SHIMADZU

INSTRUCTION MANUAL

UVmini-1240

SHIMADZU CORPORATION

ANALYTICAL INSTRUMENTS DIVISION

KYOTO JAPAN

206-94498

Shimadzu UV Visible Spectrophotometer
UVmini-1240
P/N 206-89175-92
P/N 206-89175-38
Instruction Manual

Read the instruction manual thoroughly before you use the product.
Save this instruction manual with care so you can use it any time you need it.

SHIMADZU CORPORATION
ANALYTICAL INSTRUMENTS DIVISION
KYOTO, JAPAN

Regulatory Information

For Europe :

The product complies with the requirements of the EMC Directive 89/336/EEC and Low Voltage Directive 73/23/EEC.

Product Name	:	UV-Visible Spectrophotometer
Model Name	:	UVmini-1240
Manufacturer	:	SHIMADZU CORPORATION ANALYTICAL INSTRUMENTS DIVISION
Address	:	1, NISHINOKYO-KUWABARACHO, NAKAGYO-KU, KYOTO, 604-8511, JAPAN
Authorized Representative in EU	:	SHIMADZU Deutschland GmbH
Address	:	Albert-Hahn-Strasse 6-10, D-47269 Duisburg F. R. Germany

Precautions for Safe Operation

UVmini-1240 is an ultraviolet visible spectrophotometer.
To operate the unit safe, strictly observe the following precautions.

1. Use only for the any purpose other than the above-mentioned types of analyses.

2. Follow Instruction Manual procedures, otherwise the instrument may not be used safely.

3. Observe all warnings and precautions.

4. Do not disassemble or modify the unit without the express approval of an authorized Shimadzu representative.

5. For internal repair of the product, contact your Shimadzu Representative.

MEANING OF CAUTION SIGNS

WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death, serious injury or moderate injury.
CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in moinor injury, or may result in machine damage.
NOTE	Is used to emphasizes essential information.

SAFETY SYMBOLS

Followings are explanations of the safty symbols and their locations used in UVmini-1240.

~	Alternating current. (Backside)
I	Supply On (On the power supply switch)
○	Supply Off (On the power supply switch)
	Caution, Hot surface (See next page for the location of the label)
	Caution, risk of electric shock (See next page for the location of the label)

Warning labels indicated on the unit

WARNING

High Temperature

Light source and light source chamber are very hot. When replacing the light source, be sure to turn OFF the power and check that the light source is completely cooled.

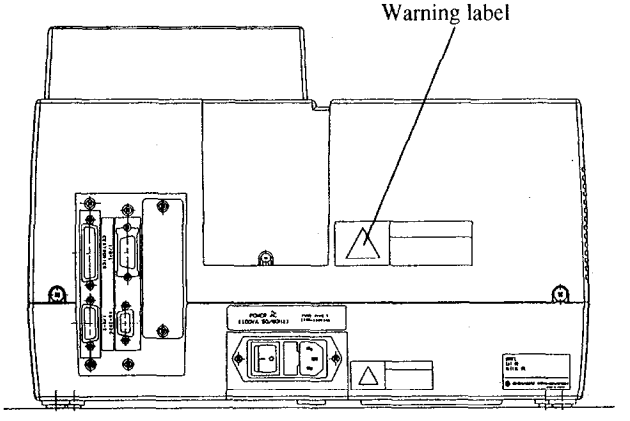


Fig. 1 UVmini-1240

WARNING

Electric Shock

When replacing the fuse, be sure to turn OFF thew power and disconnect the power supply cord.

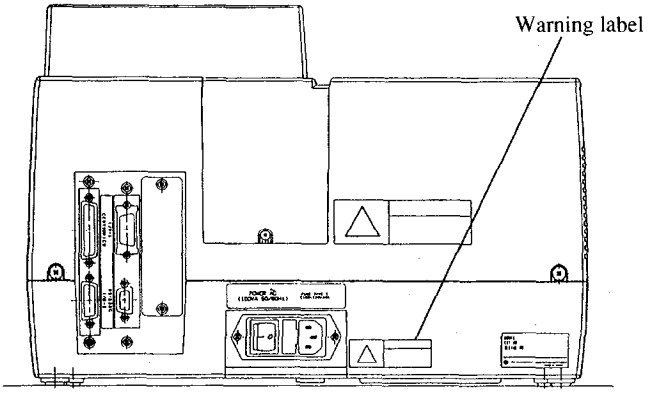


Fig. 2 UVmini-1240

CONTENT

Chapter 1 Before Using (Installation)

1. 1 Parts Inspection 1-1
1. 2 Installation Site 1-2
1.2.1 Ventilation 1-2
1.2.2 Cleaning the Unit 1-2
1. 3 Connecting Power 1-3
1.3.1 Power Supply 1-3
1.3.2 Ground 1-3
1.3.3 Connecting the Power Cable 1-3
1. 4 Turning ON Power and Initialization 1-4
1. 5 Installation Function Check 1-5
1.5.1 Baseline Flatness 1-5
1.5.2 Wavelength Accuracy 1-7

Chapter 2 Construction

2. 1 Exterior View 2-1
2.1.1 Front and Top Views 2-1
2.1.2 Rear Side View 2-2
2. 2 Sample Compartment 2-3
2. 3 Keyboard 2-4
2. 4 Light Source Compartment 2-6

Chapter 3 Mode Selection and Shared Operations

3. 1 Mode Selection Screen 3-1
3.1.1 Set Parameters [Params]/[F1] 3-2
3.1.2 IC Card [IC Card]/[F2] 3-3
3.1.3 External Control [F4] 3-3
3. 2 Overview of Various Modes 3-4
3. 3 Operations Shared by Modes 3-6
3.3.1 Save Parameters [SavParam] 3-6
3.3.2 Save Curve and Call Curve [SavCurve]/[CallCurv] 3-7
3.3.3 Data Management [DataFile] 3-10
3. 4 Screen Copy and Data Printout 3-12

Chapter 4 Photometric Mode

4. 1 Measurement Parameter Configuration Screen 4-1
4.1.1 Set Wavelength 4-1
4.1.2 [T%/ABS] 4-1
4.1.3 Sample Compartment Control [SmplCmpt] 4-1
4.1.4 Save Parameters [SavParam] 4-1

4.1.5 Measurement Screen [SmplMeas] 4-2
4.1.6 Auto zeroing [AUTO ZERO] 4-3
4.1.7 Change Sample No. [Smpl No.] 4-3
4.1.8 Quantitation by K-factor method [Factor K] 4-3
4. 2 Post-measurement Processing 4-4
4.2.1 Data Print and Screen Copy 4-4
4.2.2 Data Management [DataFile] 4-4
4.2.3 Data Display [DataDisp] 4-4

Chapter 5 Spectrum Mode

5. 1 Measurement Parameter Configuration Screen 5-1
5.1.1 Setting Parameter Items 5-2
5.1.2 Baseline Correction [BaseCorr] 5-4
5.1.3 Call Curve [CallCurv] 5-4
5.1.4 Sample Compartment Control [SmplCmpt] 5-4
5.1.5 Save Parameters [SavParam] 5-4
5. 2 Measurement 5-5
5. 3 Post-measurement Processing 5-6
5.3.1 Read Cursor 5-6
5.3.2 Enlarge/Reduce [Zoom] 5-6
5.3.3 Peak detection 5-8
5.3.4 External Transmission [ExtTrans] 5-9
5.3.5 Save Curve [SavCurve] 5-10
5.3.6 Waveform printing 5-10
5. 4 Scanning Speed and Data Sampling Interval 5-11

Chapter 6 Quantitation Mode

6. 1 Measurement Parameter Configuration Screen 6-2
6.1.1 Measuremen Parameters 6-2
6.1.2 Sample Compartment Control [SmplCmpt] 6-7
6.1.3 Measurement Screen [SmplMeas] 6-7
6.1.4 Save Parameters [Savparam] 6-7
6. 2 Creating Calibration Curve 6-8
6.2.1 Inputting concentration 6-8
6.2.2 How to Input Absorbance for Single Point Calibration Curve 6-8
6.2.3 How to input absorbance of multi-point calibration curve 6-9
6.2.4 Concentration Table 6-10
6.2.5 Calibration Curve Display 6-11
6.2.6 Changing the Concentration Table 6-12

6. 3 Unknown Sample Measurement (Quantitation) 6-13
6.3.1 Measurement Screen 6-13
6.3.2 Changing the Sample Number 6-15
6.3.3 Data Management [DataFile] 6-15
6.3.4 Data Display [DataDisp] 6-15
6.3.5 Display Equation [Equation] 6-18
6. 4 Two/Three-wavelength Quantitation Method 6-19
6.4.1 Two-wavelength Quantitation 6-19
6.4.2 Three-wavelength Quantitation 6-19

Chapter 7 Optional Program Pack

7. 1 Starting the Optional Program Pack 7-1
7. 2 Optional Program Pack Auto-start 7-2

Chapter 8 Utilities Mode

8. 1 Utilities Screen 8-1
8. 2 Setting Instrument Parameters 8-2

Chapter 9 PC Control

9. 1 Connecting to a PC 9-1
9. 2 Receiving Commands and Protocol 9-2
9. 3 Programming Example 9-4
9. 4 Explanation of Commands and Data 9-8
9. 5 Command List 9-9

Chapter 10 File Transfer

10. 1 Connecting to a PC 10-1
10. 2 Operation Method 10-2

Chapter 11 Maintenance & Checking

11. 1 Daily Maintenance & Periodic Maintenance 11-1
11. 2 Initialization & Error Display 11-2
11. 3 Trouble shooting 11-4
11. 4 Replacing Light Source 11-5
11.4.1 Light Source Specifications 11-5
11.4.2 Light Source Replacement Procedure 11-6
11. 5 Replacing Fuses 11-10
11. 6 List of Consumable Parts, Spare Parts 11-12

Chapter 12 Specifications

12. 1 Hardware Specifications 12-1
12. 2 Software Specifications 12-2

Appendix Optional Accessories

Appendix A Sample Module (Multi-cell, Sipper Operation) Appendix-1
Appendix B Printer Appendix-10
Appendix C List of Cells Appendix-13

Chapter 1 Before Using (Installation)

CONTENTS

1. 1 Parts Inspection 1-1
1. 2 Installation Site 1-2
1.2.1 Ventilation 1-2
1.2.2 Cleaning the Unit 1-2
1. 3 Connecting Power 1-3
1.3.1 Power Supply 1-3
1.3.2 Ground 1-3
1.3.3 Connecting the Power Cable 1-3
1. 4 Turning ON Power and Initialization 1-4
1. 5 Installation Function Check 1-5
1.5.1 Basclinc Flatness 1-5
1.5.2 Wavelength Accuracy 1-7

1.1 Parts Inspection

This instrument is shipped with the following items. Upon opening the shipping container, confirm that all of the listed parts are accounted for in your shipment.

Table 1.1.1 Standard Contents

	Description		Part No.	Qty.	Comments
1	Spectrophotometer (One of the following)			1	
	For 100V to 120V sites		206-89175-92		
	For 220V to 240V sites		206-89175-38		
2	Standard Accessories(One of the following)			1	
	For 100V to 120V sites		206-67099		
	For 220V to 240V sites		206-67099-01		
	2-1	AC Power Cord	071-60814-01 or 071-60814-05	1	(for 100V to 120V) (for 220V to 240V)
	2-2	Fuses	072-01652-22 or 072-01652-19	2	4.0A (100V to 120V) 2.0A (220V to 240V)
3	Instruction Manual		206-94498	1	

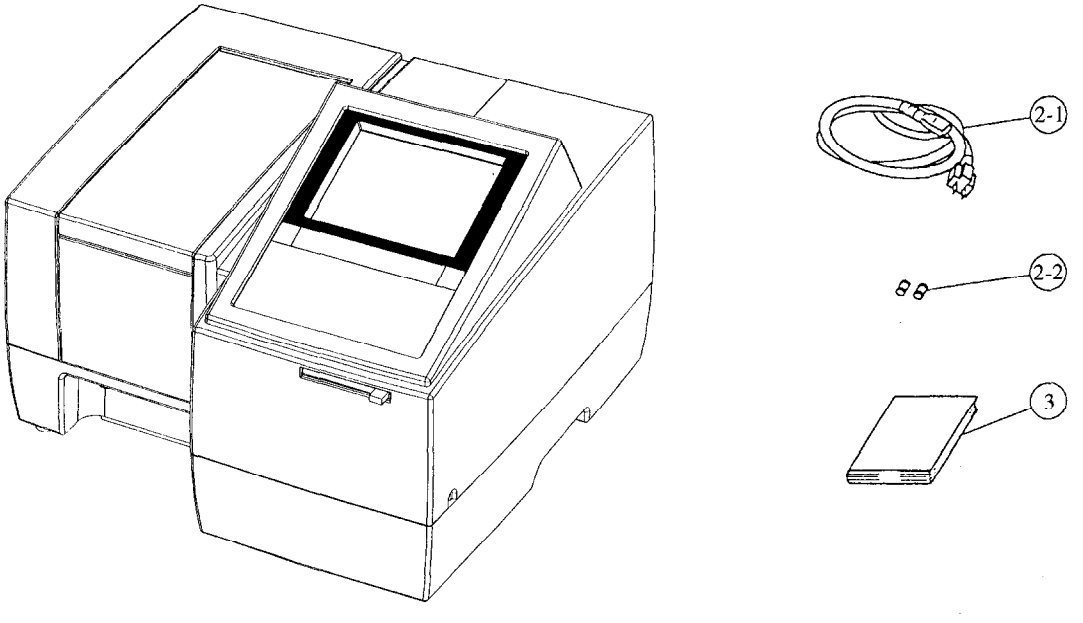


Fig. 1.1.1 Standard Contents

NOTE A thin protective film has been applied to the surface of the keyboard. This film will not be a hindrance if the keyboard is used with it in place, but if the film begins to peel during use and makes the keyboard difficult to see, peel it entirely from the surface.

1.2 Installation Site

In order to fully utilize the features of this instrument and to be able to use it for a long time in a stable condition, please install it in a location that meets the following conditions.

Any deterioration in function or mechanical damage that occurs as the result of use in location that differs from these conditions will not be covered by the warranty, even if they occur within the warranty period. Please take care in advance.

- Room temperature during use of 15 to 35°C.
- Out of direct sunlight.
- No strong vibration, or continuous weak vibration.
- No strong magnetic fields or electromagnetic fields.
- Humidity of 45 to 80%. (If the room temperature is 30°C or higher, the relative humidity must be no more than 70%.)
- No corrosive gases, or organic or inorganic gases with absorptivity in the ultraviolet range.
- Low ammounts of dust.

The dimensions of the UVmini-1240 are 416mm×379mm×274mm(W×D×H). The minmun floor space required for installation is 600mmx480mm(W×D). In addition, do not place anything in front of the fan on the left side as it may hinder ventilation.

The UVmini-1240 weighs 11kg. Install the unit on a flat surface that will support this weight.

1.2.1 Ventilation

When using organic solvent for samples, be sure to maintain sufficient ventilation.

1.2.2 Cleaning the Unit

Keep the main unit cover and the interior of the sample compartment clean for use. To clean them, moisten a piece of soft cloth slightly with water or weak detergent. Avoid wiping the unit with too wet cloth or dropping liquid inside the sample compartment.

CAUTION

Do not drop liquid such as water and organic solvent. Electrical failure or mechanical failure may be caused.

1.3 Connecting Power

1.3.1 Power Supply

The power consumption of this instrument is 160VA. Please use a power supply with a capacity of 160VA or greater. The allowable voltage fluctuation range is 10%. If the voltage fluctuates more than 10%, please use a voltage stabilizer.

1.3.2 Ground

The power cord for this instrument is a 3-wire type which includes a ground wire.

Be sure to plug the power cord in the 3-wire type outlet for grounding.

NOTE

If the electrical outlet is of the 2-wire type, be sure to ground the instrument from the earth terminal of the power cord.

1.3.3 Connecting the Power Cable

(1) Check to see that the power switch on the unit is OFF (so that the ○ is pushed in).

(2) Check that the power supply voltage indicated on the rear of unit.

(3) Insert the **enclosed power cable** into the power connector on the left side of the unit.

(4) Insert the power cable into the outlet.

(5) Turn ON the unit power switch.

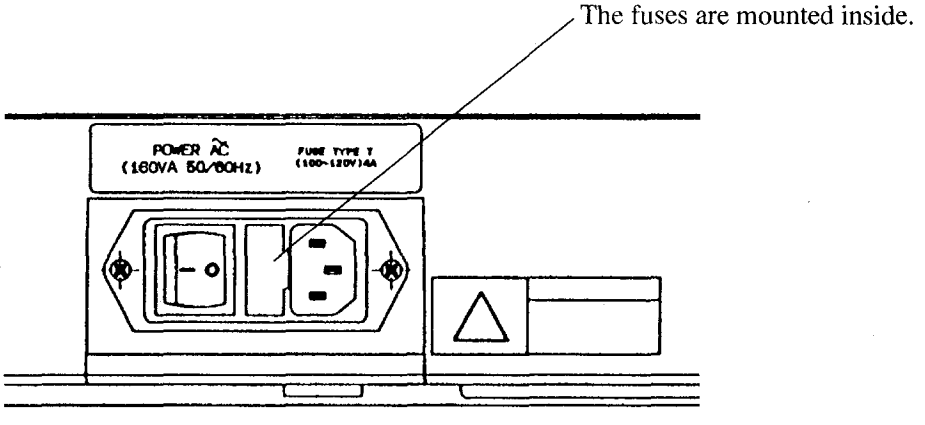


Fig. 1.3.1 Power Supply Connector

1.4 Turning ON Power and Initialization

When the power is turned ON, the spectrophotometer is checked and initialized according to the items shown in the screen in Figure 1.4.1. The time required for this initialization is approximately 6 minutes if all of the items are properly completed. Each item is initialized order. Then, when the initialization for that item is properly completed, "OK" will appear. However, if any abnormality is detected, "NG" will appear. Please refer to "11.2 Initialization and Error Display" in chapter 11 "Maintenance & Checking" regarding the content of the checks performed for each item and the points to check if an error is indicated.

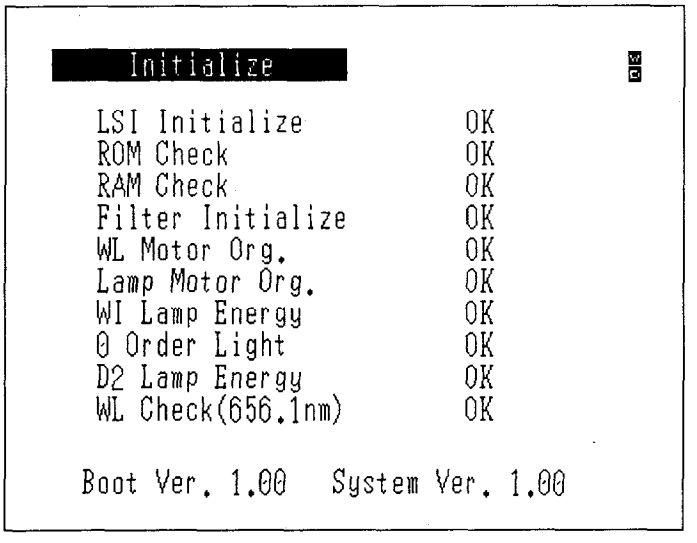


Fig. 1.4.1 Initialization screen

The following message will appear at the time Mode Selection screen is displayed when the unit is used for the first time or the conditions to select a light source have been changed.

"Baseline data is invalid. Press [RETURN] key and go to Spectrum mode to correct baseline."

This message disappears when the [ENTER] key or the [RETURN] key is pressed, but unless baseline correction is performed, it appears every time the display returns to the Mode Selection screen. When performing measurement with one wavelength such as the one in the Photometric mode, 0 Abs (100%) correction is performed by pressing the [AUTOZERO] key. This makes measurement possible. However, it is recommended to perform baseline correction once for the optimum 0 Abs correction. Perform the operation procedures from 1 to 9 described in the next section (1.5.1). When turning ON power after that, the above message is not displayed as this baseline is memorized.

During initialization after power-on, the sipper unit may occur due to an error, such as insufficient lamp energy when,

- An inappropriately mounted flow cell prevents the light beam from going through the center of cell and correctly entering the detector, or
- The beam is refracted by the remaining part of a sample in the cell.

When the unit occurs due to such an error, fill the flow cell with distilled water and turn on the unit power again. During displaying the message to sip distilled water after "Filter initialize", press [ENTER] key. After that distilled water can be sipped.

Generally, a dry flow cell allows contamination to adhere to the flow cell inner wall, consequently easily creating bubbles. Therefore, after cleaning the flow cell, turn off the spectrophotometer power with the cell

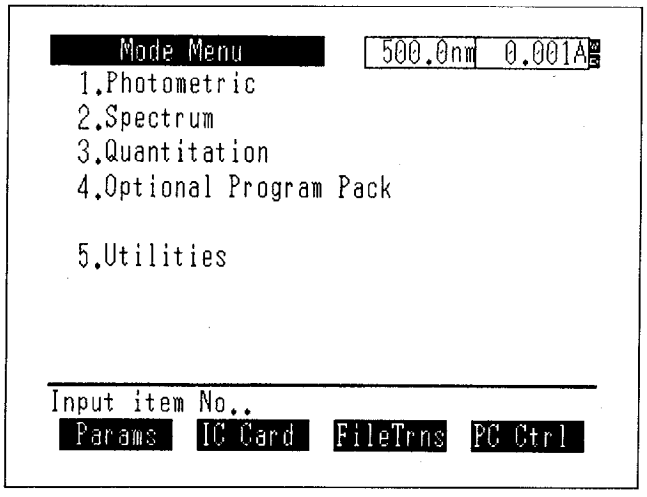
1.5 Installation Function Check

Once installation is complete, check the function of the following items. In the event that a function(s) does not fulfill the specification listed below due to a shock during shipment, immediately notify the nearest service representative.

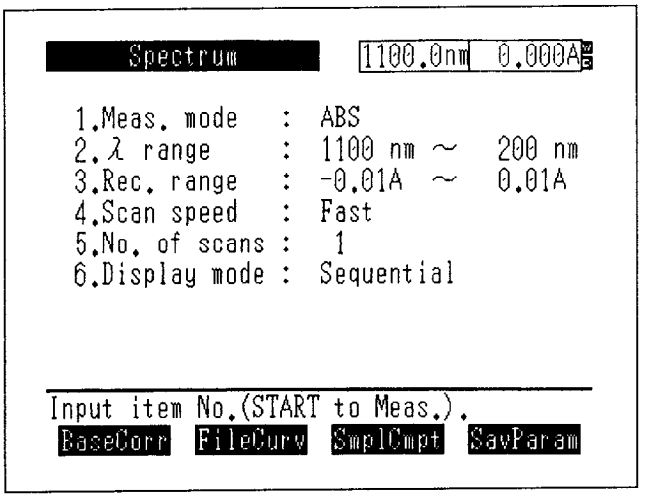
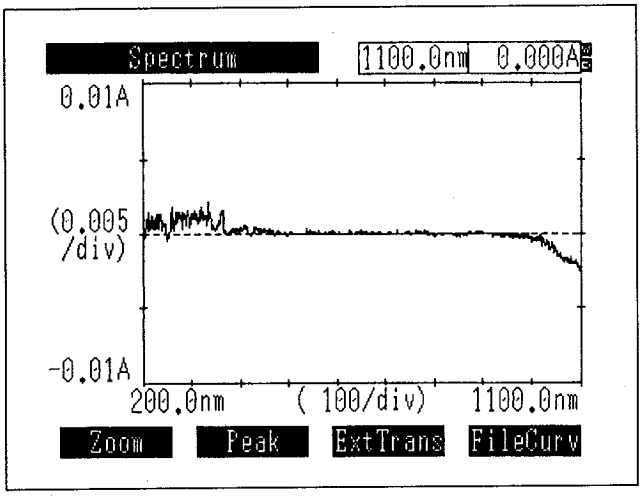
1.5.1 Baseline Flatness

Procedure

Table 1.5.1 Procedure (Baseline Flatness)

Step	Operation, Monitor Display	Key Operation
1	Turn ON power (Let sit for 60 minutes after automatic initialization)	
2		
3	Select "2. Spectrum"	[2]
4	Set the measurement mode to "ABS" (Absorbance mode).	Enter [1] until "ABS" is displayed.
5	Set scan range to 1100 ~ 200nm	[2][1][1][0][0][ENTER] [2][0][0][ENTER]
6	Set photometric range to -0.01 ~ 0.01Abs.	[3][-][0][.][0][1] [ENTER][0][.][0][1][ENTER]
7	Set scan speed to "Fast".	[4][△ or ▽][ENTER]

* continued.

Step	Operation, Monitor Display	Key Operation
8		
9	Perform baseline correction.(approx. 6 minutes)	[F1]
10	Start measurement.	[START/STOP]
11		
12	When baseline measurement restarts, press the [START/STOP] key again. When you press the [RETURN] key, the process will return to Step 8.	

Normal Specification

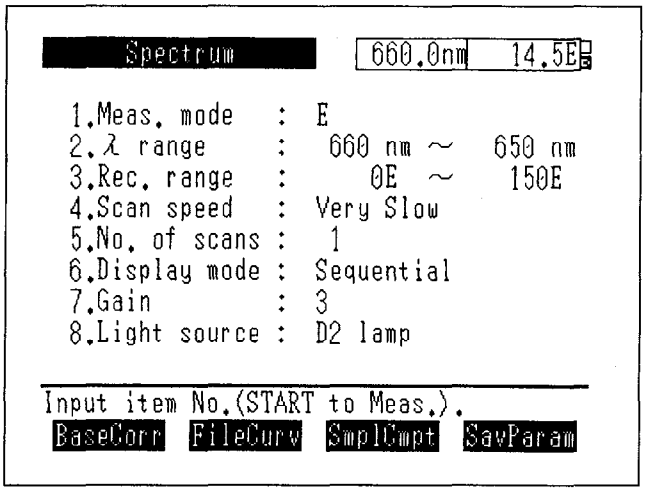
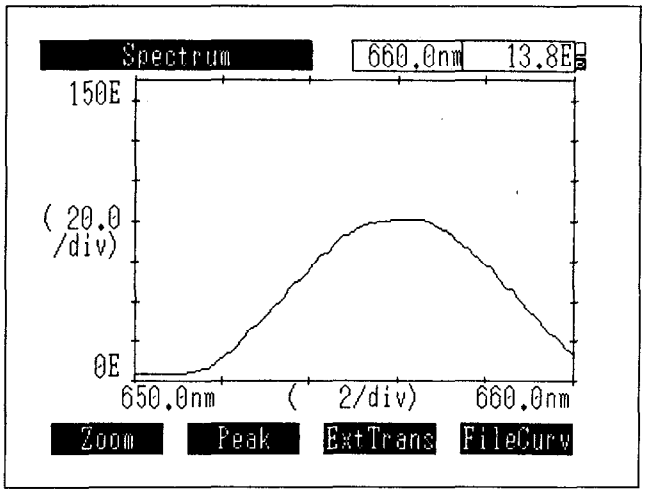
Baseline flatness should be within ±0.010Abs, not including shock noise.

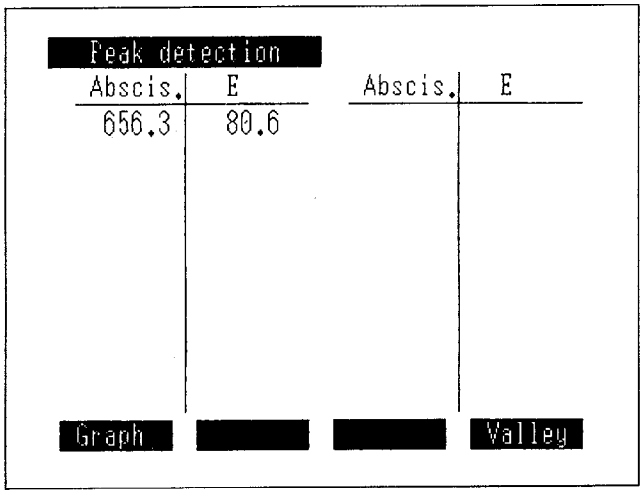
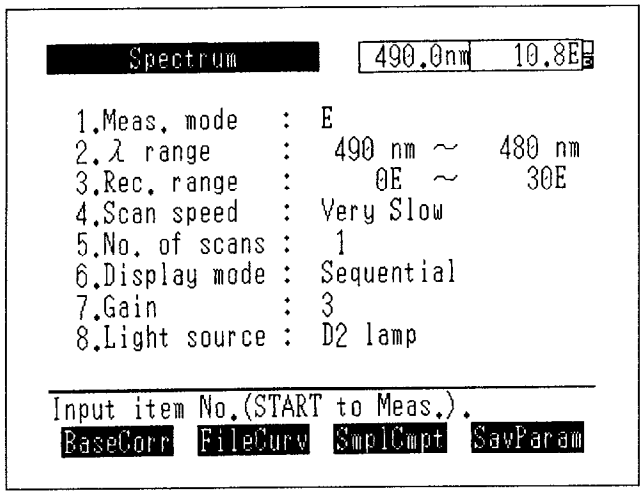
1.5.2 Wavelength Accuracy

Measurement Procedure

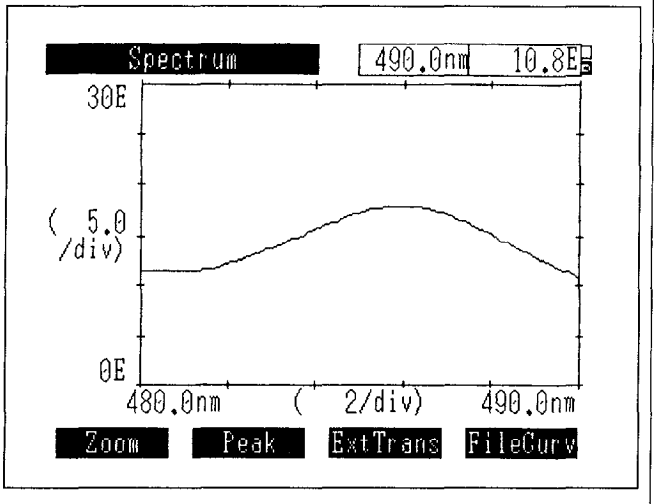
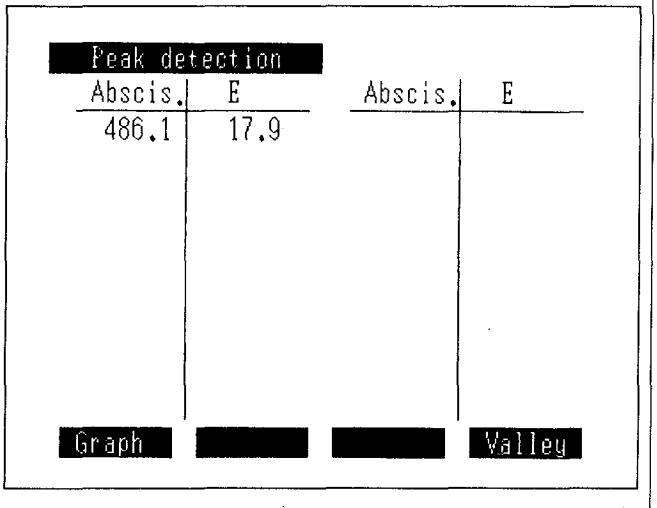
Start from Step 4 of the "Baseline Flatness" procedure.

Table 1.5.2 Procedure (Wavelength Accuracy)

Step	Operation, Monitor Display	Key Operation
1	Set the measurement mode to "E".	Enter [1] until "E" is displayed
2	Set the wavelength range to 660 ~ 650nm.	[2][6][6][0][ENTER] [6][5][0][ENTER]
3	Set the recording range to 0 ~ 150E	[3][0][ENTER][1][5][0][ENTER]
4	Set scan speed to "Very slow".	[4][△ or ▽][ENTER]
5	Set the gain to 3.	[7][3][ENTER]
6	Set the light source selection to the D2 lamp.	[8][△ or ▽][ENTER]
7		
8	Start measurement.	[START/STOP]
9		

Step	Operation, Monitor Display	Key Operation
10	Perform peak detection.	[F2]
11		
12	Find the difference between the wavelength of the peak found and 656.1nm. Within ±1.0nm.	
13	Return to the Parameter Setting screen.	[RETURN],[RETURN]
14	Set the wavelength range to 490 ~ 480nm.	[2][4][9][0][ENTER][4][8][0][ENTER]
15	Set the recording range to 0 ~ 30E.	[3][0][ENTER][3][0][ENTER]
16		
17	Start measurement.	[START/STOP]

* continued.

Step	Operation, Monitor Display	Key Operation
18		
19	Perform peak detection.	[F2]
20		
21	Find the difference between the wavelength of the peak found and 486.0nm. Within ±1.0nm.	

Normal Specification

Within ±1.0nm

Chapter 2 Construction

CONTENTS

2.1 Exterior View 2-1
2.1.1 Front and Top Views 2-1
2.1.2 Rear Side View 2-2
2.2 Sample Compartment 2-3
2.3 Keyboard 2-4
2.4 Light Source Compartment 2-6

2.1.1 Front and Top Views

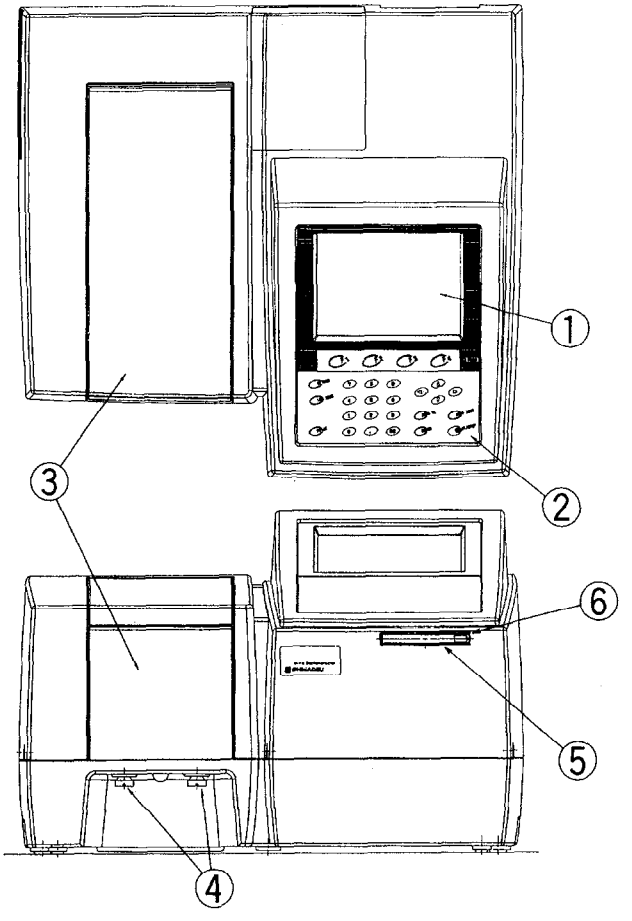


Fig. 2.1.1 Front and top views of UV-1601

① LCD Unit

This displays the operation menus and measurement results, etc. This is a 320x240 dot resolution, backlit LCD unit. You may adjust the contrast for optimum visibility.

② Keyboard

This is the input component for giving operation commands and numeric values to the instrument. See "2.3 Keyboard" for detailed instructions.

③ Sample Compartment

This is the component in which the sample being measured is set. See "2.2 Sample Compartment" for details.

④ Sample Compartment Set Screws (knurled thumbscrews).

These are screws for fastening the sample compartment unit.

⑤ IC Card Slot

This is the slot for inserting optional IC cards (Data Pack, Program Pack).

⑥ Eject Button

This is the button to press on for pulling out a inserted IC card.

2.1.2 Rear Side View

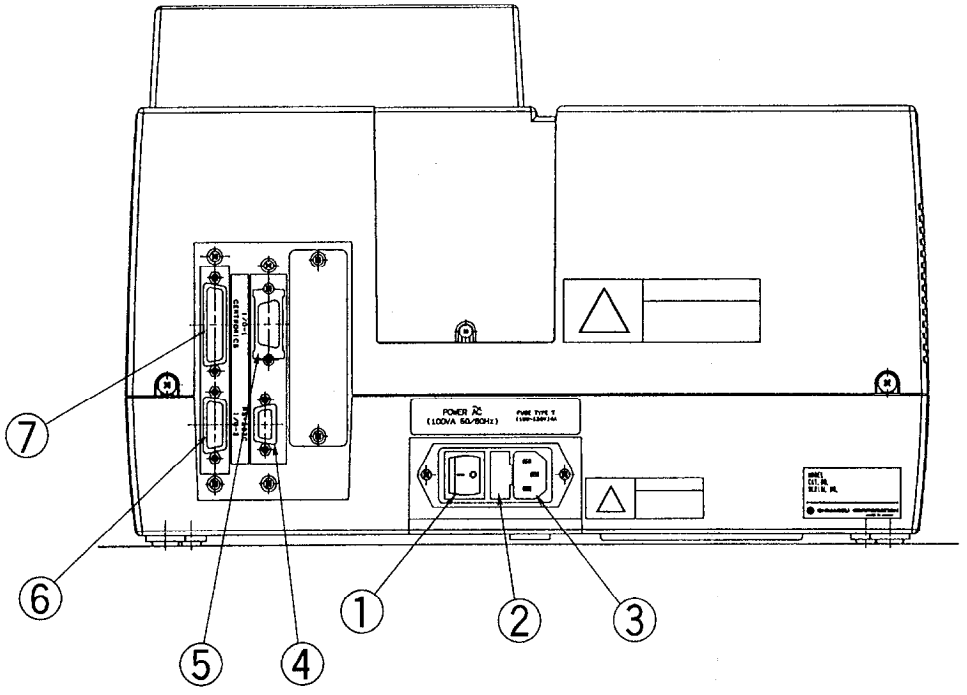


Fig. 2.1.2 Rear side view of UVmini-1240

① Power Switch

This is the switch for turning the unit ON/OFF.

ON : when I is pushed in.

OFF : when ○ is pushed in.

② Fuse Holder

Use two 4.0A fuses for the 100V to 120V range, two 2.0A fuses for the 220V to 240V range.

③ AC Power Connector

Connect the enclosed AC power cable to supply power from an AC electrical outlet.

④ RS-232C Connector

This is a standard RS-232C interface. This can be used to connect an optional printer or a computer equipped with a standard RS-232C interface.

⑤ Attachment Connector (I/O 1)

This is the interface for connecting the optional "Auto Sample Changer (ASC-5)" or "Cell Positioner (CPS-240A)" accessory.

⑥ Attachment Connector (I/O 2)

This is the interface for connecting the optional "Sipper 160" accessory or "Syringe Sipper" accessory.

⑦ Printer Connector (CENTRONICS)

This is the interface for connecting an optional printer.

2.2 Sample Compartment

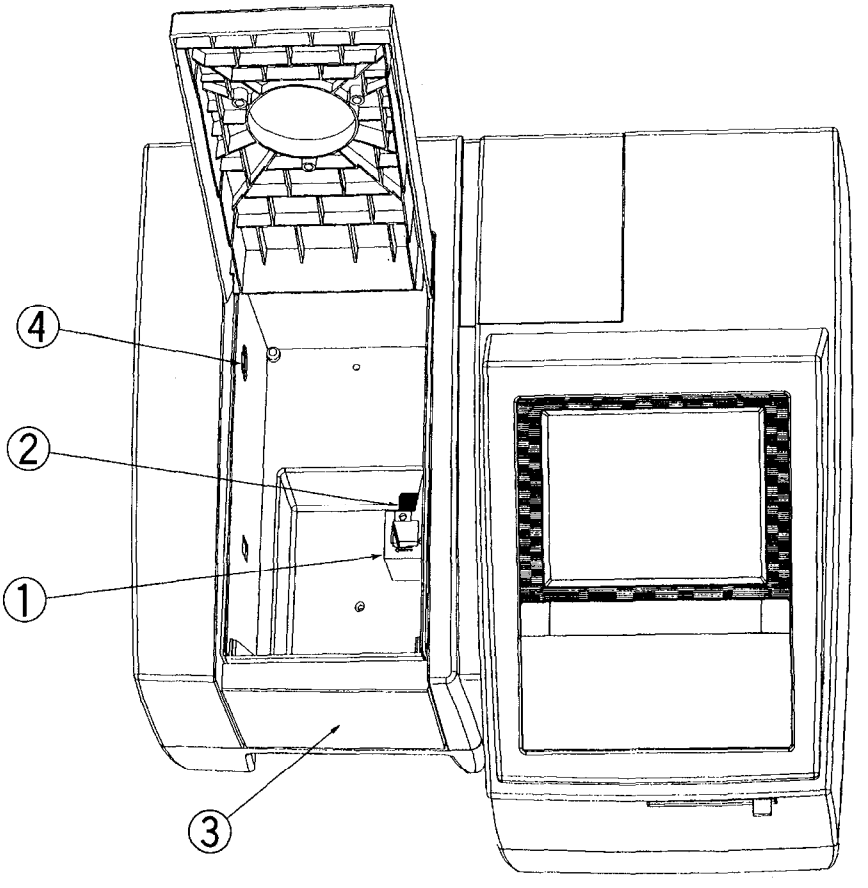


Fig. 2.2.1 Sample compartment

① Cell Holder

The cell holder for the rectangular 10mm light path cells is mounted.

② Cell Holder Set Screws

The cell holder can be easily removed by loosening the cell holder set screws.

③ Front Board, Sample Compartment

When using a flow cell, etc., holes are needed to pass tubing, etc. through. Therefore, this "Front Board, Sample Compartment" can be removed and exchanged with different types of front panels. (When mounting another front board, another sample compartment unit is required.)

④ Multi-cell Holder Drive Connector

This is the connector for driving the optional "Multi-cell Holder" accessory.

2.3 Keyboard

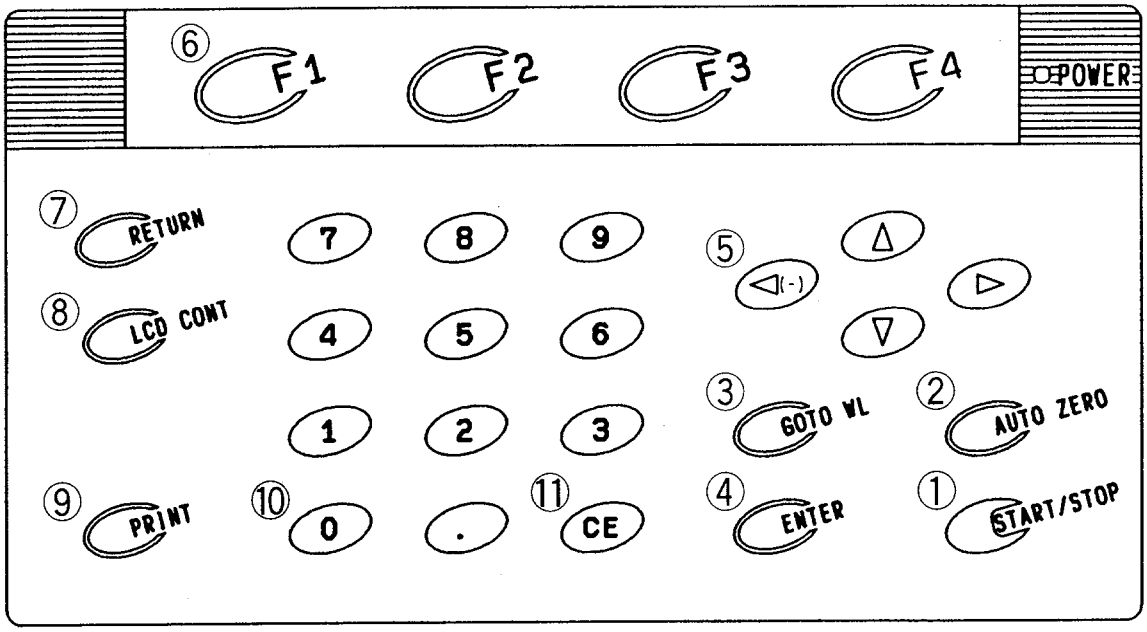


Fig. 2.3.1 Keyboard

The keyboard is shown in Figure 2.3.1. The modes and settings in the various screens can be selected using the number keys 0 through 9 or the function keys F1 through F4. When selecting modes or settings, it is not necessary to press the ENTER key after you have pressed the number keys or function key. On the other hand, when entering numeric values, such as wavelength settings orm display mode, etc., you must press the ENTER key to confirm that value.

Each Key's function is described below.

① START/STOP Key

This is the key for starting and stopping measurement once parameter setting has been completed.

② AUTO ZERO Key

When you press this key, the current wavelength will automatically be set to 0Abs (100%T). Make sure that prior to sample measurement a blank cuvette is placed in both sample and reference sides.

③ GOTO WL Key

This is the key that is used to change the current wavelength.

④ ENTER Key

When you enter a value, press this key after the value to set the entering value.

⑤ Cursor Keys (◁ (-), ▷ , △, ▽)

Use these keys to select an item and to move the cursor in the LCD screen left or right. The left cursor key can also be used to enter a negative (-) value when entering numeric values.

⑥ Function Keys (F1 through F4)

These are the keys corresponding to the functions that are displayed at the bottom of the LCD unit screen.

⑦ RETURN Key

Use this key to return to the one preceding screen from the current screen.

⑧ LCD CONT Key

Use this key to adjust contrast of the LCD display. Press the cursor keys(△ or ▽) with this key held down to change the contrast.

⑨ PRINT Key

Use this key to output a hard copy of the monitor screen.

⑩ Numeric Keys

Use these keys to enter numeric values.

⑪ CE Key

Use this key to clear a numeric value entry error. When you press this key, the numeric value which has been entered will be cleared and then you may reenter the appropriate value.

2.4 Light Source Compartment

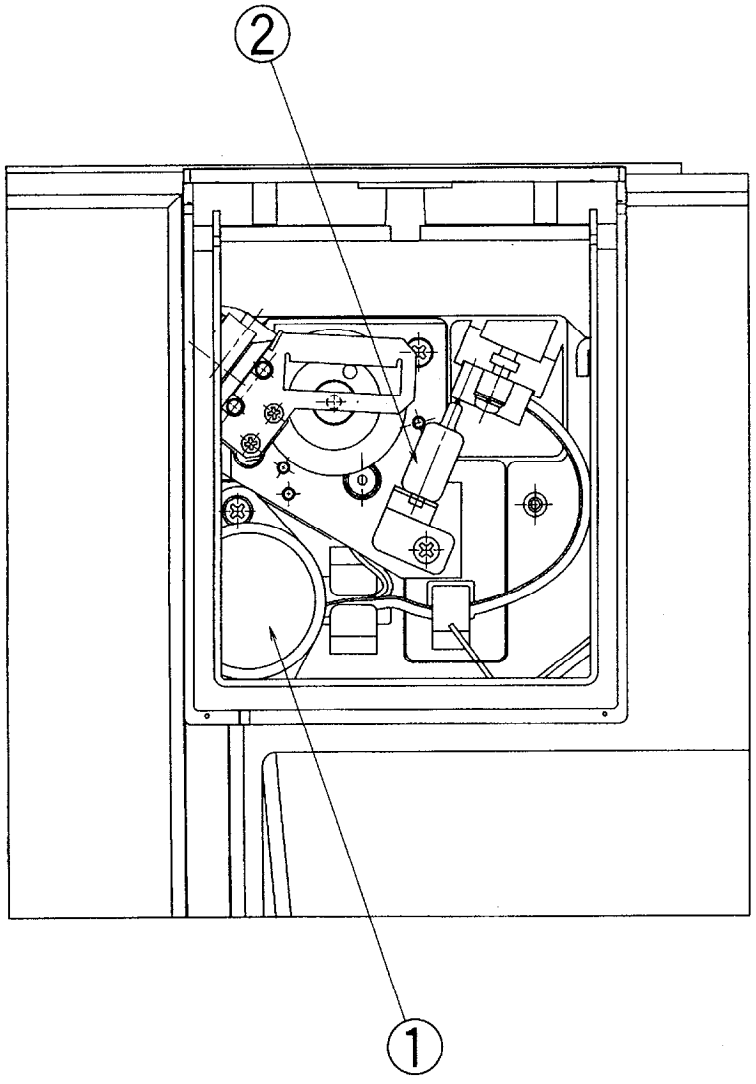


Fig. 2.4.1 Light source compartment

WARNING **HOT SURFACE**

The light source and light source compartment both get very hot. To change a light source, turn off the power and then change the light source only after checking to see than it had cooled sufficiently.

① Deuterium Lamp (D2 Lamp)
This is the ultraviolet range (190nm to light source switch wavelength*) light source.

② Tungsten Halogen Lamp (WI Lamp)
This is the visible & near infrared range (light source switch wavelength* to 1100nm) light source.

* Light source switch wavelength
The light source switch can be set anywhere in the range from 295nm to 364nm in 1nm increments.
For details, refer to Chapter 8, "8.2 Setting Instrument Parameters", <4. Light source>.

Chapter 3
Mode Selection and Shared Operations

CONTENTS

3. 1 Mode Selection Screen 3-1
3.1.1 Set Parameters [Params]/[F1] 3-2
3.1.2 IC Card [IC Card]/[F2] 3-3
3.1.3 External Control [F4] 3-3
3. 2 Overview of Various Modes 3-4
3. 3 Operations Shared by Modes 3-6
3.3.1 Save Parameters [SavParam] 3-6
3.3.2 Save Curve and Call Curve [SavCurve]/[CallCurv] 3-7
3.3.3 Data Management [DataFile] 3-10
3.4 Screen Copy and Data Printout 3-12

3.1 Mode Selection Screen

After initialization is completed, the Mode Selection screen is displayed.

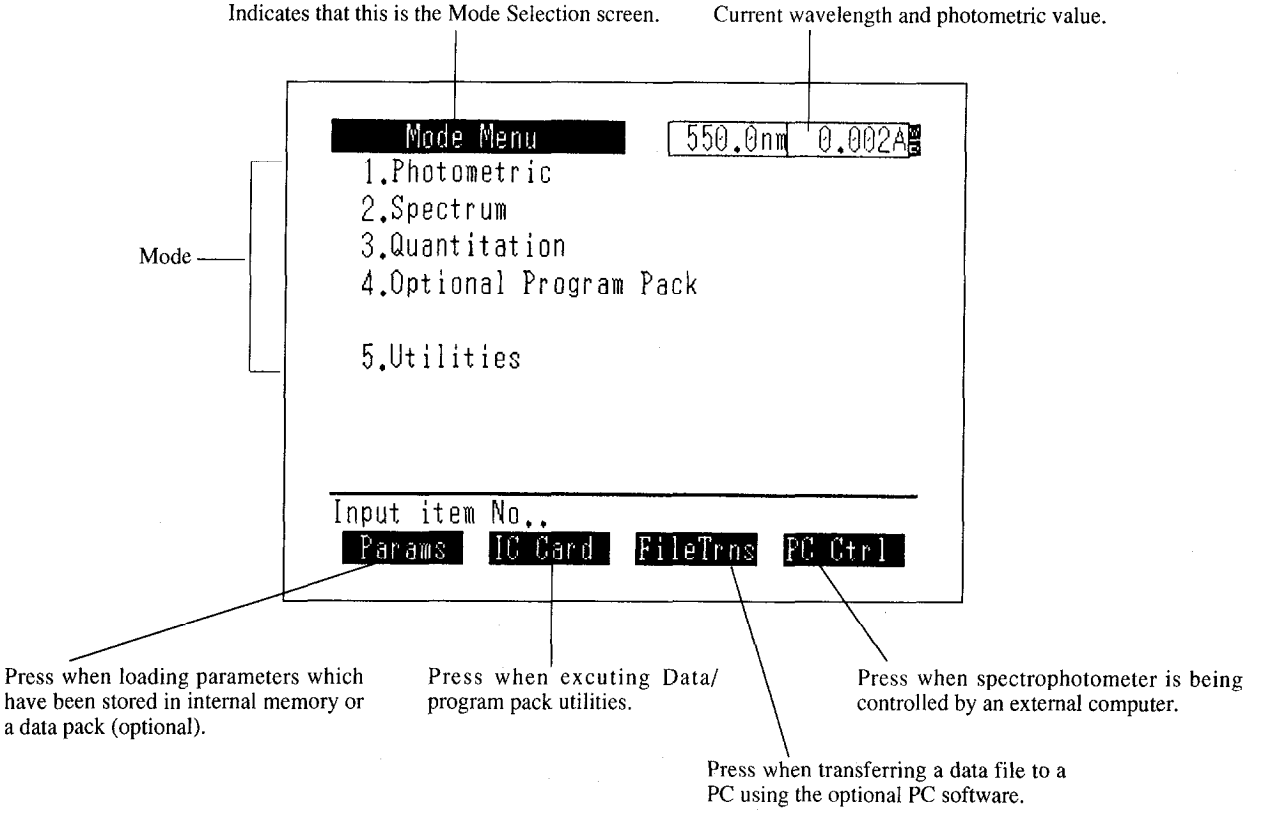


Fig. 3.1.1 Mode Selection screen

Enter an item number 1. through 5. to select that mode.

When you select the respective modes, the Parameter Configuration screen shown in "3.2 Overview of Various Modes" will be displayed.

3.1.1 Set Parameters [Params]/[F1]

In order to facilitate entering measurement parameters for each application, you can save the measurement mode and measurement parameters in memory and then load them from the Mode Selection screen. (Refer to "3.3.1 Save Parameters" about saving measurement parameters.)
Up to 16 sets of measurement parameters can be stored in the instrument memory, and if a data pack (optional) is used, a total of 62 parameter sets can be stored.

When you select [Params], the parameter file list will be displayed.

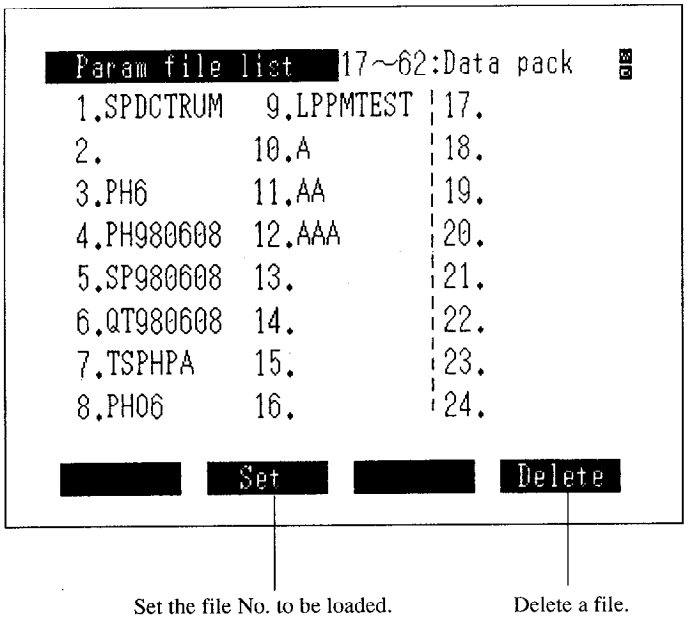


Fig. 3.1.2 Parameter file list

Select [Set] and enter the file No. for the parameters to be loaded. The screen will switch to the Parameters Configuration screen for the measurement mode stored in that file.
You can delete the file corresponding to the specified number after selecting [Delete].

You can also use the ◁ ▷ keys to change the page displayed in the Parameter file list screen.

3.1.2 IC Card [IC Card]/[F2]

This displays the IC card utilities screen.

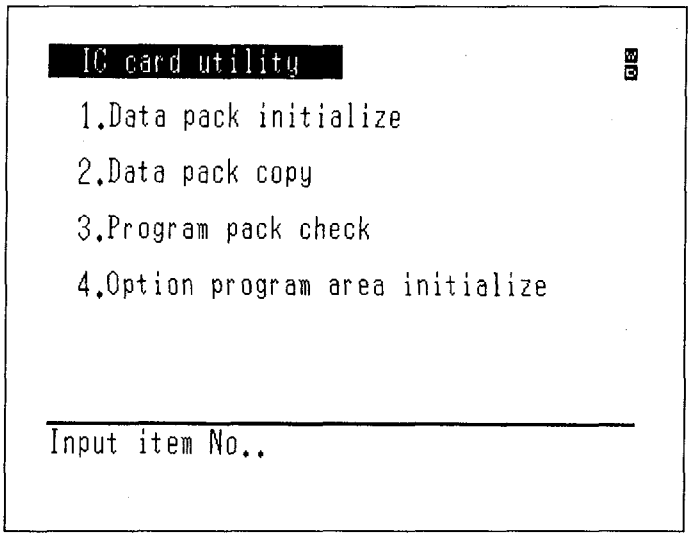


Fig. 3.1.3 IC card utilities screen

There are 4 functions available for the optional IC cards (data pack and program pack).

<1. Data pack initialize>

This function is the equivalent of a disk format on a personal computer.

A data pack absolutely must be initialized before it is used.

CAUTION

Initializing a data pack that is in use will delete all of the information stored on it.

<2. Data pack copy>

This function copies the contents of one data pack to another data pack. Please note that the optional program pack cannot be copied.

<3. Program pack check>

This is to check the contents of the program pack. The results of the title, mode No., version no. and check sum (check for content errors) checks will be displayed.

<4. Option program area initialize>

This function is used for updating the version of the optional programs. The optional programs loaded on the main unit will be deleted.

3.1.3 File Transfer [F3]

The screen will switch to the file fransfer mode screen. This mode is to transfer the data files and parameters filesto an external computer. For the details, see Chapter 10 "File Transfer".

3.1.4 External Control [F4]

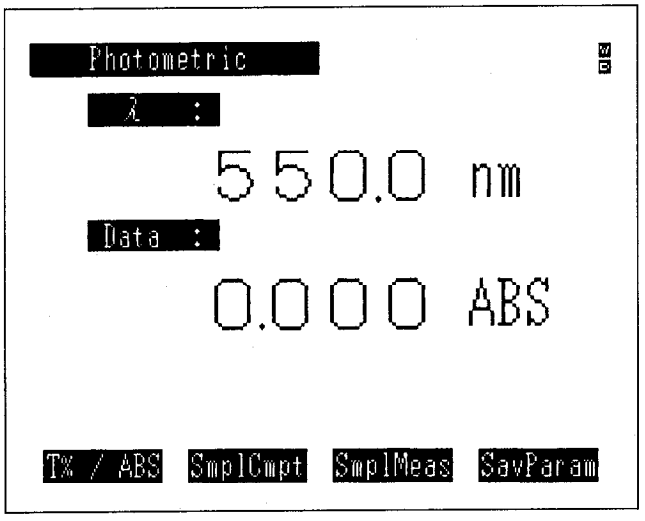
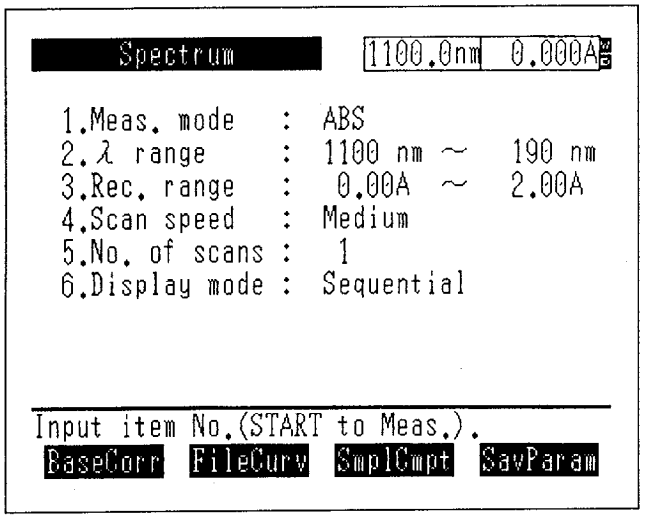
The spectrophotometer can be controlled by an external computer.

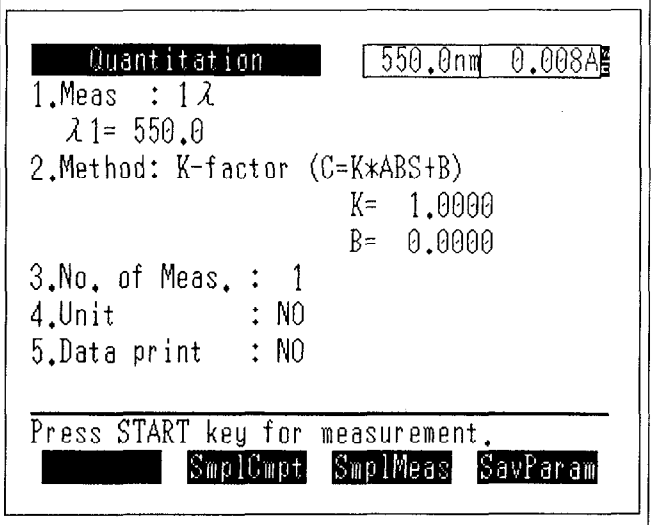
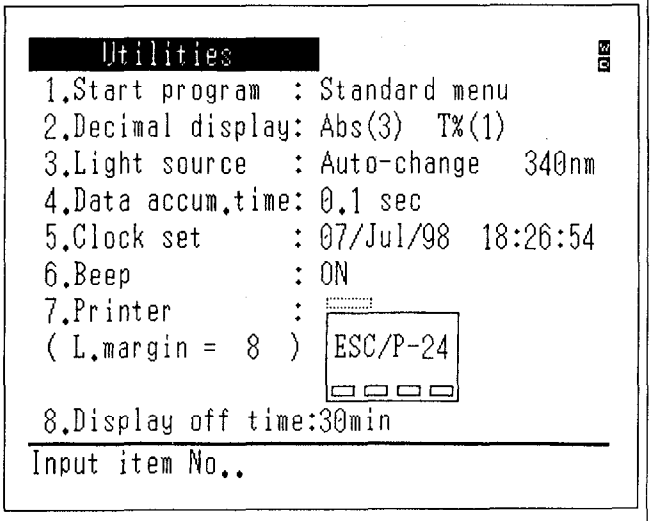
For the details, see Chapter 9 "PC Control."

3.2 Overview of Various Modes

When you select the various modes in the Mode Selection screen, their respective Parameters Configuration screens will be displayed. The Parameter Configuration screen for each mode and an overview of each are shown below.

Table 3.2.1 List of Parameter Configuration Screens

Item	Configuration Screen	Overview of Respective Mode
1.Photometric		Measures the absorbance or % transmittance of a sample at a fixed wavelength. (See Chapter 4 Photometric)
2. Spectrum		Scans a wavelength range to measure the absorbance and % transmittance of a sample as a function of wavelength. Energy measurement of a lamp can also be performed. (See Chapter 5 Spectrum)

Item	Configuration Screen	Overview of Respective Mode
3. Quantitation		Creates a calibration curve from a standard sample and quantitates an unknown sample. Measurement methods are ● 1-wavelength method, ● 2-wavelength method, ● 3-wavelength method. In addition, the following methods are available for calibration curve generation. ● K-factor method ● Single point calibration curve method ● Multi-point calibration curve method (See Chapter 6 Quantitation)
4. Optional Program Pack		Select this when using the optional program pack. (See Chapter 7 Optional Program Pack)
5. Utilities	 Utilities 1.Start program : Standard menu 2.Decimal display: Abs(3) T%(1) 3.Light source : Auto-change 340nm 4.Data accum.time: 0.1 sec 5.Clock set : 07/Jul/98 18:26:54 6.Beep : ON 7.Printer : (L.margin = 8) ESC/P-24 8.Display off time:30min Input item No..	This is the mode for setting and changing the basic operating parameters of the instrument. (See Chapter 8 Utilities)

3.3 Operations Shared by Modes

Operations which are shared by each measurement mode will be explained here. The Operations which are unique to the various modes will be explained in the chapter on the respective mode.

3.3.1 Save Parameters [SavParam]

Photometric	Parameter Configuration screen	(F4) key
Spectrum	Parameter Configuration screen	(F4) key
Quantitation	Parameter Configuration screen	(F4) key

This is the function for saving measurement parameters for the current measurement mode in the instrument memory or a data pack (optional). The stored parameters can be loaded using [Params].

When you select [SavParam], a parameter file list is displayed.

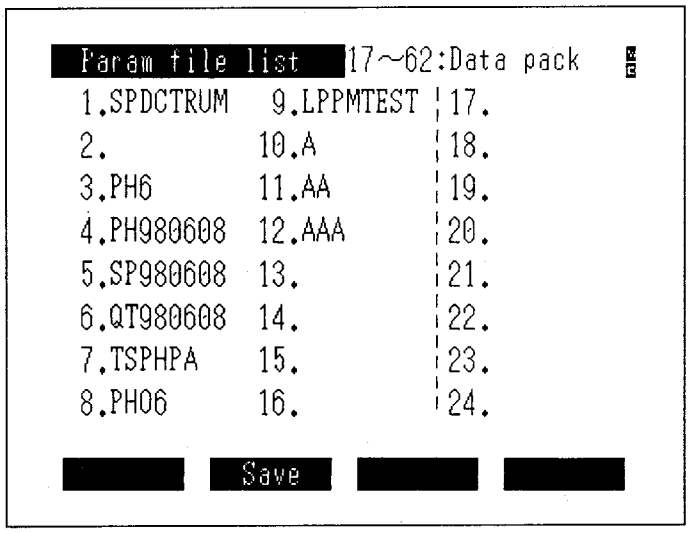


Fig. 3.3.1 Parameter file list

NOTE

Note that the measurement parameter of accessory is connected to sample compartment is not saved.

When you select [Save]/ (F2) key and enter the file No. in which the parameters are to be saved, Character input screen will be displayed.

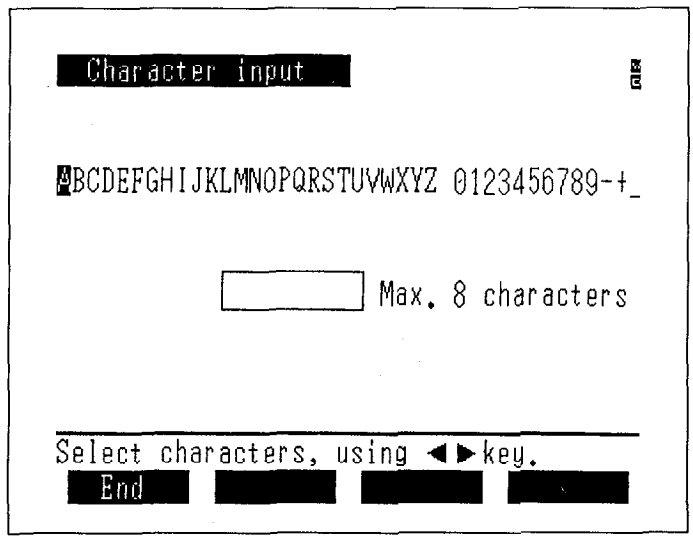


Fig. 3.3.2 Character input screen

Use the ◁ ▷ keys to move the cursor to the character that you wish to enter and then press the [ENTER] key to input the character. The characters 0 through 9 can be directly entered by pressing the corresponding number key. (Up to 8 characters)
If you make a mistake entering a character, you can delete it with the [CE] key.
The space between the Z and 0 (zero) is a "space" which can also be entered. However, a "space" can not be placed at the front of a filename.

When you are finished entering and select [End]/ F1 , the measurement parameters will be saved to the file of the specified number under the filename which was entered.

3.3.2 Save Curve and Call Curve [SavCurve]/[CallCurv]

[SavCurve] is the function which saves spectrum data to a file.
Also, [CallCurv] is the function for loading to the screen curves which have been saved in a file.

Up to 6 curves can be saved in the instrument memory, while a total of 27 can be saved if an optional data pack (optional) is used.
Of these, the data measured in the immediately preceding measurement are automatically saved in the dedicated File No. 0 (zero) under the filename "Original", and data cannot be manually saved to this file using [SavCurve].

When you select [SavCurve] or [CallCurv], a Curve file directory is displayed on the screen. Now, if there are no measurement data from an immediately preceding measurement, the [Save] function will not be displayed.

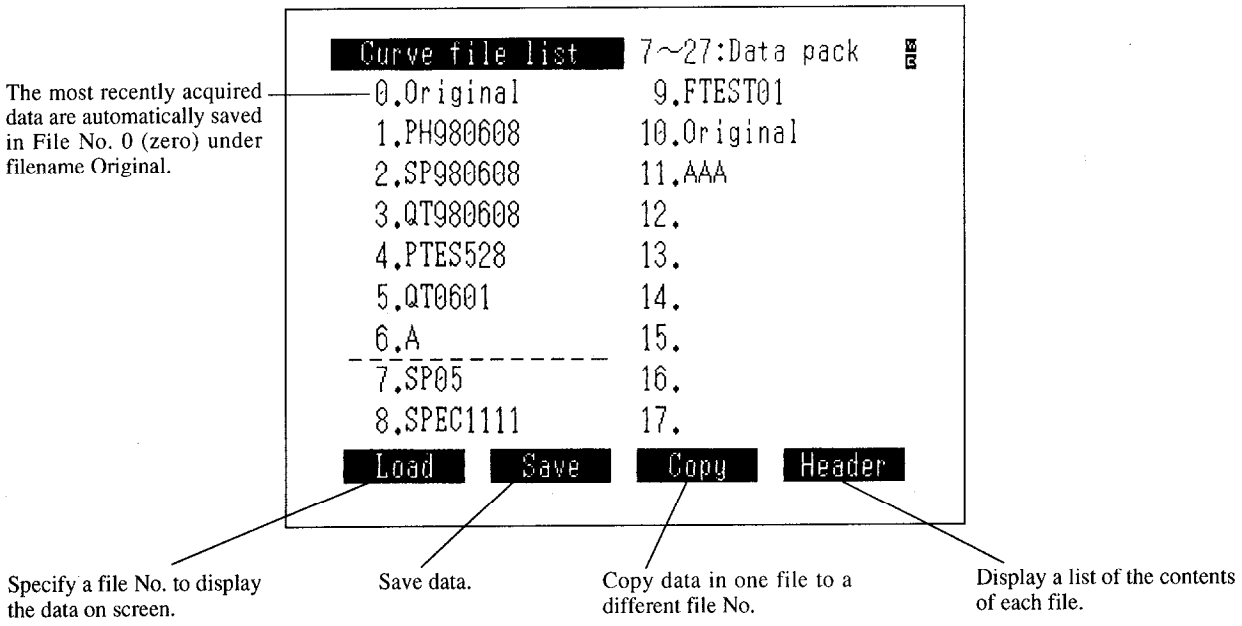


Fig. 3.3.3 Curve file directory screen

The displayed page of the Curve file directory screen can be switched using the ◁ ▷ keys.

[Load] (F1) key ;

This displays the data for the specified file No. on the screen.

If the data type (the vertical axis unit and measured mode are the same) and horizontal axis units match, data can be overlaid on the same screen by consecutively entering file Nos.

When overlaying data, the vertical and horizontal axes for the initially displayed data will be displayed.

NOTE

Since the files which are displayed on the curve file screen or the data file screen use the same area of memory, exactly identical files will be displayed. Consequently, the data files for the various modes are mixed together. Files of different modes cannot be displayed on screens of the measurement mode.

[Save] (F2) key ;

This saves measured or processed data in memory areas No. 1 through 27.

When you press [Save], you will be instructed on the screen to enter a file No. When you enter a file No. 1 through 27, the Character input screen will be displayed.

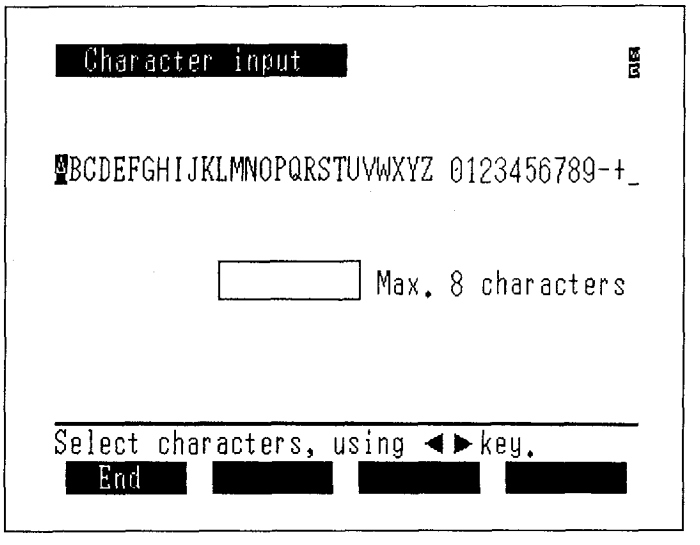


Fig. 3.3.4 Character input screen

Use the (◁)(▷) keys to move the cursor to the character that you wish to enter and then press the [ENTER] key to input the character. The characters 0 through 9 can be directly entered by pressing the corresponding number key. (Up to 8 characters)

If you make a mistake entering a character, you can delete it with the [CE] key.

The space between the Z and 0 (zero) is a "space" which can also be entered. However, a " space" can not be placed at the front of a filename.

When you are finished entering and select [End] , the measurement parameters will be saved to the file of the specified number under the filename which was entered.

[Copy] (F3) key ;

You can copy data between file Nos. 0 through 27. Specify the copy source and copy destination file Nos. as instructed on the screen. No. 0 can't be specified as the destination.

[Header] (F4) key ;

You can display the range of the horizontal axis (wavelength range) and the units thereof (nm) as well as the units of the vertical axis (ABS, T%, E) in the list (Curve file list) so as to see the type of data saved in each of the file Nos. 0 through 27.

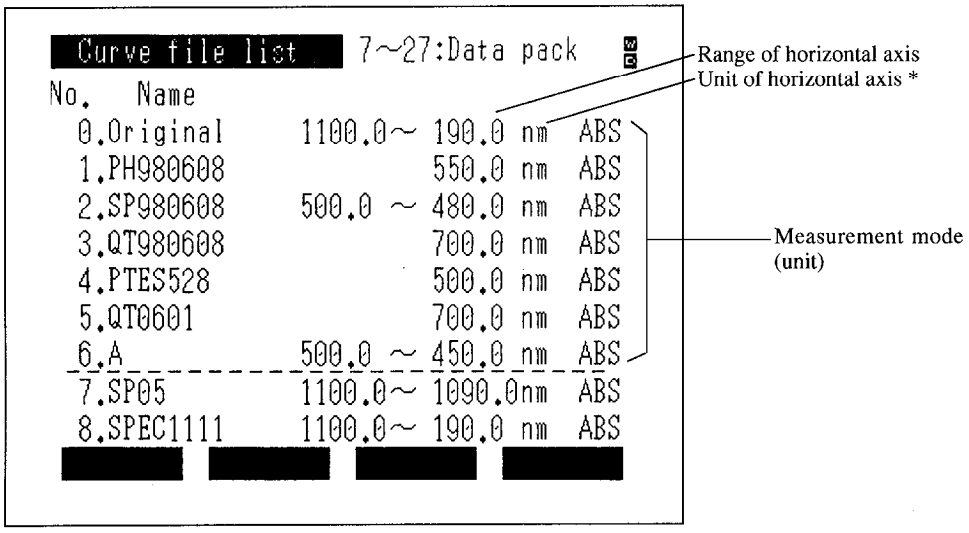


Fig. 3.3.5 Curve file list screen (Header)

* The data for Photometrics or Quantitation will display the measured wavelength.

File No. 0 "Original" ;

The most recently acquired data are automatically saved in the dedicated File No. 0 (zero) under the filename "Original".

The screen can be returned to the immediately preceding condition after file processing, such as display or copy, have been performed by loading file No. 0.

Other data cannot be saved in file No. 0.

3.3.3 Data Management [DataFile]

Photometric	Measurement screen	(F2) key
Quantitation	Measure Unknown Sample screen	(F2) key

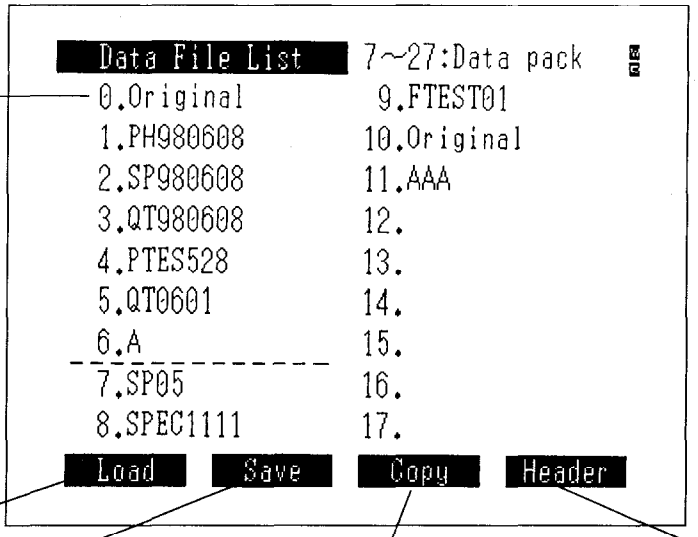
Numeric data tables, such as the photometric values and concentrations obtained in the Photometric and Quantitation modes, can be saved to and loaded from the instrument memory or an data pack (optional).

Up to 6 files of data tables can be saved in the instrument memory, while if an data pack (optional) is also used, a total of 27 files can be saved.

In addition, the maximum quantity of data comprising the various data tables is 227 itms of data for Photometric mode and 185 items of data for Quantitation mode.

Of these, the table data up to the immediately preceding measurement are automatically saved in the dedicated File No. 0 (zero) under the filename "Original".

The Data file list screen is displayed when you select [DataFile].



The most recently acquired data are automatically saved File No. 0 (zero) under filename Original.

Load a data table to the screen.

Save the current measurement data table.

Copy data in one file No. to a different file No.

Display a list of the contents of each file.

Fig. 3.3.6 Data File List screen

The operation of each function is the same as [SavCurve] and [CallCurv].

Now, if there are no measurement data from the immediately preceding measurement, the [Save] function is not displayed.

3.4 Screen Copy and Data Printout

When the priter conafrmed to ESC/P or thermal printer HCP is installed, the UVmini-1240 can print out hard copies of the screen or the measurement results. Connecting this printer makes the following 3 types of printouts possible.

① Hard copy of screen (Fig. 3.4.1)

Press the [PRINT] key to print a hard copy of the screen. Printing of date, function display, and printing area can be selected by setting.

② Print using function keys

When a function key has a [Print Out] function, as in a mode such as Photometrics in which the measurement results are recorded in table form, all of the tabular data will be printed out.

③ Print numeric data for

In modes in which the measurement results are obtained as numeric values, as each measurement is acquired (as with Photometric) these measurements will automatically be printed.

The UVmini-1240 can be connected to a commercially available printer for personal computer that conforms to the printer command ESC/P of EPSON. Connecting to the printer complied with ESC/P enables following output in addition to the above mentioned three types of printouts. Both the ESC/P-24 and the ESC/P-9 are compatible.

④ Print waveform

In the spectrum mode, it is possible to plot the waveform (spectrum) on A4 size paper when it is displayed on the meusurement screen. It is half as large as A4 paper. Examples in each mode by the 24-pin printer are displayed in Fig. 3.4.2.

By pressing the [PRINT] key while the waveform is being displayed, printing of the waveform or its hard copying can be selected.

For the connection of the printer, refer to the "Appendix B Printer".

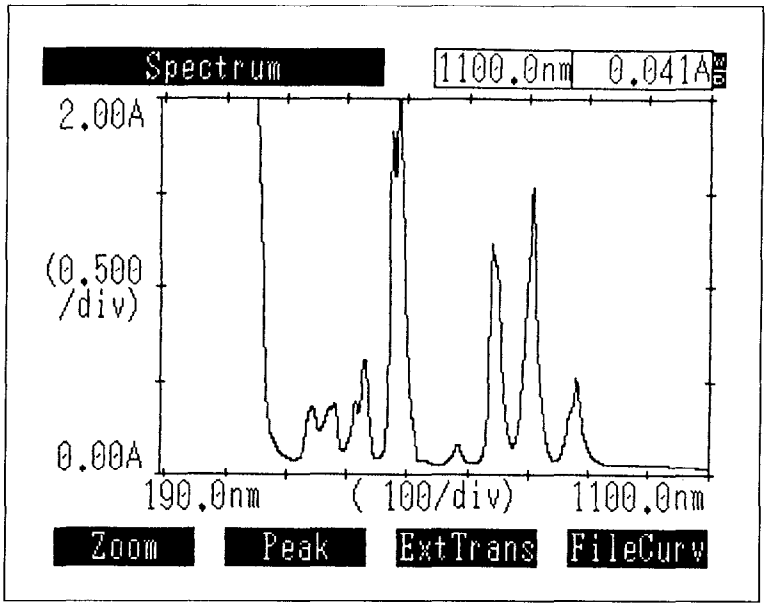


Fig. 3.4.1 Hard copy of screen

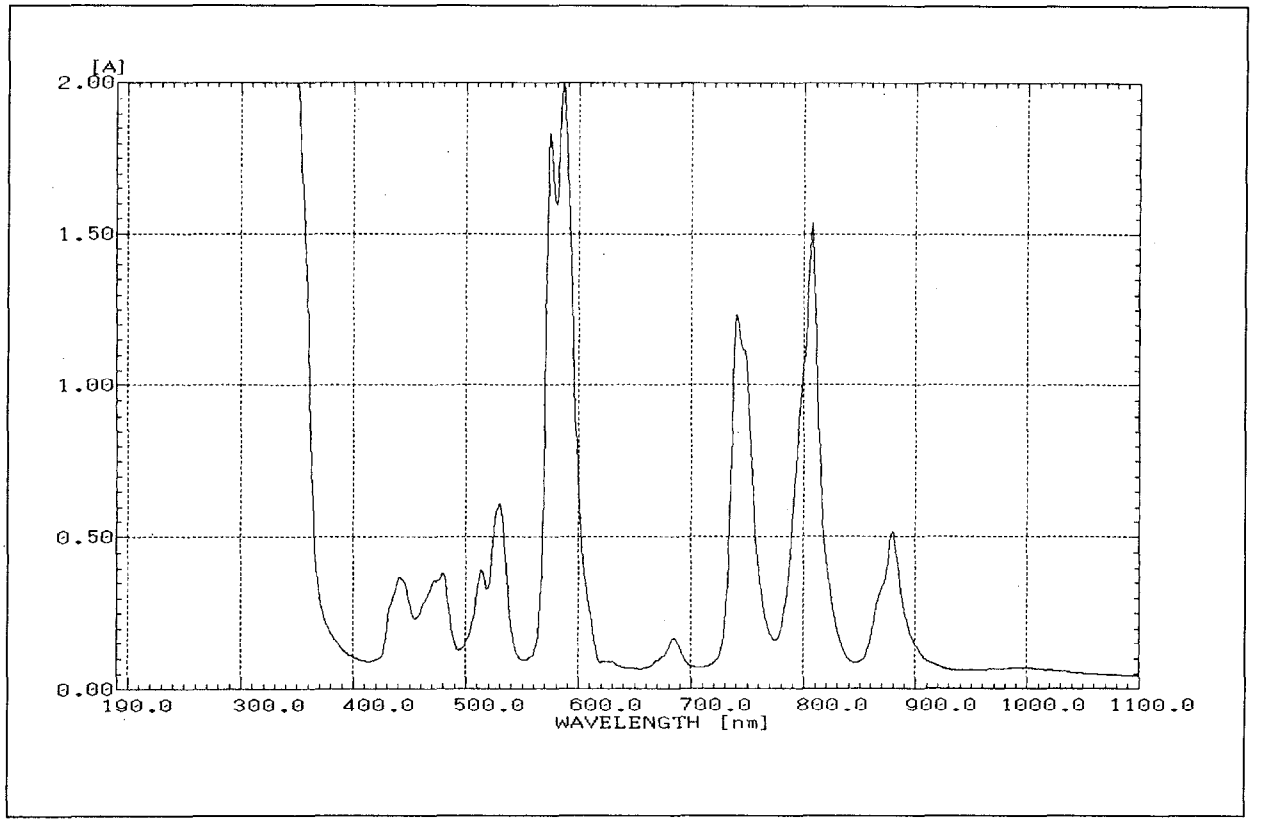


Fig. 3.4.2 Wavefrom print

Chapter 4 Photometric Mode

This is the fixed wavelength measurement mode. This measures the absorbance (ABS) or % transmittance (T%) at a fixed wavelength.

By repeating a measurement, you can create and display a table of the measurement results.

It is also possible to quantitate the results by the K-factor method.

This is a simple quantitation method. A sample concentration C is expressed as C=K*ABS, and when the value for K (K = Conc. of Std / absorbance of Std) is already known, you can enter the value for K and measure the concentration of unknown samples.

Up to 227 items of data can be saved in one file.

CONTENTS

4. 1 Measurement Parameter Configuration Screen 4-1
4.1.1 Set Wavelength 4-1
4.1.2 [T%/ABS] 4-1
4.1.3 Sample Compartment Control [SmplCmpt] 4-1
4.1.4 Save Parameters [SavParam] 4-1
4.1.5 Measurement Screen [SmplMeas] 4-2
4.1.6 Auto zeroing [AUTO ZERO] 4-3
4.1.7 Change Sample No. [Smpl No.] 4-3
4.1.8 Quantitation by K-factor method [Factor K] 4-3
4. 2 Post-measurement Processing 4-4
4.2.1 Data Print and Screen Copy 4-4
4.2.2 Data Management [DataFile] 4-4
4.2.3 Data Display [DataDisp] 4-4

4.1 Measurement Parameter Configuration Screen

When you select <1. Photometric> in the Mode Selection screen, the measurement parameter configuration screen will be displayed.

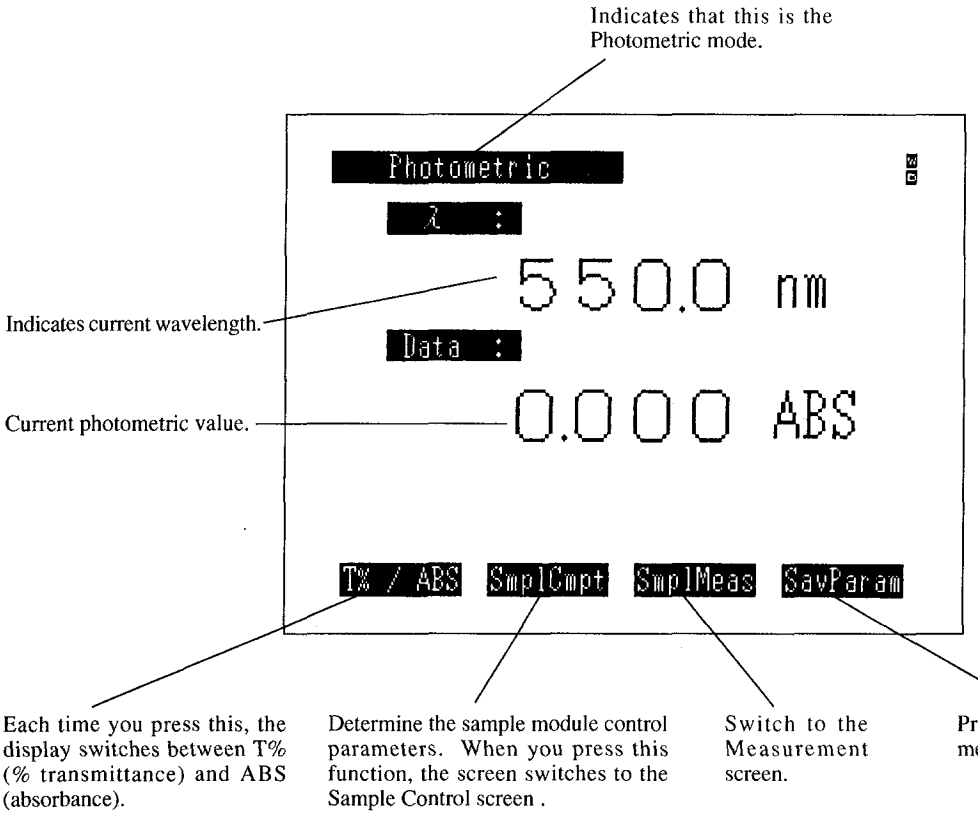


Fig. 4.1.1 Measurement parameter configuration screen

4.1.1 Set Wavelength

Use the [GOTO WL] key to set the wavelength.

4.1.2 [T%/ABS]

You can switch between the % transmittance mode (T%) and absorbance mode (ABS) each time you press the [T%/ABS] key.

4.1.3 Sample Compartment Control [SmplCmpt]

Performs settings of the sample compartment.

The setting items include types of the sample compartment, number of cells, and operation condition of the sipper.

For the details, see Appendix A "Sample Module (Multi-cell and Sipper Operation)."

4.1.4 Save Parameters [SavParam]

You can save the current measurement parameters to internal memory or to a data pack (optional).

(See 3.3.1 Save Parameters)

4.1.5 Measurement Screen [SmplMeas]

Determine the parameters and then press the [SmplMeas] or [START/STOP] key to switch to then measurement screen.

(At the same time that you press the [START/STOP] key, the first measurement will be performed.)

The method of assigning sample Nos. in the measurement screen in Figure 4.1.2 differs when a standard sample compartment, Sipper 160 and syringe sipper (both options) are used, and when a multi-cell and CPS-240 (all options) are used.

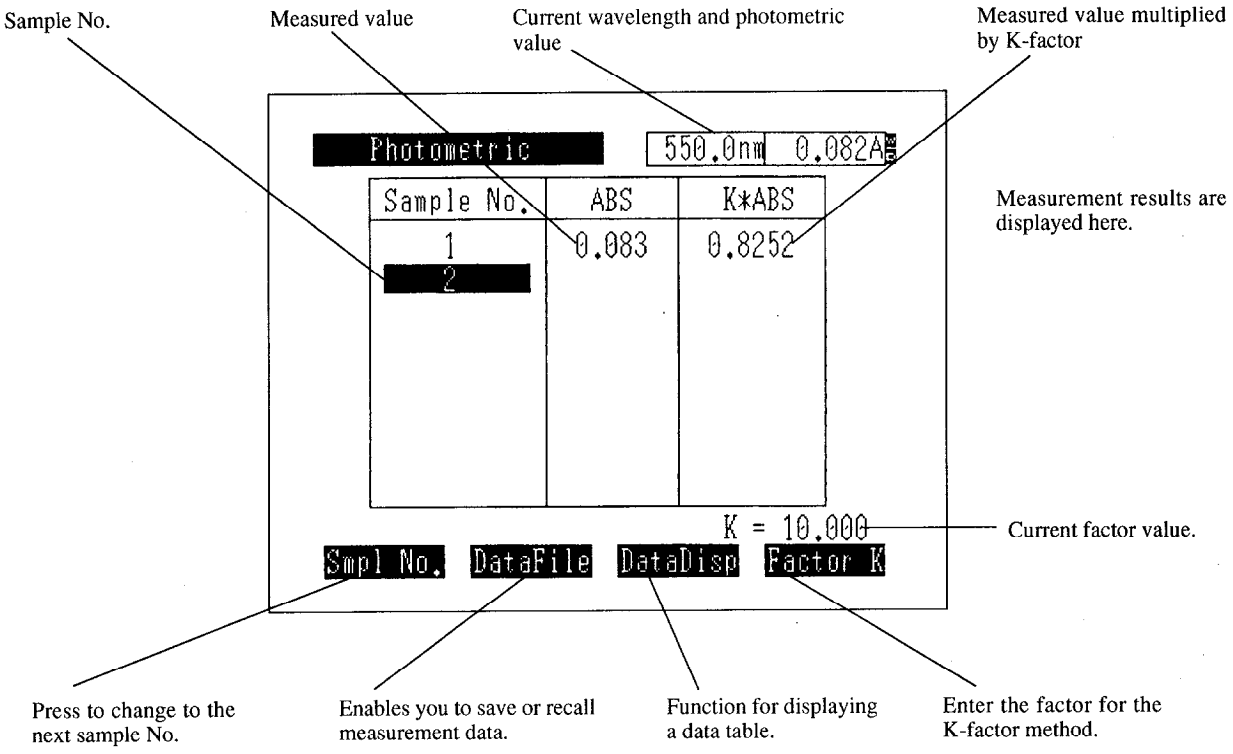


Fig. 4.1.2(A) Photometric measurement screen (for standard cell holder or when only one cell is being used)

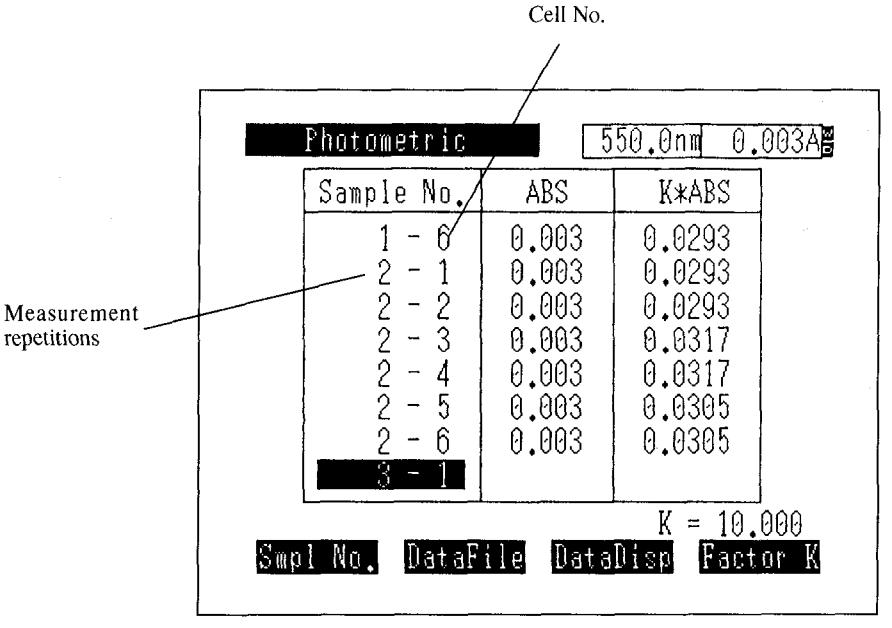


Fig. 4.1.2(B) Photometric measurement screen
(when up to 6 cells are occupied when using a multi-cell or CPS-240A)

4.1.6 Auto zeroing [AUTO ZERO]

When blank correction is necessary, set the blank sample and press the [AUTO ZERO] key before measurement. The photometric value at this time will be set to 0ABS (100%).

4.1.7 Change Sample No. [Smpl No.]

You can reassign the number for the next sample being measured by prossing [Smpl No.] (F1) in the measurement screen.

The sample number input range is 0 to 9999.

4.1.8 Quantitation by K-factor method [Factor K]

When the absorbance and concentration are directly proportional, this is a simple quantitation method that calculates the concentration by multiplying the absorbance by a certain conversion factor K.

In the measurement screen, select [Factor K] and then enter the value for K from the keyboard as instructed on the screen.

The current value for K is displayed in the lower-right of the screen. In addition, the value for factor * absorbance =K * ABS is displayed in the right-hand column of the table.

In the transmittance mode, the value for factor K*T% is displayed in the right-hand column of the table.

NOTE

When performing quantitation by the K-factor method, it is suggested that the measurement mode be set to ABS (absorbance).

4.2.1 Data Print and Screen Copy

When a printer (optional) is connected, the measurement results will be printed on the printer for every measurement. At the same-time, the same data will be output to the RS-232C port.

No.	ABS	K*ABS
1	0.082	0.8203
2	0.082	0.8203
3	0.082	0.8191
4	0.082	0.8191
5	0.082	0.8191
6	0.082	0.8203
7	0.082	0.8203
8	0.082	0.8203
9	0.082	0.8203
10	0.082	0.8215
11	0.082	0.8191

Fig. 4.2.1 Sample printout

You can also print a hard copy of the current screen on the printer by pressing the [PRINT] key.

4.2.2 Data Management [DataFile]

This function is for saving the measurement data to memory, or calling up data to the screen.
(See 3.3.3 Data Management [DataFile])

4.2.3 Data Display [DataDisp]

This function is for displaying a list of measurement data including the ones disappeared from the screen. (When measurement is repeated, the data are scrolled up one after another leaving only up to seven items of data of the latest measurements displayed on the screen.)
Using this function, it is also possible to print data list table or to delete data.

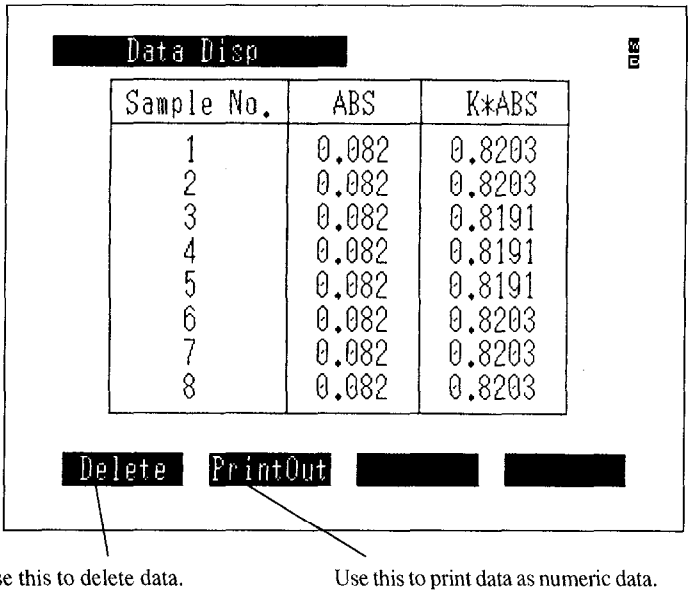


Fig. 4.2.2 Data Display screen (Photometric mode)

Using the △ or ▽ key, each eight items of data can be scrolled at one time.

[Delete] F1 key ;

This enables you to delete the entire numeric data table at once.

[PrintOut] F2 key ;

This enables you to print all of the data as a numeric data table on the printer (optional). (The [PRINT] key on the keyboard will give a hard copy of the screen currently being displayed.)

No.	ABS	K*ABS
1	0.082	0.8203
2	0.082	0.8203
3	0.082	0.8191
4	0.082	0.8191
5	0.082	0.8191
6	0.082	0.8203
7	0.082	0.8203
8	0.082	0.8203
9	0.082	0.8203
10	0.082	0.8215
11	0.082	0.8191
12	0.082	0.8191
13	0.082	0.8191
14	0.082	0.8179

Fig. 4.2.3 Printer output (Photometric mode)

On this occasion, the same data is output to the RS-232C port. The output format of the data is the same as the print output example shown in Fig. 4.2.3. At the end of each line, [CR](0Dh) and [LF] (0Ah) codes are output. At the end of each data, [SB](1Ah) code is displayed.

The transfer specifications of the RS-232C are as follows.

Baud rate	: 9600 bps
Data bit length	: 7
Stop bit	: 1
Parity	: Odd number (odd)
X parameter	: None

For the connection cable, see Chapter 9, "9.1 Connecting to a PC."

NOTE

The external transmission function comprises one-direction transmission of data from the UVmini-1240. Data transmission is executed continuously in one direction at a speed which presumes that the data are being loaded to a PC. Data are output from the RS-232C port approximately every 20ms. While this speed will be appropriate for most PCs, data may be lost with a slower PC. In addition, if you connect a printer to the RS-232C interface and attempt to print the transmission data, all of the data may not be able to be printed if the printer has a small internal buffer.

Chapter 5 Spectrum Mode

This is the mode in which spectral measurement is performed.

There are three types of measurement available: ABS (absorbance), T% (% transmittance) and single beam E (energy).

Measured spectra can be saved to memory and be subjected to various data processing such as display scale change and peak detection.

CONTENTS

5. 1 Measurement Parameter Configuration Screen 5-1
5.1.1 Setting Parameter Items 5-2
5.1.2 Baseline Correction [BaseCorr] 5-4
5.1.3 Call Curve [CallCurv] 5-4
5.1.4 Sample Compartment Control [SmplCmpt] 5-4
5.1.5 Save Parameters [SavParam] 5-4
5. 2 Measurement 5-5
5. 3 Post-measurement Processing 5-6
5.3.1 Read Cursor 5-6
5.3.2 Enlarge/Reduce [Zoom] 5-6
5.3.3 Peak detection 5-8
5.3.4 External Transmission [ExtTrans] 5-9
5.3.5 Save Curve [SavCurve] 5-10
5.3.6 Waveform printing 5-10
5. 4 Scanning Speed and Data Sampling Interval 5-11

5.1 Measurement Parameter Configuration Screen

When you select <2. Spectrum> in the Mode Selection screen, the measurement parameter configuration screen will be displayed.

The setting items of measurement parameter configuration screens differ slightly for the ABS (absorbance) and T% (% transmittance) measurement modes (Fig. 5.1.1) and for the E (energy) measurement mode (Fig. 5.1.2).

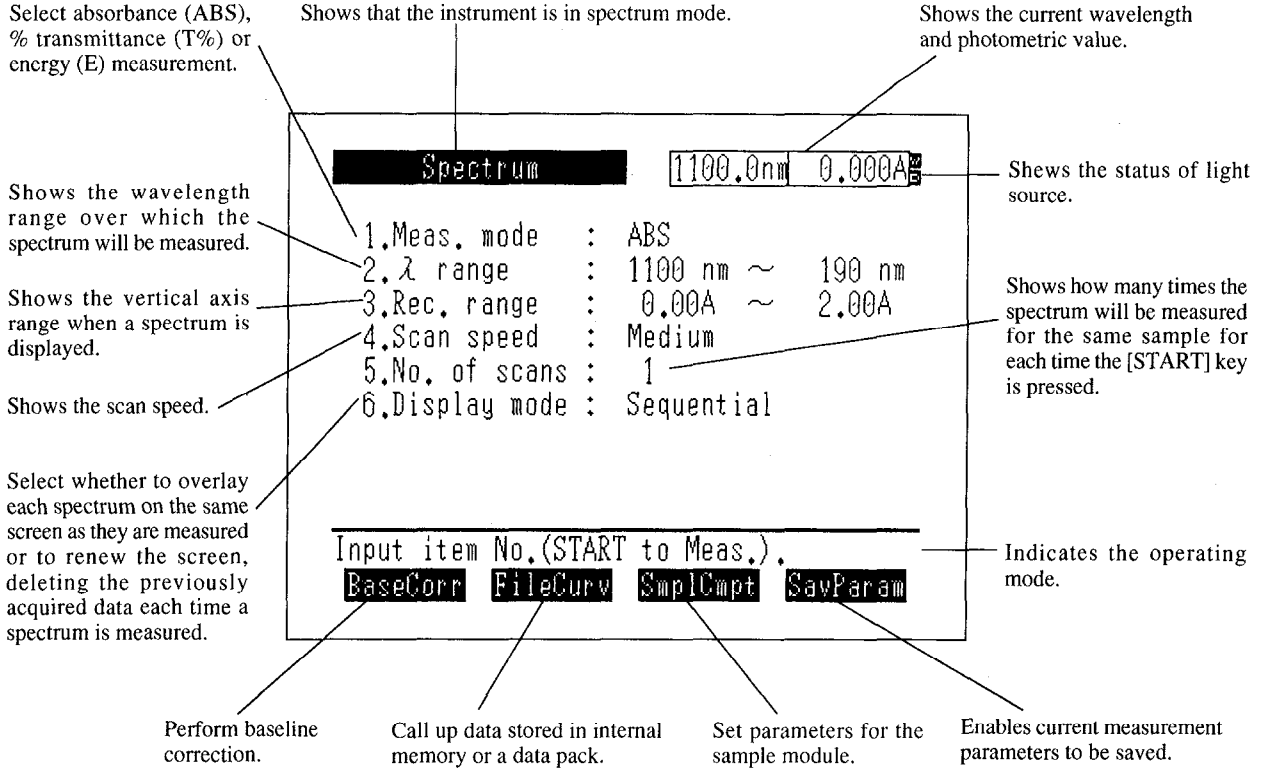


Fig. 5.1.1 Measurement parameter configuration screen (ABS, T% modes)

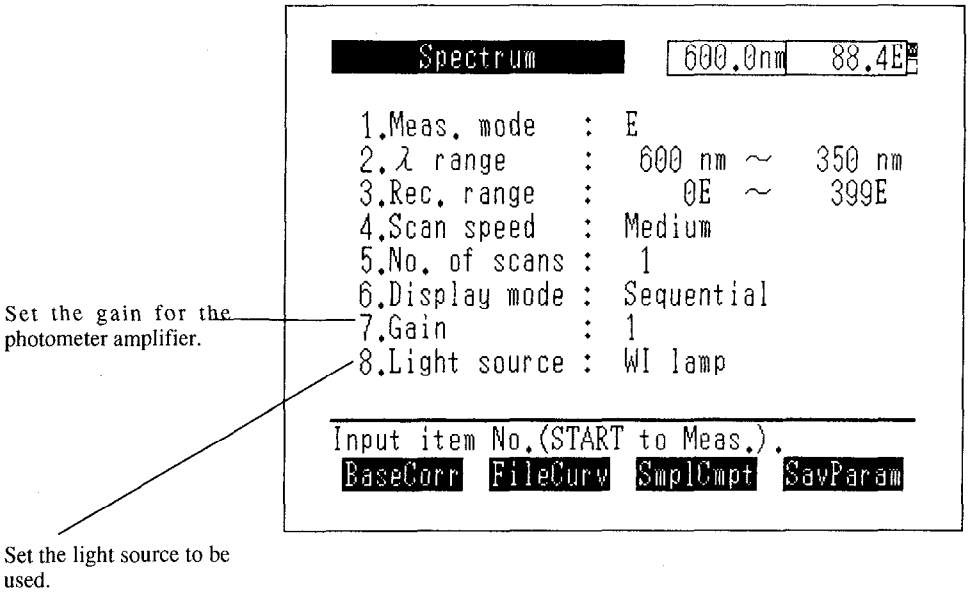


Fig. 5.1.2 Measurement parameter configuration screen (E mode)

5.1.1 Setting Parameter Items

Set the measurement parameter for each item using key dialogue.

<1. Meas. mode>

Successive selection of item number 1 cycles from ABS -> T% -> E. Simultaneously, the range in <3. Rec. range> also cycles from ABS, T% to E.

<2. λ range>

Set the range of the wavelength scan. Enter the scan starting and ending wavelength, in that order. The wavelength input range is 190nm to 1100nm and the starting wavelength must be the longer wavelength of the two.

The minimum scan range is 1nm.

(Scan start wavelength) - (Scan end wavelength) >= 1nm

<3. Rec. range>

Set the range for the vertical axis during spectrum recording. Input ranges

ABS : ± 3.99A

T% : ± 399%

E : ± 399E

<4. Scan speed>

The following 5 wavelength scanning speed levels are available.

1. Very Fast
2. Fast
3. Medium
4. Slow
5. Very Slow

Selecting the scan speed substantially means selecting the data sampling interval. The faster the speed, the wider the sampling interval becomes making the data points less. As a result, shorter time is required for scanning.

However, when the scan range is set wide, due to the limit of the memory capacity to store data (within 1,000 data points), the sampling interval becomes wide even when selecting low speed, leaving the scan speed not varied very much from that in the case of high speed.

(See 5.4 Scanning Speed and Data Sampling Interval)

<5. No. of scans>

Set the number of times a scan will be repeated.

If this is set to 2 or more times, the interval setting will be displayed with the scanning repetitions on the same display line.

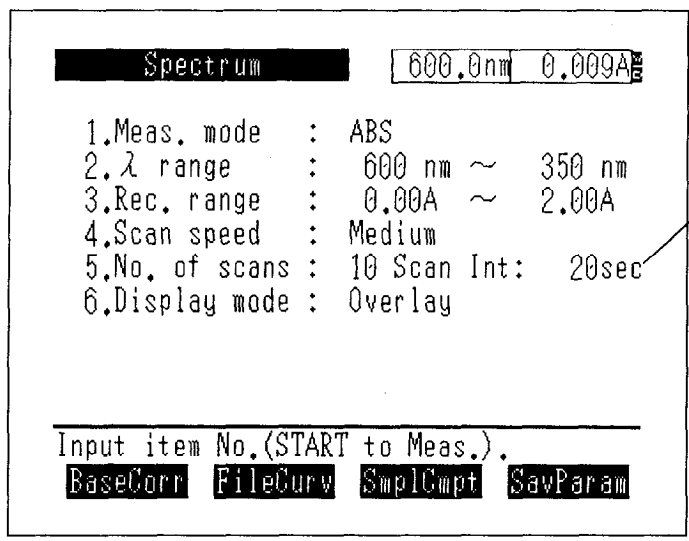


Fig. 4.3 Parameter Configuration screen with scan interval displayed

When you press the [START/STOP] key once, measurement will be repeated only the set number of times. The scan interval is the time from the scan starting time to the next starting time.

If the time required for the actual scan is longer than the set time for the scan interval, the next scan will be performed without any wait time.

On this occasion, the cycle of the parameter is changed to the time actually required.

If the set scan interval time is longer than the time required for the actual scan, the next scan will start after waiting the amount of time equal to the difference between the two times. During the wait time, the number of remaining scan repetitions and the remaining wait time will be displayed.

<6. Display mode>

This parameter will toggle between Sequential<->Overlay each time this item is selected.

Sequential; The screen is renewed for each scan and only the spectrum from that measurement is displayed.

Overlay; The spectrum display for each scan is left as it is so that multiple spectra are overlaid in the display. If the No. of scans is set to 2 or more, each spectrum will be overlaid on the preceding spectra.

<7. Gain> (E mode only)

This will be displayed only in the E (energy) mode.

This sets the gain for the photometer amplifier so that measurement can be performed without saturation of the energy curve.

The minimum setting is 1 and the maximum is 6. Sensitivity is increased by approximately 4 times

<8. Light Source> (E mode only)

This will be displayed only in the E (energy) mode

Select the light source when performing energy measurement. Measurement will be performed using the light source selected here, regardless of the setting of light source selected in the utilities mode.

WI lamp: The light source is set to the tungsten iodine lamp.

D2 lamp: The light source is set to the deuterium lamp.

OFF: Turns OFF both the WI and D2 lamps. The light source mirror position is not determined.

5.1.2 Baseline Correction [BaseCorr]

This allows you to set a blank sample and correct the baseline under the measurement parameters which have been set.

To abort correction, press the [START/STOP] key.

5.1.3 Call Curve [CallCurv]

This allows you to recall data which have been stored in the instrument memory or a data pack (optional) to the screen.

(See 3.3.2 Save Curve and Call Curve [SavCurve]/[CallCurv])

5.1.4 Sample Compartment Control [SmplCmpt]

Perform the settings for the sample compartment.

The setting items include type of the sample compartment, number of cells, and operation condition of the sipper.

For the details, see Appendix A, "Sample Module (Multi-cell and Sipper Operation)."

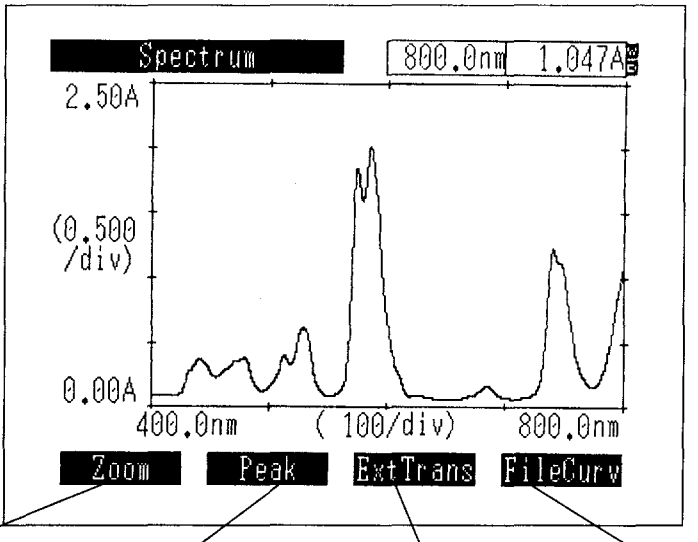
5.1.5 Save Parameters [SavParam]

You can save the current measurement parameters to the instrument memory or a data pack card (option).

(See 3.3.1 Save Parameters [SavParam])

5.2 Measurement

Once you have determined the parameters and press the [START/STOP] key, the display will switch to the measurement screen and measurement will begin. The measurement screen at the end of measurement be similar to that shown in Figure 5.2.1.



Enables you to change the ranges on the vertical and horizontal axes.

Detects and displays peaks and valleys.

Transmits the data to an external computer, etc.

Enables you to save the spectrum to memory.

Fig. 5.2.1 Measurement screen

Press the [START/STOP] key again to interrupt measurement.

The measurement results can be output to the printer (optional) as a hard copy of the screen by pressing the [PRINT] key. When connected to a printer conforming to the ESC/P, it is possible not only to print a hard copy but to plot the spectrum in a half size of A4 paper. (Waveform printing)

Pressing the [RETURN] key returns the display to the measurement parameter configuration screen. On this occasion, in order to display the measurement data again, specify "0: Original" by [CallCurv] on the parameter configuration screen.

However, please note that only the data measured last time is displayed where the overlaying measurement is being performed, even though the above operation is made.

5.3 Post-measurement Processing

After measurement is completed, you can perform the following types of data processing.

5.3.1 Read Cursor

You can read the photometric value at any wavelength on the spectrum using the cursor.

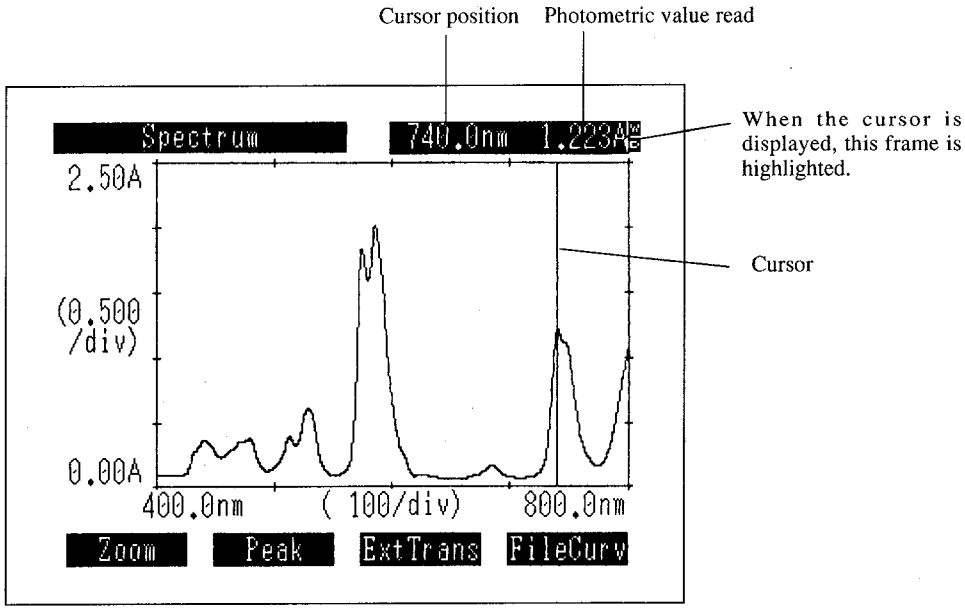


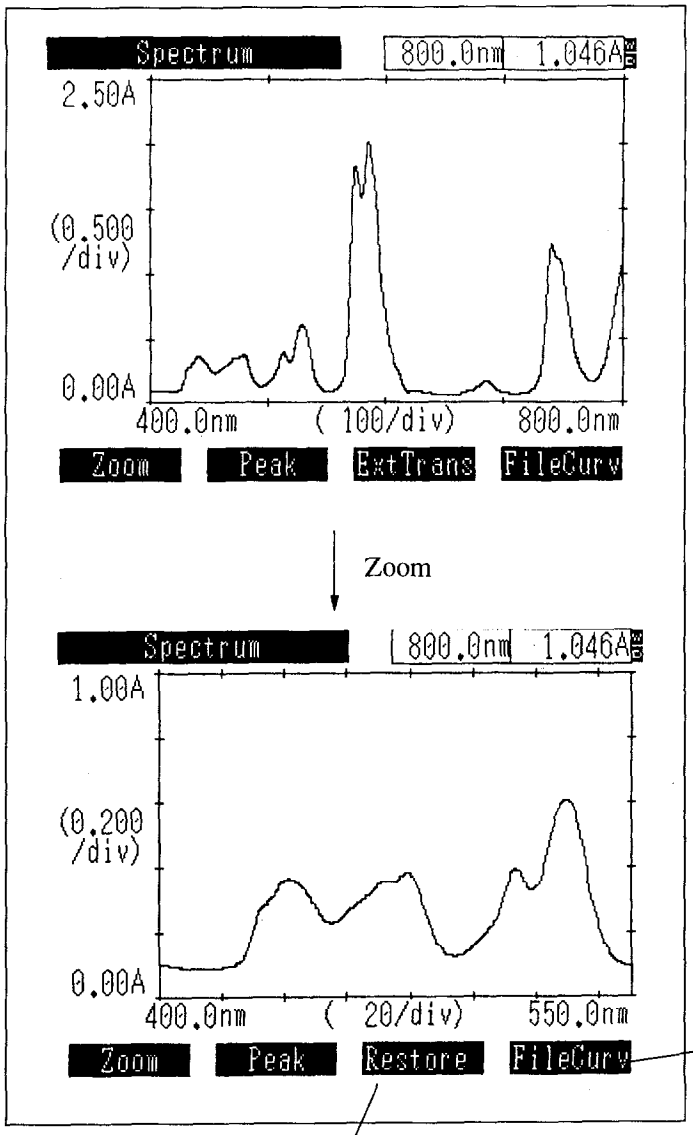
Fig. 5.3.1 Read cursor screen

In a screen in which a spectrum. is being displayed, the cursor will be displayed when you press a cursor key (◁▷). Hold the cursor key down to move the cursor quickly. At the same time, The frame at the top-right of the screen which normally displays the current wavelength and data will be highlighted and the wavelength and photometric value at the cursor position can be read.
Press any key except for a cursor key ◁▷ and the [PRINT] key to make the cursor disappear.
When Rec. mode is Overlay, the wavelength and photometric value at the cursor position will be displayed for the most recently displayed curve.

5.3.2 Enlarge/Reduce [Zoom]

You can enlarge and reduce the spectrum by changing the ranges of the vertical and horizontal axes of the displayed spectrum.
(Enlargement is available for the horizontal axis only.)

Select [Zoom] and enter the values for the vertical axis maximum and minimum and horizontal axis minimum and maximum, in that order, to change the ranges on the vertical and horizontal axes.
If you press the ◁▷ keys while entering horizontal axis values, the cursor will be displayed, enabling data values to be read directly from the curve. Press [Enter] while the cursor is displayed and the value of the point on the horizontal axis on which the cursor is resting at that time will become the entered value.



(A)

(B)

Spectrum screen
Select [Zoom]

Example where the 0~1Abs range on vertical axis and the 400~550nm range on the horizontal axis in (A) is zoomed.

Saves the data in (B).

Restores the display to the original data (A).

(A) Spectrum screen

(B) Zoomed screen

Fig. 5.3.2 Zoom function

Select [Restore] to return the zoomed data to the original data.
Even if you execute [Zoom] again, [Restore] will return to the (A) display.

You can save the data resulting from the [Zoom] by selecting [SavCurve] in the (B) display (see 3.3.2 Save Curve and Call Curve).

NOTE

1) If curves are overlaid on the screen using the [CallCurv] function, a [Zoom] will be executed only on the data which were displayed on the screen first, and the other data will be deleted from the screen.
2) When measurement results have been overlaid, a [Zoom] command will be executed on the most recently acquired data; all other data will be deleted.

5.3.3 Peak detection

This detects the peaks or valleys in the curve data and displays a list of the results. When selecting [Peak] or [Valley], the peak table shown in Fig. 5.3.3 is changed over. Up to 20 peaks, valleys can be detected.

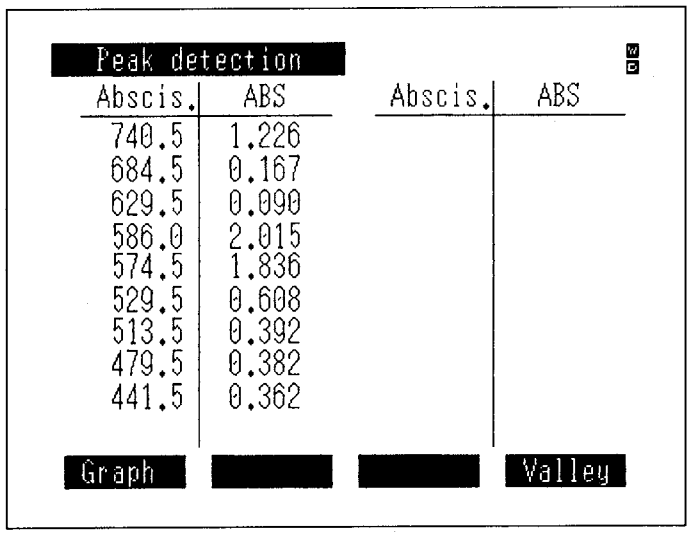


Fig. 5.3.3 Peak detection (Peak table)

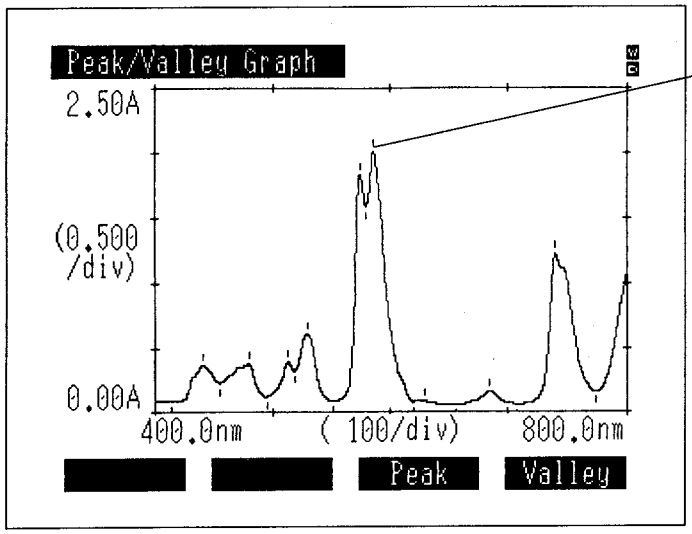


Fig. 5.3.4 Peak detection screen

When selecting [Graph] in the Peak detection screen, the curve data with the mark indicating peaks and valleys will be displayed. When you press the [RETURN] key on the Peak detection screen, the data before peak detection (without mark) will be displayed.

5.3.4 External Transmission [ExtTrans]

The spectrum data can be transferred to external devices such as computer via RS-232C port. This is used when saving data on a PC and the like.

The data is output from the long wavelength side with the wavelength and its measurement values arranged in pair.

The data format is as follows.

Absorption:	ZZZZ.Z □□ SX.XXXY[CR][LF]
Other than absorption:	ZZZZ.Z □□ SXXX.XY[CR][LF]

Z is wavelength, X and Y are measurement values, and □ is a space code. S indicates the codes of a measurement value. When it is negative, "-" is output and when it is positive or 0, a space code is output. Y is output only when the number of data display digit is set to Abs (4) T%(2) in the Utilities mode. Either of [CR](0Dh) or [LF](0Ah) is output for each data pair.

[SB](1Ah) is output at the end of each data.

The transfer specifications of the RS-232C are as follows.

Baud rate	: 9600 bps
Data bit length	: 7
Stop bit	: 1
Parity	: Odd number (odd)
X parameter	: None

For the connection cable, see Chapter 9, "9.1 Connecting to a PC."

NOTE

The external transmission function comprises one-direction transmission of data from theUVmini-1240. Data transmission is executed continuously in one direction at a speed which presumes that the data are being loaded to a PC. Data are output from the RS-232C port approximately every 20ms. While this speed will be appropriate for most PCs, data may be lost with a slower PC. In addition, if you connect a printer to the RS-232C interface and attempt to print the transmission data, all of the data may not be able to be printed if the printer has a small internal buffer.

5.3.5 Save Curve [SavCurve]

This enables you to save the spectrum data to the instrument memory or a data pack (optional).
(See 3.3.2 Save Curve [SavCurve])

5.3.6 Waveform printing

Waveform printing functions when printer selection is set to the ESC/P-24 or the ESC/P-9, and the printer compatible to the printer command ESC/P is connected.

When spectrum is displayed on the measurement screen, its waveform can be plotted on A4 size paper. The size is half of the A4 size paper. An output example is shown in Fig.3.4.2. The example was output by a 24-pin printer. Waveform printing or its hard copying can be selected by pressing the [PRINT] key while the waveform is being displayed.

Select waveform printing using the △ or ▽ key and press the [ENTER] key.

The grid for the output data can be selected among the following four grids. Select the one you desire using the △ or ▽ key and press the [ENTER] key.

The waveform to be printed by the waveform printing is either the data of the latest measurement or the data that has been initially called by Call Curve (Save Curve.) When more than one waveform is displayed by overlapping, the one which has been measured last will be printed.

5.4 Scanning Speed and Data Sampling Interval

The data sampling interval is determined by the set scanning speed and the scanning wavelength range. According to these two setting conditions, the data sampling interval is determined as shown in Table 5.4.1.

Table 5.4.1 Data Sampling Interval

		Scan range (Start wavelength to end wavelength) [mm]			
		Less than 100 nm	Less than 200 nm	Less than 500 nm	500 nm or more
Scan speed	Very Slow	0.1	0.2	0.5	1.0
	Slow	0.2		0.5	1.0
	Medium	0.5			1.0
	Fast	1.0			
	Very Fast	2.0			

The wider the data sampling interval is, the less the obtained data point becomes, which substantially makes the scan speed faster.

Another condition relating to the scan speed is the value for the data accumulation time set in the Utilities mode of the main unit. The longer the data accumulation time is set, the noise becomes less in the data to be obtained. However, this requires more time to obtain data and as a result, scan speed decreases. The scan speed becomes almost as follows according to the set values of the data sampling interval and the data accumulation time. (Table 5.4.2)

Table 5.4.2 Scan speed [nm/min.]

		Set values of the data accumulation time [sec]		
		0.05	0.1	0.2
Data sampling interval [nm]	2.0	1400	800	480
	1.0	700	400	240
	0.5	350	200	120
	0.2	140	80	48
	0.1	70	40	24

NOTE

When setting of the data accumulation time is changed, baseline correction must be performed again.

Chapter 6
Quantitation Mode

CONTENTS

6. 1 Measurement Parameter Configuration Screen 6-2
6.1.1 Measuremen Parameters 6-2
6.1.2 Sample Compartment Control [SmplCmpt] 6-7
6.1.3 Measurement Screen [SmplMeas] 6-7
6.1.4 Save Parameters [Savparam] 6-7
6. 2 Creating Calibration Curve 6-8
6.2.1 Inputting concentration 6-8
6.2.2 How to Input Absorbance for Single Point Calibration Curve 6-8
6.2.3 How to input absorbance of multi-point calibration curve 6-9
6.2.4 Concentration Table 6-10
6.2.5 Calibration Curve Display 6-11
6.2.6 Changing the Concentration Table 6-12
6. 3 Unknown Sample Measurement (Quantitation) 6-13
6.3.1 Measurement Screen 6-13
6.3.2 Changing the Sample Number 6-15
6.3.3 Data Management [DataFile] 6-15
6.3.4 Data Display [DataDisp] 6-15
6.3.5 Display Equation [Equation] 6-18
6. 4 Two/Three-wavelength Quantitation Method 6-19
6.4.1 Two-wavelength Quantitation 6-19
6.4.2 Three-wavelength Quantitation 6-19

6 Quantitation Mode

This is the mode in which unknown samples are quantitated by creating a calibration curve from standard samples. The following 3 types of quantitation are available depending on the number of wavelengths used in the measurement method:

- One-wavelength method
- Two-wavelength method
- Three-wavelength method

The two/three-wavelength methods create the calibration curve and measure the unknown sample using several wavelengths. These are effective in eliminating the effects of dispersion due to interfering components and contaminants and in correcting "floating" of the baseline due to bubbles. For more details, see "6.4 Two/Three-wavelength Quantitation Method".

The following 3 methods are available for creating calibration curves.

- K-factor (C=K*ABS+B) method
- Single point calibration curve method
- Multi-point calibration curve method

The K-factor method is one in which you manually enter the factors K and B for the calibration curve.

The Single point method is one in which the calibration curve is created by measuring a single standard sample.

The multi-point method is one in which the calibration curve is created by measuring multiple (up to 10) standard samples. The multi-point method will not only create a straight line, but can also generate 2nd and 3rd order curve fits of the data.

The quantitated data can be saved to memory or a data pack (optional). Up to 185 data can be saved per file.

6.1 Measurement Parameter Configuration Screen

When you select <3. Quantitation> in the mode selection screen, the measurement parameters configuration screen in Figure 6.1.1 will be displayed.

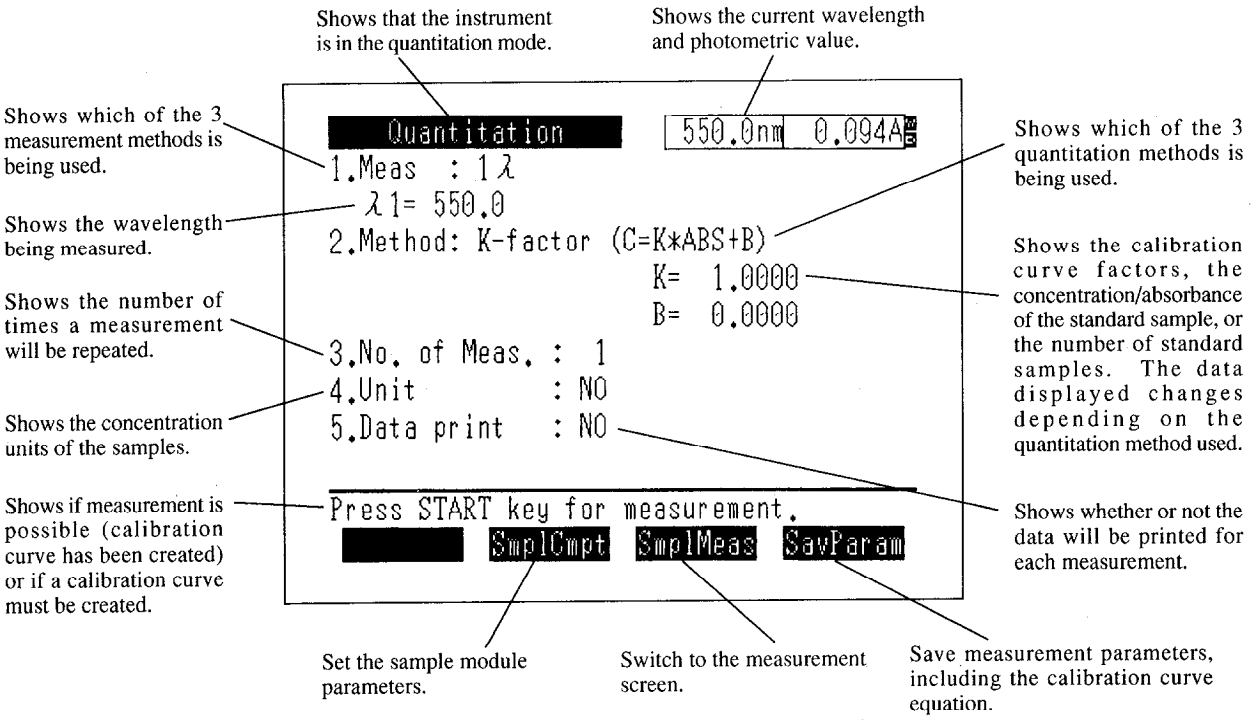


Fig.6.1.1 Measurement parameter configuration screen

6.1.1 Measuremen Parameters

Set the various measurement parameter items in a dialogue format. Select the parameter to be set by entering the item number.

<1. Meas.> (Measurement method)

The measurement method selection screen is shown in Figure 6.1.2.

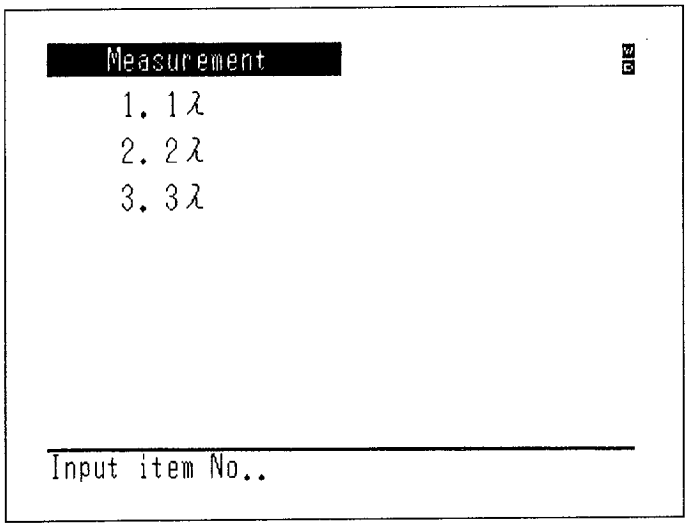


Fig.6.1.2 Measurement method selection screen

Select the measurement method from the following 3 types and then enter the measurement wavelength as instructed on the screen.

1 λ

Enter measurement wavelength λ_1.

2 λ

Enter measurement wavelengths λ_1 and λ_2. λ_1 and λ_2 will be set in the order they were entered.
(See 6.4 Two/Three-wavelength Quantitation Method)

3 λ

Enter measurement wavelengths λ_1, λ_2 and λ_3. λ_1, λ_2 and λ_3 will be sorted automatically in the order of $\lambda_1 > \lambda_2 > \lambda_3$ after they were entered.
(See 6.4 Two/Three-wavelength Quantitation Method)

<2. Method> (Quantitation method) ... (Create calibration curve)

The quantitation method can be selected from 3 methods, as shown in the screen in Figure 6.1.3. If you select single point calibration curve or multi-point calibration curve, create the calibration curve before measuring the unknown sample.

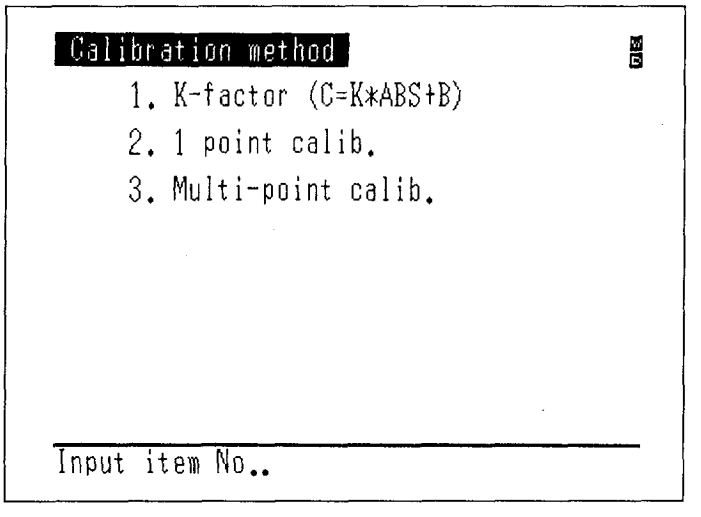
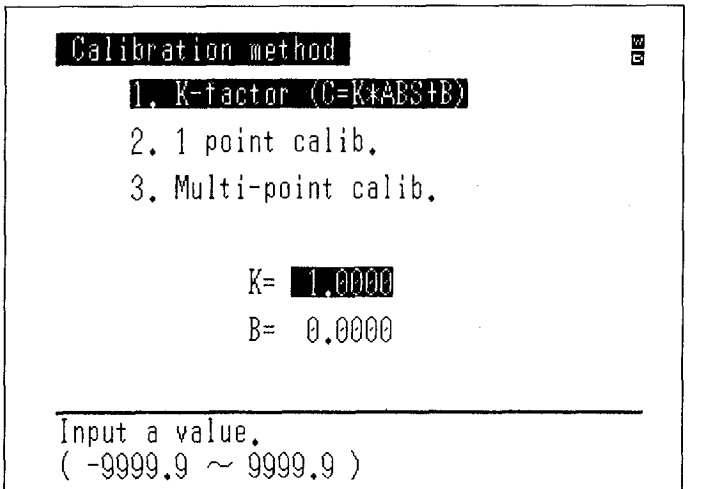


Fig.6.1.3 Quantitation method selection screen

K-factor (C=K*ABS+B)

The relationship between the concentration C and absorbance ABS of a sample is expressed as C=K*ABS+B, and when the values for the constants K and B are already known, you can manually enter the values for K and B to create the calibration curve.

If you enter K and B, you can set a blank sample, press the (AUTO ZERO) key to set ABS=0 and immediately measure the blank sample.



Single point calib.

This will measure the concentration of an unknown sample by finding the value for K in the calibration curve equation C=K*ABS from a single standard sample of known concentration. The calibration curve will be a straight line defined by the origin and the absorbance and concentration of the standard sample.Selecting single point calibration turns the parameter configuration screen to the one shown in Fig. 6.1.5. Press the [START/STOP] key to enter the calibration curve creation screen (Concentration table).

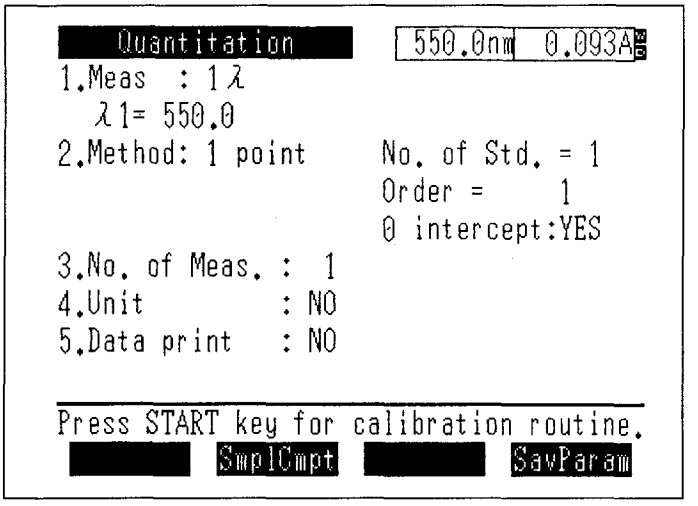


Fig.6.1.5 Prameter configuration screen (Single point calibration curve)

Multi-point calib.

1st/2nd/3rd order calibration curves can be created by the least square method from 1 to 10 standard samples of known concentrations.

Enter the number of standards samples (1-10), the order number (1-3) and whether or not to pass through the origin according to the instructions on the screen.

The number of standard samples must be more than the order number of the calibration curve when "0 intercept: YES" is selected, and must be more than (order number + 1) when "0 intercept: NO" is selected.

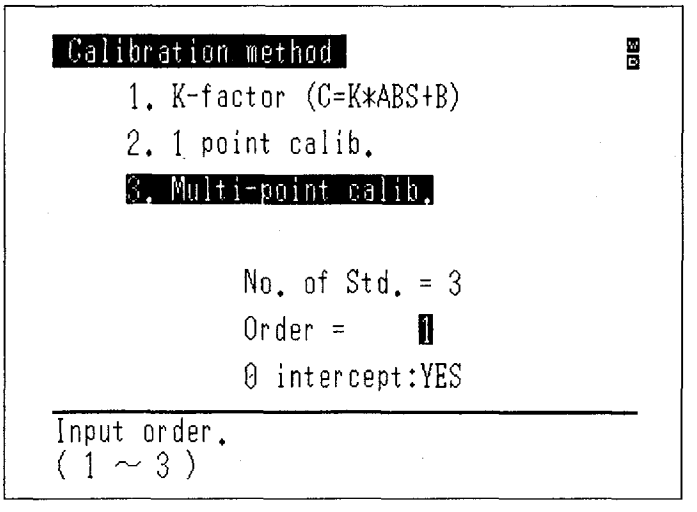


Fig.6.1.6 Multi-point calibration curve parameter configuration screen

When setting of the items is completed, the screen will return to the parameter configuration screen. (Fig. 6.1.7) If you press the (START/STOP) key at this time, the display will switch to the

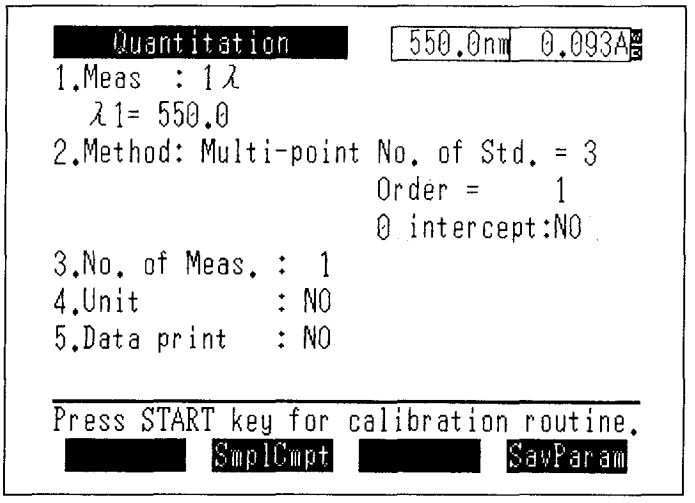


Fig.6.1.7 Prameter configuration screen (Multi-point calibration curve)

<3. No. of Meas.> (Number of Measurements)

Determine how many times the same sample will be measured during measurement.

If this is set to 2 or more, the average value of the multiple measurements will be used as the ABS value for the standard sample when the calibration curve is created. When measuring an unknown sample , the measured value for each repetition and the average value will be displayed.

(See 6.3.1 Measurement Screen)

NOTE

If you interrupt repetitive measurements by pressing the (RETURN) key, the average value will not be computed.

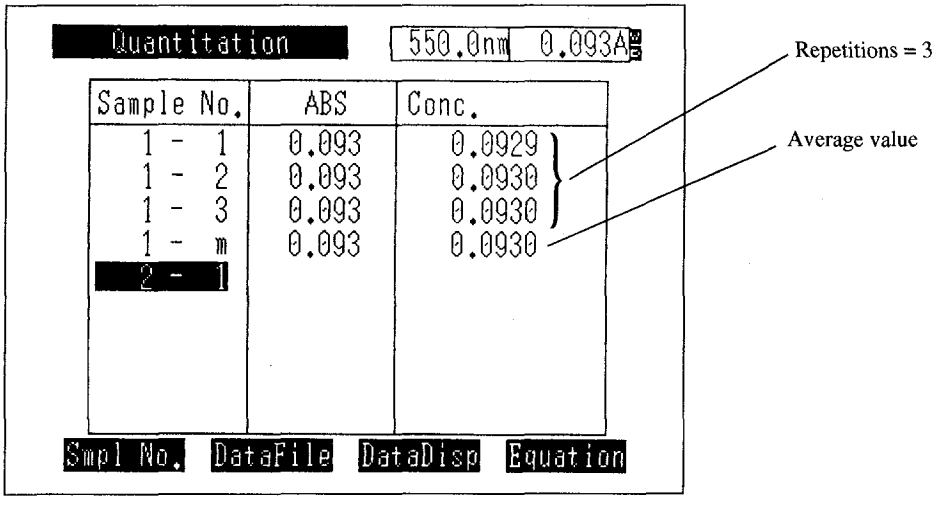


Fig.6.1.8 Sample data display screen (Unknown sample measurement screen)

NOTE

When a multi-cell or CPS-240 (all options) is used and the number of cells has been set to 2 or more, the No. of Meas. function takes precedence. In this case, automatic measurement using multiple cells cannot be performed.

<4. Unit>

Specify the unit of concentration using number 0 through 9.

Also, you can register and use an arbitrary unit (its name can be set using up to 6 characters).

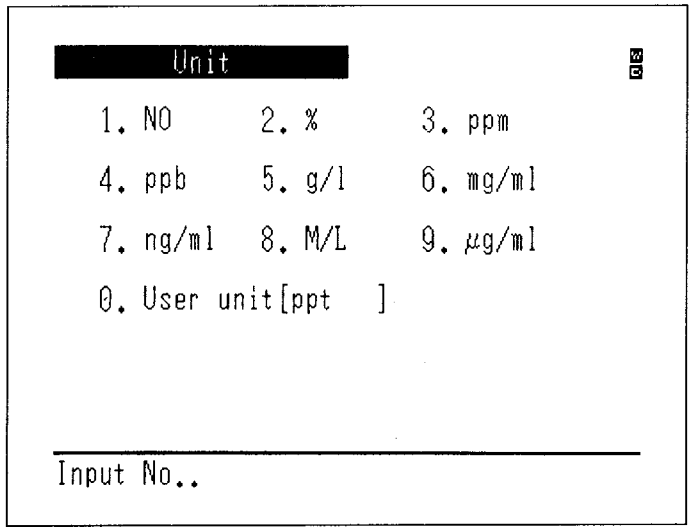


Fig.6.1.9 Unit input screen

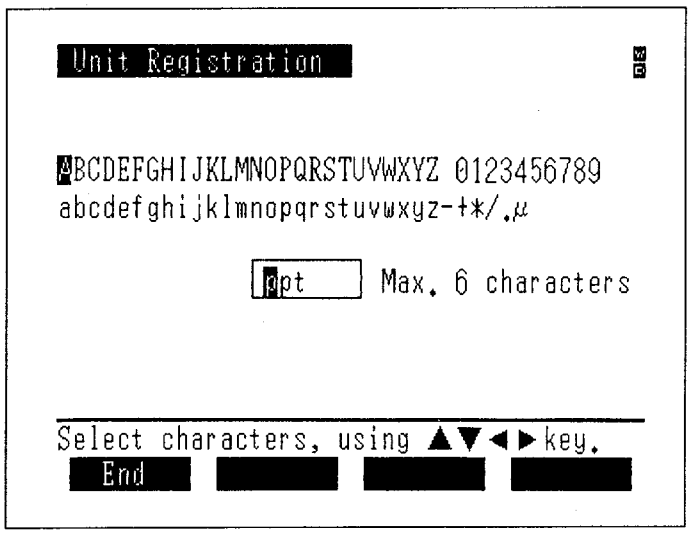


Fig.6.1.10 Unit registration screen

Use the △, ▽, ◁, ▷ keys to move the cursor to the character that you wish to enter and then press the ENTER key to input the character. The characters 0 through 9 can be directly entered by pressing the corresponding number key. (Up to 6 characters)

If you make a mistake entering a character, you can delete it with the CE key.

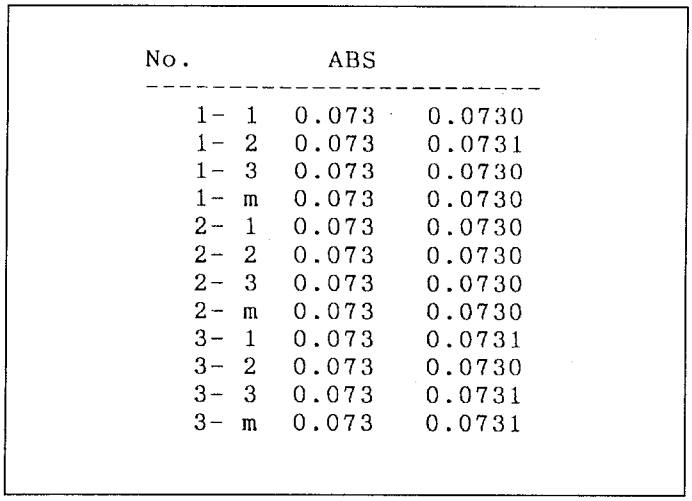
The space between the Z and 0 (zero) is a "space" which can also be entered.

When you are finished entering and select End, the unit is registered.

<5. Data print>

You can select whether or not to print the data for each measurement to the printer (optional).

(See 6.3.1 Measurement Screen)



No.	ABS	
1- 1	0.073	0.0730
1- 2	0.073	0.0731
1- 3	0.073	0.0730
1- m	0.073	0.0730
2- 1	0.073	0.0730
2- 2	0.073	0.0730
2- 3	0.073	0.0730
2- m	0.073	0.0730
3- 1	0.073	0.0731
3- 2	0.073	0.0730
3- 3	0.073	0.0731
3- m	0.073	0.0731

Fig.6.1.11 Sample printout

When data print is set to "YES", the data for each unkown sample measurement will be printed to the printer.

<6. Baseline correction>

This screen is displayed when two-or three-wavelength quantitation is selected.

Set a blank sample and perform baseline correction in the specified wavelangth range. To cancel correction, press the (START/STOP) key.

6.1.2 Sample Compartment Control [SmplCmpt]

Set the parameters such as the sample module being used, the number of cells, etc.

Perform the settings for the sample compartment.

The setting items include type of the sample compartment, number of cells, and operation condition of the sipper.

For the details, see Appendix A, "Sample Module (Multi-cell and Sipper Operation).

6.1.3 Measurement Screen [SmplMeas]

Switch to the screen for unknown sample measurement.

(See 6.3.1 Measurement Screen)

6.1.4 Save Parameters [Savparam]

This enables you to save the current measurement parameters, including the calibration curve which has been created, to the instrument memory or an data pack (optional).

(See 3.3.1 Save Parameters [SavParam])

6.2 Creating Calibration Curve

If single point calibration curve or multi-point calibration curve is selected for quantitation method, it is necessary to create calibration curve before performing measurement (quantitation) of the unknown sample.

When the (START/STOP) key is pressed on the parameter configuration screen, the concentration table is displayed on the screen and creation of a calibration curve starts. (Fig. 6.2.1)

6.2.1 Inputting concentration

First, input the concentration of the standard sample (STD). When inputting the concentration of more than one standard sample, the order of inputting the values is irrelevant to high/low of concentration.

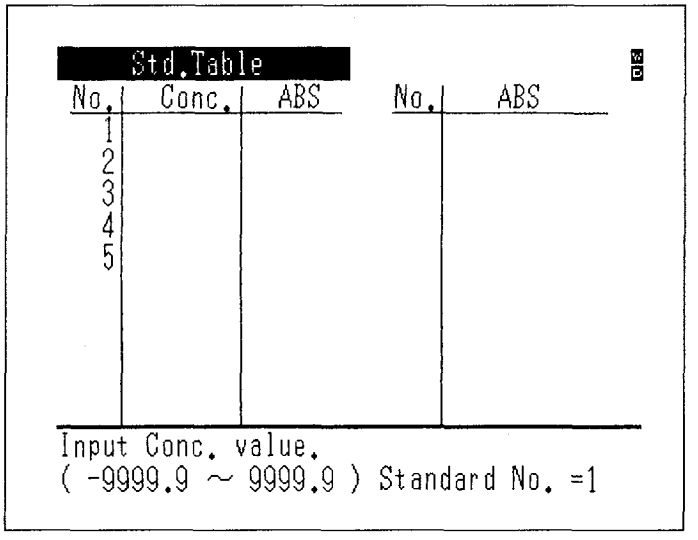


Fig.6.2.1 Concentration table (Concentration input)

After inputting the concentration of all the standard samples, determine the absorbance (ABS value) of the standard samples. How to input the absorbance is different for single point calibration curve and for multi-point calibration curve. For a multi-point calibration curve, sequential measurement input is made possible by the multi-cell.

6.2.2 How to Input Absorbance for Single Point Calibration Curve

The following two kinds of method are provided for inputting the ABS value.

1) Key input

   The numerical value of ABS is input by the keyboard.

2) Measurement input (only Cell 1 is used.)

   Set the standard samples and press the (START/STOP) key.

   In the case of multi-cell or the CPS-240 (all options), only Cell 1 is used.

6.2.3 How to input absorbance of multi-point calibration curve

The following three kinds of input method are provided.

1) Key input

The numerical value of absorbance is input by the keyboard.

2) Measurement input (Only cell 1 is used.)

Set the standard samples in Cell 1 of the standard sample compartment or the multi-cell in due order. Start measurement by pressing the (START/STOP) key.

3) Multi-cell sequential measurement input

Set the standard samples in the multi-cell, micro multi-cell, or CPS-240 from Cell 1 in due order. Start a sequential measurement by pressing the (START/STOP) key.

If the number of the standard samples is larger than that of the accessory cells, measurement is possible by replacing the cells in the middle. For example, if measurement is performed with eight standard samples using a 6-position multi-cell, measurement is performed for up to 6 cells by pressing the (START/STOP) key. To measure the remaining two, replace the cell (filling the cells from the one with the smaller number), press the (START/STOP) key again.

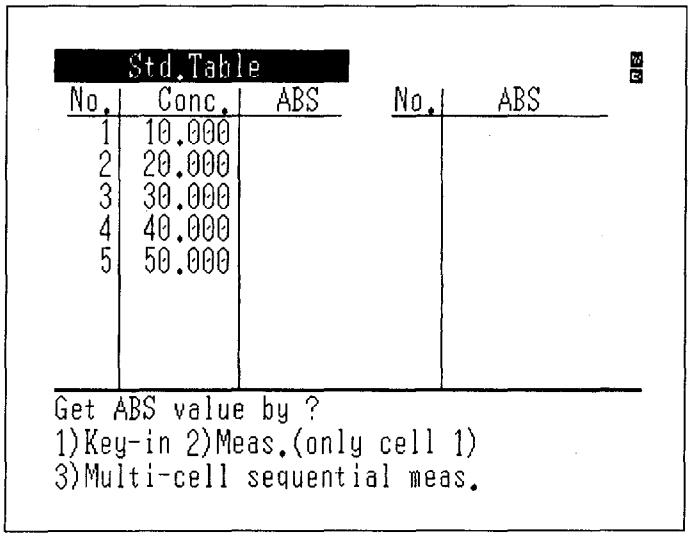


Fig.6.2.2 Multi-point calibration curve creation screen

If the number of repetitions is set to 2 or higher in the parameter configuration screen, an indicator of the number of repetitions will be displayed and the average value will be used to determine the K value. The results of each measurement will be displayed in the measurement value table on the right. After the repetitive measurements are completed, the average value (represented by m at the bottom of the right side) will be displayed in the concentration table on the left.

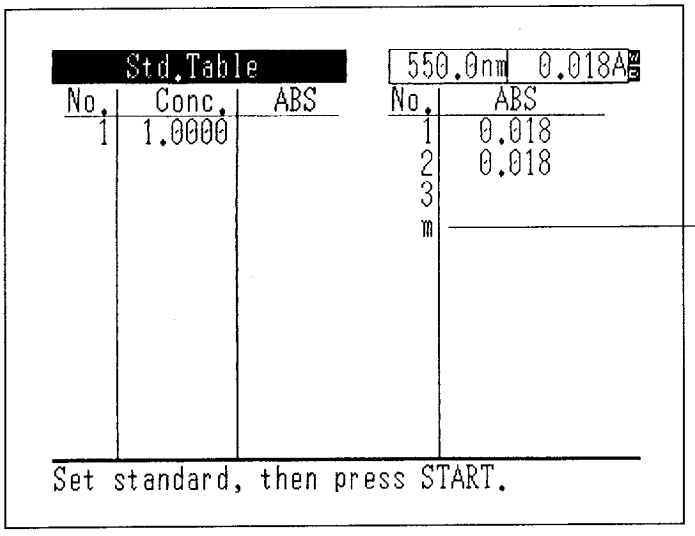


Fig.6.2.3 Single point calibration curve creation screen

6.2.4 Concentration Table

After ABS values have been input completely, a list of concentration and absorbance is completed.

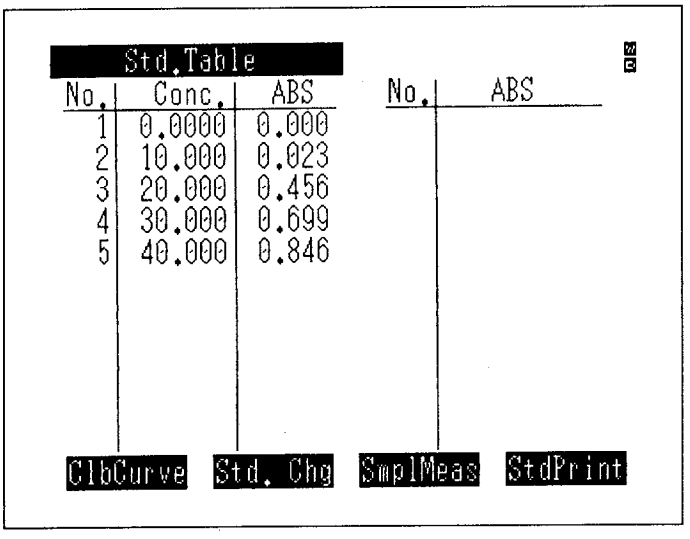


Fig.6.2.4 Concentration table screen

CalCurve (F1) key ;

Displays calibration curve.

Std. Chg (F2) key ;

Changes, deletes, and adds the standard sample data.

StdPrint (F4) key ;

Outputs the concentration table data to a printer. On this occasion, the same data is output to the RS-232C port.

6.2.5 Calibration Curve Display

A single point or multi-point calibration curve which has been created can be displayed on the screen by selecting [CalCurve] in concentration table screen.

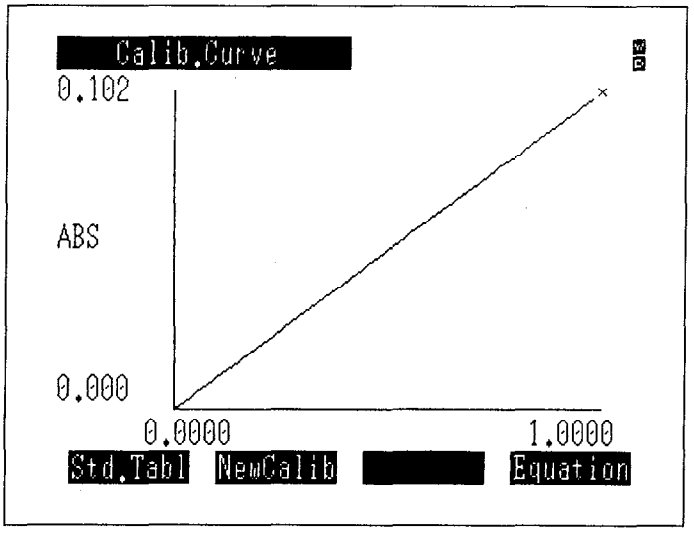


Fig.6.2.5 Single point calibration curve display

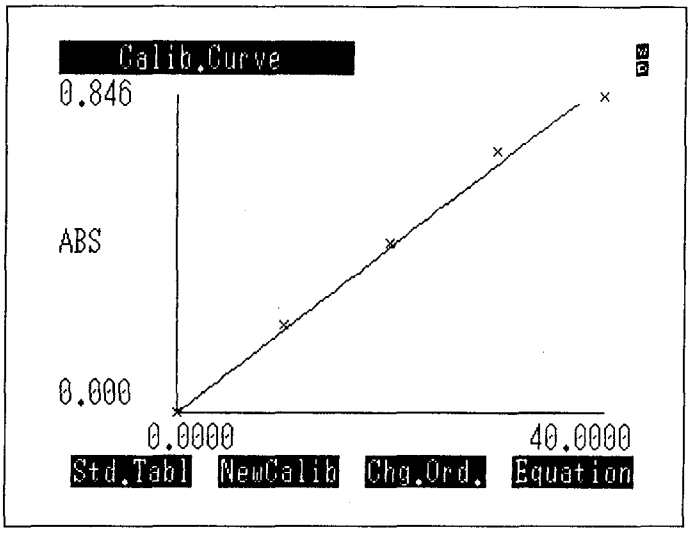


Fig.6.2.6 Multi-point calibration curve display

The coordinate positions of each standard sample are shown by the x marks.

You can change the values for the concentration and ABS for all of the standard samples and create a new calibration curve using [NewCalib]. All standard sample data up to that point will be deleted when [NewCalib] is executed.
You can change the order of the calibration curve with [Chg.Ord.]. When data is available at only one point, this is not displayed.
The equation for the calibration curve will be displayed by [Equation].

6.2.6 Changing the Concentration Table

Pressing [Std. Chg] on the concentration table displays the screen for changing standard sample concentration and ABS.

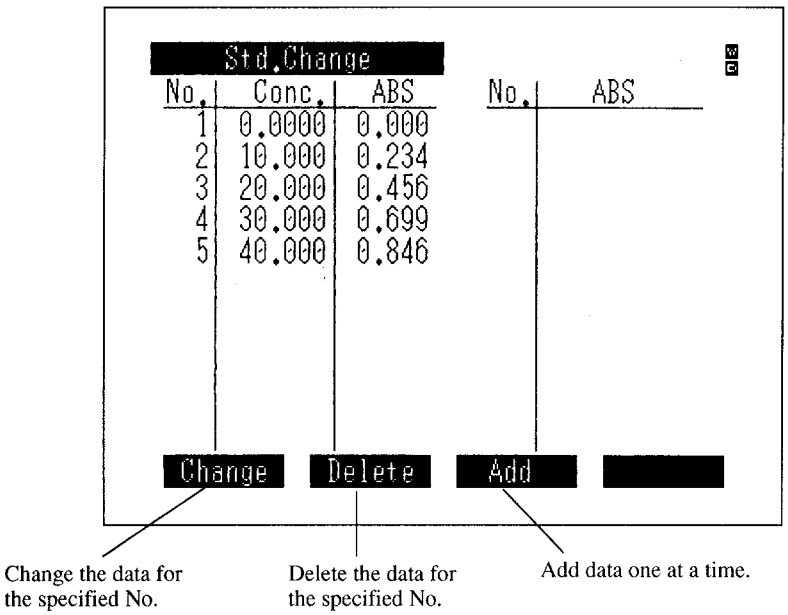


Fig.6.2.7 Concentration table change screen

You can [Change], [Delete] or [Add] standard sample data in the concentration table change screen.

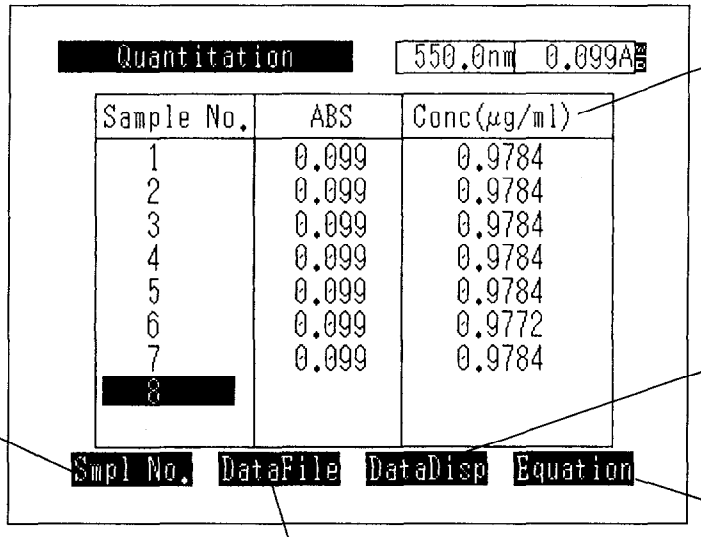
[Change] (F1) key ;
Allows you to change the concentration or ABS for the standard sample at the specified No.
[Delete] (F2) key ;
Deletes the data at the specified No.
[Add] (F3) key ;
Allows you to add concentration and ABS standard samples, one at a time.

In all of these cases, the calibration curve will automatically be recalculated.

6.3 Unknown Sample Measurement (Quantitation)

6.3.1 Measurement Screen

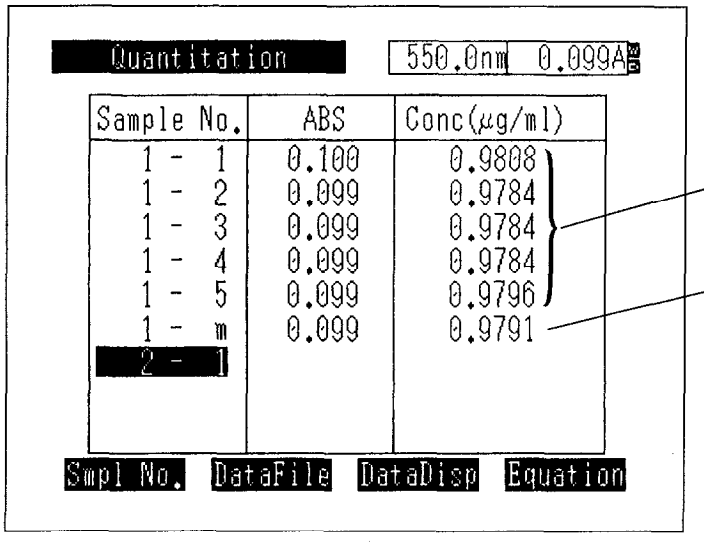
When creation of the calibration curve has been completed, you can switch to the measurement screen using the [SmplMeas] or the (START/STOP) key and perform measurements.
(The first measurement will be performed when the (START/STOP) key is pressed.)
The display format in the measurement screen will differ somewhat depending on the settings for the No. of measurements and sample control.



No.	ABS	ug/ml
1	0.099	0.9784
2	0.099	0.9784
3	0.099	0.9784
4	0.099	0.9784
5	0.099	0.9784
6	0.099	0.9772
7	0.099	0.9784

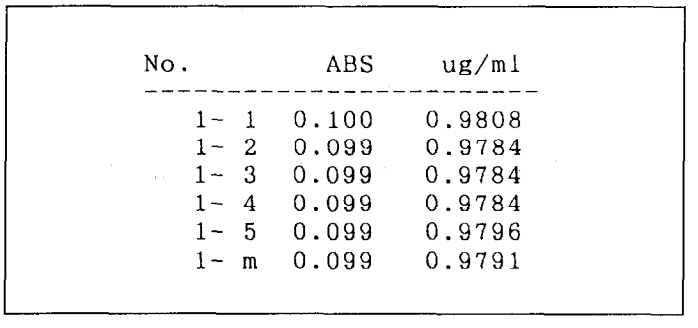
Sample printout

(A) Measurement screen (1 cell, 1 measurement)



Measure Sample No. 1 five times.

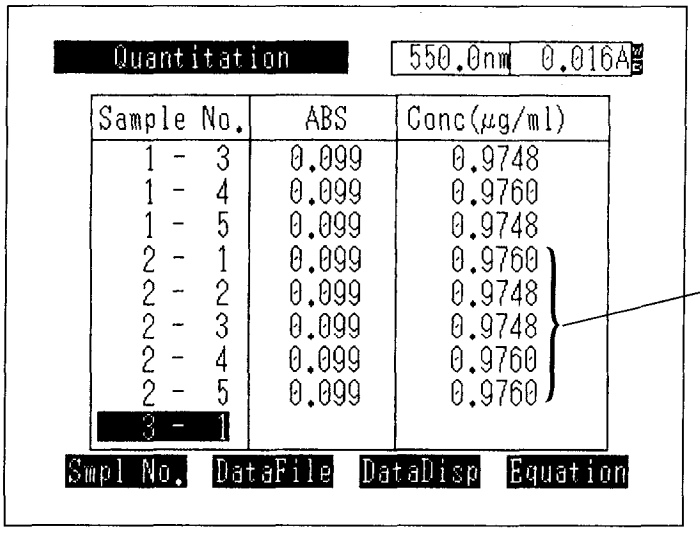
Average value of measurement Nos. 1 through 5 of Sample No. 1.

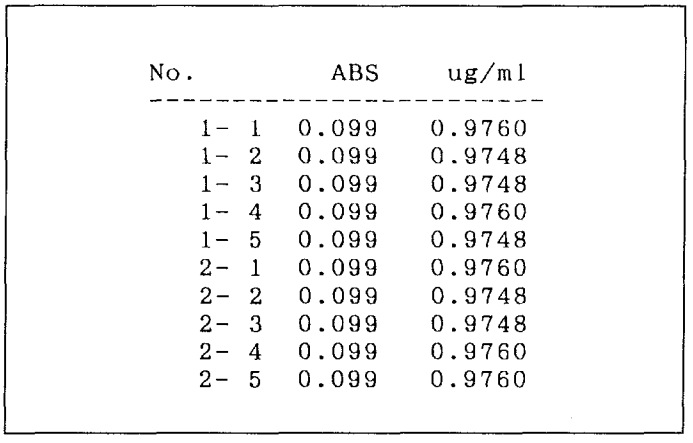


No.	ABS	ug/ml
1- 1	0.100	0.9808
1- 2	0.099	0.9784
1- 3	0.099	0.9784
1- 4	0.099	0.9784
1- 5	0.099	0.9796
1- m	0.099	0.9791

Sample printout

(B) Measurement screen (1 cell, 5 measurements)





No.	ABS	ug/ml
1- 1	0.099	0.9760
1- 2	0.099	0.9748
1- 3	0.099	0.9748
1- 4	0.099	0.9760
1- 5	0.099	0.9748
2- 1	0.099	0.9760
2- 2	0.099	0.9748
2- 3	0.099	0.9748
2- 4	0.099	0.9760
2- 5	0.099	0.9760

(C) Measurement screen (5 cells, 1 measurement)

Fig.6.3.1 Measurement screens and data printout examples

6.3.2 Changing the Sample Number

Pressing the Smpl No. (F1) on the measurement screen changes the No. of the sample to be measured for the next time.

6.3.3 Data Management [DataFile]

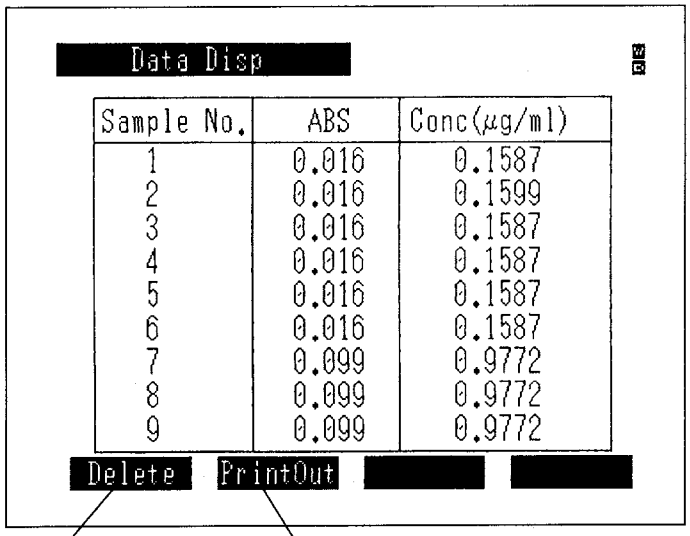
This function saves measurement data or recalls saved data to the screen.

(See 3.3.3 Data Management [DataFile])

6.3.4 Data Display [DataDisp]

On the measurement screen, the data is scrolled up one after another when measurement is repeated, leaving only eight items of data of the latest measurement displayed.

A list of the measurement data including the ones disappeared from the screen is displayed by this function. Using this function, it is also possible to print the data list or to delete data.



Data are displayed from No. 1.

Use this to delete data.

Use this to print data as numeric data.

Fig.6.3.2 Data Display screen

Using the △ or ▽ key, nine items of data can be scrolled at one time.

Delete (F1) key ;
This enables you to delete the entire numeric data table at once.

PrintOut (F2) key ;
This enables you to print all of the data as a numeric data table on the printer (optional). (The PRINT key on the keyboard will give a hard copy of the screen currently being displayed.)

No.	ABS	ug/ml
1	0.016	0.1587
2	0.016	0.1599
3	0.016	0.1587
4	0.016	0.1587
5	0.016	0.1587
6	0.016	0.1587
7	0.099	0.9772
8	0.099	0.9772
9	0.099	0.9772
10	0.099	0.9772
11	0.099	0.9748
12	0.099	0.9748
13	0.099	0.9736

Fig.6.3.3 Printer output

On this occasion, the same data is output to the RS-232C port. The output format of the data is the same as the print output example shown in Fig. 6.3.3. At the end of each line, [CR](0Dh) and [LF] (0Ah) codes are output. At the end of each data, [SB](1Ah) code is displayed.

The transfer specifications of the RS-232C are as follows.

Baud rate : 9600 bps
Data bit length : 7
Stop bit : 1
Parity : Odd number (odd)
X parameter : None

For the connection cable, see Chapter 9, "9.1 Connecting to a PC."

NOTE

The external transmission function comprises one-direction transmission of data from the UVmini-1240. Data transmission is executed continuously in one direction at a speed which presumes that the data are being loaded to a PC. Data are output from the RS-232C port approximately every 20ms. While this speed will be appropriate for most PCs, data may be lost with a slower PC. In addition, if you connect a printer to the RS-232C interface and attempt to print the transmission data, all of the data may not be able to be printed if the printer has a small internal buffer.

6.3.5 Display Equation [Equation]

This displays the equation used to compute a calibration curve created as a single point or multi-point calibration curve. The factor values in the K-factor method are displayed in the parameter configuration screen.

When using the multi-point calibration curve, relative coefficient r^2 is displayed only at the time of "0 intercept : NO" with a linear equation.

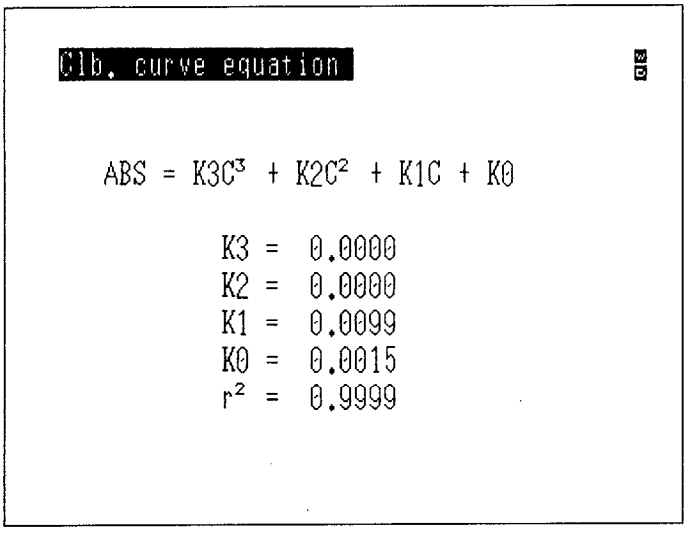


Fig.6.3.4 Sample calibration curve equation display

Regarding relative coefficient r^2

Relative coefficient r^2 is obtained by the following formula.

With linear equation :

$$r^2 = \frac{\{ (Ai - \overline{A})(Ci - \overline{C}) \}^2}{\{ (Ai - \overline{A})^2 \} \{ (Ci - \overline{C})^2 \}}$$

Ci is concentration of a standard sample

Ai is absorbance of a standard sample

$\overline{C}$ is mean value of Ci

$\overline{A}$ is mean value of Ai

With quadratic or cubic equation (passing the origin = none), R^2 obtained by the following formula is displayed.

$$R^2 = \frac{\{ (Ai - \overline{A})(Ei - \overline{E}) \}^2}{\{ (Ai - \overline{A})^2 \} \{ (Ei - \overline{E})^2 \}}$$

$Ei = K3Ci^3 + K2Ci^2 + K1Ci + K0$

$\overline{E}$ = Mean value of Ei

6.4 Two/Three-wavelength Quantitation Method

This is an accurate quantitation method which can be used to eliminate the effects of dispersion due to interfering components and contaminants and in correcting "floating" of the baseline due to bubbles when such conditions exist.

6.4.1 Two-wavelength Quantitation

This method quantitates based on the difference between the photometric values at two wavelengths. This allows for the elimination of the effects of interfering components.

Where B_1 and B_2 are the absorbances for the target component B at wavelengths λ_1 and λ_2, and C_1 and C_2 are the absorbances for the interfering component C ($A_1 = B_1 + C_1$, $A_2 = B_2 + C_2$), when wavelengths λ_1 and λ_2 are selected so that $C_1 = C_2$, then $A_1 - A_2 = B_1 - B_2$ so that only the information for the target compound is left. Normally, the absorbance wavelength for the target component is set for λ_1.

An example of two-wavelength measurement is shown in Figure 6.4.1.

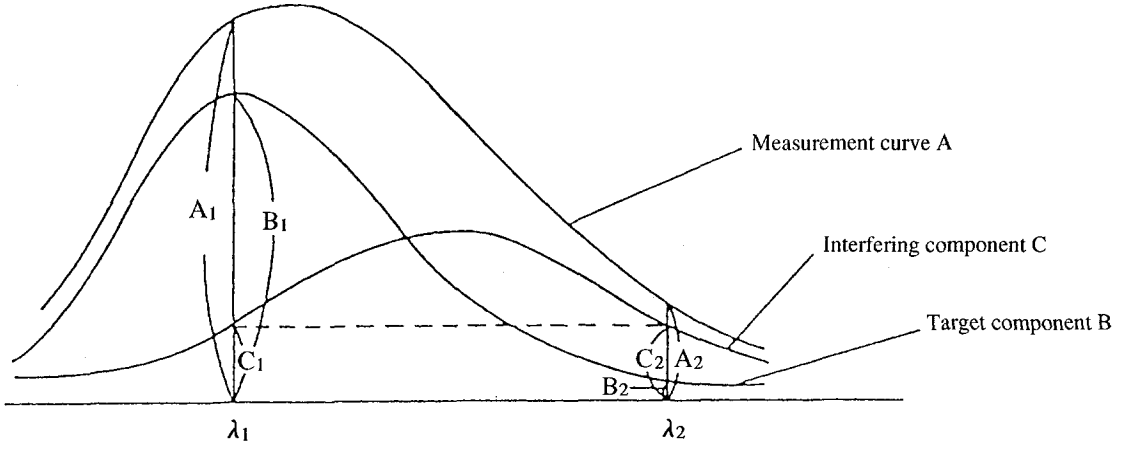


Fig.6.4.1 Schematic diagram of two-wavelength quantitation

Quantitation measurement is then performed according to these parameters.

6.4.2 Three-wavelength Quantitation

The following calculation is performed based on the photometric values at three wavelengths.

$$A_2 - A_4 \quad \left(\text{Where, } A_4 = \frac{(\lambda_1 - \lambda_2)\, A_3 + (\lambda_2 - \lambda_3)\, A_1}{\lambda_1 - \lambda_3} \right)$$

(See Fig. 6.4.2) Three-wavelength computation also eliminates the effects of interfering components, while also being useful in eliminating "floating" of sloped baselines due to dust, etc.

The elimination of the effects of an interfering component will be explained below using Figure 6.9.2.

If λ_1, λ_2 and λ_3 are taken so that the points S, T and U of the interfering component are connected by a single straight line, then $A_2 - A_4 = B_2 - B_4$ leaving only the information for the target component. Normally, the absorbance wavelength for the target component is set for λ_2. Quantitation measurement is then performed according to these parameters.

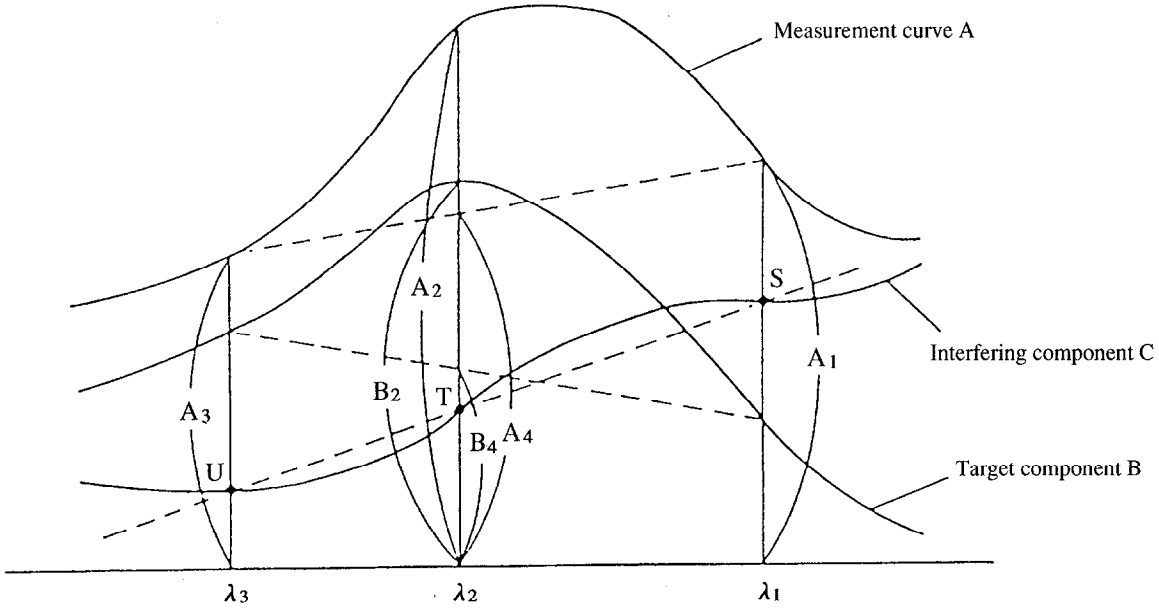


Fig.6.4.2 Schematic diagram of three-wavelength quantitation

Chapter 7
Optional Program Pack

CONTENTS

7.1 Starting the Optional Program Pack 7-1

7.2 Optional Program Pack Auto-start 7-2

7.1 Starting the Optional Program Pack

Insert the optional program pack into the IC card slot on the front panel of the spectrophotometer main unit. The optional program starts operating when <4. Optional Program Pack> is selected in the Mode Selection screen.

The optional program, when used once, is transferred to the internal memory and retained in the spectrophotometer main unit until another optional program is inserted and executed. Accordingly, if any program already exists in the main unit, its name is displayed at the line below "Optional Program Pack." In such an occasion, it is possible to execute the program without inserting the card.

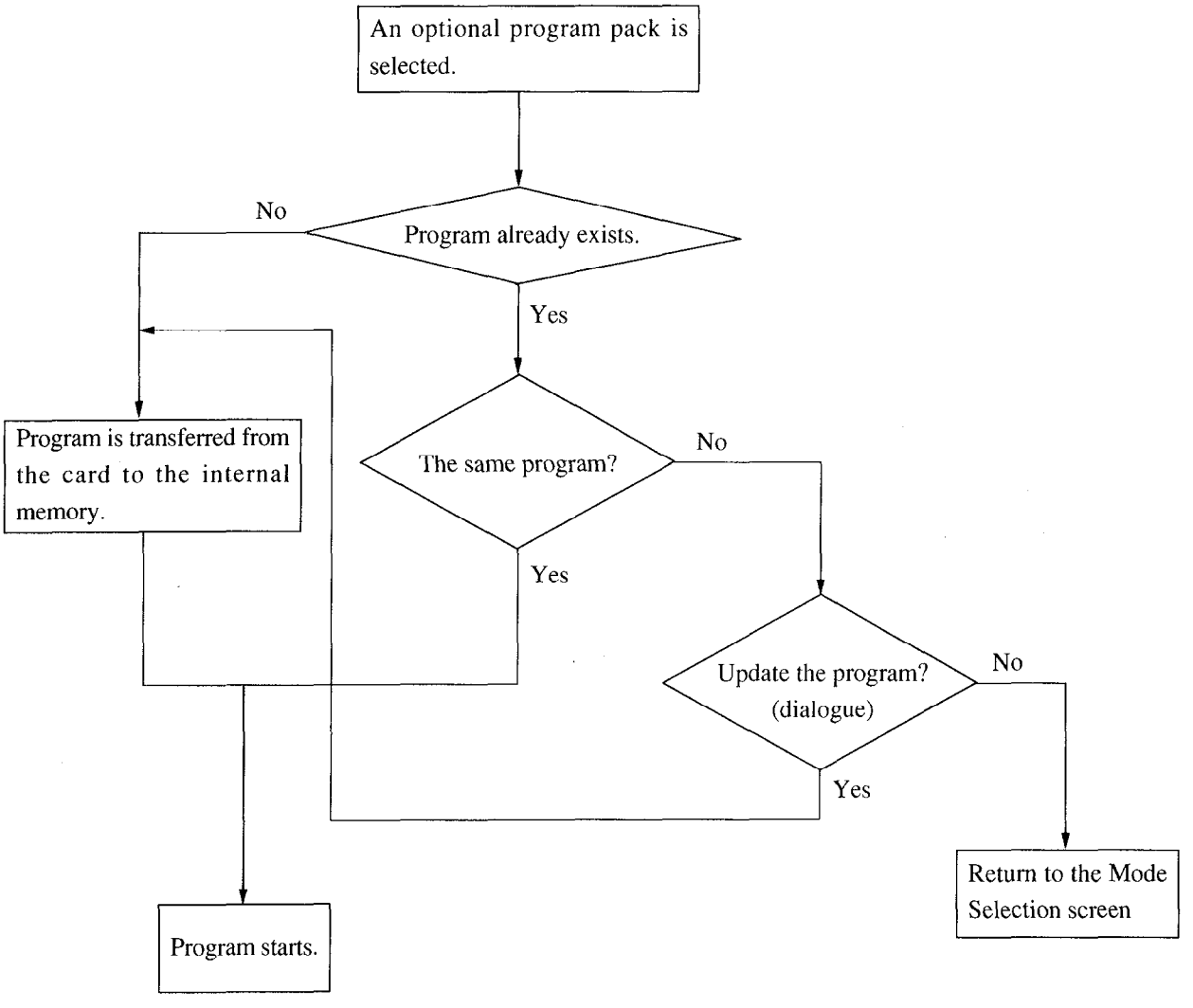


Fig.7.1.1 Flow chart of starting an optional program

7.2 Optional Program Pack Auto-start

If <1. Start program> in the <5. Utilities> mode of the mode selection screen has been set to "Optional Program Pack", a program pack which is inserted into the IC card slot while the power is ON will automatically be started.

Starting operation is the same as in the previous section.

Chapter 8 Utilities Mode

This is the mode for setting the instrument's operating parameters, such as the light source switching printer selection or the number of data columns displayed.

The parameters which can be set in this mode are parameters which are shared with other modes.

These will also be stored internally, even if the power is turned OFF.

CONTENTS

8.1 Utilities Screen 8-1

8.2 Setting Instrument Parameters 8-2

8.1 Utilities Screen

When you select <5. Utilities> in the mode selection screen, the utilities menu shown in Figure 8.1.1 will be displayed.

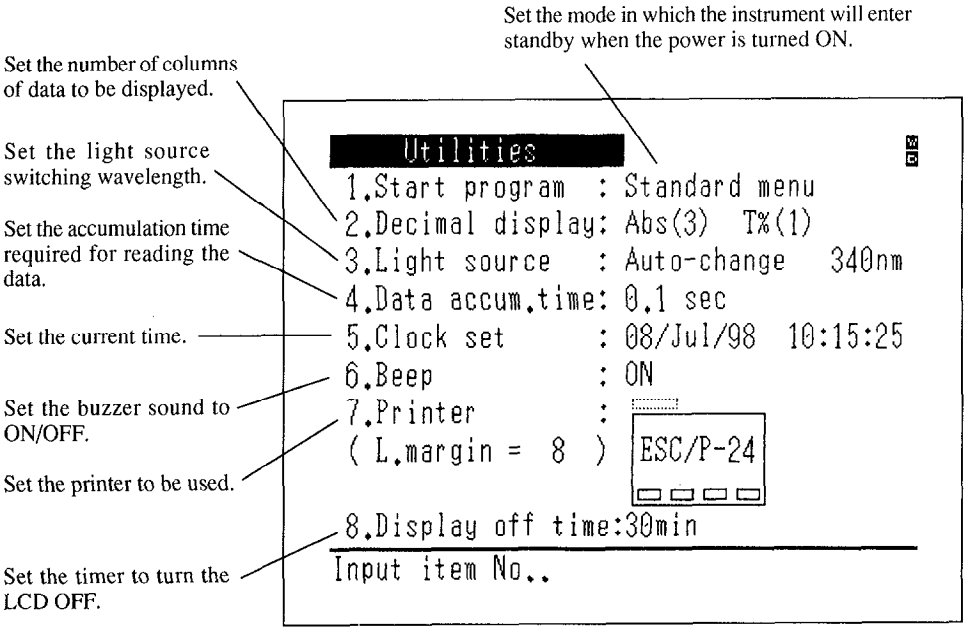


Fig.8.1.1 Utilities menu screen

< 1 . Start program >

This function determines the mode in which the instrument will be in after the power is turned ON and initialization is completed. Select the item with the cursor key ▽ , △ .

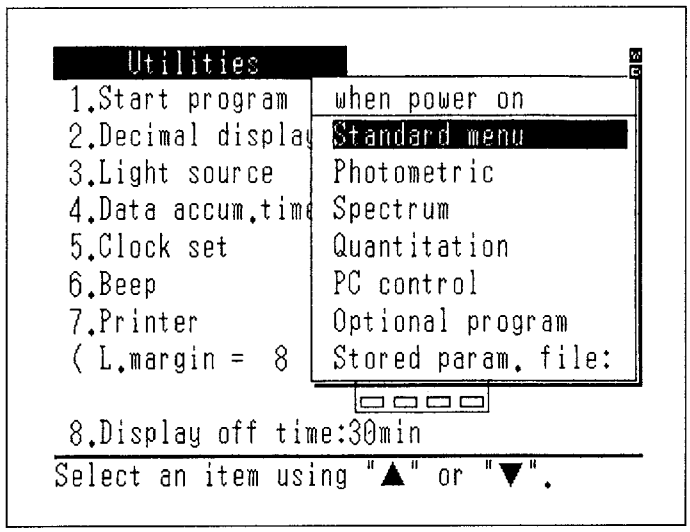


Fig.8.1.1 Start program selection screen

(1) Standard menu

The instrument is set to this mode for shipping. The mode selection screen will be displayed when the power is turned ON.

(2) Photometric, Spectrum and Quantitation.

The instrument will stand by at the parameter configuration screen of the selected mode.

(3) Optional program pack

The program pack inserted into the slot or the program retained in the internal memory will automatically starts. If no program pack is available, the message saying "Set a card then press ENTER key." will be displayed.

(4) Stored param. file

The measurement parameter file stored in instrument memory and set here will be called up and the instrument will go to standby.

> Saving Measurement Parameters...
> Save measurement parameters to a file by pressing the [SavParam] function key in the measurement parameter configuration screen for the respective mode. See "3.3.1 Save Parameters [SavParam]" for more details.

(5) PC control

The instrument automatically goes to the PC control mode. (See 9 PC control)

< 2 . Decimal display >

Abs three digits, T% one digit/Abs four digits, T% two digits can be switched for the number of decimal places to be displayed.

< 3 . Light source >

Automatic switching :

A deuterium lamp (D_2 lamp) is used in the ultra-violet region and a tungsten iodine lamp (WI lamp) is used in the visible/near-infrared region. The switching wavelength for these two lamps are set to 340.0 nm at the time of shipment, but it can be set freely between 295.0 nm to 364.0 nm.

WI lamp only :

Irrelevant to the setting of the measurement wavelength, the WI lamp is always the light source.

D_2 lamp only :

Irrelevant to the setting of the measurement wavelength, the D_2 lamp is always the light source.

< 4 . Data accumulation time >

Designates the accumulation time to read data.

Three options are available: 0.05, 0.1, and 0.2 sec.

The longer the time, the less the dispersion of the obtained data becomes, but the number of data output per unit time becomes less.

The number of output per second is almost the reciprocal of the accumulation time. Usually, it is set to 0.1 sec. Changing this setting changes the value of Abs = 0 (100 %) as well. Press the (AUTO ZERO) key again to obtain Abs = 0.

< 5 . Clock set >

Use this to set the time of the clock. The clock is the 24-hour type and is set in the order (Year/Month/Date Hour: Minute:Second). Since it has a battery back-up, it is not necessary to set the clock every time you turn ON the power.

Ex.) 10/Dec/94 12:34:56

< 6 . Buzzer sound >

Set this to turn ON/OFF of the buzzer.

< 7 . Printer setting >

The printer to be connected is selected and the format of a hard copy is set.

(1) Following Three types of printers can be connected.

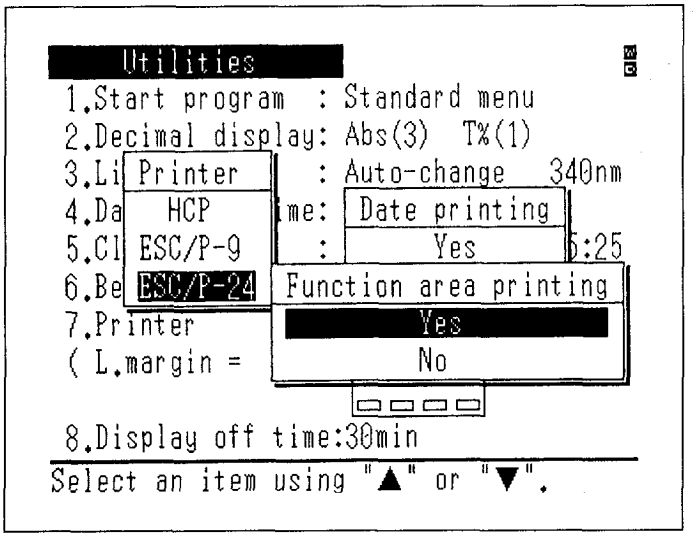


Fig.8.2.2 Printer selection screen

- HCP

  Set this when the screen copy printer HCP-1C (optional) is being used.

- ESC/P9

  Set this when using a printer that supports the ESC/P control code for EPSON 9-pin printers.

- ESC/P24

  Set this when using a printer that supports the ESC/P control code for EPSON 24-pin printers. This is also applied for laser printers.

  When selecting ESC/P9 and ESC/P24, the left margin can also be set. The setting range is from 0 to 9.

NOTE **If you do not properly select the printer type, the printer will not operate properly.**

(2) Date print

Set this whether the date should be printed in the hard copy output.

(3) Function key print

Set this whether the region to display function keys should be output in a hard copy.

< 8 . Turning OFF the LCD automatically >

THE LCD is automatically turned OFF when measurement is not performed. The following 4 kinds of time are available for OFF timer setting. When nothing is executed during the set time, the LCD is turned OFF.

10 min, 30 min, 60 min, ∞

Chapter 9 PC Control

This is the mode in which the UVmini-1240 is controlled by an external computer (PC). An RS-232C interface is used.

CONTENTS

9. 1 Connecting to a PC 9-1
9. 2 Receiving Commands and Protocol 9-2
9. 3 Programming Example 9-4
9. 4 Explanation of Commands and Data 9-8
9. 5 Command List 9-9

9.1 Connecting to a PC

Use the cable specified in the wiring specifications below as the RS-232C interface cable that connects the Spectrophotometer to a PC. Connect the RS-232C connector on the right side of the Spectrophotometer with the RS-232C connector on the PC.

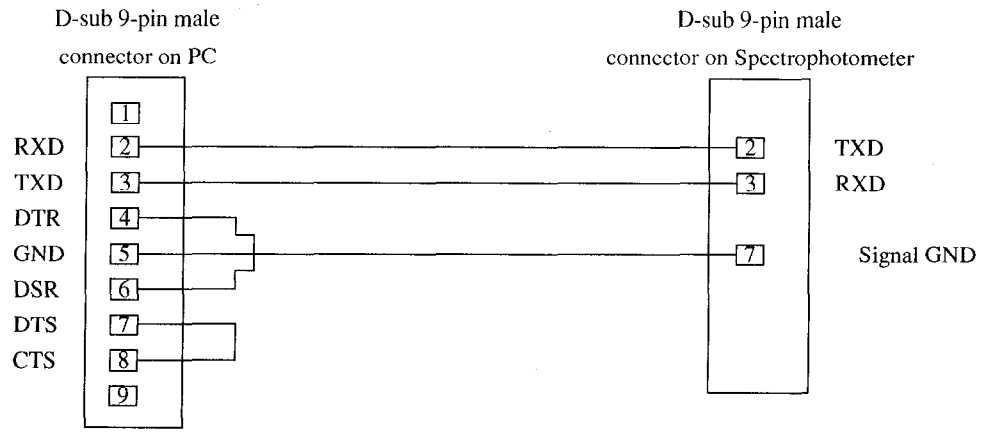


Fig.9.1.1 RS-232C cable for IBM

- The part number of this RS-232C cable is 200-86408.
- A total of 3 wires are actually used: 2 for input/output and 1 for ground.
- The connector for connecting to the PC, when seen from the PC side as above, has the control wire pins connected to each other so that input and output are always enabled.

9.2 Receiving Commands and Protocol

When you select [PC Ctrl] (F4) in the mode selection screen, the following screen is displayed. It becomes possible to communicate with PC via the RS-232C interface.

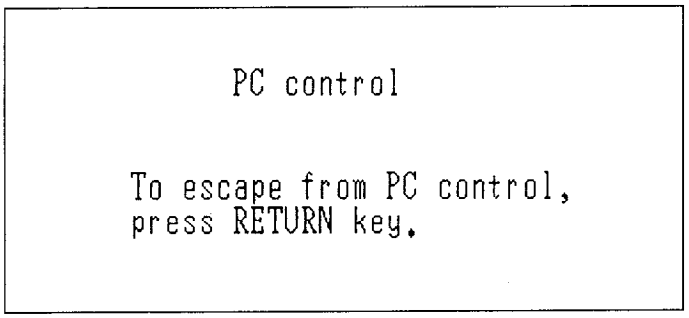


Fig.9.2.1 PC control mode screen

The exchange of signals (communication) with the PC must be performed with one being the "speaker" and the other the "listener". In this case, the speaker will be referred to as the master and the listener as the slave.

The cxchange of signals is performed under a set procedure (protocol). These signals comprise not only commands and data, but also codes for the control of the procedure (control codes). The control codes shown in the table below are used in the exchange of signals between the UV and a PC.

Table 9.2.1 Control Codes

Control Code (Hexadecimal)	Direction	Function
ENQ ($05) (Enquiry)	Master to Slave	Enquiry code sent when you wish to send commands or data. In particular, the first ENQ of a series of transactions also indicates the start of communication.
EOT ($04) (End of Transmission)	Master to Slave	Code for announcing the end of communication. Use this when there are no more data to be sent.
ESC ($1B) (Escape)	Bi-directional	Code sent when you wish to interrupt communication.
ACK ($06) (Acknowledge)	Slave to Master	Code returned from receiving side in affirmative response to a command, data or code which has been sent.
NAK ($15) (Negative Acknowledge)	Slave to Master	Code returned from receiving side in negative response to a command, data or code which has been sent.
NUL ($00) (Null)	Master to Slave	Code for recognizing the end of a variable-length signal, such as a command or data, etc. This is also called the terminator.

The transmission parameters are as follows.

Transmission rate : 9600bps

Data bits : 7 bits

Stop bit : 1 bit

Parity bit : Odd

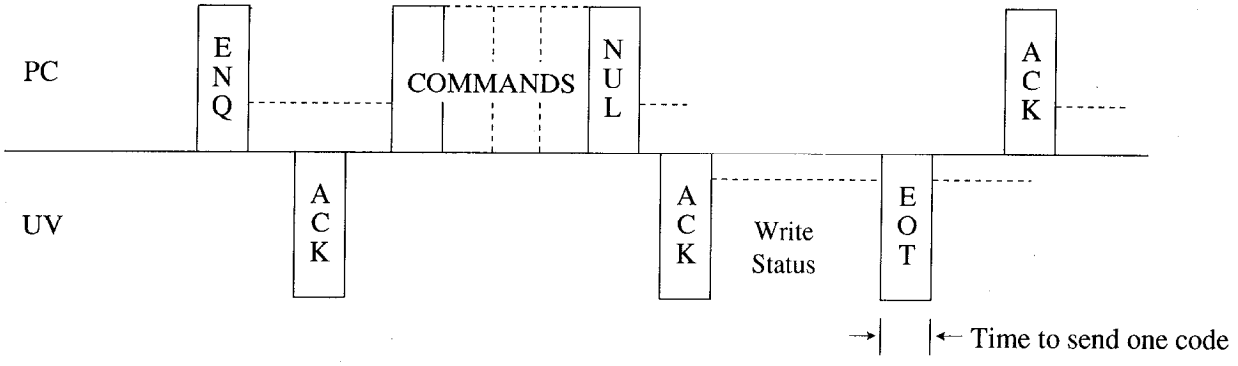
The types of commands sent from the PC to the UV can be generally classified as follows according to the direction of the data flow.

a) Write command ... Allows the status of the UV to be set.

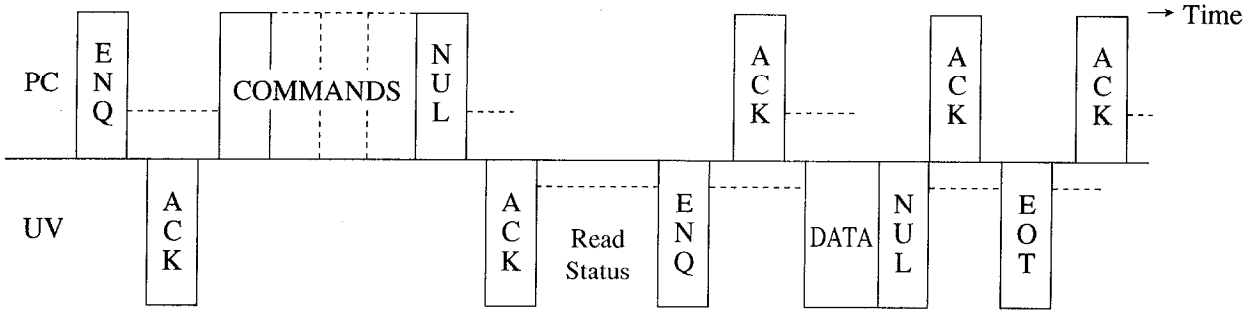
b) Read command ... Allows the status of the UV to be recognized.

The procedures for these commands have several types. A time chart is shown below. In the figure, the '----" mark indicates the master. Please note that the master and slave roles alternate in the communication process.

a) Write command ... Protocol A



b) Read command ... Protocol B, Protocol B'



The write command in a) is protocol A, the type in which data are received only once from the external computer at the read command in b) is protocol B, and when there are multiple data received it is called protocol B'.

9.3 Programming Example

This section describes in detail the procedures of three transmission types: protocol A, protocol B, and protocol B'.

N in the description stands for the number of repetition. It is 5 in this example.

Checking the number of repetition and checking time-out are omitted in the flow chart.

Protocol A

(1) Establishing communication link ① in Flow Chart 1.

Prior to sending command from the master station (PC in this case), the ENQ code is sent to make the slave station (spectrophotometer in this case) prepare for reception of command codes. The slave station returns ACK to inform that reception of the command data is ready.

<When abnormality occurs:>

- When NAK is returned for ENQ, ENQ is sent again. If NAK is returned for Nth time re-sending (5 times in this case) of ENQ, it is judged that abnormality has occurred at the slave station and communication ends.
- If any other code than ACK and NAK is returned, it is ignored and the master waits for the next response.
- If no response is made after a certain period of time, ENQ is sent again. If response is not made for the Nth time re-sending, it is judged that abnormality has occurred at the slave station and communication ends.

(2) Sending command data ② in Flow Chart 1

When establishment of the communication link is correctly completed, the master station (PC) sends command data. When the slave station (spectrophotometer) receives the data correctly, ACK is returned. The master station and the slave station are exchanged on this occasion.

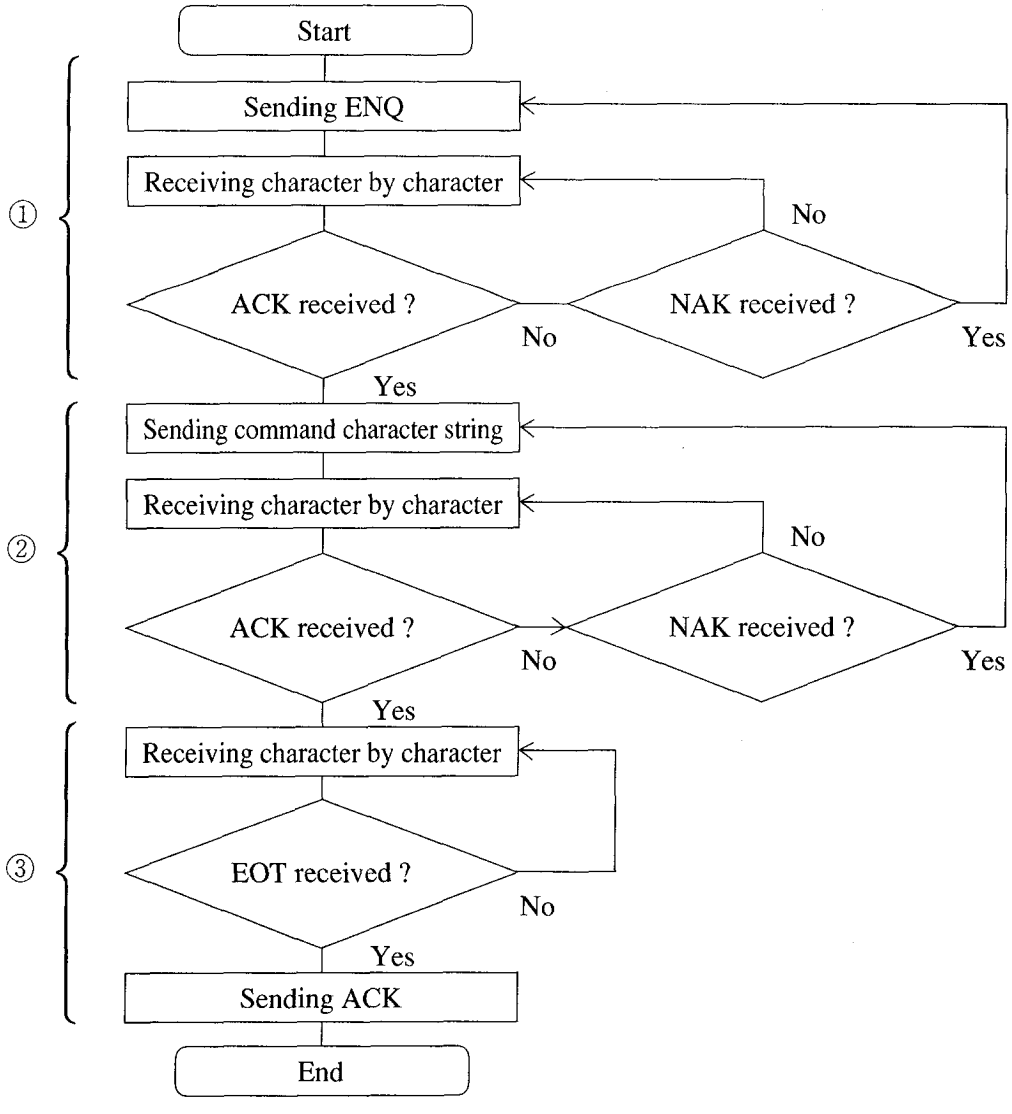
<When abnormality occurs:>

- If NAK is returned for the command data, the previously sent data is sent again. If NAK is returned for Nth time re-sending, it is judged that abnormality has occurred at the slave station and communication ends.
- When any code other than ACK and NAK is returned, it is ignored and the master waits for the next ENQ.
- If no response is made for the Nth time sending, it is judged that abnormality has occurred at the slave station and communication ends.

(3) Ending ③ in Flow Chart 1

The master station (spectrophotometer in this case) processes the command data and sends EOT to the slave station (PC in this case) when processing ends. The slave station waits until EOT is sent and returns ACK when EOT is sent. This completes communication.

Flow Chart 1


Start
Sending ENQ
Receiving character by character
No
ACK received ?
NAK received ?
No
Yes
Yes
Sending command character string
Receiving character by character
No
ACK received ?
NAK received ?
No
Yes
Yes
Receiving character by character
EOT received ?
No
Yes
Sending ACK
End
①
②
③

Protocol B and protocol B'

(1) Establishing communication link

Same as that of protocol A.

(2) Sending command data

Same as that of protocol A.

(3) Receiving answer-back data ① in Flow Chart 2.

The master station (spectrophotometer in this case) processes the command data and when processing ends, it sends ENQ code to make the slave station (PC) prepare for data reception. The slave station waits until it receives ENQ and returns ACK to inform the master station (spectrophotometer) that the slave is ready for data reception. The master station (spectrophotometer) receives this ACK and starts data transmission.

With protocol B', there are more than one sending data. The slave station (PC) sends ACK for every reception of the data to inform the master station of data reception.

<When abnormality occurs:>

- If no answer-back data is sent after a certain period of time, ENQ is sent again. If no data is returned for Nth time re-sending, it is judged that abnormality has occurred at the master station spectrophotometer) and ends communication.
- While the character string is being received character by character, if the next character is not received after a certain period of time, NAK is returned immediately.

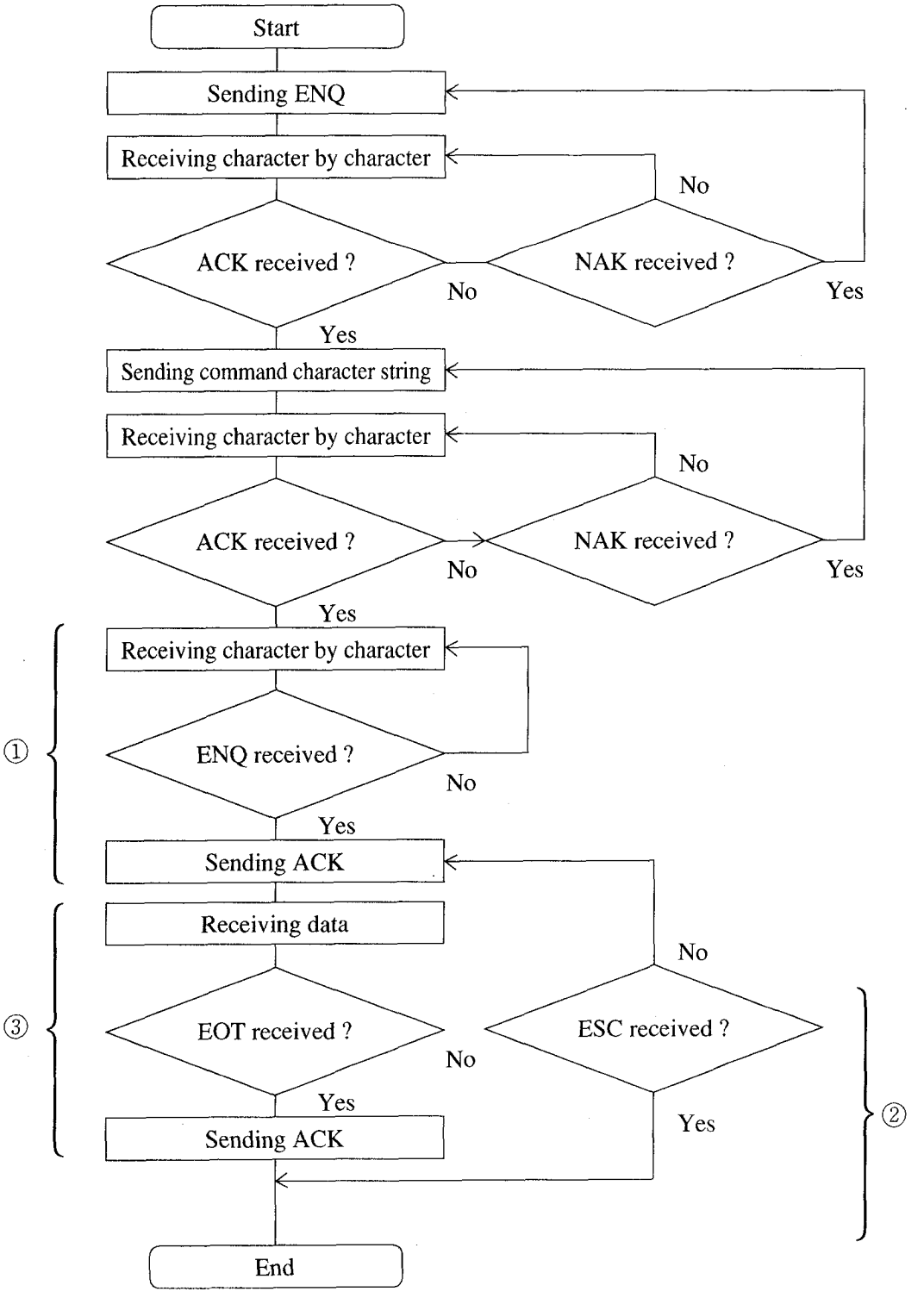
(4) Interrupting data reception ② in Flow Chart 2

With protocol B', in order to interrupt data reception from the slave station (PC in this case) while it is receiving more than one data, ESC is sent instead of ACK. The master station (spectrophotometer) cancels data transmission and communication link ends. Also, if data cannot be sent due to occurrence of abnormality while the master station (spectrophotometer) is sending data, ESC is sent instead of the data and communication link ends.

(5) Ending ③ in Flow Chart 2

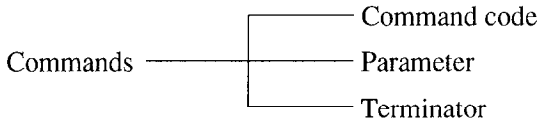
The master station (spectrophotometer) sends EOT after sending all the data. The slave station (PC) judges the end of data reception by receiving EOT and send ACK to end transmission.

Flow Chart 2


Start
Sending ENQ
Receiving character by character
No
ACK received ?
NAK received ?
No
Yes
Yes
Sending command character string
Receiving character by character
No
ACK received ?
NAK received ?
No
Yes
Yes
Receiving character by character
①
ENQ received ?
No
Yes
Sending ACK
Receiving data
No
③
EOT received ?
ESC received ?
No
Yes
Sending ACK
Yes
②
End

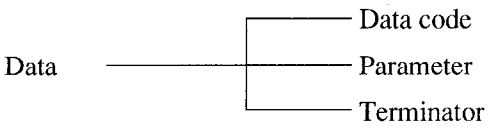
9.4 Explanation of Commands and Data

The commands which can be sent from an external computer are made up of the following elements.



A command code consists of a single lower-case alphabetic code. The number of a parameter is depends on the command code. Commands can be divided into those with no parameter, those with only one parameter and those with multiple parameters. When there are multiple parameters, it is necessary to separate the parameters with a symbol (delimiter). "," (comma) is used as the delimiter. Since all parameters are sent as ASCII text, if you wish to set the number 15, this would be expressed in hexadecimal as $31,$35. NUL is used as the terminator.

Data which is sent from the Spectrophotometer have the following structure.



A data code consists of a sigle lower-case alphabetic code as same as a command code. There is only one parameter, reflected by a text string. If the parameter is 10.36, it would be expressed in hexadecimal as $31,$30,$2E,$33,$36. NUL is used as the terminator.

9.5 Command List

The terminator symbol has been omitted from the command format places in the command list. When sending to the UVmini-1240, send a terminator code (NUL) right after the content shown in the table as the actual command. "n", "m" and "t" in the command format indicate parameters. The protocol types are A, B and B' and correspond with the time chart in 9.2.

Protocol A : Writing command

Protocol B : Reading command

Protocol B' : Reading command with more than one data to be obtained

Table 9.2 Command List

Command format	Protocol type	Name	Description of processing and precautions
an, m, u	A	Measurement	Performs wavelength scan. The measured data is saved in the continuous data storage area inside the spectrophotometer. To take data in, use the [f] command (file data transfer) as well. Parameters n and m correspond to the starting wavelength and the ending wavelength respectively. The parameter is set to the value of wavelength multiplied ten times. For example, 500.0 nm is 5000 and 765.4 nm is 7654. Set n and m so that they satisfy the following conditions. $1900 \leqq n,m \leqq 11000$ $n-m \geqq 100$ Parameter u designates the measurement speed. They correspond respectively as follows. u = 1: Very fast u = 2: Fast u = 3: Medium u = 4: Slow u = 5: Very slow Measurement pitch is determined according to Table 9.3 Relationship of the measurement command parameters.

*continued.

Table 9.3 Relationship of the measurement command parameters

u	Wavelength difference in the measured wavelength (n–m)			
	Less than 100nm	Less than 200nm	Less than 500nm	500nm or more
1: Very fast	2.0nm	2.0nm	2.0nm	2.0nm
2: Fast	1.0nm	1.0nm	1.0nm	1.0nm
3: Medium	0.5nm	0.5nm	0.5nm	1.0nm
4: Slow	0.2nm	0.2nm	0.5nm	1.0nm
5: Very slow	0.1nm	0.2nm	0.5nm	1.0nm

Table 9.2

Command format	Protocol type	Name	Description of processing and precautions
bn, m	A	Time scan	Performs time scan. The measured data will be saved in the continuous data storage area inside the spectrophotometer. To take data in, use the [f] command (file data transmission) as well. Parameter n designates measurement time. Set it satisfying the following condition. $1 \leqq n \leqq 6500$ Parameter m designates the unit of measurement time. Setting conditions are as follows. m=0: second m=1: minute
cn, m	A	Baseline correction	Performs baseline correction. Parameters n and m correspond to the starting wavelength and the ending wavelength respectively. The parameter is set to the value of wavelength multiplied ten times. Set n and m so that they satisfy the following conditions. $1900 \leqq n,m \leqq 11000$ $n - m \geqq 100$
d	B	Current data	Outputs the current data. When this command is sent, the spectrophotometer performs one measurement and outputs the data as follows. dk Parameter k is the current data and formatted as follows according to the measurement mode. At ABS : ± x.xxxy Besides ABS : ± xxx,xy The sign of the parameter code is output when it is negative. When it is positive, a space is output. Also, y is output only when the number of data display digits set in the Utilities mode of the spectrophotometer is Abs(4) , 7%(2).
fn	B'	File data transfer	The data saved in the storage area of the spectrophotometer is taken in by the [a] command (scan measurement) or the [b] command (time scan measurement). Parameter n is the number of data items you wish to take in. The data from the beginning to n can be taken in. If the value larger than the data items saved in the storage area is set, the processing will end at the point where you ran out of data. n must satisfy the following condition. $1 \leqq n \leqq 2000$ The data to this command is output as follows. zzzz.z □□ ± x.xxxy zzzz.z □□ ± xxx.xy z indicates wavelength (time), x and y indicate measurement data, and ??? indicates "space" data. The code for the measured data is output when it is negative only. When it is positive, a space is output. Also, y is output only when the number of data display digits set in the Utilities mode of the spectrophotometer is Abs(4) , T%(2).

*continued

Table 9.2

Command format	Protocol type	Name	Description of processing and precautions
gn	A	Gain setting	Sets the gain when energy is measured. Parameter n must satisfy the following conditions. $1 \leqq n \leqq 6$
jn	A	Data accumulation time	1Sets the data accumulation time to obtain one item of data. Parameter n corresponds with accumulation times as follows. n = 1: 50 msec n = 2: 100 msec n = 3: 200 msec
In	A	Light source setting	Sets the light source for energy measurement. Parameter n corresponds with light sources as follows. n = 1: WI lamp n = 2: D_2 lamp n = 3: Optional lamp
mn	A	Multi-cell selection	Changes the accessories of multi-cell and, if required, initializes it. Parameter n corresponds with multi-cells as follows. n = 1: standard cell n = 2: 6-position cell n = 10: CPS
on, m, t	A	Syringe sipper	Controls the syringe sipper. This command is valid when a syringe sipper is connected to the sample compartment. Parameter n designates the operation mode. n = 1: Initialization n = 2: Sip (Valve at the sample side.) n = 3: Purge (Valve at the drain side.) n = 4: Purge (Valve at the sample side.) Parameter m designates the sip speed. It corresponds with speed as follows. The unit is m*l*/sec. m = 1: 1.2 m = 2: 0.6 m = 3: 0.3 m = 4: 0.2 m = 5: 0.1 Parameter t designates the capacity. The following condition must be satisfied. The unit is 0.01 m*l*. $0 \leqq t \leqq 1000$ Parameter m and parameter t are valid when operation mode n is 2, 3, or 4. Although, set a value also in mode 1, Initialization. Example 1: Initialization o1, 1, 1 Example 2: Feeding 5m*l* from the sample side to the syringe at the speed of 0.6 m*l*/sec. o2, 2, 500

Table 9.2

Command format	Protocol type	Name	Description of processing and precautions
pn, m, t	A	Sipper 160	Controls the Sipper 160. This command is valid when the Sipper 160 is connected to the sample compartment of the spectrophotometer. Parameter n designates operation mode. n = 1: Initialization n = 2: Sip n = 3: Purge Parameter m designates sip speed. It corresponds with speed as follows. m = 1: Fast m = 2: Medium m = 3: Slow Parameter t designates rotation time. Satisfy the following condition. The unit is second. $-64 \leqq t \leqq 64$ Parameter m and parameter t are valid when operation mode n is 2 or 3. Although, set a value also in mode 1, Initialization. Example 1: Initialization p1, 1, 1 Example 2: Feeding from the sample side to the sipper for ten seconds at high speed. p2,1,10
qn	A	Move cell position	Moves the cell position of the multi-cell or the CPS-240. Parameter corresponds to the direction of cell's movement as follows. n = 1: Move one cell forward. n = 2: Move one cell backward. (CPS-240) Moves to Cell 1. (Multi-cell) This command is valid when the multi-cell or the CPS-240 is connected to the sample compartment of the spectrophotometer.
q	B	Check cell position	Checks the present cell position of the multi-cell or the CPS-240. When the command is executed, the data is returned from the spectrophotometer as follows. qk Parameter k corresponds to the cell position No. as follows. With the 6-position cell or with the CPS-240: $1 \leqq n \leqq 6$ This command is valid when the multi-cell or the CPS-240 is connected to the sample compartment of the spectrophotometer.

9 PC Control

Table 9.2

Command format	Protocol type	Name	Description of processing and precautions
r	B	ASC nozzle	Checks the nozzle condition of the auto-sample changer, ASC-5. If the nozzle is lowered according to this, sample absorption can start. When the command is executed, the data is returned from the spectrophotometer as follows. rk Parameter k is a nozzle condition number and it corresponds with conditions as follows. k = 1: Nozzle is lowered. k = 2: Nozzle is raised. This command is valid when the ASC-5 (optional) is connected.
sn	A	Syringe sipper lamp	Turns ON/OFF the syringe sipper lamp. This command is valid when the syringe sipper is connected to the sample compartment of the spectrophotometer. Parameter n corresponds with the lamp condition as follows. n = 0: lamp OFF n = 1: lamp ON
vn	A	Measurement mode	Sets the measurement mode. Parameter n corresponds with the mode number as follows. n = 1: Absorbance (Abs) n = 2: Transmittance (T%) n= 3: Energy
wn	A	Wavelength setting	Sets wavelength. The value of the set wavelength multiplied 10 times is used for parameter n. For example, to set to 500.0 nm, use 5000. n must satisfy the following condition. $1900 \leqq n \leqq 11000$
x	A	Auto zero	Performs auto-zeroing (to make the absorbance zero or to make the transmittance 100% under the current conditions).

Chapter 10 File Transfer

This is the mode to transfer the data files and condition files inside the memory or in the data pack of the spectrophotometer to an external computer (PC). Use a PC software, "UV Data Manager" (optional) that controls UV data.

CONTENTS

10.1 Connecting to a PC 10-1

10.2 Operation Method 10-2

10.1 Connecting to a PC

For how to connect the spectrophotometer to an external computer and the RS-232C interface cable, see Chapter 9 "PC Control."

10.2 Operation Method

When [FileTrns] (F3) key is selected in the Mode Selection screen, the following screen is displayed. From this state, communication is possible via the RS-232C interface, and the UV Data Manager becomes available.

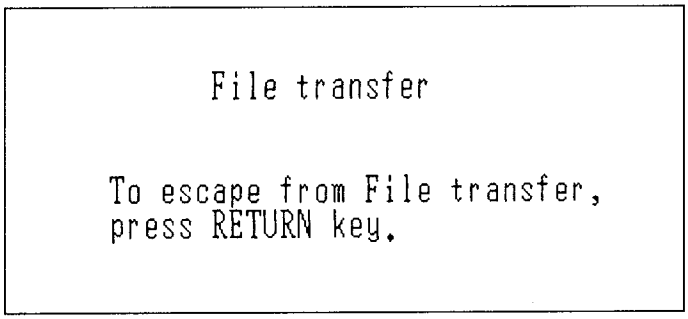


Fig.10.2.1 File transfer screen

To return from the File Transfer mode to the Mode Selection screen, press the (RETURN) key. or how to use the software on the PC, the UV Data Manager, see the instruction manual of the UV Data Manager.

Chapter 11
Maintenance & Checking

CONTENTS

11. 1 Daily Maintenance & Periodic Maintenance 11-1
11. 2 Initialization & Error Display 11-2
11. 3 Trouble shooting 11-4
11. 4 Replacing Light Source 11-5
11.4.1 Light Source Specifications 11-5
11.4.2 Light Source Replacement Procedure 11-6
11. 5 Replacing Fuses 11-10
11. 6 List of Consumable Parts, Spare Parts 11-12

11.1 Daily Maintenance & Periodic Maintenance

(1) Cleaning Sample Compartment (Daily)

When handling large numbers of liquid samples, check the floor of the sample compartment for spilled solution samples. Wipe up spilled samples immediately. according to Section 1.2.2 "Cleaning the Unit".

> **NOTE** Please be aware that if spilled samples are left, they may evaporate and the vaporized gas will fill the light path in the sample compartment, corroding the interior and causing inaccurate measurement results.

(2) Checking Baseline Flatness (Monthly)

Inspect the flatness of the baseline according to the procedure in Chapter 1 "1.5.1 Baseline Flatness". If there is an abnormality in the baseline (the curve is greater than ±0.010Abs), correct the instrument baseline.

(3) Checking Wavelength Accuracy (Monthly)

Inspect the wavelength accuracy according to the procedure in Chapter 1 "1.5.2 Wevelength Accuracy". If there is an abnormality in the wavelength accuracy (the peak wavelength shift is greater than ±1.0nm), contact your Service Representative.

11.2 Initialization & Error Display

When the power switch is turned ON, the spectrophotometer performs various checks and initial settings in the order shown in the table on Fig. 11.2.1, and if everything is normal, initialization is completed after about 4.5 minutes. Result of each step will be displayed as it is completed. If a step is properly completed, "OK" will be displyayed. However, if any kind of abnormality is detected, "NG" will be displyayed. If a "NG" message is displayed, inspect the instrument according to the check point items in the table. If the problem is still unclear, contact your Service Representative and describe the displayed error message.

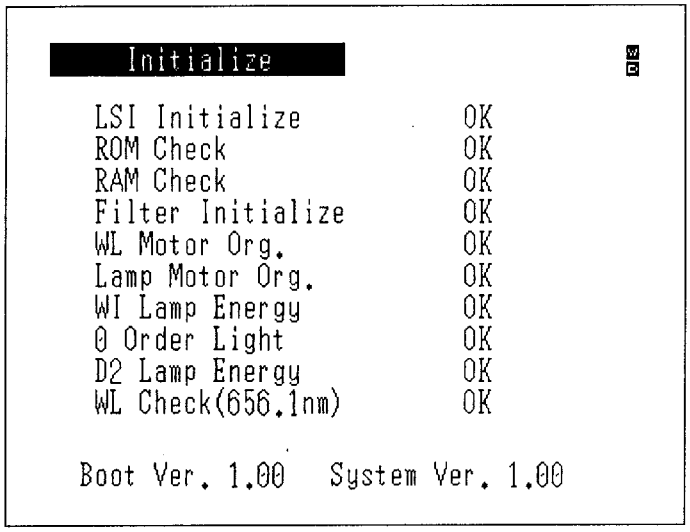


Fig.11.2.1 Initialization screen

Table 11.2.1 Initialization and Errors

	Display	Description	Remedial Action
1	LSI Initialize	Initialize each I/O	Try turning the power OFF and then ON again. If the same error occurs again, contact your Service Representative.
2	ROM Check	Check program ROM	
3	RAM Check	Check memory elements (RAM)	
4	Filter Origin	Detect reference position of filter.	
5	WL Motor Org.	Detects mechanical wavelength origin position.	
6	Lamp Motor Org.	Detect reference position of motor that drives light source switching mirror.	• Remove the light source compartment cover and check if the WI lamp is lit. If it is not lit, try turning the power ON again. If it still does not light, the lamp must be replaced.*1 • Check to see if there is something in the sample compartment that is obscuring the light.
7	WI Lamp Energy	Checks whether or not the WI lamp (tungsten iodine lamp) light energy is at full level.	
8	0 Order Light	Checks 0-order light which is the optical origin	
9	D_2 Lamp Energy	Checks whether or not the D_2 lamp (deuterium lamp) light energy is at sufficient level.	• Remove the light source compartment cover and check if the D_2 lamp is lit. If it is not lit, try turning the power ON again. If it still does not light, the lamp must be replaced.*1 • Check to see if there is something in the sample compartment that is obscuring the light.
10	λ Check	Checks wavelength by detecting the intensity line at 656.1nm using the D_2 lamp.	

*1 Refer to Fig.11.4.3 and Fig.11.4.4 in section 11.4.2 to remove the light source compartment cover.

11.3 Trouble shooting

There are many instances in which the spectrophotometer will not operate properly as the result of consumable part deterioration, an operational error or neglect of maintenance and inspection. Please check the following items. If the cause of operation failure is still unknown after this inspection, contact your Service Representative.

(1) Does not operate at all. Nothing appears on the LCD unit screen.

Checking Point	Remedial Action
1. Is the power cord securely connected ?	Securely connect the cord.
2. Is the fuse blown ?	Replace the fuse. 100V to 120V area : 4.0A 220V to 240V area : 2.0A

(2) After power is ON, error message is displayed during initialization.
Inspect the check points listed in "Table 11.2.1 Initialization and Errors".

(3) Numbers cannot be entered from the keyboard.

Checking Point	Remedial Action
1. Is an incorrect value being entered ? Example GOTO WL=1150nm	Enter the correct value.
2. Is the computer IC or the keyboard defective ?	Contact our Service Representative.

(4) Photometry values are odd.

Checking Point	Remedial Action
1. Did you press mistakenly the (AUTO ZERO) key during measurement ?	Return to the blank condition (reference condition) and press the (AUTO ZERO) key again. Perform proper processing.
2. Sample processing error	
3. Is the cell being used appropriate ?	Do not use a glass cell in the ultraviolet range.

(5) Baseline curve does not meet normal specifications.

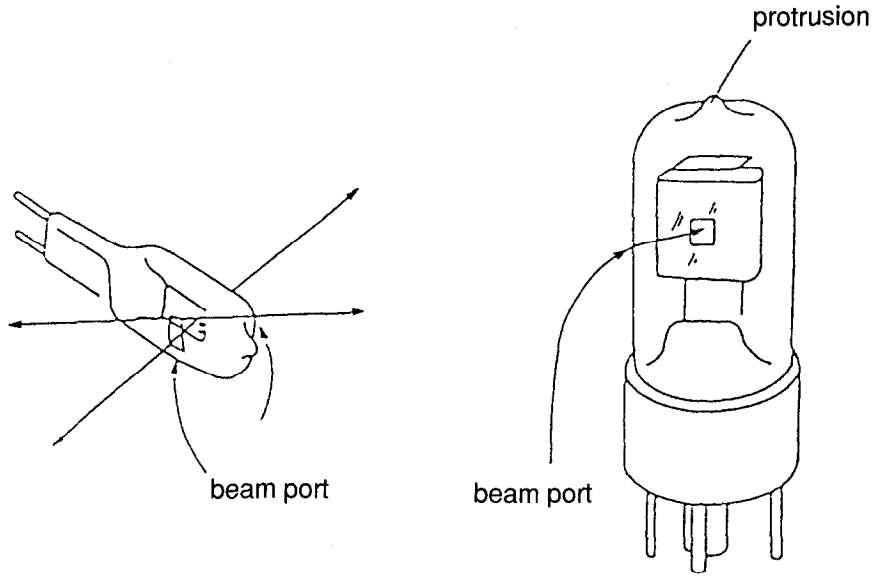
Checking Point	Remedial Action
1. Is the beam restricted ?	Some of the unit specifications may not be met when the beam is restricted, or certain optional accessories are installed.
2. Are you using optional accessory ?	

11.4 Replacing Light Source

11.4.1 Light Source Specifications

Table 3.4.1 Light Source Specifications

	WI Lamp	D_2 Lamp
Part No.	062-65005	062-65055-05
Type	55134	L-6380
Average life	2000 hours	500 hours
Characteristics	12V 20W	Discharge voltage : 75~95V Discharge current : 300mA Discharge start voltage : 230~350V
Shape	Fig. 11.4.1 (a)	Fig. 11.4.1 (b)



(a) WI Lamp (b) D_2 Lamp

Fig.11.4.1 Light source appearances

CAUTION A deuterium lamp (D_2) lamp radiates ultraviolet rays harmful to eyes and skin. Do not stare at the lamp directly while it is lit.

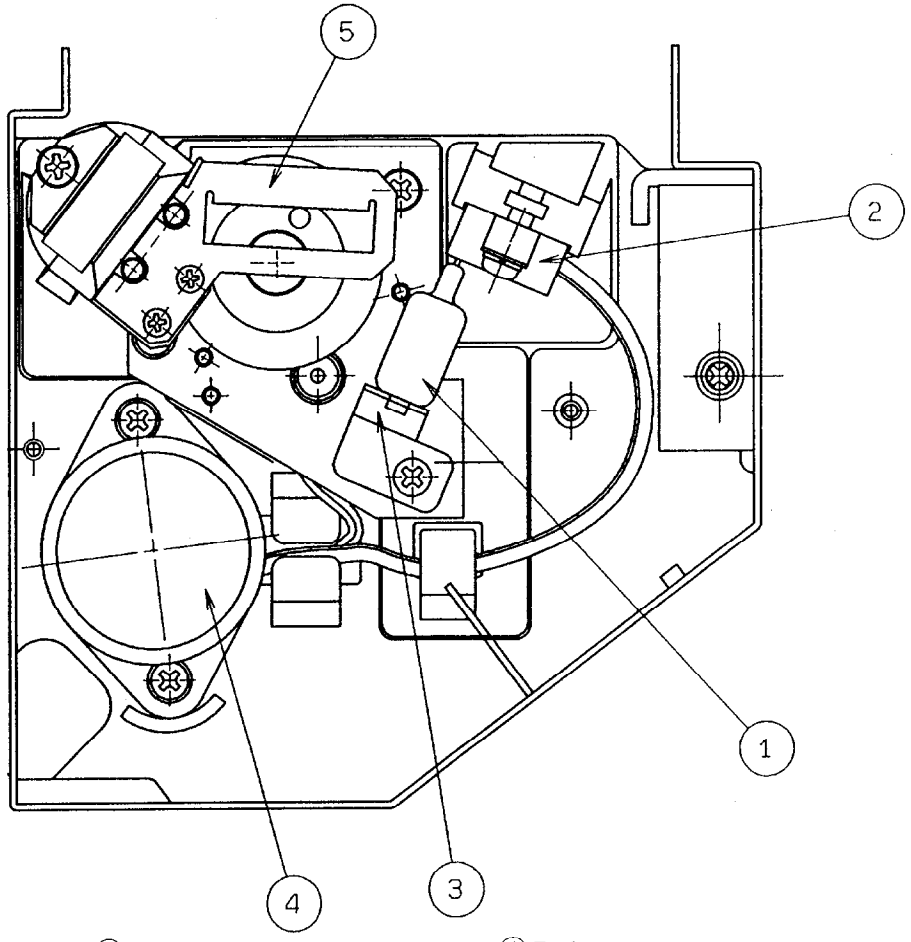
11.4.2 Light Source Replacement Procedure

WARNING HOT SURFACE

The light source and light source compartment both get very hot. To change a light source, turn off the power and then change the light source only after checking to see that it has cooled sufficiently.

CAUTION

1. Please wear gloves when handling the light source so as not to leave fingerprints on the beam port of the new light source. A fingerprint will burn onto the bulb, and when the light source gets hot, light transmission will deteriorate.
2. Be especially careful when removing and mounting the light source compartment cover so that the back of the cover does not strike the protrusion on the top of the D_2 lamp (deuterium lamp). Such a hit could cause a leak in the tube's vacuum.



① WI lamp
② WI lamp socket
③ WI lamp retainer spring
④ D_2 lamp
⑤ D_2 lamp lock fitting

Fig.11.4.2 Interior of light source compartment

• **Replacing the D_2 lamp**

(1) Using a Philip's screwdriver, remove the screws at the rear of the main unit shown in Fig. 11.4.3.

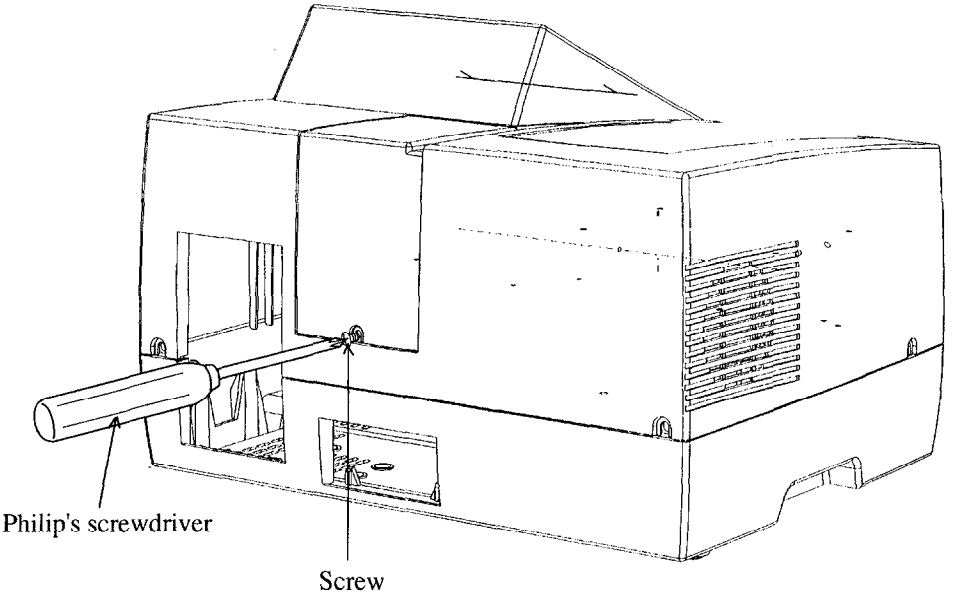


Fig.11.4.3 Light source cover

(2) Next, pull the light source cover in the direction of the arrow in Figure 11.4.4 to remove the light source cover.

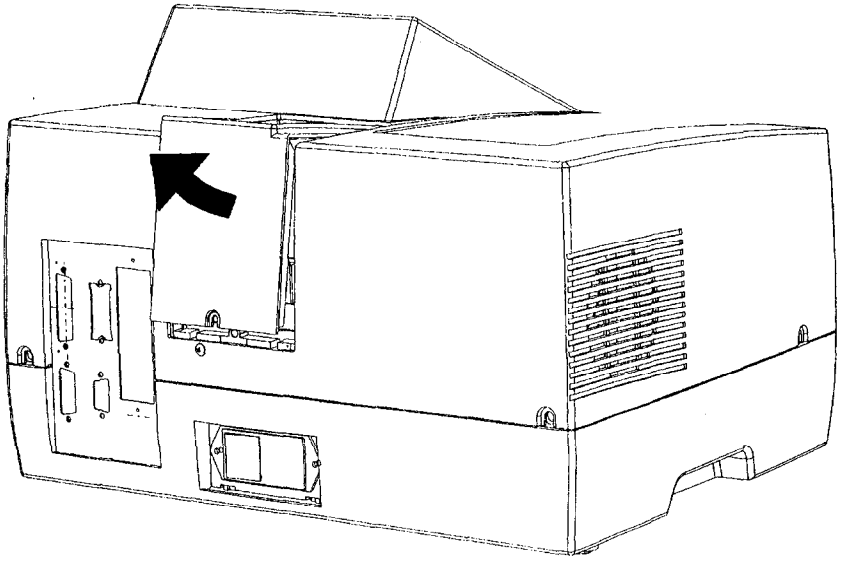


Fig.11.4.4 Removing the light source cover

(3) Slowly extract the D_2 lamp upward and remove it from its socket.

(4) Insert the new D_2 lamp in the socket. Check at that time to see that it is well seated.

(5) Turn ON the power.

(6) Press the (GOTO WL) key and set the wavelength to 250nm.

(7) Check to see that the beam is shining into the monochromator entrance slit properly. The spectrophotometer will automatically make horizontal adjustments. (The center of the beam does not necessarily have to match the center of the slit.) If the lamp has not been replaced properly, the beam may not match with the entrance slit in the vertical direction.

(8) Close the cover of the light source compartment and be sure to tighten the screws. Do not use the unit with the cover of the light source compartment removed.

• Replacing the WI lamp

(1) Press on the parts indicated by the arrows in Figure 11.4.3 on the sides of the light source cover, lift the cover up and release the "catch".

(2) Next, pull the light source cover in the direction of the arrow in Figure 11.4.4 to remove the light source cover.

(3) Remove the WI lamp retainer spring from the end of the top of the WI lamp. Since there is fear of touching the D_2 lamp with your hand at this time, either cover the D_2 lamp with a clean piece of paper or cloth or remove the D_2 lamp before performing this operation. (Refer to "Replacing D_2 Lamp" for the procedure of removing the D_2 lamp.)

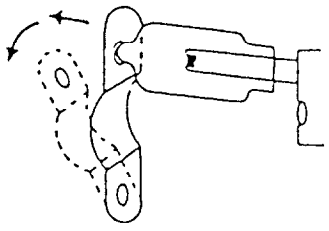


Fig.11.4.5 Removing the WI lamp

(4) Extract the WI lamp from its socket.

(5) Please wear gloves so as not to contaminate the beam port of the WI lamp. Then, holding the new WI lamp so as to grasp it from the top and bottom, insert it into its socket.

(6) Insert the protrusion at the top of the WI lamp into the hole in the retainer spring so that the WI lamp does not fall out.

(7) Reset the previously removed D_2 lamp. Refer to "Replacing D_2 Lamp" for the method of resetting the D_2 lamp.

(8) Turn ON the power.

(9) Check to see that the beam is shining into the monochromator entrance slit properly. The spectrophotometer will automatically make horizontal adjustments. (The center of the beam does not necessarily have to match the center of the slit.) If the lamp has not been replaced properly, the beam may not match with the entrance slit in the vertical direction.

(10) Close the light source compartment cover and be sure to tighten the screws. Do not use the unit with the light source compartment cover removed.

11.5 Replacing Fuses

WARNING **ELECTRICAL SHOCK**

There is possibility of electric shock. Before replacing the fuse, turn OFF the power and remove the power cord.

When the fuse burns out, replace it by the following procedure. Use only the specified fuse.

(1) Turn OFF the power.

(2) Remove the power cord from the power connector.

(3) Use a standard screwdriver to open the cover on the fuse holder, as shown in Figure 11.5.1.

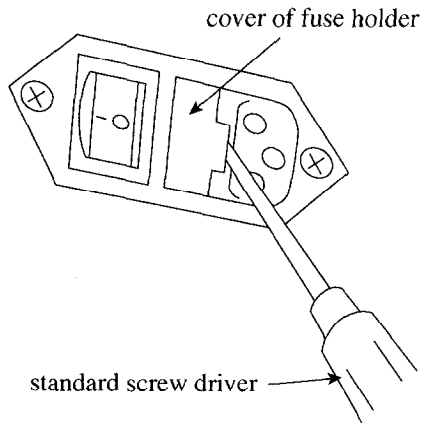


Fig.11.5.1 Opening the fuse holder cover

(4) Pull out the fuse holder, as shown in Figure 11.5.2.

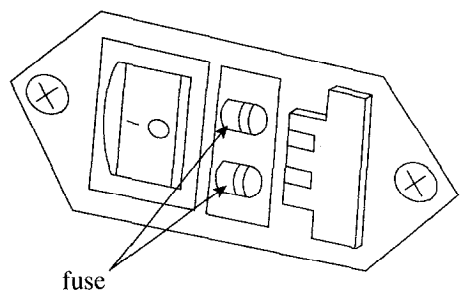


Fig.11.5.2 Interior of fuse holder

(5) Remove the old fuse from the fuse holder and replace it with the new fuse. Of the two fuses, you need only replace the burned out fuse. (If both fuses are burned out, replace both fuses.)

(6) Replace the fuse in the fuse holder.

(7) Close the fuse holder cover until you hear its snap shut.

NOTE After replacing the fuse, turn ON the power switch and check to see that the unit initializes properly.

CAUTION Play attention to the rating and type of the fuse.
Be sure to replace with the fuse of the specified rating and type.
Power supply voltage 100V to 120V: Part No. 072-01652-22
250V 4A T (5 × 20)
Power supply voltage 220V to 240V: Part No. 072-01652-19
250V 2A T (5 × 20)

11.6 List of Consumable Parts, Spare Parts

Part Name	Model	Part No.
Tungsten iodide lamp	55134	062-65005
Deuterium lamp	L-6380	062-65055-05
Cover, sample compartment		206-89180
Cell holder assembly		206-89184-91
Screw, knurl		204-00570
Fuse (for 100V to 120V)	250V 4A T (5 × 20)	072-01652-22
Fuse (for 220V to 240V)	250V 2A T (5 × 20)	072-01652-19
AC power cord (for 100V to 120V)		071-60814-01
AC power cord (for 220V to 240V)		071-60814-05

Chapter 12 Specifications

CONTENTS

12.1 Hardware Specifications 12-1

12.2 Software Specifications 12-2

12.1 Hardware Specifications

Measurement Wavelength Range	190 ~ 1100nm
Spectral Band Width (Resolution)	5nm
Wavelength Display	0.1nm units
Wavelength Setting	0.1nm units (1nm units in scan)
Wavelength Accuracy	± 1.0nm
Wavelength Repeatability	± 0.3nm
Wavelength Scanning Speeds	GOTO WL command : approx. 3800nm/min Wavelength scan : 24 ~ 1400nm/min
Light Source Switching	Automatic switching with wavelength range. Can be set anywhere in the range from 295nm to 364nm by the unit of 1nm. (340nm is recommended.)
Stray Light	Less than 0.05%
Photometric System	Single beam optics
Photometric Range	Absorbance : –0.5 ~ 3.999Abs (when uncorrected baseline curve is within 0.5Abs.) Transmittance : 0 ~ 300%
Recording Range	Absorbance : –3.99 ~ 3.99Abs Transmittance : –399 ~ 399%
Photometric Accuracy	± 0.005Abs (at 1.0Abs) ± 0.003Abs (at 0.5Abs)
Photometric repeatability	± 0.002Abs (at 1.0Abs)
Auto Zero Function	[AUTO ZERO] key enables one-touch setting
Baseline Stability	0.001Abs/h
Baseline Flatness	0.010Abs
Noise Level	0.002Abs (0.0005Abs RMS)
Baseline Correction	Automatic correction using computer memory
Light Source	20W halogen lamp (long-life 2000 hour), Deuterium lamp (socket-type), On-board automatic light source positioning mechanism
Monochromator	Uses concave holographic grating
Detector	Silicon photodiode
LCD	Backlit (320 × 240 dot), Adjustable contrast
Sample Compartment	Interior dimensions 110 × 230 × 105 (mm) (W × D × H) (Partial depth 155mm) Removable type 2-screw attachment Beam dimensions 2 × 7mm (W × H) (at center of accessary cell holder)
Power Supply	100V system (100V to 120V) P/N 206-89175-92 200V system (220V to 240V) P/N 206-89175-38 50/60Hz 160VA
Dimensions	416 × 379 × 274 (mm) (W × D × H)
Weight	11kg
Ambient Temperature	Room temperature 15 ~ 35°C
Ambient Humidity	Humidity 45 ~ 80% (less than 70% at temperature higher than 30°C)

12.2 Software Specifications

Photometric	(1) Fixed wavelength measurement, light measurement mode; T% ABS (2) Quantitation by K factor method (coefficient input) (3) Saving/loading function of table data (4) Automatic printing function and automatic output function to the RS-232C port (5) When the CPS-240 or multi-cell (both options) is used : Sequential measurement up to 6 cells is possible.
Spectrum	(1) Spectrum measurement Measurement mode : ABS ; T%, E Scan speed : Very fast, fast, medium, slow, very slow Repetition times of scan : 1 to 99 Recording method : Overlay/Sequential is selectable. (2) Spectrum data processing function Detection of peaks/valleys (up to 20 for both) Enlarge/Reduce (Reduction is available with the vertical axis only.) Data loading by cursor keys Data saving/loading function (main unit : 6, data pack: 21) (3) Function of transferring spectrum data via RS-232C port to an external PC (4) When ESC/P printer is used: waveform printing of spectrum (A5 size output)
Quantitation	(1) One-wavelength measurement, two-wavelength/three-wavelength measurement (2) Function relating to calibration curve Automatic calculation of concentration by K factor method Automatic calculation of concentration by single point calibration curve method Multi-point calibration curve Number of standard samples (2 to 10) Calibration curve: 1st- to 3rd-order regression calibration curve Selection of the original passing Repetition measurement (1 to 10 times) of standard samples and creation of calibration curve according to its mean measurement value Display of calibration curve formula Display of relative coefficient of calibration curve (3) Measurement Quantitation by repetition measurement (1 to 10 times) and its mean measurement value (4) Saving/loading function of table data (5) Automatic data printing function/Automatic data output function to RS-232C port (6) With the CPS-240 or multi-cell (both options) is in use : Sequential measurement up to six cells is possible.
Shared functions	(1) Selection function of the setting condition after power is turned ON. Stand-by mode can be designated to enter any parameter configuration screen among the Photometric, Spectrum, and Quantitation modes. Also, it can be designated by a parameter file. (2) Backup of the previous measurement conditions (3) Selection function of the number of decimal places The number of decimal places for absorbance can be switched to three digits or four digits. (4) Buzzer ON/OFF function (5) Automatic turning OFF function of LCD (6) Hard copy function of the screen with a printer in use Printing of the date on a hard copy is selectable. (7) External control function The UVmini can be controlled from an external computer. The interface used is the RS-232C. (8) File transfer function Using optional PC file transfer software, sending data files and condition files to PC and receiving them from PC is possible.

Appendix Optional Accessories

CONTENTS

Appendix A Sample Module (Multi-cell, Sipper Operation) Appendix-1
Appendix B Printer Appendix-10
Appendix C List of Cells Appendix-13

Appendix A Sample Module (Multi-cell, Sipper Operation)

When you use a function key to call up the sample control screen from a measurement parameter configuration screen, you can set the measurement parameters for the sample module.
The following accessories are available which can be mounted in place of the standard sample module and operated in synchronization with the main instrument.

1. Multi-cell (Cell holder capable of handling 6 cells.)
2. CPS-240 (6-cell holder with a temperature control function)
3. Sipper 160 (Perform measurements while drawing sample into a flow cell using a pump.)
4. Syringe sipper (Perform measurements while drawing sample into a flow cell using a syringe.)

Refer to the instruction manuals of the accessaries for the instructions for mounting the various accessories.
Note that 8-position, 12-position, and 16-position cells mentioned in the selection items are not optional.

A-1 Multi-cell Sample Compartment (6-position)

This accessory is equipped with max.6 sample cell holders.

The sample cell holders can be moved automatically or by key operations on the spectrophotometer unit.

The cell holders at the front is numbered 1.

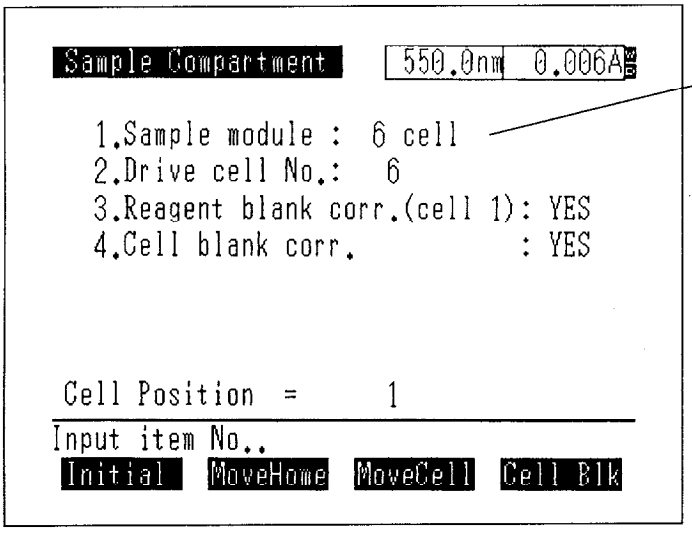


Fig. A.1 Sample control screen (6position multi-cell)

(1) Sample module

Specify the name of the instrument mounted in the sample module. Select the 6-position cell.

The screen of Fig. A.1 is displayed after initialization. Set this to 1 when the standard sample module is used. To initialize the 6-position cell, press [Initial] (F1).

(2) Drive cell No.

Enter the number of cells being measured.

(3) Reagent blank corr. (cell 1)

This indicates that the sample being used as the reagent blank has been placed in the cell position 1.

Enter the [3] key to switch the display between "YES" and "NO".

Refer to "A.5 About the Blank Correction Function" for details about "reagent blank correction".

(4) Cell blank corr.

Set whether or not to perform cell blank correction on the measurement results.

Enter the [4] key to switch the display between "YES" and "NO". If "YES" is set, [Cell BIK](F4) appears.

Refer to "A.5 About the Blank Correction Function" for details about "cell blank correction".

(5) [MoveHome] (F2 key)

This moves cell 1 (the cell inserted into the front-most cell holder) into the measurement light path.

(6) [MoveCell] (F3 key)

This advances the holder one cell. If cell 6 is the cell which is currently in the light path, the holder will move to cell 1 when you press this key.

(7) [Cell Blk] (F4 key)

This acquires absorbance (transmittance) data for the cell which is inserted in the respective cell holder. Cell blank correction subtracts the absorbance acquired at this time from the sample measurement results for each cell. (The two are divided for transmittance.)

When "Cell blank corr." is set to "YES", be sure to perform cell blank correction for the cell being used.

This function operates only when "Cell blank corr." is set to "YES".

NOTE Cells cannot be automatically moved and measured in modes which are accompanied by a spectrum display (Spectrum mode). Press the [MoveCell] (F3) key when you wish to move the cell.

A-2 CPS-240

The CPS-240 is an isothermic cell holder which is used to simultaneously hold the 6 cells at a set temperature through electronic control.

The various settings are the same as for a Multi-cell. Refer to "A.1 Multi-cell Sample Compartment ". Refer to the CPS-240 manual regarding setting the temperature of the CPS-240.

A-3 Sipper 160

This is an accessory that uses a pump to draw liquid sample into a flow cell.

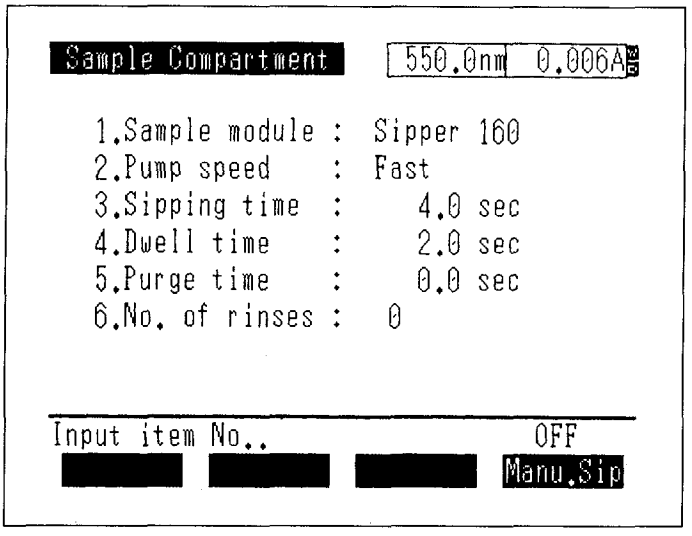


Fig. A.2 Sample control screen (Sipper160)

(1) Sample module

When the sample module setting is Sipper 160, a screen like the one above is displayed.

(2) Pump speed

This indicates the pump rotation speed. The input range is 1 to 4: 1. Fast, 2. Medium, 3. Slow, 4. Halt. Select the 4. Halt when using the electromagnetic valve.

(3) Sipping time

Set the time that the sample will be aspirated. The input range is 0 to 99.9 seconds.

(4) Dwell time

Set the time interval between aspiration of a sample and measurement. The input range is 0 to 99.9 seconds.

(5) Purge time

Set the time after measurement is completed that the sample will be purged. The input range is -99.9 to 99.9 seconds. When set to a negative value, the pump will reverse to purge the sample, In other words, the sample will be discharged from the tube through which it was aspirated.

(6) No. of rinses

Set the number of times that the inside of the flow cell will be rinsed before measurement. The sip- purge operation will be repeated the number of times set here. Measurement is not performed during this operation.

(7) [Manu.Sip] (F4 key)

This key switches the manual suction function ON/OFF. Each time you press this key, the function toggles between ON ⟷ OFF. Manual sipping draws the sample while the sipper lever is pressed, regardless of the sipping time setting, and no measurement is performed.

* When using the auto sample changer ASC-5 (optional) for link measurement, refer to the manual for ASC-5.

A-4 Syringe Sipper

This is an accessory to sip the liquid sample to the flow cell using the syringe.

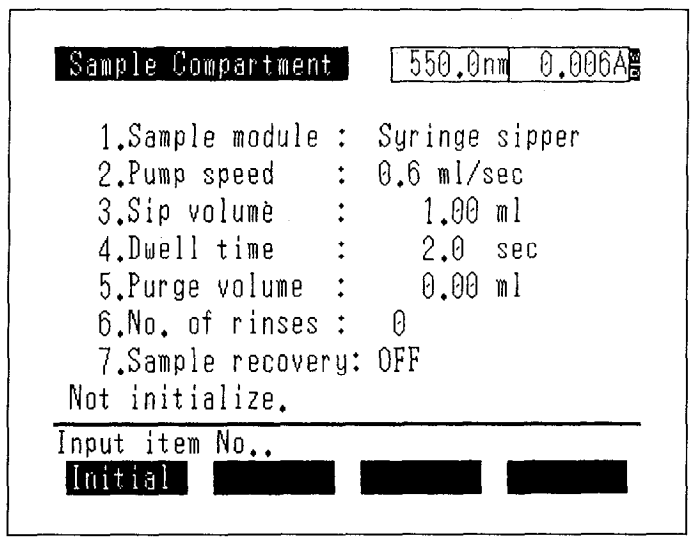


Fig. A.3 Sample control screen (syringe sipper)

Initial Initialize

When the unit is connected after turning ON the power, the accessories must be initialized with F1 key. If they have not been initialized, the set capacity of sample may not be sipped or drained.

(1) Sample module

When the sample module is set to " Syringe Sipper," a screen like the one above is displayed.

(2) Pump speed

Select the pump operating speed from four steps: 1.2, 0.6, 0.3, 0.2 or 0.1 ml/sec.

(3) Sip volume

Set the sample sipping volume in the unit of ml. Input range is 0.00 to 10.00 ml.

(4) Dwell time

Set the time from sample sipping to measurement start in the unit of second. Input range is 0.00 to 9.99 sec.

(5) Purge volume

Set the sample purge volume after measurement in the unit of ml. Input range is 0.00 to 10.00 ml.

(6) No. of rinses

Set the number of times that the inside of the flow cell will be rinsed before measurement. The sip and purge operation will be repeated the number of times set here. Measurement is not performed during this operation. Input range is 0 to 4 times.

(7) Sample recovery

Select the direction to which the sample is purged after measurement, the drain nozzle side or the sipping nozzle side.

The [7] key is used to toggle Return (ON) and Discharge (OFF).

A-5 About the Blank Correction Function

The blank correction functions included in modes in which a multi-cell or CPS-240 are available in [SmplCntl] are used in the following instances.

1. Reagent blank correction

Using the sample placed in cell position 1 as a blank, the cells in the other positions (2-6) are measured. In other words, after the samples in cell positions 2 through 6 have been measured, the measured value for the sample in cell position 1 is subtracted from the various measured values.

Because of this, even if time changes occur in the blank sample or drift develops due to the increasing temperature of the instrument, accurate data can be acquired by canceling these fluctuating factors.

2. Cell blank correction

Even though cells are constructed in the same manner, there are naturally going to be slight optical differences. In cell blank correction, at first blank samples are placed in a square cells and the measured values in that condition are recorded. Then, when an unknown sample is measured and those results are displayed, the previously recorded blank measured value is canceled from the various measurement results. Thus, the measured value of only the sample is obtained.

If both of these two blank correction functions are functioning, the measured value for the other cells can be corrected with the sample in cell 1 as the reagent blank, while also performing a cell blank for each individual cell.

Blank correction is one type of data processing and is calculated as subtraction for absorbance and division for transmittance.

Note that the standard measurement modes in which the blank correction function can be used are the Photometric mode and Quantitation mode. This function cannot be used in the Spectrum mode.

Table A.1 Blank Correction List

	Cell Position		Cell blank corr.=NO Reag blank corr.=NO	Cell blank corr.=NO Reag blank corr.=YES	Cell blank corr.=YES Reag blank corr.=NO	Cell blankcorr.=YES Reag blank corr.=YES
Output Data	Cell n (n=2-6)	ABS	An	An-A_I	An-an	(An-an)-(A_I-a_I)
		T%	Tn	Tn/T_I×100(%)	Tn/t_n×100(%)	Tn·t_I/t_n/·T_I×100(%)
	Cell 1 (Cell used as reagent blank)	ABS	A_I	Photometric :A_I Quantitation :A_I-a_I	A_I-a_I	Photomeetric :A_I-a_I Quantitation :(A_I-a_I)-(A_I-a_I)
		T%	T_I	T_I	T_I/t_I ×100(%)	T_I/t_I×100(%)

Wherein,

An: Absorbance with no blank correction on cell n

Tn: Transmittance with no blank correction on cell n

an: Cell blank value for cell n (absorbance)

n: Cell blank value for cell n (transmittance)

NOTE The range over which correction can be performed, due to internal data processing calculation restrictions, are up to 399.9% for transmittance and down to -0.602Abs for absorbance.

When a blank correction function is working, accurate data are obtained only when an actual measurement operation has been performed (when the [START/STOP] key has been pressed). Please note that the value displayed in the upper right corner of the sample control screen or measuring mode, which indicates the current value, displays the uncorrected value.

Appendix B Printer

NOTE Refer to the printer's user's manual for detailed operation of the printer.

This section explains how to connect the printer to the UVmini-1240 using thermal printer the HCP-1C as an example. The explanation given here is also applicable to the printers which conforms to ESC/P except selection items in step 7.

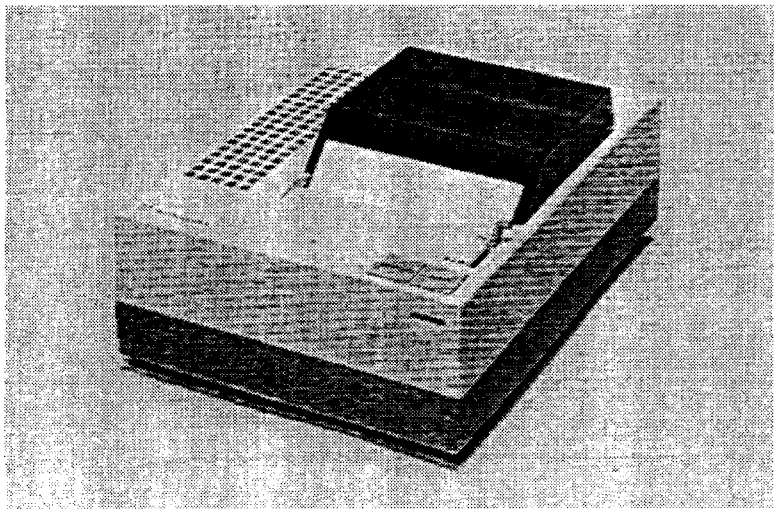


Fig.B.1 Thermal printer

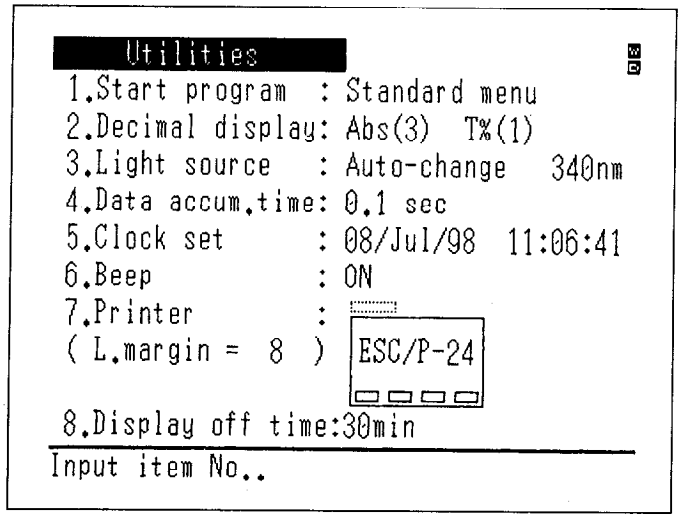
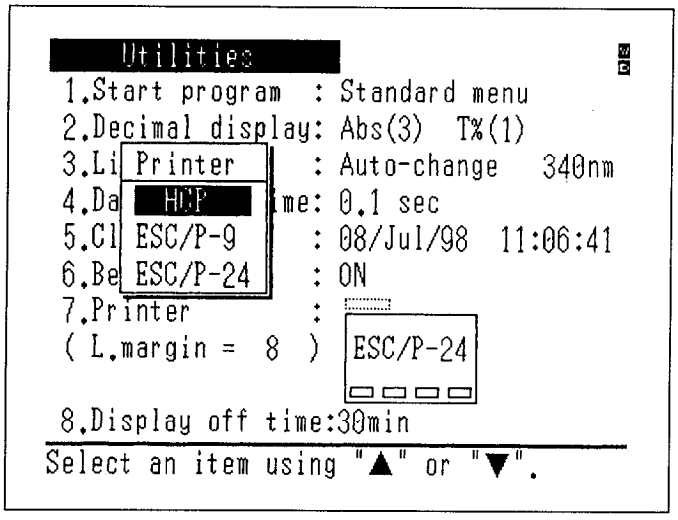
B.1 Installation Procedure

The HCP-1C and the UVmini-1240 are connected using thel printer cable included with the printer. For connecting a ESC/P type printer, the special printer cable (088-50904-20) is required.

Table B.1 Printer Installation Procedure

Step	Operation, Monitor Display	Key Operation
1	Return to the Top Menu.	Press the [RETURN] key until the screen stops changing.
2	Mode Menu 550.0nm 0.007A 1.Photometric 2.Spectrum 3.Quantitation 4.Optional Program Pack 5.Utilities Input item No., Params IC Card FileTrns PC Ctrl	

* continued

Step	Operation, Monitor Display	Key Operation
3	Select "5. Utilities"	[5]
4		
5	Select "7. Printer"	[7]
6		
7	Select "HCP"	[△] or [▽]

(1) Hard copy of screen : A hard copy of the screen will be printed when you press the [PRINT] key.

(2) Print using function key: When the function keys are assigned a [PRINT] function as in modes in which the measurement results are recorded in table format, as in Photometrics, all of the table data will be printed.

(3) Print numeric data for each measurement: When the measurement results are obtained in the form of numeric values, as in Photometrics, the measurement results will be automatically printed if the printer is simply connected to the unit.

(4) To feed paper: Press the [ON LINE] key on the printer to turn the on line display OFF. Then press the [FEED] key.
After using this, press the [ON LINE] key again to turn the on line display back ON.

Appendix C List of Cells

Table C.1 List of Optional Cells

Name		Shape	Quartz (S cell)	Glass (G cell)	Q'ty	Special holder
Square cell, optical length 10mm		A	200-34442	200-34565	1	Not required
Square cell, matching type		A	201-98716	201-98746	2/set	Not required
Sealed-type square cell, optical length 10mm		B	200-34444	200-34444-01	1	Not required
Semi microcell,optical length 10mm required sample volume 1.0m*l* or more		C	200-66501	200-66501-01	1	Not required
Semi microcell, optical length 10mm required sample volume 1.0m*l* or more		D	200-66551	200-66579-12	1	Not required
Super-micro black cell, with 10mm optical path and required sample volume of 100μL or more		K	200-66578-11		1	Super-micro cell holder (206-14334-01) req'd
Micro black cell, with 10mm opti-cal path and required sam-ple volume of 100μl more		L	200-66578-12		1	Super-micro cell hold(206-14334-01) req'd
Cylindrical cell (OD 25μ") (ID 22μ")	L(Optical.length) = 10mm		200-34448 (quartz window)	200-34448-01 (glass window)	1	Cylindrical cell holder (204-06216) req'd
	l =20mm		200-34472 (quartz window)	200-34472-01 (glass window)	1	
	l =50mm		200-34473-01 (quartz window)	200-34473-03 (glass window)	1	
	l = 100mm		200-34473-02 (quartz window)	200-34473-04 (glass window)	1	
Square long absorption cell	*l* =20mm	G	200-34446	200-34446-01	1	Long-path rectangular cell holder (204-23118-01) req'd
	l = 50mm		200-34944	200-34944-01	1	
Short optical lentth cell *l* = 5mm	*l* =1mm	H	200-34660-01	200-34662-01	1	Short optical lentth celi spacer re'd.
	l =2mm		200-34655	200-34662-11	1	
			200-34449	200-34449-01	1	
Spacer for short optical length cell K	for 1mm	J	204-21473-03		1	Not required
	for 2mm		204-21473-01		1	
	for 5mm		204-21473-02		1	

Nomenclature	Optical length	Shape	Quartz cell (S cell)	Capacity	Optical width of cell	Special holder	Remarks
Flow cell	L=10mm	I	200-34670	1.5mL	4 × 36	Not req'd, but front plate with hole req'd	For general use,without tubes
Flow cell for Syringe Sipper	L=10mm	P	22092618	33μL	ϕ2 × 10	Not required	include tubes

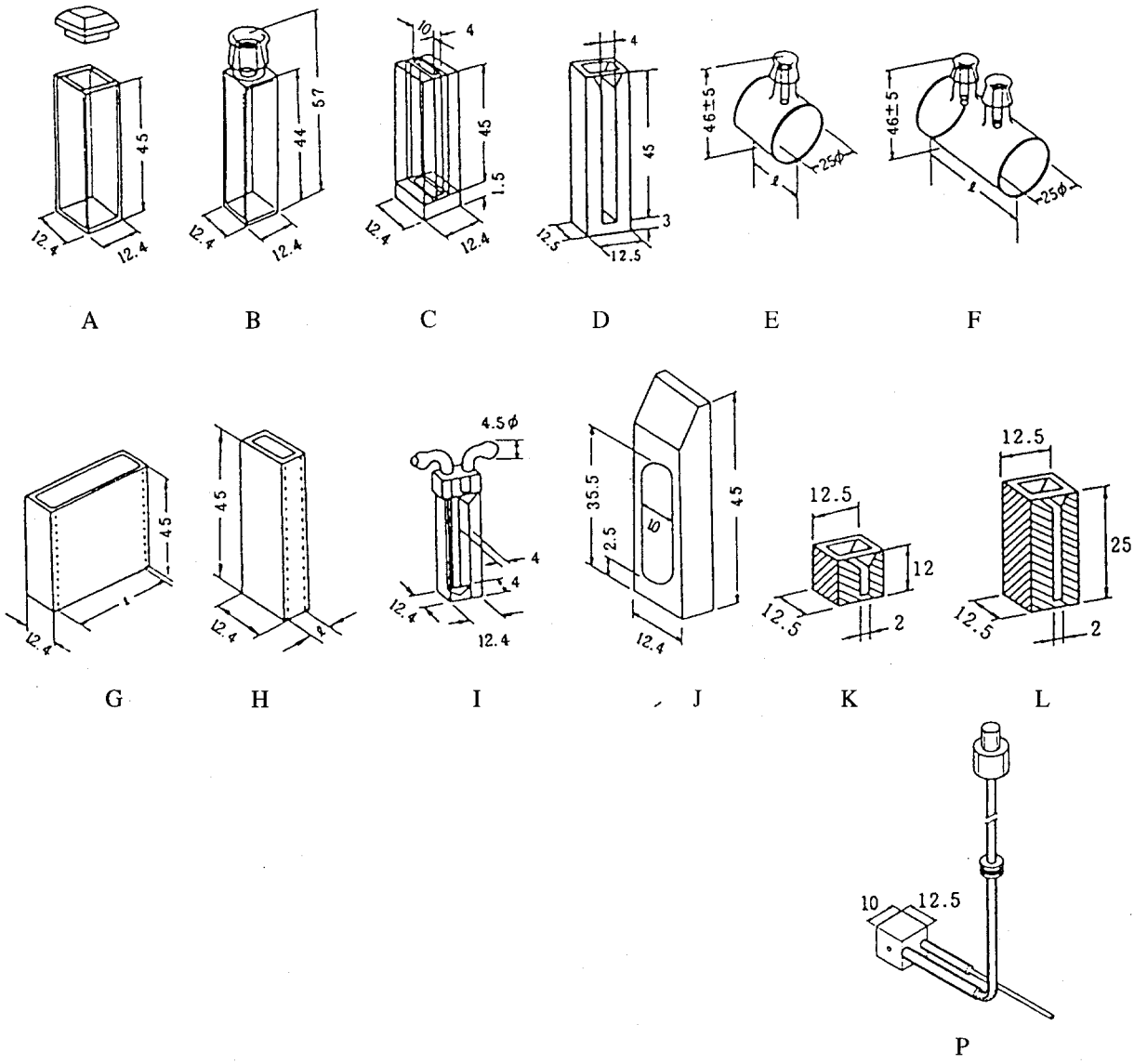


Fig. C.1 Optional Cell Shapes

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