time

Data List

No.	File Name	Type	Date
1	NO3-(Hitachi Taro)	PHT	2010/10/10
2	Cr6+(Hitachi Hanako)	PHT	2010/03/30
3	Stability	TMS	2010/05/05
4	Vitamin A	WLS	2010/02/24

Fig. 4-10 Example of Print List

4.1.4 Photometry Based on Saved Calibration Curve Data

1. Startup of this product

   Start up this product. (For startup method, see section 2.3.1.)

2. Calibration Curve Data Loading Procedure

   (1) Press the [MAIN MENU] key. The Main Menu screen (Fig. 4-11) appears.

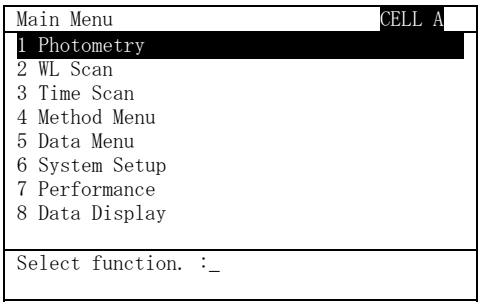


Fig. 4-11 Main Menu Screen

   (2) For loading the saved calibration curve data, press the <5> key (for Data Menu) and then the [ENTER] key or press the [▲]/[▼] key to select Data Menu and then the [ENTER] key.

   (3) Data Menu screen (Fig. 4-12) appears.

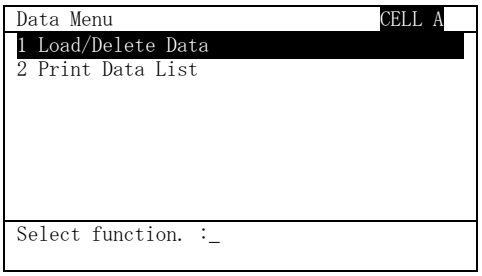


Fig. 4-12 Data Menu Screen

(4) For loading the saved calibration curve, press the <1> key (for Load/Delete Data) and then the [ENTER] key or press the [▲]/[▼] key to select Load/Delete Data and then the [ENTER] key. The Load/Delete Data screen (Fig. 4-13) appears.

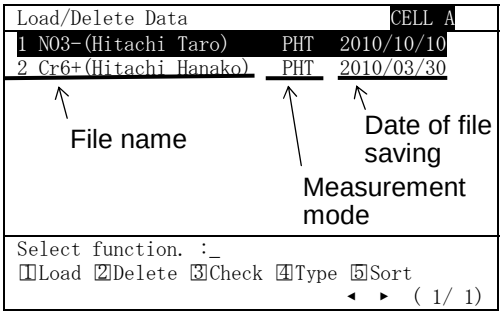


Fig. 4-13 Load/Delete Data Screen

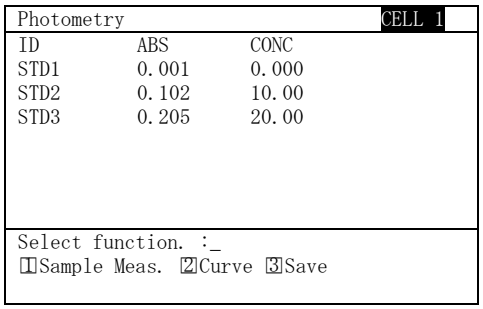
(5) On this screen, the saved data files are listed.
The photometric data including the calibration curve is indicated by PHT in the column of measurement mode.
For checking the parameters according to which the saved data had been measured, press the <3> key (for Check) and then the [ENTER] key. The outline of the selected Method is now displayed. After check, you can return to the previous display by pressing the [RETURN] key. Select the data, in which the desired calibration curve is saved, by the [▲]/[▼] key and press the [ENTER] key. The saved data will be displayed.

NOTE: For measurement with 6 Cell Mode turned ON in the system setup, be sure to load the data measured in the 6 Cell Mode ON status and use it for your measurement. For measurement with 6 Cell Mode turned OFF in the system setup, be sure to load the data measured in the 6 Cell Mode OFF status and use it for your measurement.
And, for measurement with the auto sipper (separately available), be sure to load the data measured with the auto sipper and use it for your measurement.

3. Sample Measurement

(1) The contents of data are displayed. When the contents are only standard data, the list shown in Fig. 4-14 appears, and that shown in Fig. 4-15 appears when the data of sample measurement is included.
If wavelength scan or time scan data is opened, the calibration curve data cannot be found.
Therefore, you must return to Step 2 “Calibration Curve Data Loading Procedure” and select the data again.

[When the open data is standard data alone]

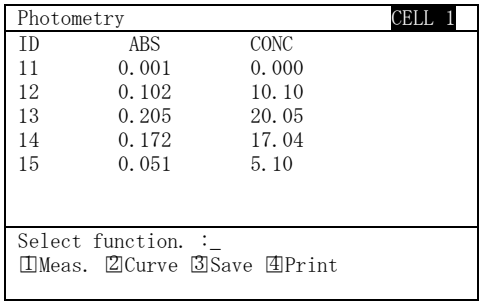


Example of screen showing measured data of 3 standard samples

Fig. 4-14 Standard Data-only Screen

Sample measurement is allowed by selecting the <1> key (for Sample).

[When the open data includes sample data]



Example of screen showing measured data of 15 unknown samples

Fig. 4-15 Sample Data-included Screen

When you select the <1> key (for Meas.) and then the <1> key (for New Meas.), the data area of the open file is cleared and sample measurement is allowed with the same calibration curve as that of this file.

(2) Set a sample for auto zero and execute auto zero. Then, measure the sample. Thus, sample measurement can be performed with the saved calibration curve.

4.2 Loading and Deleting the Saved Method

Introduced here is the photometric method by way of loading the saved Method.

4.2.1 Measurement via Loading of Saved Method

1. Startup of This Product

   Start up this product. (For startup method, see section 2.3.1.)

2. Method Loading Procedure

   (1) After completion of initial setting, the Main Menu screen (Fig. 4-16) appears.

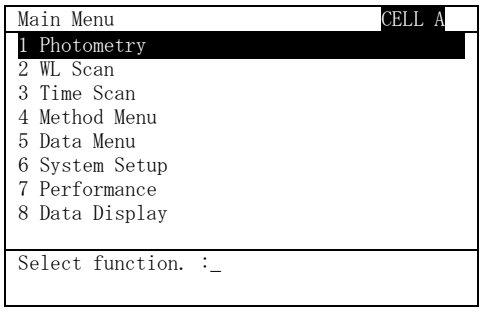


Fig. 4-16 Main Menu Screen

   (2) For loading a Method, press the <4> key (for Method Menu) and then the [ENTER] key or press the [▲]/[▼] key to select Method Menu and then the [ENTER] key.

   (3) Method Menu screen (Fig. 4-17) appears.

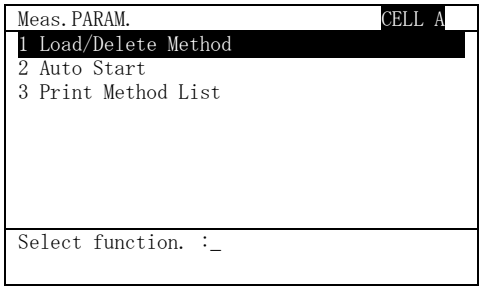


Fig. 4-17 Method Menu Screen

(4) For loading a Method, press the <1> key (for Load/Delete Data) and then the [ENTER] key or press the [▲]/[▼] key to select Load/Delete Data and then the [ENTER] key.

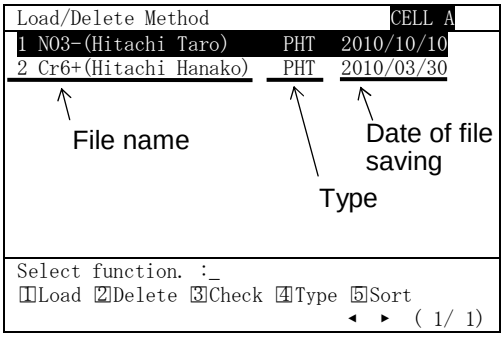
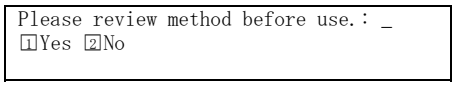


Fig. 4-18 Load/Delete Data Screen

(5) On this screen, the saved Methods are listed.
File name, type and date of file saving are displayed from the left. The type denotes the type of Method. Photometry, WL Scan and Time Scan are abbreviated as PHT, WLS and TMS, respectively. Select the Method to be loaded by the [▲]/[▼] key and press the [ENTER] key. Then, the Method for the selected file will be loaded. In case the measurement parameters of the selected file name are unknown, the outline of the selected Method can be displayed by pressing the <3> key (for Check) and then the [ENTER] key.
After check, you can return to the previous display by pressing the [RETURN] key.

NOTE: When a Method for the 6-cell turret is displayed though the auto sipper (separately available) is mounted to the instrument or a Method for the auto sipper is displayed though the 6-cell turret is mounted to the instrument, a guidance “Please review method before use.” will appear. This is because parameters intrinsic to the auto sipper or 6-cell holder are not contained in the saved Method.



For loading the method after confirmation of the above guidance, select [1] Yes, or [2] No for avoiding method loading. For details, refer to Table 4-7.

Table 4-7 Set Status of Instrument when Displaying Measurement Parameter

Measurement Parameter to be Displayed	Set Status of Instrument		
	6 Cell Mode ON	**6 Cell Mode OFF**	**Auto Sipper (separately available)**
6 Cell Mode ON	This measurement parameter is taken.	6 Cell Mode in system step is changed to the ON status, which is taken as a measurement parameter.	Measurement parameters except for the auto sipper are taken. In a saved Method, auto sipper-related parameters are not set. So, be sure to review the Method before measurement.
6 Cell Mode OFF	6 Cell Mode in system step is changed to the OFF status, which is taken as a measurement parameter.	This measurement parameter is taken.	
Auto sipper (separately available)	Measurement parameters except for 6 Cell Mode are taken. In a saved Method, 6 Cell Mode-related parameters are not set. So, be sure to review the Method before measurement.		This measurement parameter is taken.

4.2.2 Deletion of Saved Method

1. Startup of This Product

   Start up this product. (For startup method, see section 2.3.1.)

2. Call-up of Load/Delete Method Screen

   (1) Press the [MAIN MENU] key. The Main Menu screen (Fig. 4-19) appears.

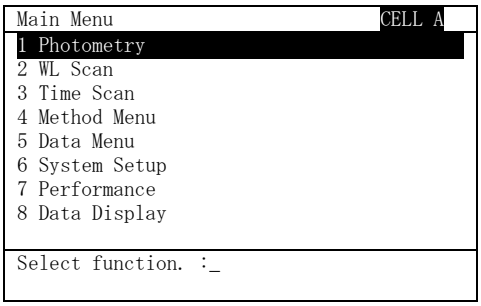


Fig. 4-19 Main Menu Screen

   (2) For displaying a list of Methods, press the <4> key (for Method Menu) and then the [ENTER] key or press the [▲]/[▼] key to select Method Menu and then the [ENTER] key.

   (3) Method Menu screen (Fig. 4-20) appears. Press the <1> key (for Load/Delete Data) and then the [ENTER] key or press the [▲]/[▼] key to select Load/Delete Data and then the [ENTER] key.

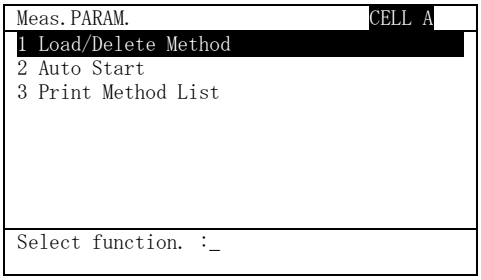


Fig. 4-20 Method Menu Screen

3. Deletion of Method

The saved Methods are now listed on the screen.
On each row, the file name, type and date of file saving are shown from the left. "Type" denotes the type of Method in an abbreviation listed in Table 4-8. Select the data to be deleted by the [▲]/[▼] key and press the <2> key (for Delete). The guidance for confirmation of your deletion will be displayed. When there is no problem, execute the deletion. For other keys, refer to Table 4-9.

NOTE: Data, once deleted, cannot be recovered. Careful confirmation is required before data deletion.

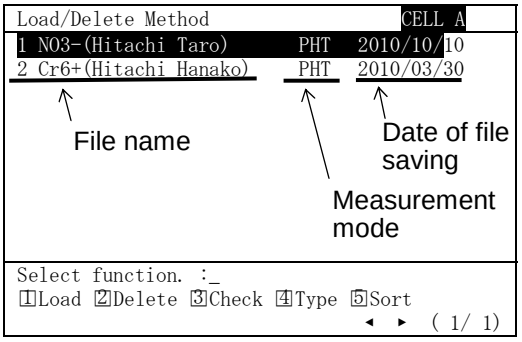


Fig. 4-21 Load/Delete Method Screen

Table 4-8 Abbreviation of Method Type

Type	Abbreviation
Photometry	PHT
Wavelength scan	WLS
Time scan	TMS

Table 4-9 Guidance for Load/Delete Method Screen

Function Key	Explanation
[1] Load	Loads the file which is now selected.
[2] Delete	Deletes the file which is now selected.
[3] Check	Enables you to check the outline of the Method in the presently selected file.
[4] Type	Enables you to select the type of the file to be displayed on the screen. Used for displaying in only one type such as photometry, wavelength scan or time scan. In default, all types are set for display.
[5] Sort	Enables you to sort the files to be displayed on the screen. Sorting is allowed in the alphabetical order of file names or in the chronological order of saved files. The alphabetical order of file names is selected by default.

4.2.3 Printing the List of Saved Methods

1. Startup of This Product

   Start up this product. (For startup method, see section 2.3.1.)

2. Display of Method List Screen

   (1) Press the [MAIN MENU] key. The Main Menu screen (shown in Fig. 4-22) appears. Press the <4> key (for Method Menu) and then the [ENTER] key or press the [▲]/[▼] key to select Method Menu and then the [ENTER] key.

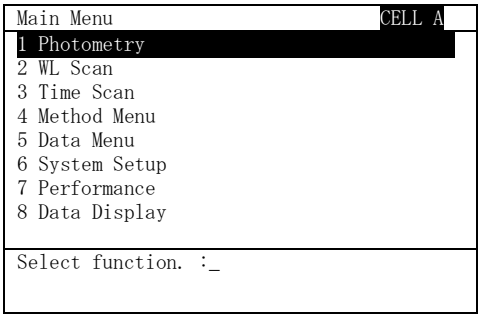


Fig. 4-22 Main Menu Screen

   (2) Method Menu screen (Fig. 4-23) appears.
   For printing the method list, press the <3> key (for Print List) and then [ENTER] key or press the [▲]/[▼] key to select Print List and then the [ENTER] key.

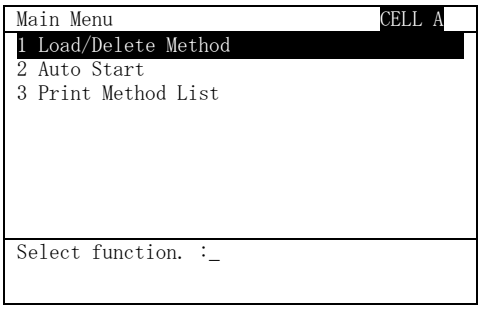


Fig. 4-23 Method Menu Screen

(3) The Print List screen (Fig. 4-24) appears. On this screen, the saved data files are listed. On each row, the file name, type and date of file saving are shown from the left. "Type" denotes the type of Method in an abbreviation listed in Table 4-10.

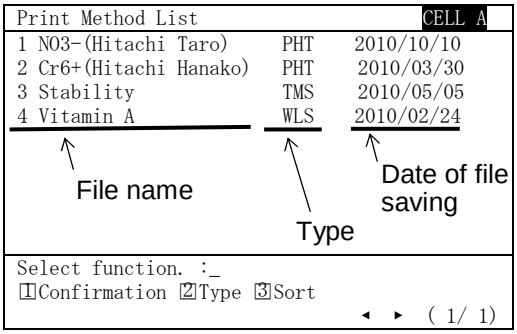


Fig. 4-24 Print List Screen

Table 4-10 Abbreviation of Method Type

Type	Abbreviation
Photometry	PHT
Wavelength scan	WLS
Time scan	TMS

3. Printing of Method List

For printing in only one type of Method, select the <2> key (for Type) and then PHT, WLS or TMS. For changing the display order of file names, select the <3> key (for Sort) and then "File Name" or "Data and Time" for display order.
The set Method will be reflected on display. When you press the [PRINT] key, the files on display are printed in the order of display. For details of other key operations, refer to Table 4-11. For an example of printout, see Fig. 4-25.

Table 4-11 Guidance for Print List

Function Key	Explanation
[1] Confirmation	Enables you to confirm the outline of the Method in the presently selected file.
[2] Type	Enables you to select the type of the file to be displayed on the screen (from among All, Photometry, WL Scan and Time Scan). In default, all types are set for display. Select function.: _ 1:All, 2:Photometry, 3:WL Scan, 4:Time Scan
[3] Sort	Enables you to sort the files to be displayed on the screen. Sorting is allowed in the alphabetical order of file names (File Name) or in the chronological order of saved files (Date and Time). The alphabetical order of file names is selected by default. Select function.:_ 1:File Name, 2:Date and Time

Method List

No.	File Name	Type	Date
1	NO3-(Hitachi Taro)	PHT	2010/10/10
2	Cr6+(Hitachi Hanako)	PHT	2010/03/30
3	Stability	TMS	2010/05/05
4	Vitamin A	WLS	2010/02/24

Fig. 4-25 Example of Print List

4.3 Data Processing

Explanation is given here on data processing of calibration curve, spectrum and time-scan measurement.

4.3.1 Scale Change of Calibration Curve

1. Display of Calibration Curve Data

[Confirmation from saved data]

For check by opening the saved data, open the photometric data including the saved calibration curve data according to “4.1.1 Loading the Saved Data.”
Upon opening the calibration curve data, a guidance (Fig. 4-26) is presented. Select the <2> key (for Curve).

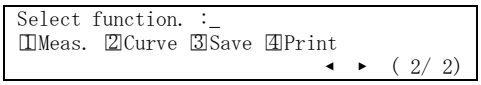


Fig. 4-26 Example of Guidance upon Opening of Calibration Curve Data

[During measurement]

During measurement by selecting Photometry in the Main Menu, Conc for Data Mode and 1st Order for Curve Type, select Curve Confirmation or Curve indicated in the guidance.

2. Scale Changing Procedure

(1) Calibration curve data is now opened. Select the <1> key (for Scale).

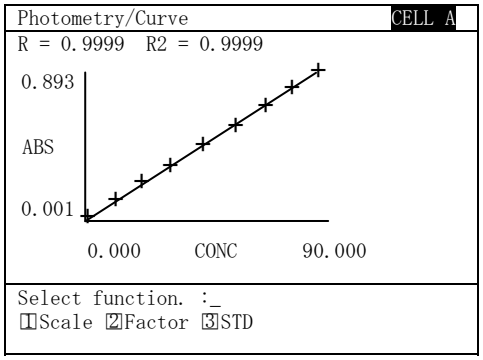


Fig. 4-27 Calibration Curve Data

(2) Scale Change screen (Fig. 4-28) appears. On this screen, a scale change, scale resetting and auto scale operation are allowed. For each parameter (setting item), refer to Table 4-12 “Scale Changing Parameters.”

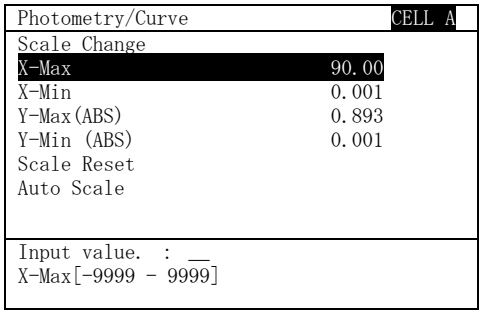


Fig. 4-28 Scale Change Screen

Table 4-12 Scale Changing Parameters

Parameter	Explanation
X-Max	Sets the maximum value on the X axis (representing the concentration of standard solution) of calibration curve. Settable within -9999 to -0.001, 0, 0.001 to 9999 (indication in max. 4 digits). Change on the set axis is adopted by pressing the [RETURN] key.
X-Min	Sets the minimum value on the X axis (representing the concentration of standard solution) of calibration curve. Settable within -9999 to -0.001, 0, 0.001 to 9999 (indication in max. 4 digits). Change on the set axis is adopted by pressing the [RETURN] key.
Y-Max (ABS)	Sets the maximum value on the Y axis (representing the absorbance) of calibration curve. Settable within -9.999 to 9.999. Change on the set axis is adopted by pressing the [Return] key.
Y-Min (ABS)	Sets the minimum value on the Y axis (representing the absorbance) of calibration curve. Settable within -9.999 to 9.999. Change on the set axis is adopted by pressing the [Return] key.
Scale Reset	Sets the default value of scale. For setting, press the <1> key (Execute). Select function. :_ 1:Execute
Auto Scale	Judges the maximum and minimum values of the measured data on the Y axis, and automatically optimizes the scale. For setting, press the <1> key (Execute). Select function. :_ 1:Execute

4.3.2 How to Check Calibration Curve Factor, Correlation Coefficient and Determination Coefficient

1. Display of Calibration Curve Data

[Confirmation from saved data]

For check by opening the saved data, open the photometric data including the saved calibration curve data according to "4.1.1 Loading the Saved Data."
Upon opening the calibration curve data, a guidance (an example shown in Fig. 4-29) is presented. Select the <2> key (for Curve).

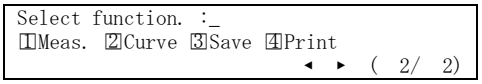


Fig. 4-29 Example of Guidance upon Opening of Calibration Curve Data

[During measurement]

During measurement by selecting Photometry in the Main Menu, Conc for Data Mode and 1st Order for Curve Type, select Curve Confirmation or Curve indicated in the guidance.

2. Curve Factor Checking Procedure

(1) The calibration curve data is now opened. Select the <2> key (for Factor).

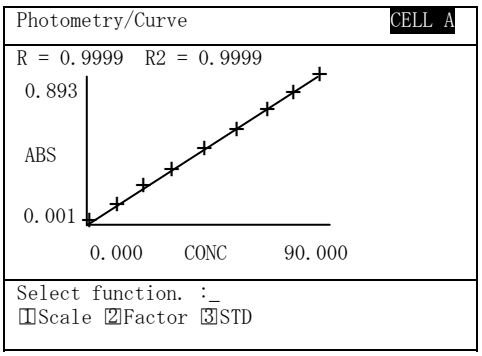


Fig. 4-30 Calibration Curve Data

(2) Curve Factor Confirmation screen (Fig. 4-31) appears. On this screen, Curve Factor, Correlation coefficient and determination coefficient can be set. For each parameter, refer to Table 4-13.

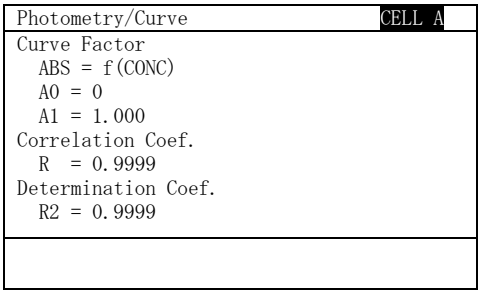


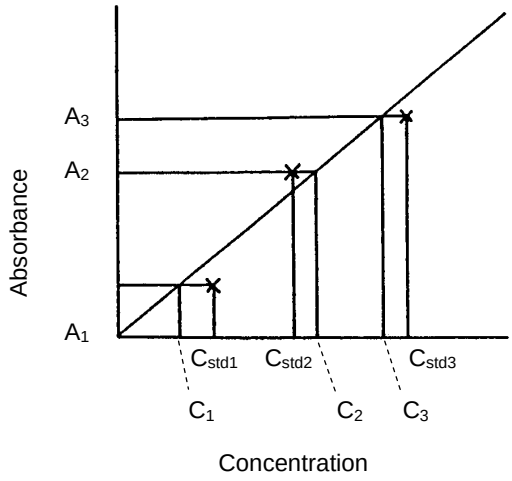
Fig. 4-31 Calibration Curve Factor Confirmation Screen

Table 4-13 Explanation of Calibration Curve Factor Confirmation Screen

Parameter	Explanation
Curve Factor	Denotes the factor of calibration curve. A0 and A1 stand for the values expressed by the following equation. [When ABS = f(CONC)] Absorbance = A1 x concentration + A0 Concentration = (absorbance - A0)/A1 [When CONC = f(ABS)] Concentration = A1 x absorbance + A0
Correlation Coef.	Used for evaluating the linearity of calibration curve. When this value is closer to 1.0000, the linearity can be evaluated to be higher. Calculation formula is introduced in Explanation 4-1.
Determination Coef.	Used for evaluating the linearity of calibration curve. When this value is closer to 1.0000, the linearity can be evaluated to be higher. Calculation formula is introduced in Explanation 4-1.

Explanation 4-1 Calculation Formulae for Concentration Difference, Correlation Coefficient, Determination Coefficient, etc. of Calibration Curve

Introduced below are calculation formulae for evaluating a calibration curve.



Measured value and calibration curve

A_n : Absorbance value obtained by measuring standard samples
$\overline{A}$: Averaged absorbance value obtained by measuring standard samples
C_{stdn} : Concentration of each standard
C_n : Concentration on calibration curve, which corresponds to A_n
$\overline{C}$: Averaged concentration on calibration curve, which corresponds to A_n
N : Number of standards

Concentration difference DIFF : $DIFF_n = C_n - C_{stdn}$

Relative difference RD : $RD_n = \dfrac{DIFF_n}{\overline{A}} \times 100$

Student's t (t-test) : $t_n = \dfrac{DIFF_n}{\sqrt{\dfrac{\sum (DIFF_n)^2}{N-1}}}$

Relative coefficient : $R = \sqrt{\dfrac{\left(\sum \left(C_n - \overline{C}\right)^2\right) - \left(\sum \left(C_n - C_{stdn}\right)^2\right)}{\sum \left(C_n - \overline{C}\right)^2}}$

Determination coefficient : $R2 = (R)^2$

4.3.3 Deletion and Recovery of Calibration Curve Data

1. Displaying Calibration Curve Data

   [For check from saved data]

   For check by opening the saved data, open the photometric data including the saved calibration curve data according to section 4.1.1.
   Upon opening the calibration curve data, a guidance (an example shown in Fig. 4-29) is presented. Select the <2> key (for Curve).

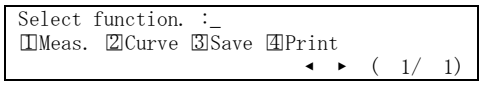


Fig. 4-32 Example of Guidance upon Opening of Calibration Curve Data

   [During measurement]

   During measurement by selecting Photometry in the Main Menu, Conc for Data Mode and 1st Order for Curve Type, select Curve Confirmation or Curve indicated in the guidance.

2. Displaying Standard Sample Data

   (1) The calibration curve data is now opened. Select the <3> key (for STD).

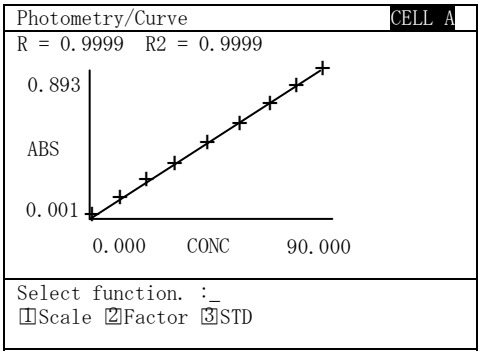


Fig. 4-33 Calibration Curve Data

(2) Each standard data is now displayed as shown below.

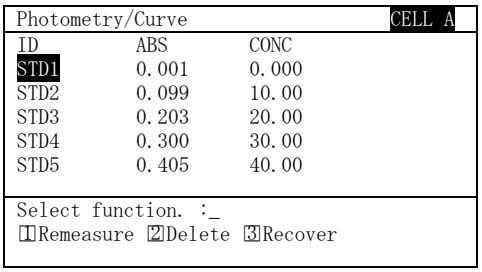


Fig. 4-34 Each Standard Data

Table 4-14 Guidance for Photometry/Curve

Function Key	Explanation
[1] Remeasure	To be selected for remeasuring an already measured sample. Upon selection, the following guidance appears. Select a sample to be remeasured by the [▲]/[▼] key and place the sample in cell 1. Then, press the [Start] key. Remeasurement will start. For auto zero operation, press the [AUTOZERO] key. Photometry CELL A ID ABS CONC 6 0.301 30.00 7 0.251 25.11 8 0.419 40.90 9 0.110 11.00 10 0.234 23.50 Set sample to Cell1(Sample 10).: _ START:Meas.; AUTOZERO:Autozero ◂ ▸ (2/ 2)
[2] Delete	The measured data of a standard which you don't want to use for a calibration curve can be excluded from calculation by selecting the data by [▲]/[▼] key and pressing the <1> key (for Delete). After deletion, the asterisk (*) mark is put at the head of the data. Select function. :_ [1]Delete
[3] Recover	The measured data of a standard which has been excluded from calculation can be recovered by selecting the data by [▲]/[▼] key and pressing the <1> key (for Recover). After recovery, the asterisk (*) mark put at the head of the data will disappear. Select function. :_ [2]Recover

4.3.4 Scale Change (Wavelength/Time Scan Data)

1. Displaying Data

   [For check from saved data]

   For check by opening the saved data, open the saved wavelength scan data or time scan data according to section 4.1.1.

   [During measurement]

   When measurement is in progress with WL Scan or Time Scan selected in Main Menu, you should wait till the end of the measurement.

2. Data Processing Screen

   For wavelength scan data, the WL Scan screen (Fig. 4-35) appears, and the Time Scan screen (Fig. 4-36) appears for time scan data. Then, select the <2> key (for Scale).

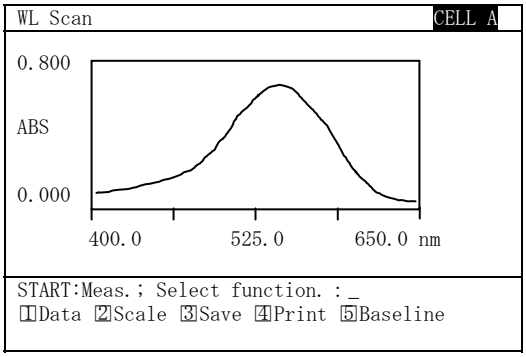


Fig. 4-35 Wavelength Scan Data

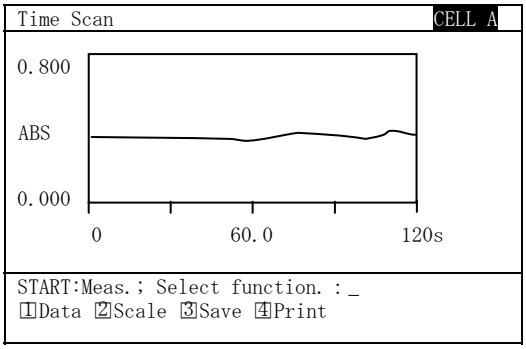


Fig. 4-36 Time Scan Data

3. Changing the Scale

For wavelength scan data, the scale change screen for wavelength scan (Fig. 4-37) will appear. For time scan data, the scale change screen for time scan (Fig. 4-38) will appear. On each screen, scale change, scale resetting and auto scale operation can be set. For each parameter, refer to Table 4-15 and 4-16 which lists scale change parameters.

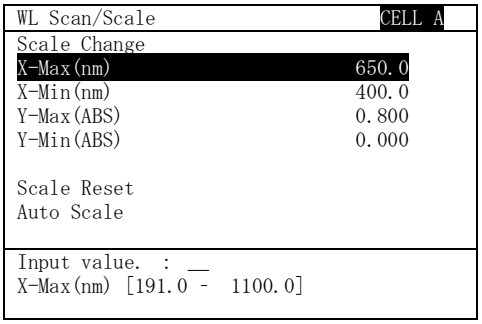


Fig. 4-37 Scale Changing Screen for Wavelength Scan

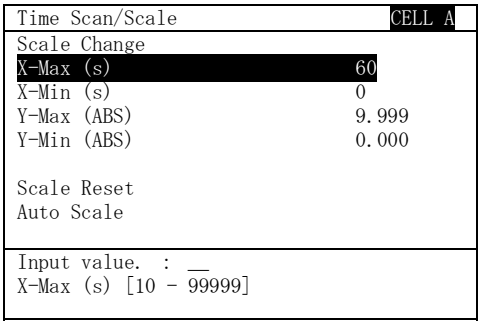


Fig. 4-38 Scale Changing Screen for Time Scan

Table 4-15 Scale Changing Parameters for Wavelength Scan

Function Key	Explanation
X-Max	Sets the maximum value on the X axis (wavelength axis) of spectrum. Settable within 191.0 to 1100.0. For adopting and changing the set axis, return to the spectrum screen by pressing the [RETURN] key.
X-Min	Sets the minimum value on the X axis (wavelength axis) of spectrum. Settable within 190.0 to 1099.0. For adopting and changing the set axis, return to the spectrum screen by pressing the [RETURN] key.
Y-Max	Sets the maximum value on the Y axis (representing the absorbance or transmittance) of spectrum. Settable range is as follows. Absorbance : -9.999 to 9.999 Transmittance : -9.999 to 999.9 For adopting and changing the set axis, return to the spectrum screen by pressing the [RETURN] key.
Y-Min	Sets the minimum value on the Y axis (representing the absorbance or transmittance) of spectrum. Settable range is as follows. Absorbance : 9.999 to 9.999 Transmittance : -9.999 to 999.9 For adopting and changing the set axis, return to the spectrum screen by pressing the [RETURN] key.
Scale Reset	Sets scale in the default value. For setting, press the <1> key (Execute). Select function. :_ 1Execute
Auto Scale	Judges the maximum and minimum values of the measured data on the Y axis, and automatically optimizes the scale. For setting, press the <1> key (Execute). Select function. :_ 2Execute

Table 4-16 Scale Changing Parameters for Time Scan

Function Key	Explanation
X-Max	Sets the maximum value on the X axis (time axis) of spectrum. Settable within 10 to 99999. For adopting and changing the set axis, return to the spectrum screen by pressing the [RETURN] key.
X-Min	Sets the minimum value on the X axis (time axis) of spectrum. Settable within 0 to 99989. For adopting and changing the set axis, return to the spectrum screen by pressing the [RETURN] key.
Y-Max	Sets the maximum value on the Y axis (representing the absorbance) of calibration curve. Settable range is as follows. Absorbance : -9.999 to 9.999 Transmittance : -9.999 to 999.9 For adopting and changing the set axis, return to the spectrum screen by pressing the [RETURN] key.
Y-Min	Sets the minimum value on the Y axis (representing the absorbance) of spectrum. Settable range is as follows. Absorbance : -9.999 to 9.999 Transmittance : -9.999 to 999.9 For adopting and changing the set axis, return to the spectrum screen by pressing the [RETURN] key.
Scale Reset	Sets scale in the default value. For setting, press the <1> key (Execute). Select function. :_ 1:Execute
Auto Scale	Judges the maximum and minimum values of the measured data on the Y axis, and automatically optimizes the scale. For setting, press the <1> key (Execute). Select function. :_ 1:Execute

4.3.5 Peak Detection (Wavelength Scan Data)

1. Displaying Data

   [For check from saved data]

   For check by opening the saved data, open the saved wavelength scan data according to section 4.1.1.

   [During measurement]

   When measurement is in progress with WL Scan selected in Main Menu, you should wait till the end of the measurement.

2. Data Processing Screen

   (1) The guidance for wavelength scan data (Fig. 4-39) is then opened. In this guidance, select the <1> key (for Data). The guidance for data screen (Fig. 4-40) will be displayed. In this guidance, select the <2> key (for Peak).

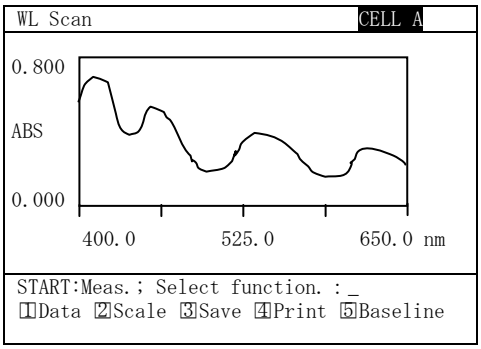


Fig. 4-39 Guidance for Wavelength Scan Data

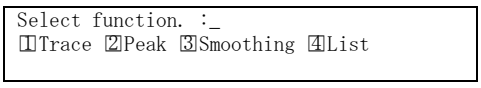


Fig. 4-40 Guidance for Data Screen

3. Peak Detection Screen

(1) The peak detection screen (Fig. 4-41) is now opened. The peak and valley detected according to the peak parameters set for measurement are indicated by + marks at the peak positions on the spectral profile. When plural peaks and valleys have been detected, you can move to different peak/valley by pressing the [◄]/[►] key. The wavelength and photometric value at the cursor position are indicated at the top left of this screen. Also, the present peak detection parameters are indicated at the right of the wavelength and photometric value. For changing the peak/valley detection parameters, select the <1> key (for Peak PARAM.), and the <2> key (for Peak Table) for displaying the peak table. For details of Peak PARAM. and Peak Table, refer to Table 4-17.

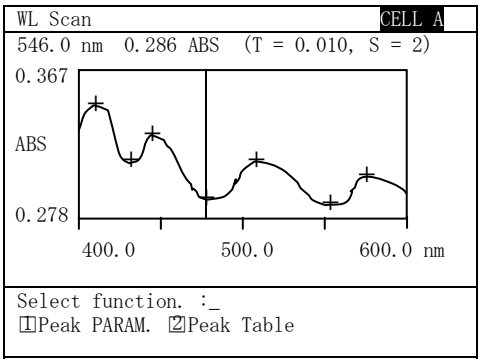


Fig. 4-41 Peak Detection Screen

Table 4-17 Peak Detection Data Processing

Function Key	Explanation
[1] Peak PARAM.	Used for changing the peak and valley detection parameters. For details of each parameter, refer to Table 3-39 which lists calculation parameters. WL Scan/Peak CELL A Peak PARAM. Threshold 0.010 Sensitivity 2 Input value. : __ Threshold [0.001 - 1.000]
[2] Peak Table	Displays peak table. Each wavelength of the detected peak and valley, and the photometric value at the wavelength are indicated. Peak and valley data are indicated at the left and right, respectively. WL Scan/Peak CELL A Peak Table (T=0.010 S=2) No WL(nm) Peak WL(nm) Valley 1 498.0 0.297 546.0 0.286 2 468.0 0.290 Select function. :_ [1]Peak PARAM. [2]Peak Trace ◄ ► (1/ 1)

4.3.6 Data Tracing (Wavelength/Time Scan Data)

1. Displaying Data

   [For check from saved data]

   For check by opening the saved data, open the saved wavelength scan data or time scan data according to section 4.1.1.

   [During measurement]

   When measurement is in progress with WL Scan or Time Scan selected in Main Menu, you should wait till the end of the measurement. For stopping the measurement, press the [STOP] key.

2. Data Processing Screen

   (1) For wavelength scan data, the WL Scan screen (Fig. 4-42) appears, and the Time Scan screen (Fig. 4-43) appears for time scan data. Then, select the <1> key (for Data).

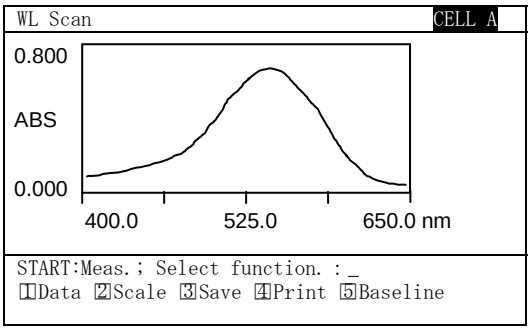


Fig. 4-42 Wavelength Scan Data

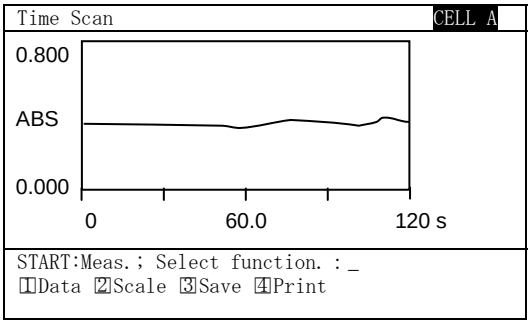


Fig. 4-43 Time Scan Data

(2) For wavelength scan data, the guidance for wavelength scan (Fig. 4-44) is displayed. And, for time scan data, the guidance for time scan (Fig. 4-45) is displayed. On each screen, select the <1> key (for Trace).

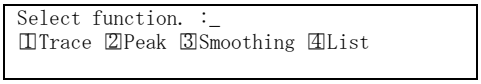


Fig. 4-44 Guidance for Wavelength Scan

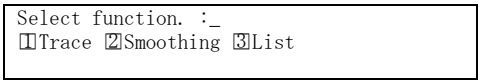


Fig. 4-45 Guidance for Time Scan

3. Tracing Data

For wavelength scan data, the WL Scan/Trace screen (Fig. 4-46) is displayed. And, for time scan data, the Time Scan/Trace screen (Fig. 4-47) is displayed. The cursor on each screen can be moved by pressing the [◄]/[►] key. The wavelength and photometric value at the present cursor position are indicated at the top left of each screen. Thus, the photometric values at the aimed-at wavelength and time point can be read.

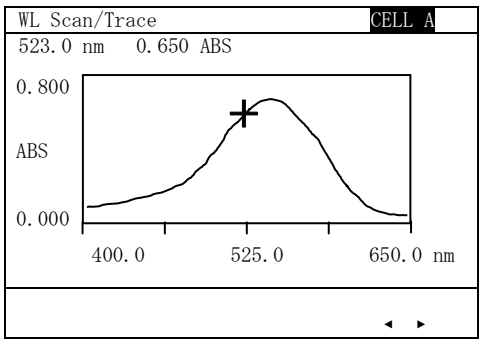


Fig. 4-46 WL Scan/Trace Screen

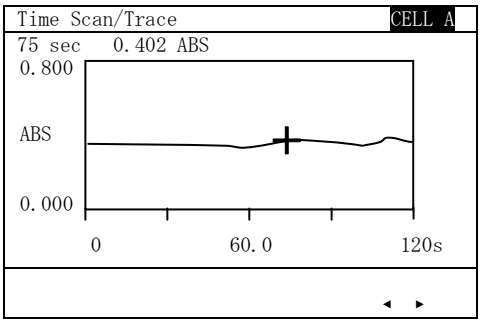


Fig. 4-47 Time Scan/Trace Screen

4.3.7 Data Smoothing (Wavelength/Time Scan Data)

1. Displaying Data

   [For check from saved data]

   For check by opening the saved data, open the saved wavelength scan data or time scan data according to section 4.1.1.

   [During measurement]

   When measurement is in progress with WL Scan or Time Scan selected in Main Menu, you should wait till the end of the measurement. For stopping the measurement, press the [STOP] key.

2. Data Processing Screen

   (1) For wavelength scan data, the WL Scan screen (Fig. 4-48) appears, and the Time Scan screen (Fig. 4-49) appears for time scan data. Then, select the <1> key (for Data).

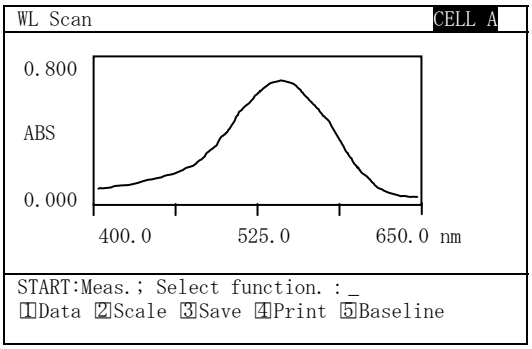


Fig. 4-48 Wavelength Scan Data

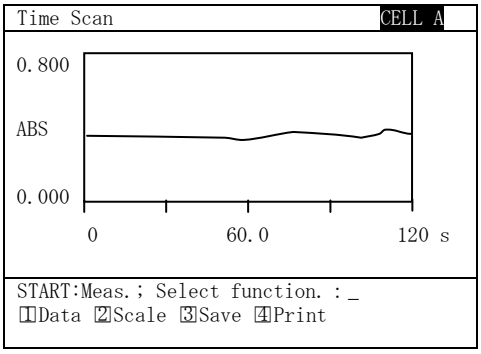


Fig. 4-49 Time Scan Data

(2) For wavelength scan data, the guidance for wavelength scan (Fig. 4-50) is displayed. In this guidance, select the <3> key (for Smoothing).
For time scan data, the guidance for time scan (Fig. 4-51) is displayed. In this guidance, select the <2> key (for Smoothing).

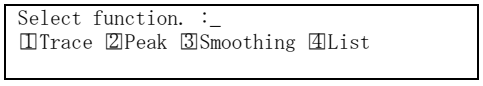


Fig. 4-50 Guidance for Wavelength Scan

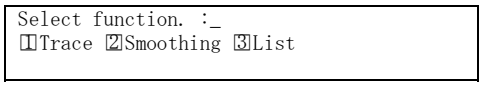


Fig. 4-51 Guidance for Time Scan

3. Smoothing Data

For wavelength scan data, the WL Scan/Smoothing screen (Fig. 4-52) is displayed. And, for time scan data, the Time Scan/Smoothing (Fig. 4-53) is displayed. For smoothing, select the <1> key (for Smoothing) on each screen. Upon selection, the spectral profile on the screen is smoothed. The spectral profile can be smoothed repeatedly by selecting the <1> key (for Smoothing) repeatedly. For returning to the original data, select the <2> key (for Reset).

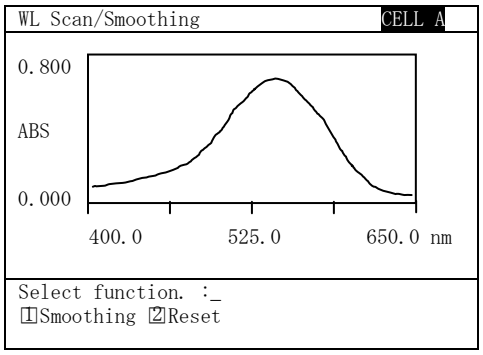


Fig. 4-52 WL Scan/Smoothing Screen

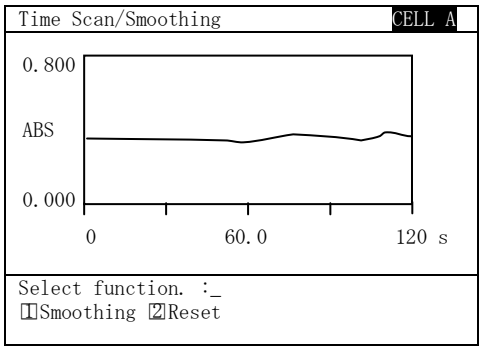


Fig. 4-53 Time Scan/Smoothing Screen

4.3.8 Displaying Data in List (Wavelength/Time Scan Data)

1. Displaying Data

   [For check from saved data]

   For check by opening the saved data, open the saved wavelength scan data or time scan data according to section 4.1.1.

   [During measurement]

   When measurement is in progress with WL Scan or Time Scan selected in Main Menu, you should wait till the end of the measurement. For stopping the measurement, press the [STOP] key.

2. Data Processing Screen

   (1) For wavelength scan data, the WL Scan screen (Fig. 4-54) appears, and the Time Scan screen (Fig. 4-55) appears for time scan data. Then, select the <1> key (for Data).

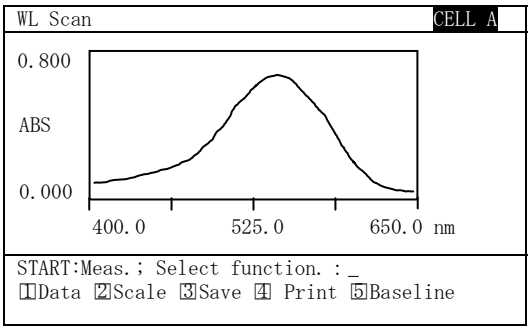


Fig. 4-54 Wavelength Scan Data

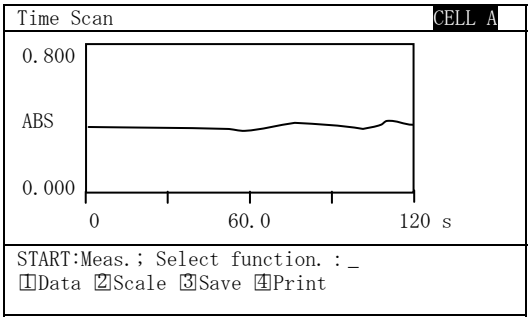


Fig. 4-55 Time Scan Data

(2) For wavelength scan data, the guidance for wavelength scan (Fig. 4-56) is displayed. In this guidance, select the <4> key (for List). For time scan data, the guidance for time scan (Fig. 4-57) is displayed. In this guidance, select the <3> key (for List).

```
Select function. :_
[1]Trace [2]Peak [3]Smoothing [4]List
```

Fig. 4-56 Guidance for Wavelength Scan

```
Select function. :_
[1]Trace [2]Smoothing [3]List
```

Fig. 4-57 Guidance for Time Scan

3. Displaying data in list

For wavelength scan data, the WL Scan/List screen (Fig. 4-58) is displayed. And, for time scan data, the Time Scan/List screen (Fig. 4-59) is displayed. You can see the next or previous page on each screen by pressing the [◄]/[►] key. For changing the display interval, select the <1> key (for Int. (nm/s)). For details of setting method, refer to the data list screen (shown in Table 4-18).

```
WL Scan/List                                        CELL A
No.  WL(nm)   ABS      No.  WL(nm)   ABS
1    600.0    0.299    9    584.0    0.298
2    598.0    0.299    10   582.0    0.297
3    596.0    0.299    11   580.0    0.296
4    594.0    0.299    12   578.0    0.295
5    592.0    0.299    13   576.0    0.294
6    590.0    0.299    14   574.0    0.293
7    588.0    0.299    15   572.0    0.292
8    586.0    0.299    16   570.0    0.291
Select function. :_
[1]Int.(nm)  (2.0)
                                    ◄  ►  (  1/  7)
```

Fig. 4-58 WL Scan/List Screen

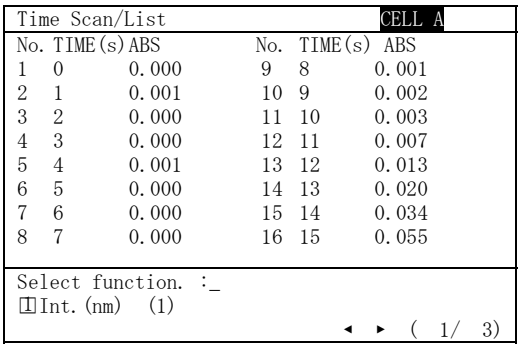
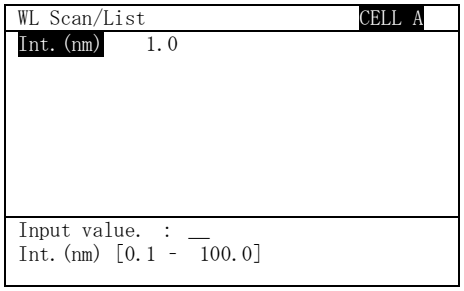
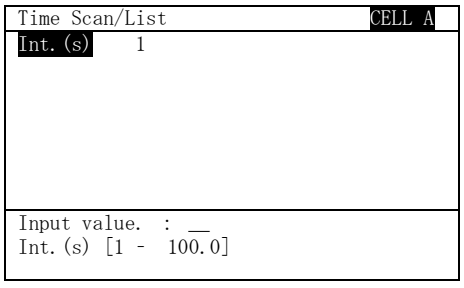


Fig. 4-59 Time Scan/List Screen

Table 4-18 Data List Screen

Function Key	Explanation
[1] Int. (nm/s)	To be selected for changing the display interval. Input a display interval value, and press the [RETURN] key for returning to each initial data list screen.





4.4 Measurement in Statistical Calculation Mode

In quantitation of solution sample concentration and in measurement of a DNA sample (by ratio calculation), the mean value (MEAN), standard deviation (SD) and relative standard deviation (RSD) can be calculated every specified number of calculations when you make setting for statistical calculation before measurement.

GUIDE: When auto start has been set, parameters are automatically set after the power switch is turned on and the process advances up to the measurement screen. For automatic start setting method, see section 4.5.

[For quantitation of solution sample concentration]

Depending on each mode, set measurement parameters by reference to the following subsections. However, in setting of sample conditions, you must set the statistical calculation in ON status, and set the number of samples for statistical calculation in setting the number of calculations.

6-cell auto mode:
3.2.1 Determining Concentration of Solution
6-cell manual mode, 6-cell mode OFF:
3.3.1 Determining Concentration of Solution

After measurement, the result of statistical calculation is displayed every specified number of calculations as shown below. N, MEAN, SD and RSD stand for the number of calculations, mean concentration value, standard deviation in concentration and relative standard deviation in concentration, respectively.

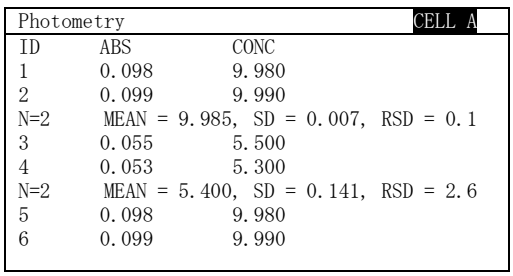


Fig. 4-60 Result of Statistical Calculation in Quantitation of Solution Sample Concentration

[For measurement of DNA sample (by ratio calculation)]

Depending on each mode, set measurement parameters by reference to the following subsections. However, in setting of sample conditions, you must set the statistical calculation in ON status, and set the number of samples for statistical calculation in setting the number of calculations.

6-cell auto mode:

3.2.3 Measuring DNA Sample (measurement through ratio calculation)

6-cell manual mode, 6-cell mode OFF:

3.3.3 Measuring DNA Sample (measurement through ratio calculation)

After measurement, the result of statistical calculation is displayed every specified number of calculations as shown below. N, MEAN, SD and RSD stand for the number of calculations, mean absorbance difference or ratio value, standard deviation and relative standard deviation, respectively.

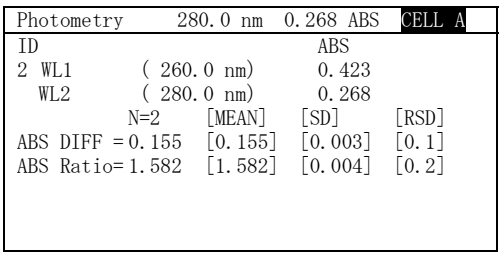


Fig. 4-61 Result of Statistical Calculation in DNA Measurement

4.5 Auto Start Function

The instrument can always be started up under the same measurement parameters by using the auto start function. This is a very useful function when measurement is always carried out in only one mode.

1. Startup of This Product

   Start up this product. (For startup method, see section 2.3.1.)

2. Method Loading Procedure

   (1) Press the [MAIN MENU] key. The Main Menu screen (shown in Fig. 4-62) appears.

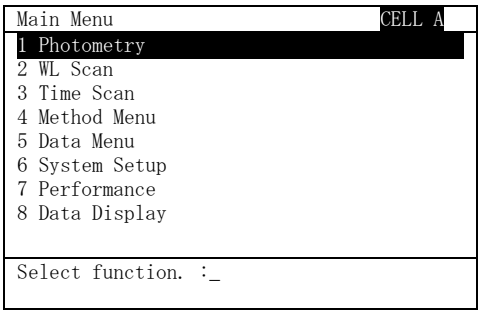


Fig. 4-62 Main Menu Screen

   (2) For loading a method, press the <4> key (for Method Menu) and then the [ENTER] key or press the [▲]/[▼] key to select Method Menu and then the [ENTER] key.

   (3) Method Menu screen (Fig. 4-63) appears. For auto start setting, press the <2> key or the [▲]/[▼] key to select Auto Start, and then the [ENTER] key.

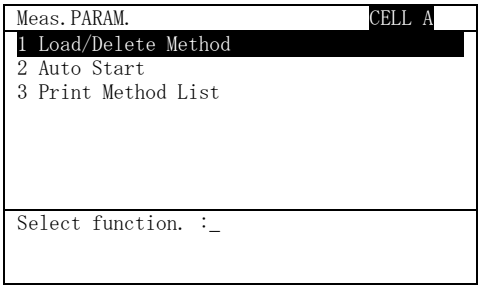


Fig. 4-63 Meas. PARAM. Screen

3. Auto Start Setting

(1) The Auto Start screen (Fig. 4-64) appears. On this screen, the saved methods are listed. On each row, file name, type (PHT: photometry, WLS: wavelength scan, TMS: time scan) and date of file saving are shown from the left. Select the method to be automatically started by the [▲]/[▼] key and press the [ENTER] key. For the set method, an asterisk (*) is put at the head of its file name.
Figure 4-65 shows the screen when the file name “1 NO3-(Hitachi Taro)” is selected for auto start. when this method is adopted, [RETURN]key is pushed.

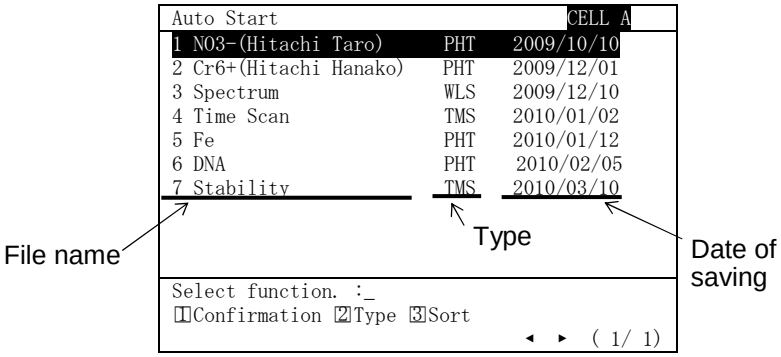


Fig. 4-64 Auto Start Screen

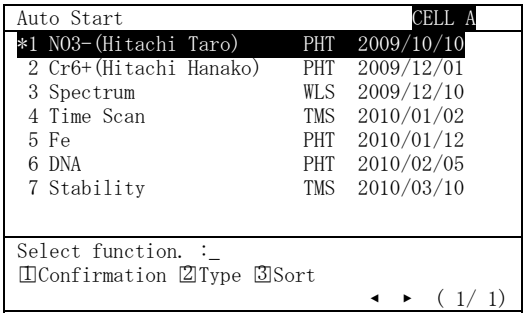


Fig. 4-65 Auto Start-Set Status

By the above setting, the same measurement parameters are always set upon startup of the instrument and the system moves up to the measurement screen.

NOTE: Before startup of the instrument, make sure that the same accessory as one in the Method file used for auto start is mounted.
For example, when the automatically started Method is a file using the 6-cell turret, make sure that the 6-cell turret is mounted to the instrument. For a Method using the single cell holder (separately available) or rectangular cell holder (separately available), confirm that each accessory is mounted.
For a Method using the auto sipper (separately available), confirm that the auto sipper is mounted to the instrument.

For releasing the auto start setting, select the file for which auto start has been set, and then press the [ENTER] key. Auto start is now canceled.
Make sure the asterisk has disappeared.

4.6 Introduction and Mounting Method of Separately Available Options

Introduced below are separately available options.
These options should be used according to your analytical purpose. Of the single cell holders, mask for micro cell and rectangular long-path cell holder, mounting method and instrument setting method are explained in 4.6.1 to 4.6.5.

Table 4-19 Introduction of Separately Available Options

Purpose	Option (separately available)		Sample Volume
Measurement with usual cell holder	Single cell holder	P/N: 3J2-0110	1.7 to 3.5 mL
Application to small-volume samples (340 to 600 µL)	Single cell holder	P/N: 3J2-0110	340 to 600 µL
	Mask for micro cell	P/N: 200-1537	
	Micro quartz cell 10 mm	P/N: 124-0357	
	Black quartz micro cell 10 mm	P/N: 200-0551	
Application to very small-volume samples (90 µL or less)	Single cell holder	P/N: 3J2-0110	
	Mask for trace sample cell	P/N:3J2-0132	
	1.5 µL Trace sample cell	P/N:3J2-0120	1.5 to 4.0 µL
	12 µL Trace sample cell	P/N:3J2-0121	12 to 40 µL
	50 µL Trace sample cell	P/N:3J2-0122	50 to 90 µL
Sensitivity enhancement	Rectangular long-path cell holder	P/N: 3J2-0111	17 to 35 mL
	10 mm quartz cell	P/N: 210-3939	
Use of sipper	Auto sipper	P/N: 3J2-0105	—

For these separately available options and the hottest information about them, contact your dealer or the maintenance service company authorized by Hitachi High-Technologies Corporation.

4.6.1 Single Cell Holder (Separately Available)

A single cell holder has only one cell setting position like the conventional cell holders. This holder should be employed when you want to use cells by the usual method.

1. Removal of 6-cell turret

   Remove the 6-cell holder, referring to the 6-cell turret removing method described in “a.” of 2.4.5.

2. Mounting of Single Cell Holder

   (1) Open the sample compartment and place a single cell holder so that its positioning holes receive the guide pins of the sample compartment. The single cell holder must be mounted facing the rectangular cell setting position toward the front of the instrument as shown below.

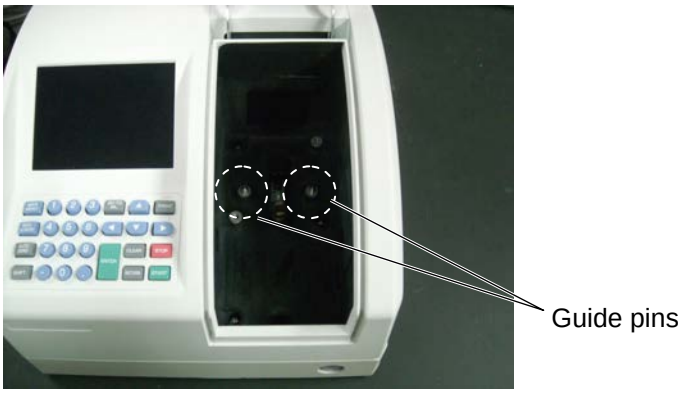


Fig. 4-66 Guide Pins of Sample Compartment

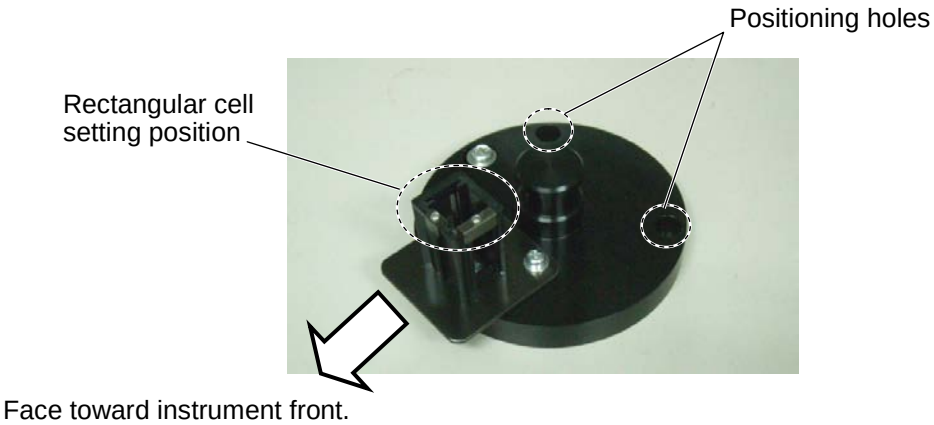


Fig. 4-67 Appearance of Single Cell Holder

(2) Only one screw is used for fastening both the sample compartment and single cell holder. Tighten the screw firmly using a Phillips screwdriver.

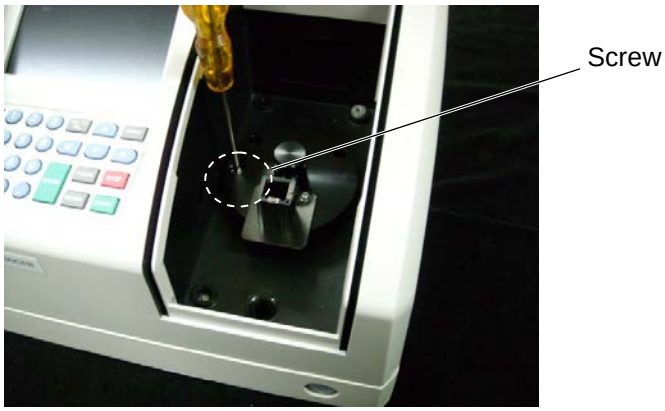


Fig. 4-68 Mounting Single Cell Holder in Sample Compartment

(3) Holder mounting is now completed. Close the lid of the sample compartment.

Fig. 4-69 View After Mounting the Single Cell Holder

3. Change of 6-cell Mode Setting

The 6-cell mode setting needs to be changed.
Turn the 6-cell mode setting from ON to OFF, referring to section 2.5.4.
Carry out measurement, after referring to section 4.6.5.

4.6.2 Mask for Micro Cell (Separately Available)

The mask for micro cell is used in combination with a single cell holder and a micro cell. In this combination, a sample is measurable in a smaller volume (340 to 600 μL) than with a 10 mm rectangular cell.

1. Mounting of Single Cell Holder

   Mount a single cell holder in the same procedure as in 4.6.1.

2. Mounting of Mask for Micro Cell

   (1) Shown below are the external view of this mask and its illustration drawn as viewed in the lateral direction. The swelled side of the mask is shown as the “Convex side of mask” and the sunk side is shown as the “Concave side of mask” in the figure.

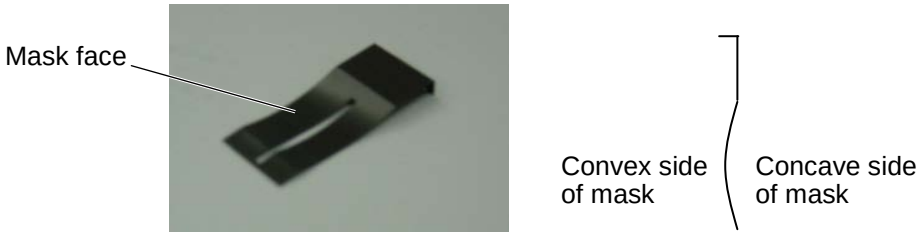


Fig. 4-70 External View and Illustration of Mask for Micro Cell

   (2) Shown below is the external view of a single cell holder. The cell holder has a groove for mask insertion. Insert the mask into the groove by sliding. The mask must be inserted orienting the convex side as directed in the figure. Insert the mask completely until it no longer moves.

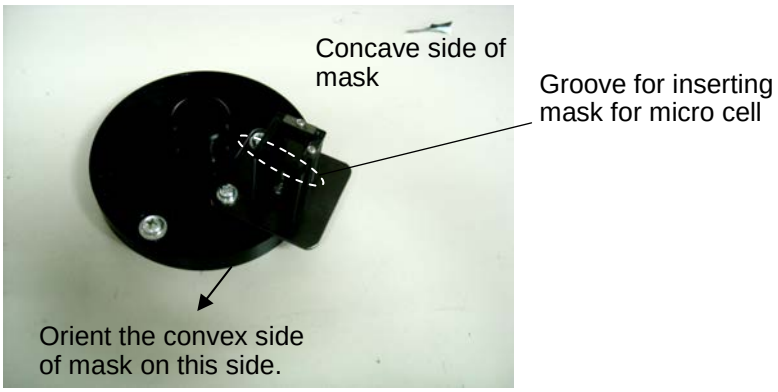


Fig. 4-71 External View of Single Cell Holder

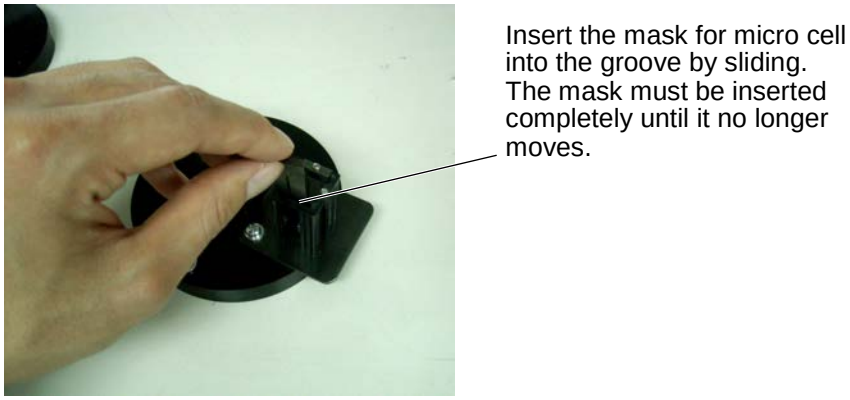


Fig. 4-72 Insertion of Mask for Micro Cell

3. Change of 6-cell Mode Setting

   The 6-cell mode setting needs to be changed.
   Turn the 6-cell mode setting from ON to OFF, referring to section 2.5.4.
   Carry out measurement, after referring to section 4.6.5.

4.6.3 Rectangular Long-Path Cell Holder (Separately Available)

The rectangular long-path cell holder enables the user to measure a sample using a cell having an optical path length 10, 20, 30, 40, 50 and 100 mm. In this application, low-concentration samples can be measured at enhanced absorbance levels.

1. Removal of 6-cell turret
   Remove the 6-cell turret, referring to the 6-cell turret removing method described in “a.” of 2.4.5.

2. Mounting of Rectangular Long-path Cell Holder

   (1) Open the sample compartment and place the rectangular long-path cell holder so that its positioning holes receive the guide pins of the sample compartment. This holder must be mounted locating the rectangular cell mounting position on the front side of the instrument as shown below.

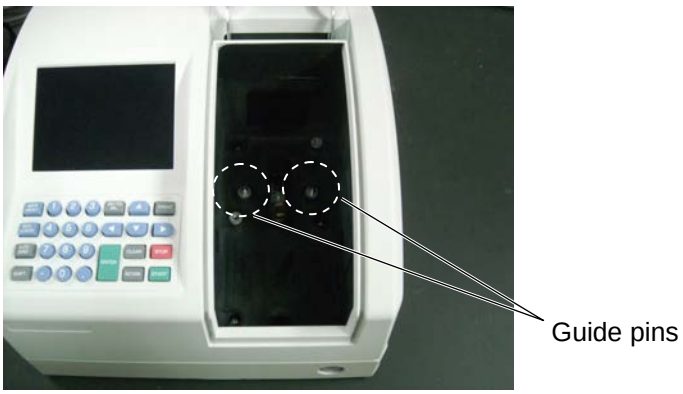


Fig. 4-73 Guide Pins of Sample Compartment

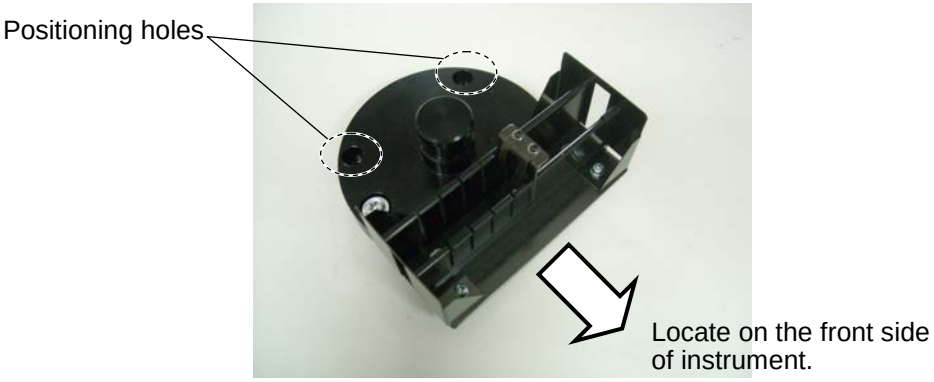


Fig. 4-74 Appearance of Rectangular Long-Path Cell Holder

(2) Only one screw is used for fastening both the sample compartment and rectangular long-path cell holder. Tighten the screw firmly using a Phillips screwdriver.

Fig. 4-75 Mounting Rectangular Long-Path Cell Holder in Sample Compartment

(3) Holder mounting is now completed. Close the lid of the sample compartment.

Fig. 4-76 View After Mounting the Rectangular Long-Path Cell Holder

3. Change of 6-cell Mode Setting

The 6-cell mode setting needs to be changed.
Turn the 6-cell mode setting from ON to OFF, referring to section 2.5.4.
Carry out measurement, after referring to section 4.6.5.

4.6.4 How to Return 6-Cell Turret

1. Removal of Present Cell Holder

   Firstly, remove the mask for micro cell when mounted to the single cell holder. Then, remove the single cell holder or rectangular long-path cell holder, whichever mounted, by loosening the screw shown in the figure below.

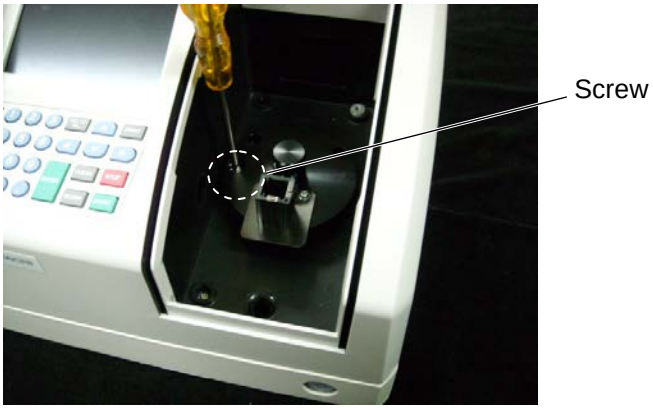


Fig. 4-77 Removal of Single Cell Holder

Fig. 4-78 Removal of Rectangular Long-Path Cell Holder

2. Mounting of 6-cell Turret

   Mount the 6-cell turret, referring to the 6-cell turret mounting method described in “b.” of 2.4.5.

3. Change of 6-cell Mode Setting

   The 6-cell mode setting needs to be changed.
   Turn the 6-cell mode setting from OFF to ON, referring to section 2.5.4.

4.6.5 Measurement in 6Cell Mode OFF Status

Explained here is the measurement method when the 6cell mode is set at OFF for using a single cell holder or rectangular long-path cell holder. When the 6cell mode is set at OFF, measurement should be carried out, referring to section 3.3 except for the following.

(1) Because 6cell mode OFF is a method to be used when the 6-cell turret is not used (i.e., a single cell holder or rectangular long-path cell holder is used), operations involving a movement of the 6-cell turret cannot be performed.

(2) For execution of auto zero, a guidance “Set autozero sample to Cell A.” is issued in the 6-cell manual mode. However, in the 6cell mode OFF status, cell position is not specified (by omitting “to Cell A”). So, set the sample in the cell holder in the sample compartment.

(3) For baseline correction in spectrum measurement, a guidance “Set baseline sample to Cell A.” is issued in the 6-cell manual mode. However, in the 6cell mode OFF status, cell position is not specified (by omitting “to Cell A”). So, set the sample in the cell holder in the sample compartment.

(4) In the guidance for cell position (see section 2.4.2), Cell S is always indicated when the 6cell mode is set at OFF.

(5) For execution of auto zero in measurement via the enlarge display screen (Data Display), firstly place a sample for auto zero execution in the cell holder, and then press the [Autozero] key. Upon pressing this key, auto zero is directly executed.

5. PERFORMANCE CHECK

This section pertains to the performance check method for checking whether the instrument provides the specified performance. For performance check with a pen type low-pressure mercury lamp, a separately available option is required. For mounting method of this lamp, refer to the instruction manual for the separately available option.

5.1 Check with Instrument Main Unit Alone

(1) After startup of the instrument, press the [MAIN MENU] key to display the Main Menu screen (Fig. 5-1). Confirm that nothing is contained in the sample compartment and close the lid. For selection of performance check, press the <7> key (Performance) and then the [ENTER] key or press the [▲]/[▼] key to select Performance followed by the [ENTER] key.

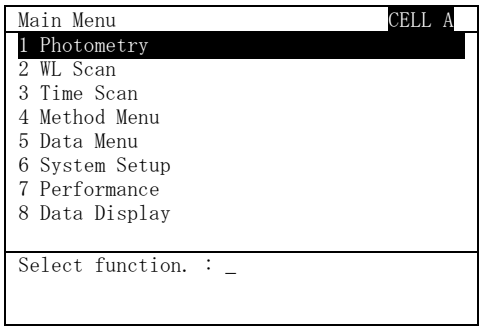


Fig. 5-1 Main Menu Screen

(2) The instrument performance check screen (Fig. 5-2) appears.

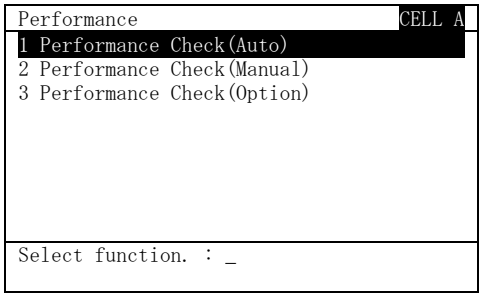


Fig. 5-2 Instrument Performance Check Screen

[For automatic execution of instrument performance check]

For automatically executing instrument performance check, press the <1> key (Performance Check (Auto)) and then the [ENTER] key. For subsequent operation, refer to section 5.1.8.

[For instrument performance check in each item]

For checking instrument performance in each performance item, press the <2> key (Performance Check (Manual)) and then the [ENTER] key. For subsequent operation, refer to section 5.1.1 to 5.1.6.

[For instrument performance check with separately available Hg lamp]

For checking instrument performance with a Hg lamp available at option, press the <3> key (Performance Check (Option)) and then the [ENTER] key. For subsequent operation, refer to section 5.2.1 to 5.2.3.

5.1.1 Wavelength Accuracy

(1) Display the screen for each item of instrument performance check (Fig. 5-3). For display method, follow the procedure starting from section 5.1. Using the [▲]/[▼] key, move the cursor to the measuring wavelength in any of WL Accuracy (484.6nm), (229.0nm) and (822.8nm), and then select [1] Yes. The accuracy at the selected wavelength will be checked. If check is not desired actually, select [2] No.

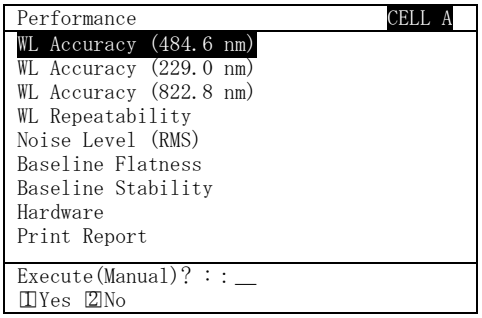


Fig. 5-3 Screen for Each Item of Instrument Performance Check

(2) The guidance for informing the parameter setting process (Fig. 5-4) appears, and parameters will be set and wavelength accuracy will be checked.

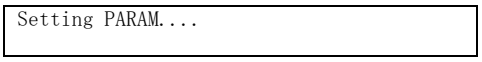


Fig. 5-4 Guidance for Parameter Setting Process

(3) After the check of wavelength accuracy, the screen after this check is displayed as shown in Fig. 5-5. Measurement result is indicated on the wavelength accuracy line; a peak difference at each wavelength of bright line and OK when the judgment standard is met or NG if not met. If NG is indicated, carry out wavelength calibration by the method instructed in section 5.3.1, and then check the wavelength accuracy again in the correct procedure. If NG recurs, refer to section 6.8.

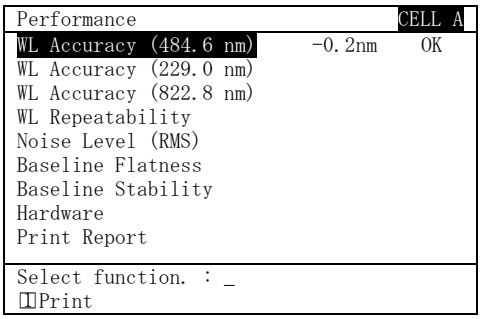


Fig. 5-5 Screen after Wavelength Accuracy Check

(4) For printing the measurement result, press the <1> key (Print). The performance check item selecting screen returns when you press the [RETURN] key.

Table 5-1 Measuring Conditions and Judgment Standard for Wavelength Accuracy (at 484.6 nm)

Item	Wavelength Accuracy (at 484.6 nm)
Measuring conditions	Emission spectrum of Xe lamp bright line (with detector on the monitor side) Wavelength range : 478.6 to 490.6 nm Scan speed : 40 nm/min Data interval : Fine Response : Medium Spectrum to be measured
Calculation method	Determination of a difference between peak wavelength of the measured spectrum and 484.6 nm Wavelength accuracy (at 484.6 nm) = (obtained peak wavelength) - 484.6
Judgment standard	Within ±1.0 nm

Table 5-2 Measuring Conditions and Judgment Standard for Wavelength Accuracy (at 229.0 nm)

Item	Wavelength Accuracy (at 229.0 nm)
Measuring conditions	Emission spectrum of Xe lamp bright line (with detector on the monitor side) Wavelength range : 223.0 to 235.0 nm Scan speed : 40 nm/min Data interval : Fine Response : Medium Spectrum to be measured
Calculation method	Determination of a difference between peak wavelength of the measured spectrum and 229.0 nm Wavelength accuracy (at 229.0 nm) = (obtained peak wavelength) - 229.0
Judgment standard	Within ±2.0 nm

Table 5-3 Measuring Conditions and Judgment Standard for Wavelength Accuracy (at 822.8 nm)

Item	Wavelength Accuracy (at 822.8 nm)
Measuring conditions	Emission spectrum of Xe lamp bright line (with detector on the monitor side) Wavelength range : 816.8 to 828.8 nm Scan speed : 40 nm/min Data interval : Fine Response : Medium Spectrum to be measured
Calculation method	Determination of a difference between peak wavelength of the measured spectrum and 822.8 nm Wavelength accuracy (at 822.8 nm) = (obtained peak wavelength) - 822.8
Judgment standard	Within ±2.0 nm

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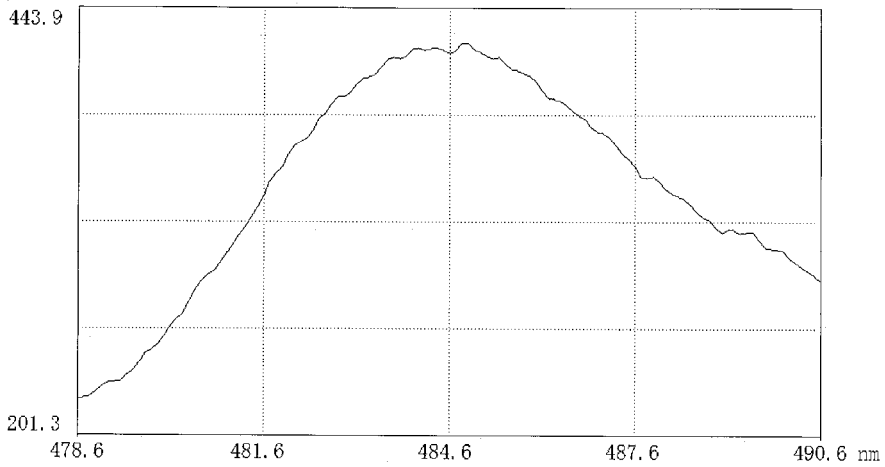

Performance Check
WL Accuracy(484.6nm) : +0.2nm Tolerance +/-1.0nm OK

Spectrophotometer
Model : U-5100 Spectrophotometer
Serial No. : 000000000000
ROM Ver. : 3J25300
Option :

Instrument

Meas.Mode :	WL Scan	Response :	Medium
Data Mode :	E(R)	Bandpass(nm) :	5.0
Start WL(nm) :	490.6	Baseline :	User
End WL(nm) :	478.6	6 Cell Mode :	OFF
Speed(nm/min) :	40		
Delay(s) :	0		
Data Int. :	Fine		

Fig. 5-6 Example Result of Wavelength Accuracy Check (at 484.6 nm)

5.1.2 Wavelength Repeatability

(1) Display the screen for each item of instrument performance check (Fig. 5-7). For display method, follow the procedure starting from section 5.1. Using the [▲]/[▼] key, move the cursor to Repeatability of WL, and then select [1] Yes. Wavelength repeatability will be checked. If check is not desired actually, select [2] No.

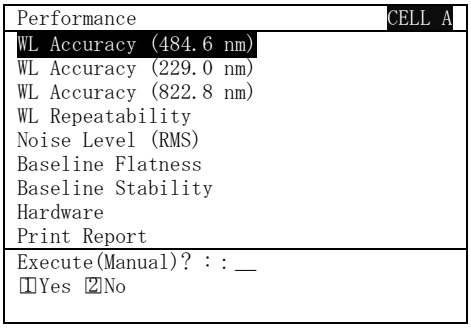

Fig. 5-7 Screen for Each Item of Instrument Performance Check

(2) The guidance for informing the parameter setting process (Fig. 5-8) appears, and parameters will be set and wavelength repeatability will be checked.

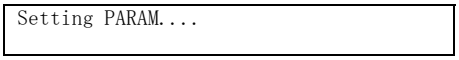

Fig. 5-8 Guidance for Parameter Setting Process

(3) After the check of wavelength repeatability, the screen after this check is displayed as shown in Fig. 5-9. Measurement result is indicated on the wavelength repeatability line followed by OK when the judgment standard is met or NG if not met. If NG is indicated, check the wavelength repeatability again in the correct procedure. If NG recurs, refer to section 6.8.

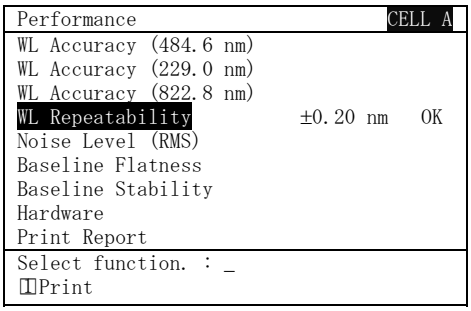

Fig. 5-9 Screen after Wavelength Repeatability Check

(4) For printing the measurement result, press the <1> key (Print). The performance check item selecting screen returns when you press the [RETURN] key.

Table 5-4 Measuring Conditions and Judgment Standard for Wavelength Repeatability

Item	Wavelength Repeatability
Measuring conditions	Emission spectrum of Xe lamp bright line (with detector on the monitor side) Wavelength range : 478.6 to 490.6 nm Scan speed : 40 nm/min Data interval: Fine Response : Medium Spectrum to be measured 3 times. 2nd measurement after shifting to 1100 nm. 3rd measurement after shifting to 190 nm.
Calculation method	A difference between maximum and minimum peak wavelength values in 3 measurements is determined. Then, wavelength repeatability is calculated according to the following formula. Wavelength repeatability = ±(difference between maximum and minimum peak wavelength values)/2
Judgment standard	Within ±0.5 nm

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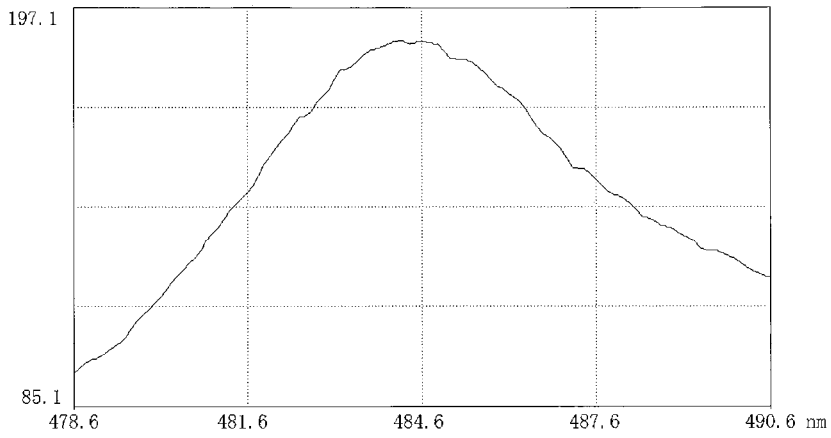

Performance Check
WL Repeatability : +/-0.20nm Tolerance +/-0.5nm OK

Spectrophotometer
Model : U-5100 Spectrophotometer
Serial No. : 000000000000
ROM Ver. : 3J25300
Option :

Instrument

Meas.Mode :	WL Scan	Response :	Medium
Data Mode :	E(R)	Bandpass(nm) :	5.0
Start WL(nm) :	490.6	Baseline :	User
End WL(nm) :	478.6	6 Cell Mode :	OFF
Speed(nm/min) :	40		
Delay(s) :	0		
Data Int. :	Fine		

Fig. 5-10 Example Result of Wavelength Repeatability Check

5.1.3 Noise Level (RMS)

(1) Display the screen for each item of instrument performance check (Fig. 5-11). For display method, follow the procedure starting from section 5.1. Using the [▲]/[▼] key, move the cursor to Noise Level (RMS), and then select [1] Yes. Noise level will be checked. If check is not desired actually, select [2] No.

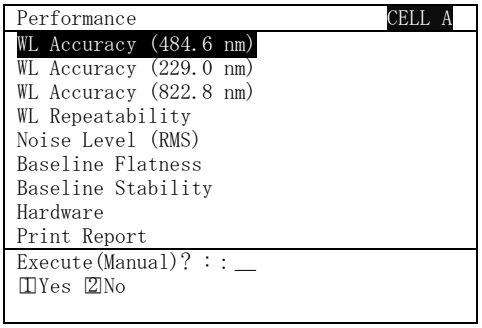

Fig. 5-11 Screen for Each Item of Instrument Performance Check

(2) The guidance for informing the parameter setting process (Fig. 5-12) appears, and parameters will be set and noise level will be checked.

Fig. 5-12 Guidance for Parameter Setting Process

(3) After the check of noise level, the screen after this check is displayed as shown in Fig. 5-13. Measurement result is indicated on the noise level line followed by OK when the judgment standard is met or NG if not met. If NG is indicated, check the noise level again in the correct procedure. If NG recurs, refer to section 6.8.

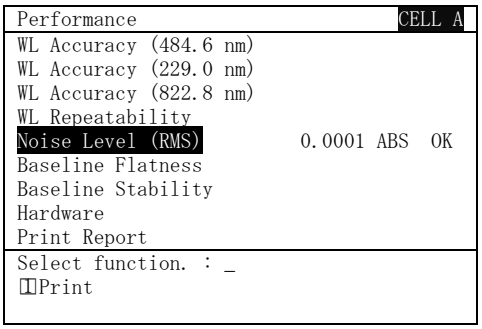

Fig. 5-13 Screen after Noise Level Check

(4) For printing the measurement result, press the <1> key (Print). The performance check item selecting screen returns when you press the [RETURN] key.

Table 5-5 Measuring Conditions and Judgment Standard for Noise Level (RMS)

Item	Noise Level (RMS)
Measuring conditions	Time scan measurement (ABS measurement) Wavelength : 260 nm Response : Medium Measurement after auto zero operation
Calculation method	Calculation of noise level (RMS) from the measured absorbance according to the following formula Noise level (RMS) = $\sqrt{\frac{\sum_{i=1}^{n}(X_i - \sum_{i=1}^{n}(X_i / n))^2}{n}}$ (n: total number of data points, X_i: ABS at 1st point)
Judgment standard	Within 0.0002 Abs

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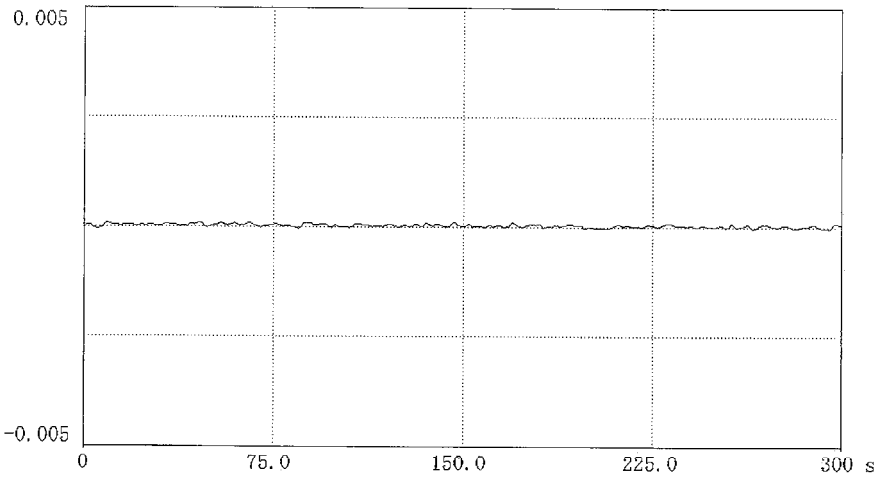


Performance Check
Noise Level(RMS) : 0.0000ABS Tolerance 0.0002ABS OK

Spectrophotometer
Model : U-5100 Spectrophotometer
Serial No. : 000000000000
ROM Ver. : 3J25300
Option :

Instrument

Meas.Mode :	Time Scan	Response :	Medium
Data Mode :	ABS	Bandpass(nm) :	5.0
WL(nm) :	260.0	6 Cell Mode :	OFF
Scan Time(s) :	300		
Delay(s) :	0		

Fig. 5-14 Example Result of Noise Level Check

5.1.4 Baseline Flatness

(1) Display the screen for each item of instrument performance check (Fig. 5-15). For display method, follow the procedure starting from section 5.1. Using the [▲]/[▼] key, move the cursor to Baseline Flatness, and then select [1] Yes. Baseline flatness will be checked. If check is not desired actually, select [2] No.

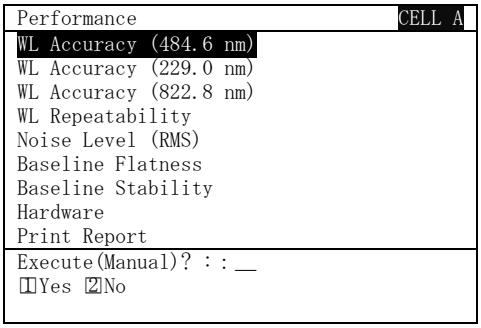


Fig. 5-15 Screen for Each Item of Instrument Performance Check

(2) The guidance for informing the parameter setting process (Fig. 5-16) appears, and parameters will be set and baseline flatness will be checked.

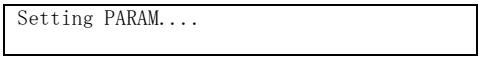


Fig. 5-16 Guidance for Parameter Setting Process

(3) After the check of baseline flatness, the screen after this check is displayed as shown in Fig. 5-17. Measurement result is indicated on the baseline flatness line followed by OK when the judgment standard is met or NG if not met. If NG is indicated, check the baseline flatness again in the correct procedure. If NG recurs, refer to section 6.8.

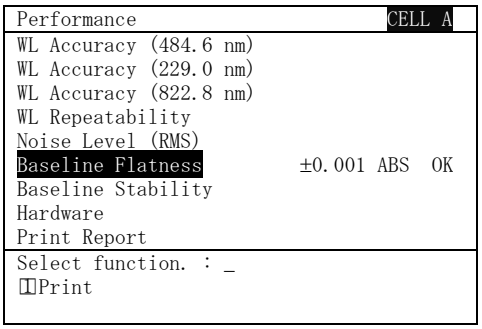


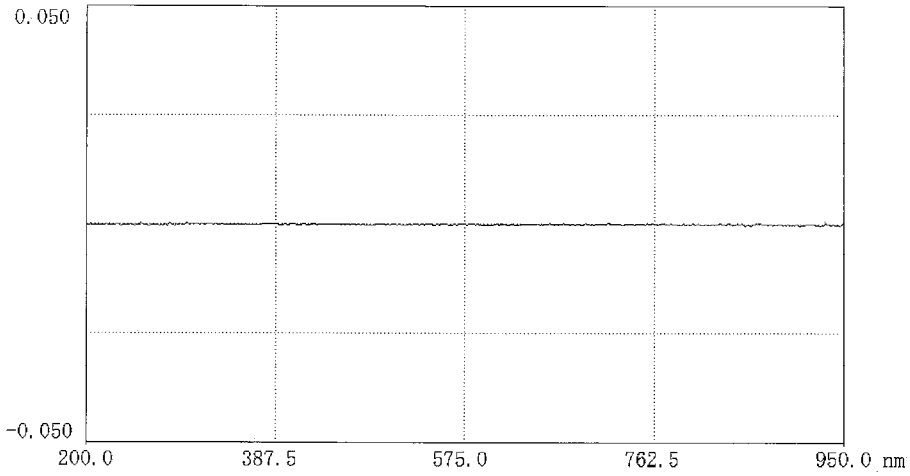
Fig. 5-17 Screen after Baseline Flatness Check

(4) For printing the measurement result, press the <1> key (Print). The performance check item selecting screen returns when you press the [RETURN] key.

Table 5-6 Measuring Conditions and Judgment Standard for Baseline Flatness

Item	Baseline Flatness
Measuring conditions	Wavelength scan measurement (ABS measurement) Wavelength range : 200 to 950 nm Scan speed : 200 nm/min Data interval : Normal Response : Medium Use of data measured after baseline correction. Excluding influence by noise, water vapor and absorption due to quartz
Calculation method	750 points of data, excluding the top data, are grouped into 150 blocks (1 block corresponding to 5 nm), and the maximum value (a(i)) and minimum value (b(i)) in “i” block are determined. Then, flatness (c(i)) for 5 nm is calculated by the following formula. Flatness (c(i)) for 5 nm = (a(i) - b(i))/2 + b(i) Flatness (c(i)) for 5 nm in all data (150 blocks) is calculated and the maximum value (A) and minimum value (B) of c(i) are determined. Then, baseline flatness is calculated by the formula given below. Baseline flatness = ±(A - B)/2
Judgment standard	Within ±0.010 Abs

Report : 2009/02/09 16:16



Performance Check
Baseline Flatness : +/-0.000ABS Tolerance +/-0.010ABS OK

Spectrophotometer
Model : U-5100 Spectrophotometer
Serial No. : 000000000000
ROM Ver. : 3J25300
Option :

Instrument

Meas.Mode :	WL Scan	Response :	Medium
Data Mode :	ABS	Bandpass(nm) :	5.0
Start WL(nm) :	950.0	Baseline :	User
End WL(nm) :	200.0	6 Cell Mode :	OFF
Speed(nm/min) :	200		
Delay(s) :	0		
Data Int. :	Normal		

Fig. 5-18 Example Result of Baseline Flatness Check

5.1.5 Baseline Stability

(1) Display the screen for each item of instrument performance check (Fig. 5-19). For display method, follow the procedure starting from section 5.1. Baseline stability is required to be measured 20-25℃ at room temperature and 2 hours after power-on and under an ambient temperature change within 5 °C. Using the [▲]/[▼] key, move the cursor to Baseline Stability, and then select [1] Yes. Baseline stability will be checked.
If check is not desired actually, select [2] No.

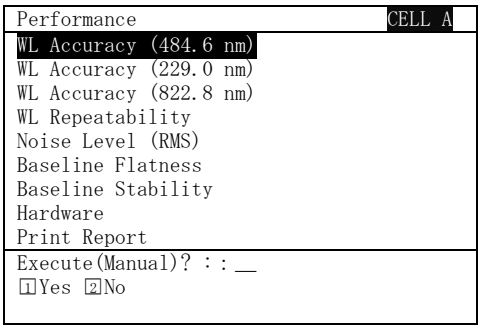


Fig. 5-19 Screen for Each Item of Instrument Performance Check

(2) The guidance for informing the parameter setting process (Fig. 5-20) appears, and parameters will be set and baseline stability will be checked.

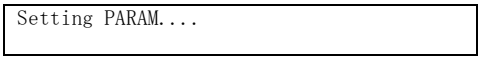


Fig. 5-20 Guidance for Parameter Setting Process

(3) After the check of baseline stability, the screen after this check is displayed as shown in Fig. 5-21. Measurement result is indicated on the baseline stability line followed by OK when the judgment standard is met or NG if not met. If NG is indicated, check the baseline stability again in the correct procedure. If NG recurs, refer to section 6.8.

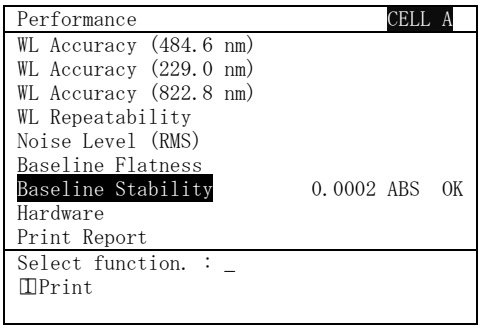


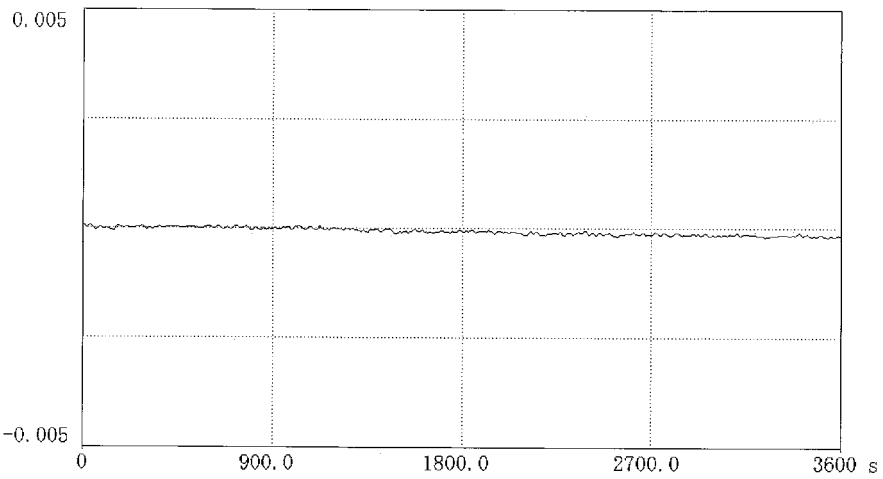
Fig. 5-21 Screen after Baseline Stability Check

(4) For printing the measurement result, press the <1> key (Print). The performance check item selecting screen returns when you press the [RETURN] key.

Table 5-7 Measuring Conditions and Judgment Standard for Baseline Stability

Item	Baseline Stability
Measuring conditions	Time scan measurement (ABS measurement) Wavelength range : 260 nm Measurement time : 3600 s Response : Medium Room temperature 20 to 25 °C, at 2 hours after power-on, temperature fluctuation within 5 °C, noise excluded. Use of data measured after execution of auto zero.
Calculation method	Only one smoothing is applied to the obtained data. In the result, the maximum value (A) and minimum value (B) of absorbance are determined. Then, baseline stability is calculated by the following formula. Baseline stability (Abs/h) = A - B
Judgment standard	Within 0.0007 Abs/h

Report : 2009/02/09 17:16



Performance Check
Baseline Stability : 0.0003ABS Tolerance 0.0007ABS OK

Spectrophotometer
Model : U-5100 Spectrophotometer
Serial No. : 000000000000
ROM Ver. : 3J25300
Option :

Instrument

Meas.Mode :	Time Scan	Response :	Medium
Data Mode :	ABS	Bandpass(nm) :	5.0
WL(nm) :	260.0	6 Cell Mode :	OFF
Scan Time(s) :	3600		
Delay(s) :	0		

Fig. 5-22 Example Result of Baseline Stability Check

5.1.6 Hardware Check

(1) Display the screen for each item of instrument performance check (Fig. 5-23). For display method, follow the procedure starting from section 5.1. Using the [▲]/[▼] key, move the cursor to Hardware, and then select [1] Yes. The hardware will be checked. If check is not desired actually, select [2] No.

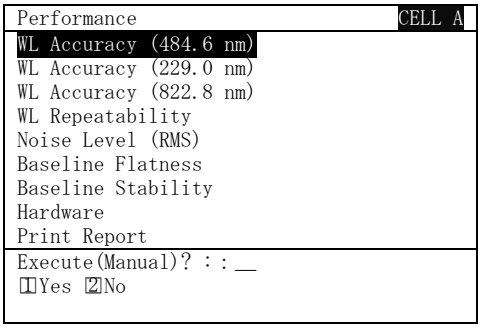


Fig. 5-23 Screen for Each Item of Instrument Performance Check

(2) After the check of RAM, ROM, lamp, wavelength driver, wavelength and lamp usage, the hardware check screen (Fig. 5-24) is displayed. The check result of each item is indicated here. For printing the measurement result, press the <1> key (Print). After check, return to the performance check item selecting screen by pressing the [RETURN] key.

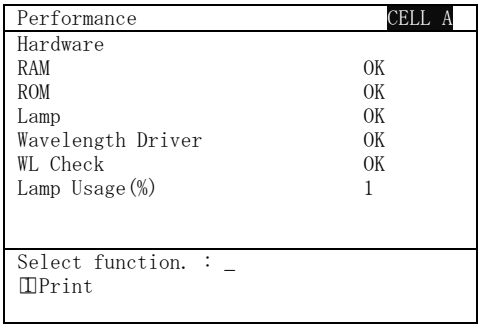


Fig. 5-24 Hardware Check Screen

Table 5-8 Judgment Standard for Hardware

Item	Hardware
Check items	RAM : RAM is checked. ROM : ROM is checked. Lamp : It is checked whether the lamp is lit or not. Wavelength Driver : Wavelength driver is checked. Wavelength : Wavelength calibration at 484.6 nm is executed on the initialization screen and it is checked whether a peak is detected or not.
Judgment standard	OK in all check items

5.1.7 Report Printing

(1) Display the screen for each item of instrument performance check (Fig. 5-25). For display method, follow the procedure starting from section 5.1. By the Print Report function, each item subjected to performance check can be printed in the format of a report. For execution of this function, select [1] Yes.

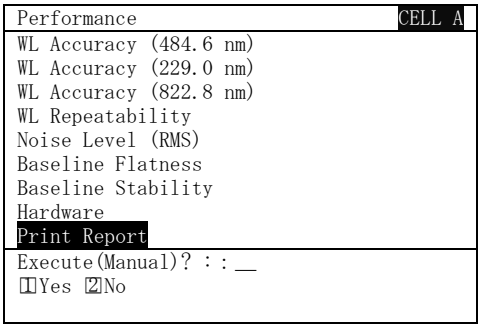


Fig. 5-25 Screen for Each Item of Instrument Performance Check

(2) A report is printed as shown below.

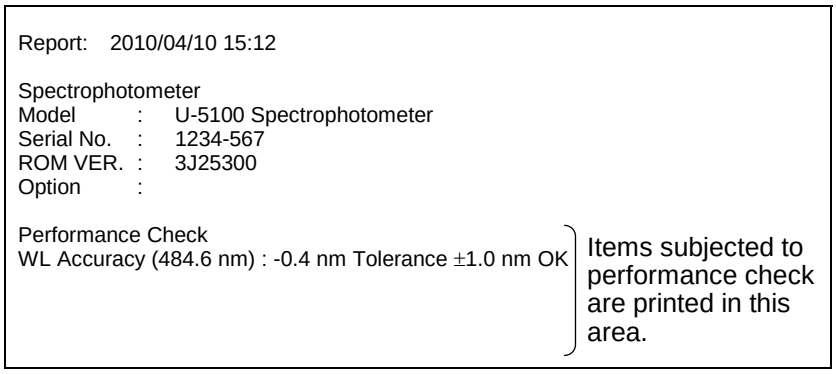


Fig. 5-26 Example of Report Printing

5.1.8 Auto Check

(1) Display the screen for automatically checking the instrument performance (Fig. 5-27). For display method, follow the procedure starting from section 5.1. Make sure nothing is contained in the sample compartment and select [1] Yes for execution of automatic performance check.

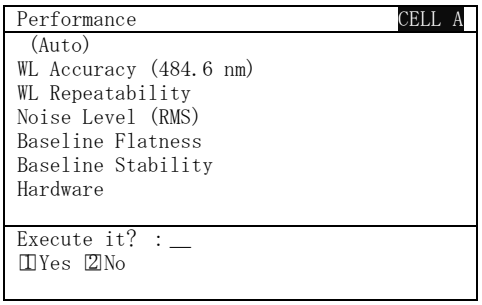


Fig. 5-27 Screen for Automatic Check of Instrument Performance

(2) Then, the guidance for confirmation of automatic printout (Fig. 5-28) is displayed. For automatic printout, confirm that a printer is connected, power supply is turned on and paper has been prepared. Then, select the <1> key (Yes). For avoiding automatic printout, select the <2> key (No). When automatic printout is selected, it will start after measurement of each item. However, if printout cannot start due to a trouble on the printer or any other cause, an error message “Cannot print out.” will be issued.
When you select [1] Abort Meas., measurement for the current automatic performance check is aborted. Or when you select [2] Continue Meas., printout is avoided and the next check starts.

Fig. 5-28 Guidance for Confirmation of Automatic Printout

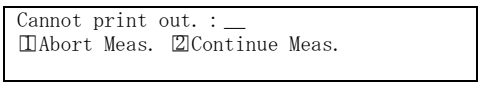


Fig. 5-29 Error Message Issued when Printout is Impossible

(3) After start of measurement, you must wait for about 80 minutes till the end of all measurements. Upon completion of measurement, the screen after completion of automatic performance check (Fig. 5-30) is displayed. OK appears when the result of each check meets the judgment standard or NG appears if it does not meet the standard. If NG is indicated, take a corrective measure, referring to section 5.1.1 to 5.1.6.

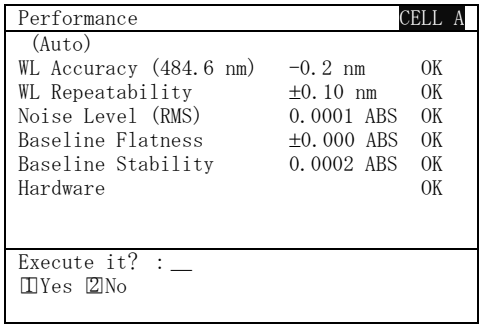


Fig. 5-30 Screen after Automatic Performance Check

5.2 Check with Pen Type Low-Pressure Mercury Lamp Available at Option

For performance check with a pen type low-pressure mercury lamp, a separately available option is required. For mounting method of this lamp, refer to the instruction manual for the separately available option.

CAUTION

If you gaze directly at the lit Xe flash lamp, your eyes may be damaged. This lamp emits intense ultraviolet rays. Therefore, you must not gaze directly at the lamp.
For gazing at the lamp, put on UV-cut glasses.

(1) After startup of the instrument, press the [MAIN MENU] key to display the Main Menu screen (Fig. 5-31). Confirm that nothing is contained in the sample compartment and close the lid. For selection of performance check, press the <7> key (Performance) and then the [ENTER] key or press the [▲]/[▼] key to select Performance followed by the [ENTER] key.

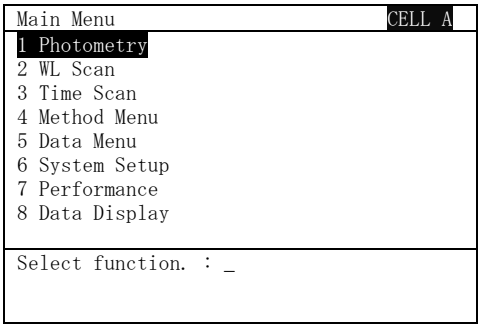


Fig. 5-31 Main Menu Screen

(2) The instrument performance check screen (Fig. 5-32) appears. Press the <3> key (Performance Check (Option)) and then the [ENTER] key.

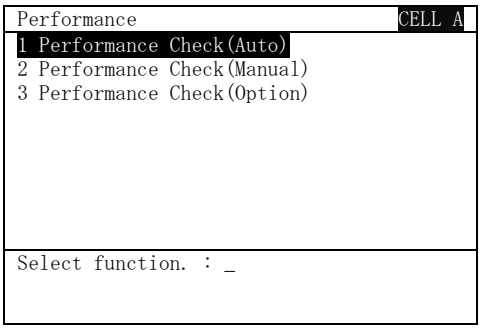


Fig. 5-32 Instrument Performance Check Screen

(3) Mount the pen type low-pressure mercury lamp available at option to the main unit. For mounting method of this lamp, refer to the instruction manual for this option.
In succession, refer to section 5.2.1 to 5.2.3.

5.2.1 Wavelength Accuracy (with Hg Lamp)

(1) Display the Performance Check (Option) screen (Fig. 5-33). For display method, follow the procedure starting from section 5.2. Using the [▲]/[▼] key, move the cursor to WL Accuracy Hg (253.7 nm), (435.8 nm) or (546.1 nm) to be checked, and then select [1] Yes. The wavelength accuracy at the selected wavelength with the Hg lamp will be checked. If check is not desired actually, select [2] No.

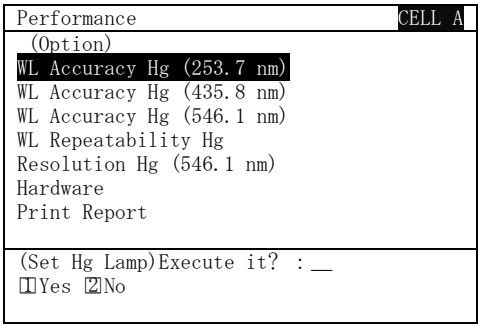


Fig. 5-33 Performance Check (Option) screen

(2) The guidance for informing the parameter setting process (Fig. 5-34) appears, and parameters will be set and wavelength accuracy check will be carried out.

Fig. 5-34 Guidance for Parameter Setting Process

(3) After the check of wavelength accuracy, the screen after this check is displayed as shown in Fig. 5-35. Measurement result is indicated on the wavelength accuracy line; a peak difference at each wavelength of bright line and OK when the judgment standard is met or NG if not met. If NG is indicated, carry out wavelength calibration by the method instructed in 5.3.1, and then check the wavelength accuracy again in the correct procedure. If NG recurs, refer to section 6.8.

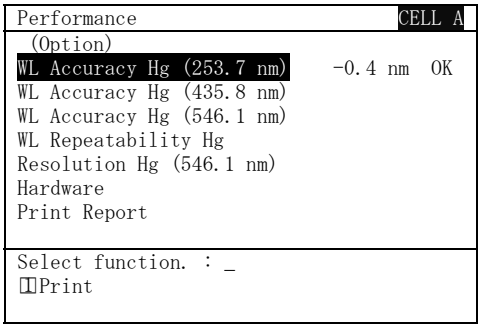


Fig. 5-35 Screen after Wavelength Accuracy Check

(4) For printing the measurement result, press the <1> key (Print). The performance check item selecting screen returns when you press the [RETURN] key. For checking the wavelength accuracy at other wavelength, repeat the procedure from step (1).

Table 5-9 Measuring Conditions and Judgment Standard for Wavelength Accuracy Hg

<table>
<tr><th>Item</th><th>Wavelength Accuracy (at 253.7 nm)(435.8 nm)(546.1 nm)</th></tr>
<tr><td>Measuring conditions</td><td>Emission spectrum of Hg lamp bright line (with detector on the monitor side)
<table>
<tr><td></td><td colspan="3">Wavelength of bright line from Hg lamp</td></tr>
<tr><td></td><td>253.7 nm</td><td>435.8 nm</td><td>546.1 nm</td></tr>
<tr><td>Wavelength range</td><td>247.7 to 259.7 nm</td><td>429.8 to 441.8 nm</td><td>540.1 to 552.1 nm</td></tr>
</table>
Scan speed : 40 nm/min
Data interval : Fine
Response : Medium
Spectrum to be measured</td></tr>
<tr><td>Calculation method</td><td>A difference between the peak wavelength of measured spectrum and the bright line is determined. Then, the wavelength accuracy is calculated by each formula in the following table.
<table>
<tr><td></td><td colspan="3">Wavelength of bright line from Hg lamp</td></tr>
<tr><td></td><td>253.7 nm</td><td>435.8 nm</td><td>546.1 nm</td></tr>
<tr><td>Wavelength accuracy</td><td>(Obtained peak wavelength) - 253.7</td><td>(Obtained peak wavelength) - 435.8</td><td>(Obtained peak wavelength) - 546.1</td></tr>
</table></td></tr>
<tr><td>Judgment standard</td><td>Within ±2.0 nm</td></tr>
</table>

5.2.2 Wavelength Repeatability (with Hg Lamp)

(1) Display the Performance Check (Option) screen (Fig. 5-36). For display method, follow the procedure starting from section 5.2. Using the [▲]/[▼] key, move the cursor to WL Repeatability Hg, and then select [1] Yes. Wavelength repeatability with the Hg lamp will be checked. If check is not desired actually, select [2] No.

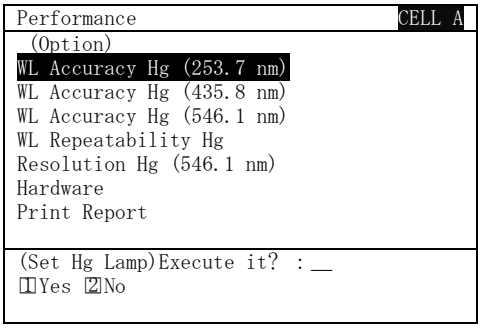


Fig. 5-36 Performance Check (Option) Screen

(2) The guidance for informing the parameter setting process (Fig. 5-37) appears, and parameters will be set and wavelength repeatability Hg will be checked.

Fig. 5-37 Guidance for Parameter Setting Process

(3) After the check of wavelength repeatability with the Hg lamp, the screen after this check is displayed as shown in Fig. 5-38. Measurement result is indicated on the Hg wavelength repeatability line followed by OK when the judgment standard is met or NG if not met. If NG is indicated, check the wavelength repeatability again in the correct procedure. If NG recurs, refer to section 6.8.

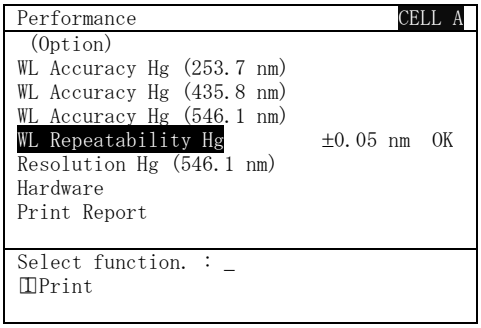


Fig. 5-38 Screen after Wavelength Repeatability Check

(4) For printing the measurement result, press the <1> key (Print). The performance check item selecting screen returns when you press the [RETURN] key.

Table 5-10 Measuring Conditions and Judgment Standard for Wavelength Repeatability with Hg Lamp

Item	Wavelength Repeatability with Hg Lamp
Measuring conditions	Emission spectrum of Hg lamp bright line (with detector on the monitor side) Wavelength range : 540.1 to 552.1 nm Scan speed : 40 nm/min Data interval : Fine Response : Medium Spectrum to be measured 3 times. 2nd measurement after shifting to 1100 nm. 3rd measurement after shifting to 190 nm.
Calculation method	A difference between maximum and minimum peak wavelength values in 3 measurements is determined. Then, wavelength repeatability is calculated according to the following formula. Wavelength repeatability = ±(difference between maximum and minimum peak wavelength values)/2
Judgment standard	Within ±0.5 nm

5.2.3 Resolution

(1) Display the Performance Check (Option) screen (Fig. 5-39). For display method, follow the procedure starting from section 5.2. Using the [▲]/[▼] key, move the cursor to Resolution Hg (546.1nm), and then select [1] Yes. Resolution with the Hg lamp (546.1 nm) will be checked. If check is not desired actually, select [2] No.

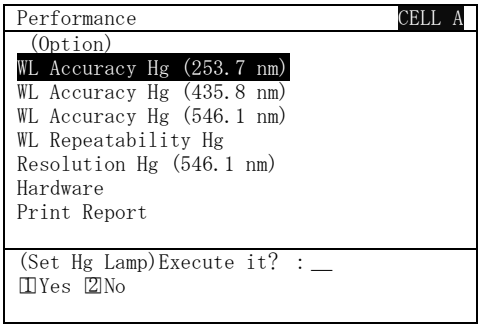


Fig. 5-39 Performance Check (Option) Screen

(2) The guidance for informing the parameter setting process (Fig. 5-40) appears, and parameters will be set and resolution with the Hg lamp (546.1 nm) will be checked.

Fig. 5-40 Guidance for Parameter Setting Process

(3) After the check of resolution with the Hg lamp (546.1 nm), the screen after this check is displayed as shown in Fig. 5-41. Measurement result is indicated on the Resolution Hg (546.1nm) line followed by OK when the judgment standard is met or NG if not met. If NG is indicated, check the resolution again in the correct procedure. If NG recurs, refer to section 6.8.

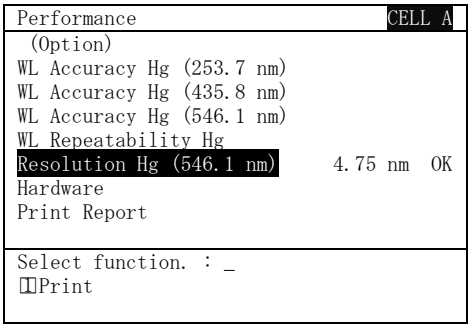
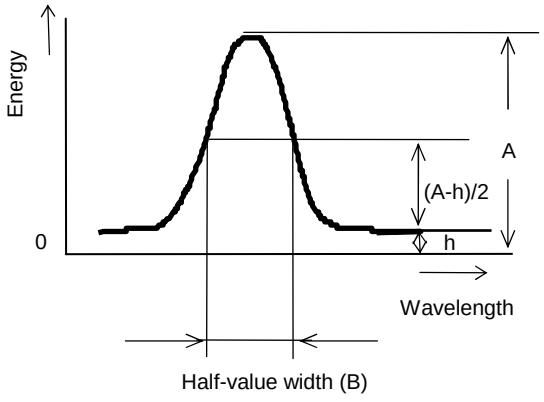


Fig. 5-41 Screen after Resolution Check with Hg Lamp (546.1 nm)

(4) For printing the measurement result, press the <1> key (Print). The performance check item selecting screen returns when you press the [RETURN] key.

Table 5-11 Measuring Conditions and Judgment Standard for Resolution with Hg Lamp (546.1 nm)

Item	Resolution with Hg Lamp (546.1 nm)
Measuring conditions	Emission spectrum of Hg lamp bright line (with detector on the monitor side) Wavelength range : 540.1 to 552.1 nm Scan speed : 40 nm/min Data interval : Fine Response : Medium Spectrum to be measured.
Calculation method	For the peak value (A) in the determined spectrum, peak width B (half-value width) at a height of (A + h)/2 is obtained. The B value is taken as a resolution. 
Judgment standard	Within 5 ± 0.50 nm

5.2.4 Report Printing

(1) Display the Performance Check (Option) screen (Fig. 5-42). For display method, follow the procedure starting from section 5.2. By the Print Report function, each item subjected to performance check with the Hg lamp can be printed in the format of a report. For execution of this function, select [1] Yes.

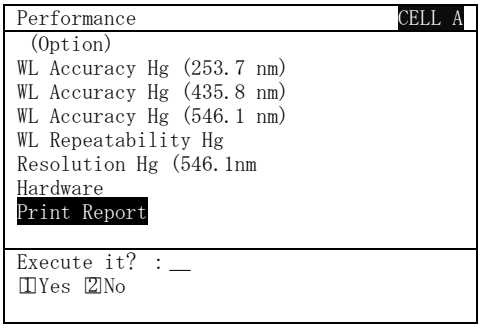
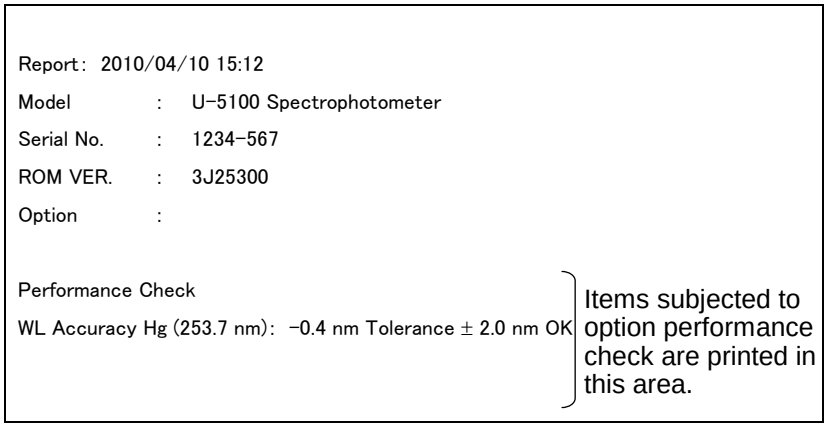


Fig. 5-42 Performance Check (Option) Screen

(2) A report is printed as shown below.



5.3 Wavelength Calibration

Wavelength calibration is required if the instrument performance specification is not satisfied in the wavelength accuracy check. The method of wavelength calibration is explained here.

5.3.1 Wavelength Calibration Method

(1) After startup of the instrument, press the [MAIN MENU] key to display the Main Menu screen (Fig. 5-43). For selection of system setup, press the <6> key (System Setup) and then the [ENTER] key or press the [▲]/[▼] key to select System Setup followed by the [ENTER] key.

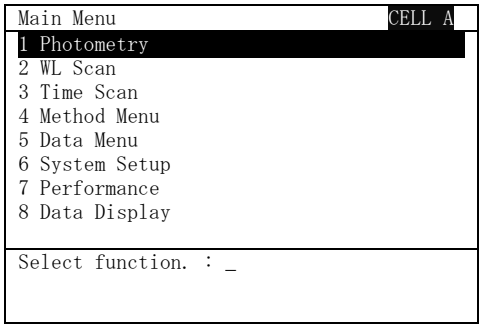


Fig. 5-43 Main Menu Screen

(2) The System Setup screen (Fig. 5-44) appears.
For selecting wavelength calibration, press the <1> key (WL CALIB.) and then the [ENTER] key or press the [▲]/[▼] key to select WL CALIB. followed by the [ENTER] key.

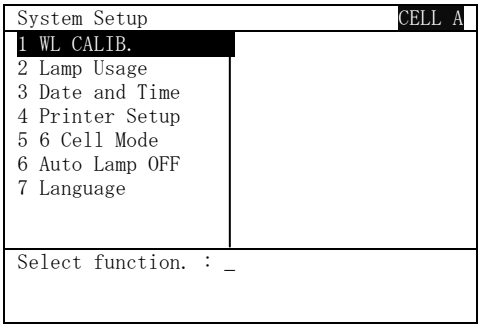


Fig. 5-44 System Setup Screen

(3) The wavelength calibration executing screen (Fig. 5-45) is displayed. Select [1] Yes for execution of wavelength calibration. If wavelength calibration is not desired actually, select [2] No.

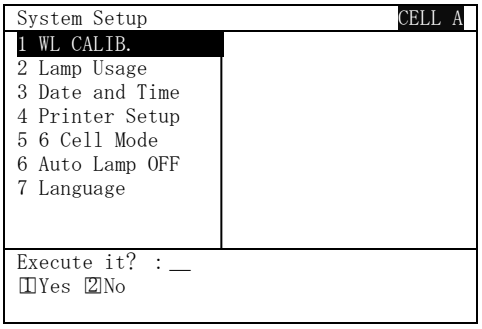


Fig. 5-45 Wavelength Calibration Executing Screen

(4) The guidance for informing the wavelength calibrating process (Fig. 5-46) is displayed and wavelength calibration starts. After the calibration, you can return to the Main Menu window by pressing the [RETURN] key.

Fig. 5-46 Guidance for Wavelength Calibrating Process

(5) Check wavelength accuracy again as required.

6. MAINTENANCE

This product is an instrument which requires periodic maintenance. In this section, explanation is given centering on instrument cleaning, storage, specifications, etc. If use of the instrument is continued without performing periodic checkup/maintenance, the instrument may become faulty, which would lead to a serious trouble such as water leak, electric leak or combustion.
Consumables and lifetime-limited parts should be purchased from your dealer or the nearest maintenance service company authorized by Hitachi High-Technologies.

6.1 Lamp Usage

You can check the present time point in the life cycle of the lamp in the following procedure.

(1) After startup of the instrument, press the [MAIN MENU] key to display the Main Menu screen (Fig. 6-1). For selection of system setup, press the <6> key (System Setup) and then the [ENTER] key or press the [▲]/[▼] key to select System Setup followed by the [ENTER] key.

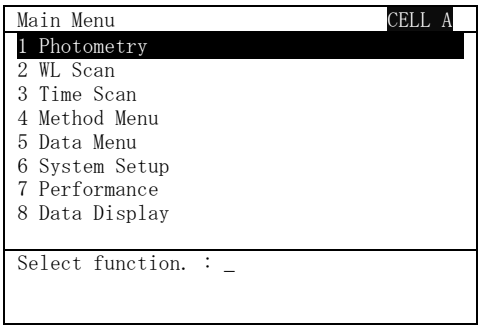


Fig. 6-1 Main Menu Screen

(2) The System Setup screen (Fig. 6-2) appears. Press the <2> key (Lamp Usage) and then the [ENTER] key or press the [▲]/[▼] key to select Lamp Usage followed by the [ENTER] key.

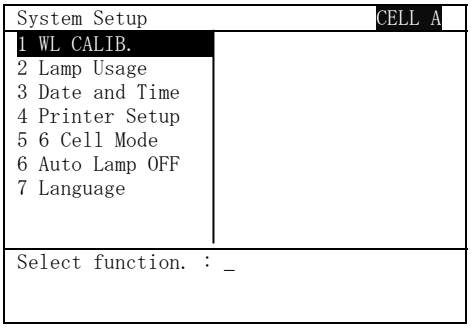


Fig. 6-2 System Setup Screen

(3) The Lamp Usage screen (Fig. 6-3) appears. Lamp usage will be indicated in percentage (%). The 100% value stands for the end of service life as a standard. If 100% is exceeded, performance check should be carried out according to Section 5 in order to check if the lamp performance is within the specified range. If out of the specified range, contact your dealer or the nearest maintenance service company authorized by Hitachi High-Technologies.

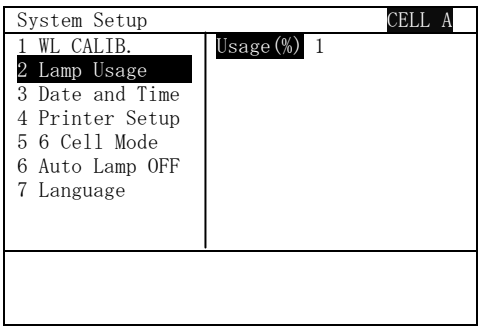


Fig. 6-3 Lamp Usage Screen

(4) After check, return to the Main Menu screen by pressing the [RETURN] key.

6.2 How to Clean the Instrument

a. Cleaning the Sample Compartment

Is a sample solution is spilled in the sample compartment, remove the 6-cell turret by the determined method (described on section 2.4.5.) and wipe off the sample solution without delay. Clean separately available options(Single cell holder, Rectangular long-path cell holder) as much as 6-cell turret.

<1> Turn off the instrument power supply.
<2> Pull out the power plug from the receptacle.
<3> Open the lid of the sample compartment.
<4> Loosen the screw at the top of the 6-cell turret and remove the holder.
<5> If the spilled sample solution flows out through the discharge port at the bottom of instrument via the drain of sample compartment, the bottom area of the instrument should be cleaned.

b. Cleaning the Exterior of Spectrophotometer

Before cleaning the exterior of the spectrophotometer, turn off the power supply and pull out the power plug from the receptacle. Then, clean the exterior always using a soft cloth or a cloth wetted with water and wringed hard.
Avoid use of alcohol, benzine, paint thinner or the like inflammable solvent for cleaning.
In case a sample or the like is spilled on the spectrophotometer, turn off the power supply and pull out the power plug from the receptacle. Then, wipe off the spilled substance as soon as possible using a soft cloth or a cloth wetted with water and wringed hard. You should confirm that the wiped area is adequately dry.
Be particularly careful not to spill a sample or the like over the control panel. If abnormality is found on the exterior, contact your dealer or the maintenance service company authorized by Hitachi High-Technologies.

6.3 Cleaning and Storing a Sample Cell

For cleaning a sample cell, wash it by the determined method using a detergent for laboratory glass apparatus. Then, rinse the cell adequately with ultrapure water and air-dry it in a clean environment followed by its storage.

6.4 Replacement of Radiation Source Lamp

This lamp is warranted for 1 year. The user must not attempt to replace the lamp definitely. Entrust lamp replacement work to a service engineer who has received training at Hitachi High-Technologies.

6.5 Caution on Lithium Battery

CAUTION

The Model U-5100 ratio beam spectrophotometer uses a lithium battery for memory backup. If the lithium battery is handled in a wrong way, it might burst.
Never try its recharging, disassembly and throwing into a flame. This battery must be disposed by a different method from that of general wastes.
When replacement of the lithium battery becomes necessary (for example, an error message “RAM Check NG” is frequently issued), contact your dealer or the maintenance service company authorized by Hitachi High-Technologies.
Entrust this replacement work to a service engineer who has received training at Hitachi High-Technologies (you are charged for this work after the warranty period of the instrument).

6.6 Replacement of Power Fuse

WARNING

Before replacement, make sure that the power cord is not connected.

If the power fuse is blown due to any cause, it should be replaced with a new one in the following procedure. If the new fuse is also blown, the instrument may be faulty. Contact your dealer or the maintenance service company authorized by Hitachi High-Technologies.

(1) Unplug the power cord from the connector of the spectrophotometer. (See <1> in Fig. 6-4.)

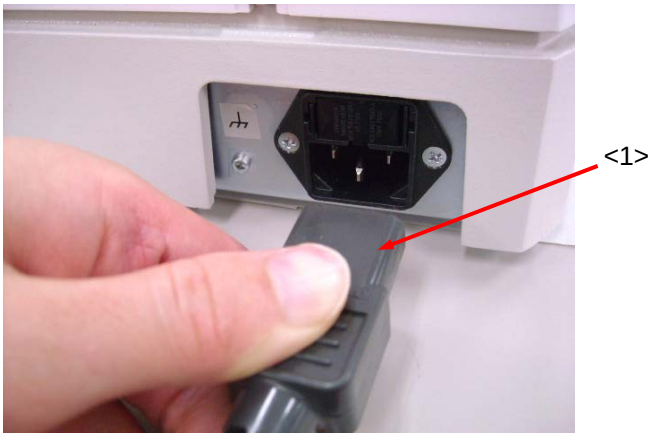


Fig. 6-4 Unplugging the Power Cord

(2) The fuse holder is located above the power connector on the rear side of spectrophotometer. Push the fuse holder stopper from either side using a blade-edge screwdriver, and the holder will come out slightly. (See <2> in Fig. 6-5.) In succession, push the other stopper in the same manner as above, and the entire holder will advance slightly toward you. Then, grasp and pull out the holder.

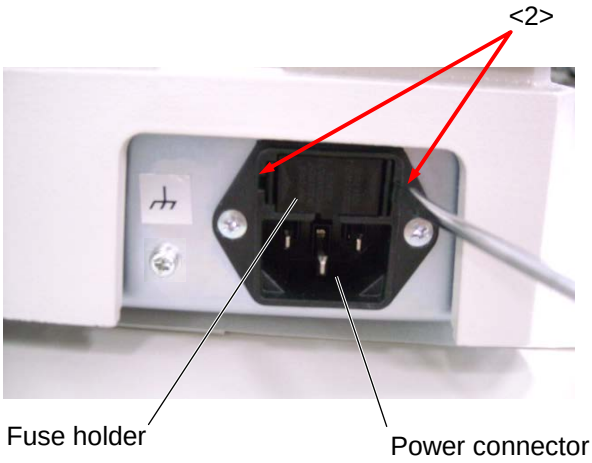


Fig. 6-5 Ejection of Fuse Holder

(3) Remove the blown fuse and replace it with a new one. (See <3> in Fig. 6-6.) Use a fuse having a proper capacity (time lag fuse (2 A), P/N J821396). It is recommended to prepare a spare fuse.

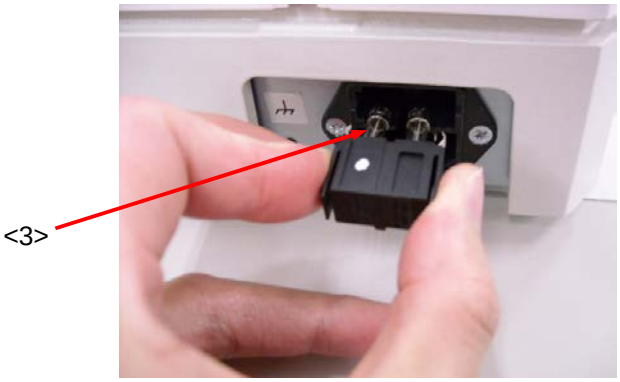


Fig. 6-6 Removal of Fuse Holder

6.7 Storage of Instrument

a. After Measurement

(1) Turn off the power switch and unplug the power cord from the receptacle.

(2) Cover the instrument with a clean cloth or the like.

NOTICE:	When an organic solvent or toxic gas sample is placed in the sample compartment, it shall be taken out of the compartment and prevented from being touched.

b. Before Leaving the Instrument Unused for a Long Time

(1) The instrument shall be stored within a temperature range from 0 to 40 °C and a relative humidity range 15 to 80% (below 70% above 30 °C) and occurrence of condensation shall be prevented.
In addition, the instrument must not receive strong vibrations.

(2) Cover the instrument with a clean cloth or the like.

(3) Prevent acidic, alkali or any other toxic gas from flowing into the instrument.

(4) Avoid a place where a strong magnetism may be generated.

(5) Avoid a dusty environment.

(6) Avoid exposure to direct sunlight.

(7) The data saved in the instrument may be erased due to complete discharge or deterioration of the lithium battery. Therefore, you should back up the important measurement data or conditions saved in the instrument by printing or the like means.

6.8 If You Encounter a Trouble

If an error message appears, take a corrective measure, referring to “a. Error Messages.” If there is an abnormality on the instrument, take a remedial measure, referring to “b. Troubleshooting.” If the instrument does not work normally despite the troubleshooting, contact year dealer or the maintenance service company authorized by Hitachi High-Technologies.

WARNING

Electric Shock due to Contact with Instrument Interior

The instrument incorporates electric components which might cause an electric shock if touched directly with hand. Checkup of the instrument interior shall be entrusted to a service engineer.

a. Error Messages

Error Message	Cause	Remedy
Peak not found.	Peak is not found in peak detection.	Peaks may be below the threshold. Lower the threshold and retry peak detection.
Printer not ready.	The printer is not ready for printing.	Set the printer in the printable status.
Set the End WL - Start WL >= 10 nm.	On the measurement parameter setup screen, the measuring wavelength range is less than 10 nm.	Adjust input so that the measuring wavelength range is 10 nm or wider.
Set the Upper Scale > Lower Scale.	In measurement parameters, the upper limit of ordinate is equal to or lower than the lower limit.	Set the ordinate so that the upper limit is higher than the lower limit.
Set X-Max > X-Min.	On the scale change screen, the maximum point on X axis is equal to or smaller than the minimum point.	Set the X axis so that the maximum point is larger than the minimum point.
Set Y-Max > Y-Min.	On the scale change screen, the maximum point on Y axis is equal to or smaller than the minimum point.	Set the Y axis so that the maximum point is larger than the minimum point.

(cont'd)

Error Message	Cause	Remedy
Set X-Max - X-Min >= 10.	On the scale change screen for time scan measurement, the difference between X-Max and X-Min is set to be less than 10 s.	Set the X axis so that the difference between Max and Min is 10 s or more.
Set X-Max - X-Min >= 1.	On the scale change screen for wavelength scan measurement, the difference between X-Max and X-Min is set to be less than 1 nm.	Set the X axis so that the difference between Max and Min is 1 nm or more.
The same CONC value cannot be set.	In calibration curve data, the same concentration value of standard sample is set doubly.	Different values should be set.
Set a NUM of STD >=2.	In calibration curve parameters, the number of standards is set to 1 (provided Thru Zero is OFF).	Set 2 or more standards or set Thru Zero in ON status.
Set Upper LMT. > Lower LMT.	In calibration curve parameters, the upper limit of concentration is equal to or lower than the lower limit.	Set the concentration scale so that the upper limit is higher than the lower limit.
Already exists. Overwrite it?:	It was attempted to save a Method file or data file in an already used file name.	When file overwriting is not desired, change to an unused file name.
Data will be deleted. Continue?	Although data exists, [MAIN MENU], [RETURN] and [START] keys were pressed.	When there is the necessary data which has not yet been saved, save the relevant file and then start up measurement.
No. of Meas. reached 150.	In sample measurement in the photometry mode, the maximum number of measurements (150) has been reached.	Terminate measurement by [STOP] key and save the current file. Then, carry out the subsequent measurements as a new series.
No. of files is full.	The number of saved files has reached the limit (50 Method files or 30 data files).	Delete unnecessary files, and then retry saving.
File name is not correct.	In saving, any character (/, :, *) unallowable for a file name is used.	Save in characters usable for a file name.
Set the No. of WL <=3.	When data mode of photometry is concentration, 4 or more wavelengths have been set.	Reduce the number of wavelengths to 3 or less. Or change the data mode to ABS or %T.

(cont'd)

Error Message	Cause	Remedy
Set WL1>WL2.	When data mode of photometry is concentration (2 wavelengths), wavelength value WL1 is smaller than WL2.	WL1 must be set at a value larger than WL2.
Set WL1>WL2>WL3.	When data mode of photometry is concentration (3 wavelengths), wavelength values are not set in the following order; WL1 > WL2 > WL3.	Set wavelength values in the order of WL1 > WL2 > WL3.
Cannot print out.	This error occurs if measurement is started with automatic printout turned ON for automatic performance check and then printout processing is executed with the printer set in printing-inhibited status during measurement.	Retry execution after setting the printer in the printable status.
Cannot load the file. (Sum Error)	Abnormality is found in loading of a Method file or data file.	Retry loading. If no improvement can be seen, contact the maintenance service company authorized by Hitachi High-Technologies.
No. of STD >=2. Cannot delete.	This error occurs if you attempt to set the remaining number of standards to 1 by data deletion in STD editing under the condition of Thru Zero:OFF.	Under the condition at left, the remaining number of standards cannot be set to 1.
Effective STD data is insufficient.	Calibration curve cannot be generated due to an insufficient number of data points, because there are the same absorbance values in standard sample measurement.	Change to an appropriate standard solution and carry out measurement again.
Set WL2 except CORR.WL.	For photometry in the DNA measurement mode, wavelength 2 and correction wavelength are set at the same value.	Specify different values for wavelength 2 and correction wavelength.
Set WL4 except CORR.WL.	For photometry in the DNA measurement mode, wavelength 4 and correction wavelength are set at the same value.	Specify different values for wavelength 4 and correction wavelength.

(cont'd)

Error Message	Cause	Remedy
Xe Lamp Error	Abnormality is found when turning on the lamp.	Turn on the lamp again. If no improvement can be seen, contact the maintenance service company authorized by Hitachi High-Technologies.
Error occurred when WL was initialized	Wavelength initialization is abnormal.	Retry wavelength initialization. If no improvement can be seen, contact the maintenance service company authorized by Hitachi High-Technologies.
WL Motor Error	Wavelength initialization is abnormal.	Retry wavelength initialization. If no improvement can be seen, contact the maintenance service company authorized by Hitachi High-Technologies.
WL CALIB. Error	Abnormality is found in wavelength calibration with the bright line of lamp.	Retry wavelength calibration. If no improvement can be seen, contact the maintenance service company authorized by Hitachi High-Technologies.
WL Correction Error	Abnormality is found in wavelength correction.	Retry wavelength correction. If no improvement can be seen, contact the maintenance service company authorized by Hitachi High-Technologies.
Data Save Error	RAM does not work normally.	Retry data saving. If no improvement can be seen, contact the maintenance service company authorized by Hitachi High-Technologies.
6 Cell Initialize Error	Initialization of 6-cell turret position is abnormal.	Mount this holder properly and retry initialization. Or if any holder other than the 6-cell turret is used, set 6-cell condition, referring to section 2.5.4.
6 Cell Move Error	Abnormality is found in detection of cell position.	Check the sample compartment to see if there is anything that hinders rotation of 6 cells.

(cont'd)

Error Message	Cause	Remedy
WL Motor Error	Irregularity is found when driving the wavelength motor.	Retry driving. If no improvement can be seen, contact the maintenance service company authorized by Hitachi High-Technologies.
Capacitor Error	Irregularity is found when setting the capacitor.	Retry setting. If no improvement can be seen, contact the maintenance service company authorized by Hitachi High-Technologies.

b. Troubleshooting

Symptom	Cause	Remedy
No indication appears even if the power switch is turned on.	<1> The power cord is unplugged. <2> The fuse is blown. <3> Any cause other than above	<1> Plug in the power cord. <2> Replace the fuse with a new one. <3> If the same symptom persists after tuning off the power switch and turning it on, contact the maintenance service company authorized by Hitachi High-Technologies.
Significant variations in measured values	<1> The sample cell or the transparent plate is contaminated or clouded with water drops. <2> The lid of sample compartment is not closed. <3> Any cause other than above	<1> Remove contaminants or water drops. <2> Close the lid of sample compartment. <3> If the same symptom persists after tuning off the power switch and turning it on, contact the maintenance service company authorized by Hitachi High-Technologies.

(cont'd)

Symptom	Cause	Remedy
NG appears for RAM check on the initialization screen.	RAM malfunctioned.	If the same symptom persists after tuning off the power switch and turning it on, contact the maintenance service company authorized by Hitachi High-Technologies.
NG appears for ROM check on the initialization screen.	ROM malfunctioned.	If the same symptom persists after tuning off the power switch and turning it on, contact the maintenance service company authorized by Hitachi High-Technologies.
NG appears for lamp check on the initialization screen.	The lamp does not light.	If the same symptom persists after tuning off the power switch and turning it on, contact the maintenance service company authorized by Hitachi High-Technologies.
NG appears for wavelength initialization on the initialization screen.	The wavelength drive mechanism is faulty.	If the same symptom persists after tuning off the power switch and turning it on, contact the maintenance service company authorized by Hitachi High-Technologies.
NG appears for wavelength check on the initialization screen.	Peak wavelength cannot be found.	Confirm that nothing is contained in the sample compartment. If the same symptom persists after tuning off the power switch and turning it on, contact the maintenance service company authorized by Hitachi High-Technologies.
NG appears for wavelength accuracy in performance check.	The result of wavelength accuracy check does not satisfy the specification.	Carry out wavelength calibration, referring to "5.3.1 Wavelength Calibration Method (section 5.3.1.)" and check the performance again. If no improvement can be seen, contact the maintenance service company authorized by Hitachi High-Technologies.
NG appears for wavelength repeatability in performance check.	The result of wavelength repeatability check does not satisfy the specification.	Check the performance again. If no improvement can be seen, contact the maintenance service company authorized by Hitachi High-Technologies.

(cont'd)

Symptom	Cause	Remedy
NG appears for noise level in performance check.	The result of noise level check does not satisfy the specification.	Check the performance again. If no improvement can be seen, contact the maintenance service company authorized by Hitachi High-Technologies.
NG appears for baseline flatness in performance check.	The result of baseline flatness check does not satisfy the specification.	Check the performance again. If no improvement can be seen, contact the maintenance service company authorized by Hitachi High-Technologies.
NG appears for baseline stability in performance check.	The result of baseline stability check does not satisfy the specification.	Check the performance again. If no improvement can be seen, contact the maintenance service company authorized by Hitachi High-Technologies.
NG appears for resolution in performance check.	The result of resolution check does not satisfy the specification.	Check the performance again. If no improvement can be seen, contact the maintenance service company authorized by Hitachi High-Technologies.

6.9 Specifications of Model U-5100 Ratio Beam Spectrophotometer

Table 6-1 Specifications of Model U-5010 Ratio Beam Spectrophotometer

Optics	Seya-Namioka mount, ratio beam
Measuring wavelength range	190 to 1100 nm
Spectral bandpass	5 nm (546.1 nm)
Stray light	0.07% or less (220 nm for NaI, 340 nm for $NaNO_2$)
Wavelength accuracy	±1 nm (at 484.6 nm), ±2 nm (at 229.0 nm, 822.8 nm)
Wavelength setting repeatability	±0.5 nm
Measurement mode	Photometry, wavelength scan, time scan, multi-wavelength measurement, ratio calculation (DNA measurement)
Photometric range	Abs : -3.000 to 3.000 %T : 0 to 300%T Conc : 0.000 to 9999
Photometric accuracy (verified with NIST SRM930)	±0.003 Abs (0 to 0.5 Abs) ±0.005 Abs (0.5 to 1.0 Abs)
Photometric repeatability (with NIST SRM930)	±0.002 Abs (0 to 1.0 Abs)
Wavelength scan speed	40, 100, 200, 400, 800, 1200, 2400 nm/min (excluding filter exchange time)
Baseline stability	0.0007 Abs/h (at 260 nm, room temperature 20 to 25 °C, temperature variation within 5 °C, 2 hours after power-on)
Baseline flatness	±0.010 Abs (within 200 to 950 nm, excluding influence by noise, water vapor and absorption due to quartz)
Noise level (RMS)	0.0002 Abs (at 260 nm, 0 Abs)
Radiation source	Xenon (Xe) flash lamp
Detector	Silicon photodiode
Display	LCD monitor with back-light illumination
Printer output	Centronics-compatible
External dimensions	356 (W) × 426 (D) × 235 (H) mm
Weight	13 kg
Power requirements	100, 115, 220, 230, 240 V, 50/60 Hz
Power consumption	60 VA

APPENDIX

Appendix a. Operating Principles of Model U-5100

Optics:

Figure “a” shows the optics of Model U-5100 ratio beam spectrophotometer. For radiation source, a xenon flash lamp is used. The white light emitted from the radiation source passes through the filter and entrance slit and is converted into a monochromatic beam by the Seya-Namioka mount monochromator. This monochromator uses a Hitachi’s original stigmatic concave diffraction grating with a grating constant of 1/600 nm, blaze wavelength of 250 nm and diffraction area of 20 mm by 25 mm. The monochromatic beam is restricted into a bandpass of 5 nm with the exit slit, reflected by the toroidal mirror (M2) and split into a monitor-side (reference) beam and a sample beam. The monitor-side beam is incident on the monitor-side detector mounted in the monochromator. The sample beam passes through a sample in the sample compartment and impinges upon the sample-side detector.

The sample and reference beams incident on the respective detectors are converted into electric signals. The Model U-5100 detects the reference beam in order to compensate for variations in light quantity with time. This optics is called “ratio beam.” The ratio beam spectroscopy ensures a highly stable photometric values unavailable with a single beam spectrophotometer.

The beam at the center of a set 10 mm rectangular cell is 9 mm high and 3 mm wide.

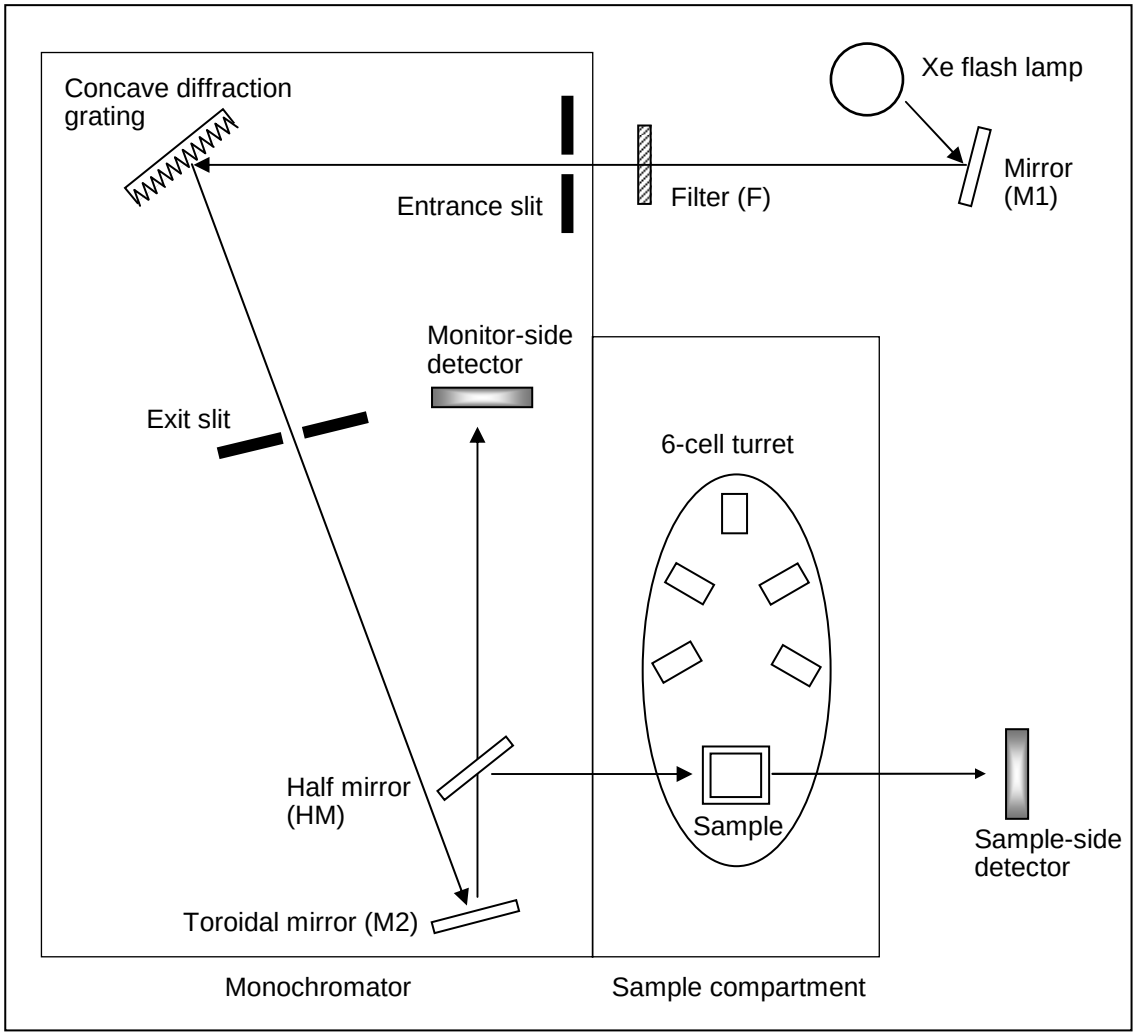


Fig. a-1 Optics of Model U-5100 Ratio Beam Spectrophotometer

Signal Processing and Control System:

Figure “a-2” shows the signal processing and control system arrangement. This system is controllable with the operation panel. After opto-electric conversion by a pair of detectors, electric signals are amplified and A/D converted, and then logarithmically converted by software to generate absorbance data. The result of measurement is displayed on the data display unit and can be printed with the printer.

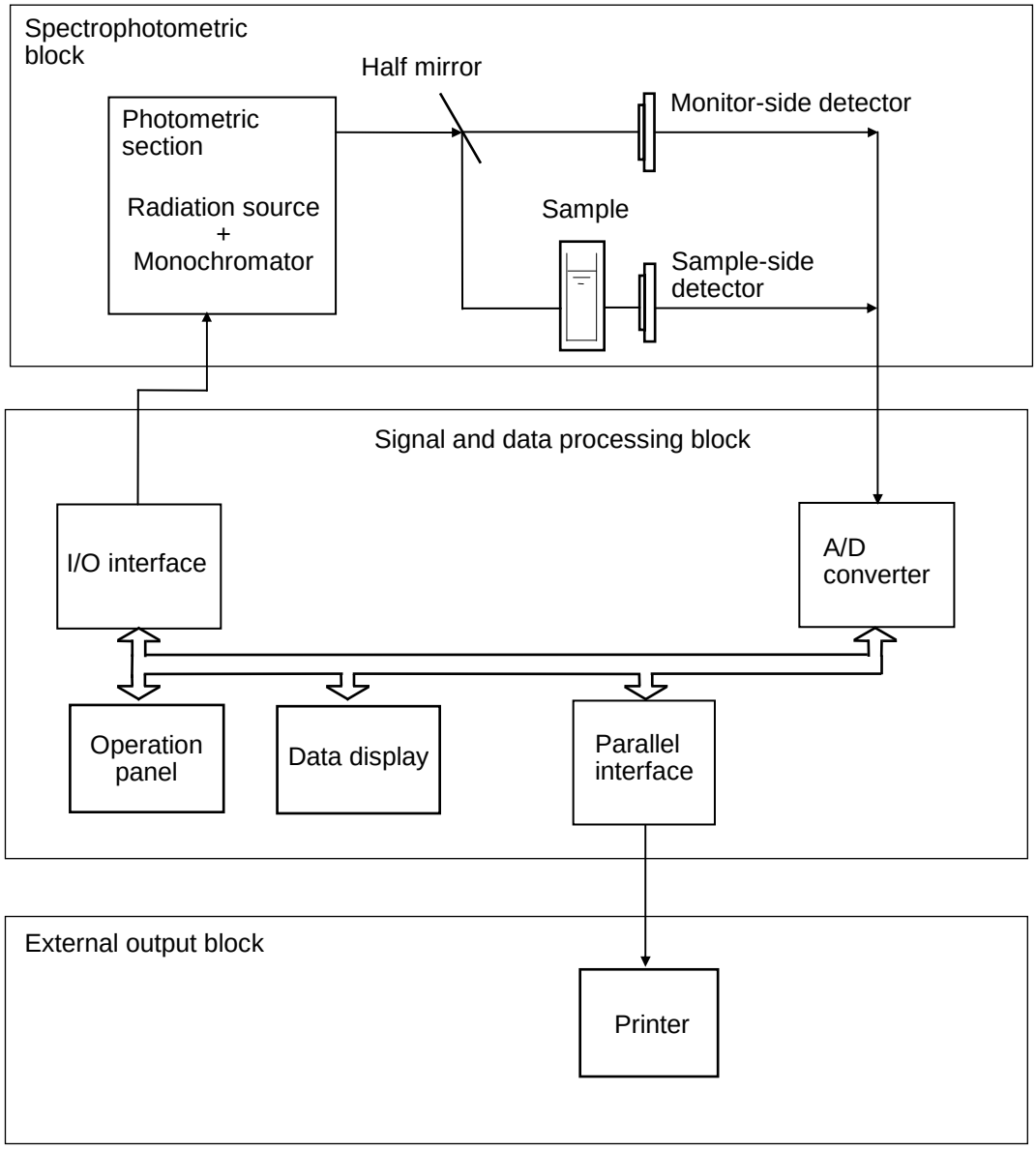


Fig. a-2 Signal Processing and Control System

Appendix b. Absorption Spectrophotometry

This spectrophotometer is designed for absorption analyses of liquid, solid and gaseous samples in the ultraviolet to visible spectral region. Assume that a monochromatic beam with intensity "I_o" travels through a single-component sample liquid phase having concentration "c" and path length "l," which results in the monochromatic radiation intensity decreasing to "I_t" Then, the relation expressed by (Equation 1) will hold. Where, ε is a constant known as absorption coefficient (absorptivity), which varies depending on sample. And, t denotes transmittance. Transmittance expressed as a percentage stands for T (percent transmittance).

$$\frac{I_t}{I_0} = 10^{-\varepsilon \cdot c \cdot \ell} = t \quad \text{..... (Equation 1)}$$

$$100 \cdot t = T \quad \text{..... (Equation 2)}$$

$$\log \frac{1}{t} = \varepsilon \cdot c \cdot \ell = A \quad \text{..... (Equation 3)}$$

Also, the common logarithm of inverse transmittance can be expressed by (Equation 3). This equation is called "Bouguer-Beer (Lambert-Beer) law. "A" in (Equation 3) is called absorbance (abbreviated as Abs). Absorbance "A" is proportional to concentration "c." Therefore, using this relationship, quantitative analysis is enabled by comparing absorbance between a concentration-known standard solution and a concentration-unknown solution. The Model U-5100 is capable of measuring both percent transmittance and absorbance.
For the customer who will use a spectrophotometer for the first time, it is recommended to read JIS K 0115:2004 "General rules for molecular absorptiometric analysis."

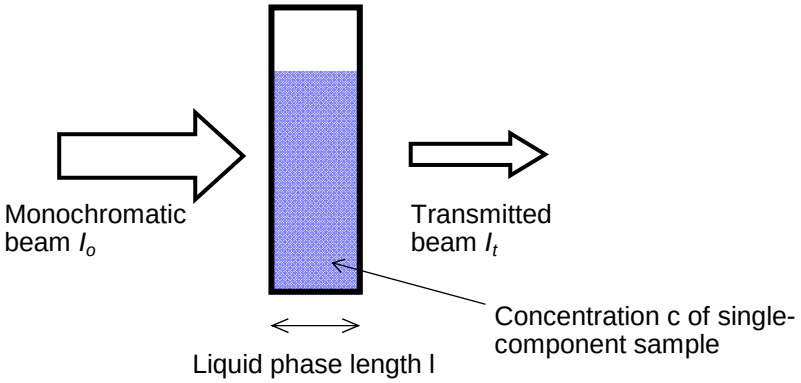


Fig. b-1 Bouguer-Beer (Lambert-Beer) Law

Appendix c. Proper Use of Spectrophotometer

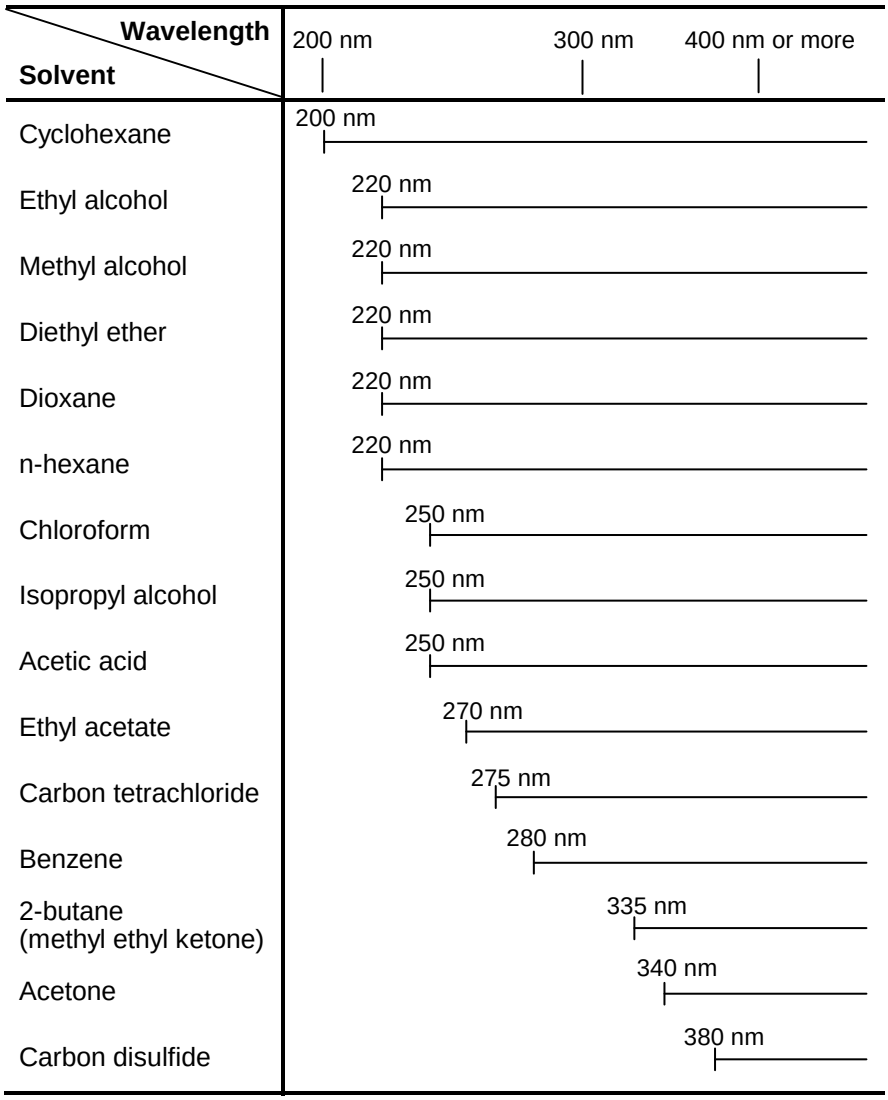
(1) Solvent Selection

When selecting a solvent for sample preparation, keep the following requirements in mind.

- No or small absorption in measuring wavelength range.
- Non-interactive with solute.
- Low volatility.

Table c-1 lists the applicable wavelength ranges of common organic solvents. (For details, refer to the new "Analytical Chemistry" volume of Experiment Chemistry Course issued by The Chemical Society of Japan.) Also, the wavelength range where organic solvents are applicable varies with grade. It is recommended to use solvents having a grade for spectrochemical analysis.

Table c-1 Applicable Wavelength Ranges (indicated by solid lines)



(2) Special Samples

Note that the Bouguer-Beer law mentioned in Appendix “b” is not applicable to the following special samples.

- Fluorescing sample
- Significantly turbid sample

In measurement of a solid sample such as glass plate, the energy of beam radiation undergoes a loss (r) due to reflection on the surface of solid substance. This case can be expressed by (Equation 4). “r” varies depending on the reflectance of substance.

$$I_t / I_0 = 10^{-\varepsilon \cdot c \cdot \ell} - r \quad \text{..... (Equation 4)}$$

Appendix d. About AUTOZERO

There are two kinds of AUTOZERO, one is SINGLE AUTOZERO, the other is MULTI-AUTOZERO.

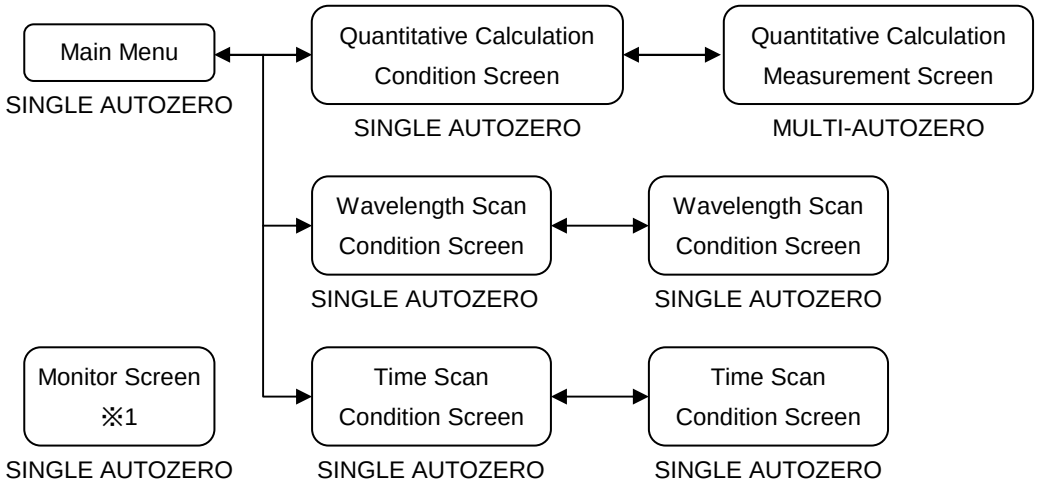
1. SINGLE AUTOZERO

The correction value, that the present Abs value becomes zero by executing AUTOZERO with the present wavelength, is calculated. SINGLE AUTOZERO is applied on most of screens except quantitative calculation measurement screen.

2. MULTI-AUTOZERO

The correction value, that the Abs value of each wavelength of a maximum of six wavelengths set in the quantitative calculation measurement condition becomes zero, is calculated. MULTI-AUTOZERO is applied only on the quantitative calculation measurement screen.

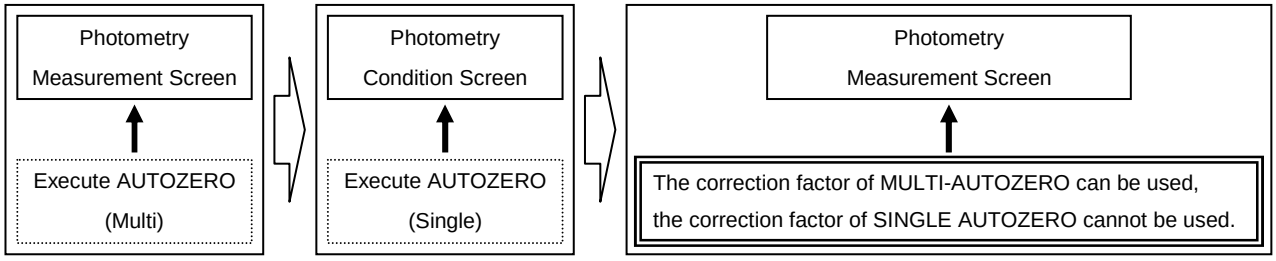
U-5100 has following screen composition. But, MULTI-AUTOZERO is applied only on the quantitative calculation measurement screen.



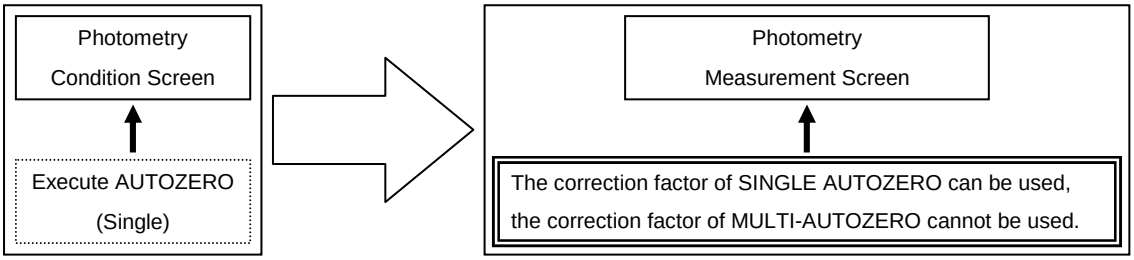
※1: The monitor screen can be transited from each screen by SHORTCUT function. But, the screen after transition becomes SINGLE AUTOZERO regardless of the screen before transition.

The correction factors of SINGLE AUTOZERO and MULTI-AUTOZERO are respectively maintained from AUTOZERO measurement to the power supply being shut as a separate value.
In the case of SINGLE AUTOZERO being applied, the correction factor of MULTI-AUTOZERO cannot be used.
In the case of MULTI-AUTOZERO being applied, if the wavelength is the same as the wavelength that was set when MULTI-AUTOZERO measurement was executed, the correction factor of MULTI-AUTOZERO can be used. If the wavelength isn't the same as the wavelength that was set when MULTI-AUTOZERO measurement was executed, the correction factor of SINGLE AUTOZERO can be used.
Therefore, even if AUTOZERO measurement is executed on the screen where SINGLE AUTOZERO is applied, it is necessary to execute AUTOZERO again for the screen where MULTI-AUTOZERO is applied on the changed screen, because it is the same as the state that AUTOZERO measurement isn't executed.
The examples, when AUTOZERO is executed by Photometry, are shown as follows.

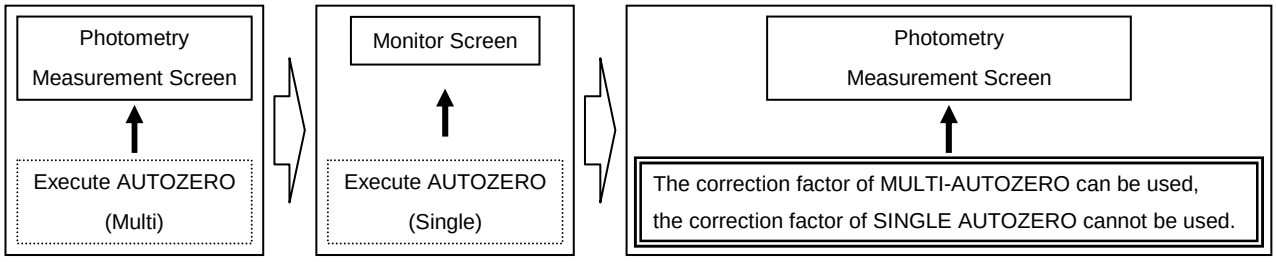
Example 1: The wavelength of SINGLE AUTOZERO is the same as the measurement wavelength of Photometry.



Example 2: MULTI-AUTOZERO isn't executed due to the measurement wavelength of Photometry.



Example 3: AUTOZERO is respectively executed on the quantitative calculation measurement screen and on the monitor screen.



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